ARTIFICIAL INTELLIGENCE
CLASS -X
2024-25

KVS RO BENGALURU

Study support material

2024

OUR PATRONS

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SUBJECT COORDINATOR:
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SUBJECT EXPERTS

Part A

1. Communication Skills- Mr. S S Mani

2. Self Management Skills- Mrs. Sonam Dutta

3. ICT Skills- Mrs. Pooja Khare

4. Entrepreneurial Skills- Mrs. Jyotirmaya

5. Green Skills- Mrs. Uma Tiwari

Part- B

1. Introduction to AI- Mr. Vimal Sharma, Mr. Sunil Kumar T

2. AI project cycle- Mrs H R Puttalakshmi

3. Neural Networks - Mrs. Uma Tiwari

4. Data Science- Mr. Jitendra Sharma

5. Computer Vision- Mrs Laxmi P

6. Natural Language Processing- Mrs. Sharada B

7. Evaluation - Mrs. Monika Khasa

8. Introduction of Python- Mr.Dilip Singh

9. Practical programs & Project- Mr. Srikanth Goud

10. Sample Paper1- Mrs Neha Pathak

11. Sample Paper2- Mrs Sumitha

12. Sample Paper3- Mr. Sunil C K

Review Committee

Mr. Amit Kumar

Mrs. Anshu Jain

Mrs Aruna D Ekanath

Table of Content

ARTIFICIAL INTELLIGENCE (SUBJECT CODE 417)
CLASS – X (SESSION 2024-25)
Total Marks: 100 (Theory-50 + Practical-50)

	UNITS	NO. OF HOURS for Theory and Practical	MAX. MARKS for Theory and Practical
PART A	**Employability Skills**		
	Unit 1: Communication Skills-II	10	2
	Unit 2: Self-Management Skills-II	10	2
	Unit 3: ICT Skills-II	10	2
	Unit 4: Entrepreneurial Skills-II	15	2
	Unit 5: Green Skills-II	05	2
	Total	**50**	**10**
PART B	**Subject Specific Skills**		
	Unit 1: Introduction to Artificial Intelligence (AI)		7
	Unit 2: AI Project Cycle		9
	Unit 3: Advance Python *(To be assessed in Practicals only)*		--
	Unit 4: Data Science (Introduction, Applications of Data Sciences, Data Science: Getting Started (up to Data Access), *remaining portion is to be assessed in practical*		4
	Unit 5: Computer Vision (Introduction, Applications of Computer Vision, Computer Vision: Getting Started (up to RGB Images), *remaining portion is to be assessed in practical*		4
	Unit 6: Natural Language Processing		8
	Unit 7: Evaluation		8
	Total		**40**
PART C	**Practical Work:**		
	Practical File with minimum 15 Programs		15
	Practical Examination		5
	• Unit 3: Advance Python		5
	• Unit 4: Data Science		5
	• Unit 5: Computer Vision		
	Viva Voce		5
	Total		**35**
PART D	Project Work / Field Visit / Student Portfolio (Any one to be done)		10
	Viva Voce		5
	Total		**15**
	GRAND TOTAL	**200**	**100**

DETAILED CURRICULUM/TOPICS FOR CLASS X

Part-A: EMPLOYABILITY SKILLS

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills-II	10
2.	Unit 2: Self-management Skills-II	10
3.	Unit 3: Information and Communication Technology Skills-II	10
4.	Unit 4: Entrepreneurial Skills-II	15
5.	Unit 5: Green Skills-II	05
	TOTAL	**50**

<u>Note:</u> The detailed curriculum/ topics to be covered under Part A: Employability Skills can be downloaded from CBSE website

Part-B – SUBJECT SPECIFIC SKILLS

- ❖ Unit 1: Introduction to Artificial Intelligence (AI)
- ❖ Unit 2: AI Project Cycle
- ❖ Unit 3: Advance Python
- ❖ Unit 4: Data Science
- ❖ Unit 5: Computer Vision
- ❖ Unit 6: Natural Language Processing
- ❖ Unit 7: Evaluation

UNIT 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Foundational concepts of AI	Understand the concept of human intelligence and its various components such as reasoning, problem-solving, and creativity	**Session**: What is Intelligence?
		Session: Decision Making. ● How do you make decisions? ● Make your choices!
		Session: what is Artificial Intelligence and what is not?

Basics of AI: Let's Get Started	Understand the concept of Artificial Intelligence (AI) and its domains	**Session**: Introduction to AI and related terminologies.
		● Introducing AI, ML & DL.
		● Introduction to AI Domains (Data Sciences, CV & NLP)
		● Gamified tools for each domain-
		   o Data Sciences- Impact Filter (Impact of rise in temperature on different species) https://artsexperiments.withgoogle.com/impactfilter/
		   o CV- Autodraw (It pairs machine learning with drawings from talented artists to help you draw stuff fast.) https://www.autodraw.com/

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
		o NLP- Wordtune (AI writing tool that rewrites, rephrases, and rewords your writing) https://www.wordtune.com/
	Explore the use of AI in real Life.	**Session:** Applications of AI – A look at Real-life AI implementations
	Learn about the ethical concerns involved in AI development, such as AI bias, data privacy and how they can be addressed.	**Session:** AI Ethics ● Moral Machine Activity : a platform for gathering a human perspective on moral decisions made by machine intelligence, such as self-driving cars. http://moralmachine.mit.edu/

UNIT 2 : AI PROJECT CYCLE

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Understand the stages involved in the AI project cycle, such as problem scoping, data collection, data exploration, modeling, evaluation.	**Session:** Introduction to AI Project Cycle
Problem Scoping	Learn about the importance of project planning in AI development and how to define project goals and objectives.	**Session:** Understanding Problem Scoping & Sustainable Development Goals
Data Acquisition	Develop an understanding of the importance of data collection in AI and how to choose the right data sources.	**Session:** Simplifying Data Acquisition
Data Exploration	Know various data exploration techniques and its importance	**Session:** Visualising Data
Modelling	Know about the different machine learning algorithms used to train AI models	**Session:** Introduction to modelling ● Introduction to Rule Based & Learning Based AI Approaches ● Activity : Teachable machine to demonstrate Supervised Learning https://teachablemachine.withgoogle.com/ ● Activity : Infinite Drum Machine to demonstrate Unsupervised learning https://experiments.withgoogle.com/ai/drum-machine/view/ ● Introduction to Supervised, Unsupervised & *Reinforcement Learning Models(Optional)*** ● Neural Networks
Evaluation	Know the importance of evaluation and various metrics available for evaluation	**Session:** Evaluating the idea!

UNIT 3 : ADVANCE PYTHON (To be assessed through Practicals)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Recap	Understand to work with Jupyter Notebook, creating virtual environment, installing Python Packages.	**Session:** Jupyter Notebook
	Able to write basic Python programs using fundamental concepts such as variables, data types, operators, and control structures.	**Session:** Introduction to Python
	Able to use Python built-in functions and libraries.	**Session:** Python Basics

UNIT 4: DATA SCIENCES (To be assessed through Theory)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Define the concept of Data Science and understand its applications in various fields.	**Session:** Introduction to Data Science
		Session: Applications of Data Science
Getting Started	Understand the basic concepts of data acquisition, visualization, and exploration.	**Session:** Revisiting AI Project Cycle, Data Collection, Data Access Activities: Game: Rock, Paper & Scissors https://next.rockpaperscissors.ai/

UNIT 4: DATA SCIENCES (To be assessed through Practicals)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Python Packages	Use Python libraries such as NumPy, Pandas, and Matplotlib for data analysis and visualization.	**Session**: Python for Data Sciences • Numpy • Pandas • Matplotlib
Concepts of Data Sciences	Understand the basic concepts of statistics, such as mean, median, mode, and standard deviation, and apply them to analyze data using various Python packages.	**Session:** Statistical Learning & Data Visualisation
K-nearest neighbour model (Optional)**	*Understand the basic concepts of the KNN algorithm and its applications in supervised learning.*	*Activity: Personality Prediction (Optional)***
		Session: Understanding K-nearest neighbour model (Optional)**

UNIT 5: COMPUTER VISION (To be assessed through Theory)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Define the concept of Computer Vision and understand its applications in various fields.	**Session:** Introduction to Computer Vision
		Session: Applications of CV
Concepts of Computer Vision	Understand the basic concepts of image representation, feature extraction, object detection, and segmentation.	**Session:** Understanding CV Concepts ● Computer Vision Tasks ● Basics of Images-Pixel, Resolution, Pixel value ● Grayscale and RGB images
		Activities: ● Game- Emoji Scavenger Hunt https://emojiscavengerhunt.withgoogle.com/ ● RGB Calculator: https://www.w3schools.com/colors/colors_rgb.asp ● Create your own pixel art: www.piskelapp.com ● Create your own convolutions: http://setosa.io/ev/image-kernels/

UNIT 5: COMPUTER VISION (To be assessed through Practicals)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
OpenCV	Use Python libraries such as OpenCV for basic image processing and computer vision tasks.	**Session:** Introduction to OpenCV
		Hands-on: Image Processing
Convolution Operator (Optional)**	*Apply the convolution operator to process images and extract useful features.*	*Session: Understanding Convolution operator (Optional)***
		Activity: Convolution Operator (Optional)**
Convolution Neural Network (Optional)**	*Understand the basic architecture of a CNN and its applications in computer vision and image recognition.*	*Session: Introduction to CNN (Optional)***
		Session: Understanding CNN (Optional)** ● *Kernel* ● *Layers of CNN*
		Activity: Testing CNN (Optional)**

UNIT 6: NATURAL LANGUAGE PROCESSING

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Understand the concept of Natural Language Processing (NLP) and its importance in the field of Artificial Intelligence (AI).	**Session:** Introduction to Natural Language Processing Activity : Use of Google Translate for same spelling words
		Session: NLP Applications
		Session: Revisiting AI Project Cycle
Chatbots	Explore the various applications of NLP in everyday life, such as chatbots, sentiment analysis, and automatic summarization	**Activity:** Introduction to Chatbots
Language Differences	Gain an understanding of the challenges involved in understanding human language by machine.	**Session:** Human Language VS Computer Language
Concepts of Natural Language Processing	Learn about the Text Normalization technique used in NLP and popular NLP model - Bag-of-Words	**Session: Data Processing** • Text Normalisation • Bag of Words **Hands-on:** Text processing ● Data Processing ● Bag of Words ● *TFIDF (Optional)*** ● *NLTK (Optional)***

UNIT 7: EVALUATION

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Understand the role of evaluation in the development and implementation of AI systems.	**Session:** Introduction to Model Evaluation ● What is Evaluation? ● Different types of Evaluation techniques- Underfit, Perfect Fit, OverFit
Model Evaluation Terminology	Learn various Model Evaluation Terminologies	**Session:** Model Evaluation Terminologies ● The Scenario - Prediction, Reality, True Positive, True Negative, False Positive, False Negative ● Confusion Matrix ● Activity- to make a confusion matrix based on data given for Containment Zone Prediction Model
Confusion Matrix	Learn to make a confusion matrix for given Scenario	**Session & Activity:** Confusion Matrix
Evaluation Methods	Learn about the different types of evaluation techniques in AI, such as Accuracy, Precision, Recall and F1 Score, and their significance.	**Session:** Evaluation Methods ● Accuracy ● Precision ● Recall ● Which Metric is Important? - Precision or Recall ● F1 Score
		Activity: Practice Evaluation

PART-C: PRACTICAL WORK

Suggested Programs List	- Write a program to add the elements of the two lists. - Write a program to calculate mean, median and mode using Numpy - Write a program to display line chart from (2,5) to (9,10). - Write a program to display a scatter chart for the following points (2,5), (9,10),(8,3),(5,7),(6,18). - Read csv file saved in your system and display 10 rows. - Read csv file saved in your system and display its information - Write a program to read an image and display using Python - Write a program to read an image and identify its shape using Python
Important Links	- https://cbseacademic.nic.in/web_material/Curriculum21/publication/secondary/Class10_Facilitator_Handbook.pdf - Link to AI Activities & Jupyter Notebooks (including sample projects) https://bit.ly/class_X_activities_jupyter_notebooks

PART-D: Project Work / Field Visit / Student Portfolio
 * relate it to Sustainable Development Goals
 Suggested Projects/ Field Visit / Portfolio (any one activity to be one)

Sample Projects	1. Student Marks Prediction Model 2. CNN Model on Smoke and Fire Detection
Field Work	Students' participation in the following- - AI for Youth Bootcamp - AI Fests/ Exhibition - Participation in any AI training sessions - Virtual tours of companies using AI to get acquainted with real-life usage
Student Portfolio (to be continued from class IX)	- Maintaining a record of all AI activities - Hackathons - Competitions (CBSE/Interschool) Note: Portfolio should contain minimum 5 activities

**NOTE: Optional components shall not be assessed. They are for extra knowledge

LIST OF ITEMS/ EQUIPMENTS (MINIMUM REQUIREMENTS):

The equipment / materials listed below are required to conduct effective hands-on learning sessions while delivering the AI curriculum to class 10 students. The list below consists of minimal configuration required to execute the AI curriculum for class 10 and create social impact real time solutions/ projects. The quantities mentioned here are recommended for a batch of 20 students keeping the human-machine ratio as 2:1. An exhaustive list may be compiled by the teacher(s) teaching the subject.

S. NO.	ITEM NAME, DESCRIPTION & SPECIFICATION
A	**SYSTEM SPECIFICATIONS**
1	Processor: Intel® Core™ i5-7300U Processor or equivalent with minimum SYSmark® 2018 Rating of 750 or higher
2	Graphic Card: Integrated graphics
3	Form Factor: - USFF (Ultra Small Form factor) System chassis volume less than One Litre
4	RAM: 8GB DDR4 – 2400MHz or above
5	Storage: 500 GB HDD – 7200 rpm
6	Display: 18.5" LED Monitor with HDMI, in-built-speaker,
7	Keyboard: Keyboard with numerical keypad (recommended)
8	Mouse: Optical Mouse
9	Webcam: Full HD Camera
10	Headphones with Mic
11	Dual Band Wireless Connectivity Min 800 Mbps
12	Bluetooth V4.2 or Higher
13	Ports: 4 USB 3.0 ports, dual high-definition display ports (HDMI 2.0/DP/thunderbolt 3.0 ports), High definition 8-channel audio through HDMI interface or through audio jack.
14	VPU: - Integrated or support for VPU - vision processing unit to accelerate AI machine vision applications.
B	**SOFTWARE SPECIFICATIONS**
1	Operating System: Any
2	Anti-Virus Activated
3	Internet Browser: Google Chrome
4	Productivity Suite: Any (Google+ Suite recommended)
5	Anaconda Navigator Distribution (https://bit.ly/AI-installation-guide)
6	Conceptual installations (https://bit.ly/AI-installation-guide)
7	Intel Open VINO tools
8	Python

NOTE: In keeping with the spirit of Recycle, Upcycle and Reuse, it is recommended to make use of any equipment/ devices/ accessories from the existing inventory in school.

TEACHER'S/ TRAINER'S QUALIFICATIONS:

Qualification and other requirements for appointment of teachers/trainers for teaching this subject, on contractual basis should be decided by the State/ UT. The suggestive qualifications and minimum competencies for the teacher should be as follows:

Qualification	Minimum Competencies	Age Limit
Diploma in Computer Science/ Information Technology **OR** Bachelor's Degree in Computer Applications/ Science/ Information Technology (BCA, B. Sc. Computer Science/ Information Technology) **OR** Graduate with PGDCA **OR** DOEACC A Level Certificate. The suggested qualification is the minimum criteria. However higher qualifications will also be acceptable.	• The candidate should have a minimum of 1 year of work experience in the same job role. • S/He should be able to communicate in English and local language. • S/He should have knowledge of equipment, tools, material, Safety, Health & Hygiene.	• 18-37 years (as on Jan. 01 (year)) • Age relaxation to be provided as per Govt. rules

Teachers/Trainers form the backbone of Skill (Vocational) Education being imparted as an integral part of Rashtriya Madhyamik Shiksha *Abhiyan* (RMSA). They are directly involved in teaching of Skill (vocational) subjects and also serve as a link between the industry and the schools for arranging industry visits, On-the-Job Training (OJT) and placement.

These guidelines have been prepared with an aim to help and guide the States in engaging quality Teachers/Trainers in the schools. Various parameters that need to be looked into while engaging the Vocational Teachers/Trainers are mode and procedure of selection of Teachers/ Trainers, Educational Qualifications, Industry Experience, and Certification/ Accreditation.

The State may engage Teachers/Trainers in schools approved under the component of scheme of Vocationalisation of Secondary and Higher Secondary Education under RMSA in following ways:

(i) Directly as per the prescribed qualifications and industry experience suggested by the PSS Central Institute of Vocational Education (PSSCIVE), NCERT or the respective Sector Skill Council (SSC).

OR

(ii) Through accredited Vocational Training Providers accredited under the National Quality Assurance Framework (NQAF*) approved by the National Skill Qualification Committee on 21.07.2016. If the State is engaging Vocational Teachers/Trainers through the Vocational Training Provider (VTP), it should ensure that VTP should have been accredited at NQAF Level 2 or higher.

* The National Quality Assurance Framework (NQAF) provides the benchmarks or quality criteria which the different organizations involved in education and training must meet in order to be accredited by competent bodies to provide government- funded education and training/skills activities. This is applicable to all organizations offering NSQF-compliant qualifications.

The educational qualifications required for being a Teacher/Trainer for a particular job role are clearly mentioned in the curriculum for the particular NSQF compliant job role. The State should ensure that teachers/ trainers deployed in the schools have relevant technical competencies for the NSQF qualification being delivered. Teachers/Trainers preferably should be certified by the concerned Sector Skill Council for the particular Qualification Pack/Job role which he will be teaching. Copies of relevant certificates and/or record of experience of the teacher/trainer in the industry should be kept as record.

To ensure the quality of the Teachers/Trainers, the State should ensure that a standardized procedure for selection of (Vocational) Teachers/Trainers is followed. The selection procedure should consist of the following:

(i) Written test for the technical/domain specific knowledge related to the sector;
(ii) Interview for assessing the knowledge, interests and aptitude of trainer through a panel of experts from the field and state representatives; and
(iii) Practical test/mock test in classroom/workshop/laboratory.

In case of appointment through VTPs, the selection may be done based on the above procedure by a committee having representatives of both the State Government and the VTP.

The State should ensure that the Teachers/ Trainers who are recruited should undergo induction training of 20 days for understanding the scheme, NSQF framework and Vocational Pedagogy before being deployed in the schools.

The State should ensure that the existing trainers undergo in-service training of 5 days every year to make them aware of the relevant and new techniques/approaches in their sector and understand the latest trends and policy reforms in vocational education.

The Headmaster/Principal of the school where the scheme is being implemented should facilitate and ensure that the (Vocational) Teachers/Trainers:

- Prepare session plans and deliver sessions which have a clear and relevant purpose, and which engage the students;
- Deliver education and training activities to students, based on the curriculum to achieve the learning outcomes;
- Make effective use of learning aids and ICT tools during the classroom sessions;
- Engage students in learning activities, which include a mix of different methodologies, such as project-based work, teamwork, practical and simulation-based learning experiences;
- Work with the institution's management to organise skill demonstrations, site visits, on-job trainings, and presentations for students in cooperation with industry, enterprises and other workplaces;
- Identify the weaknesses of students and assist them in up-gradation of competency;
- Cater to different learning styles and level of ability of students;
- Assess the learning needs and abilities, when working with students with different abilities
- Identify any additional support the student may need and help to make special arrangements for that support;
- Provide placement assistance

Assessment and evaluation of (Vocational) Teachers/Trainers is very critical for making them aware of their performance and for suggesting corrective actions. The States/UTs should ensure that the performance of the (Vocational) Teachers/Trainers is appraised annually. Performance based appraisal in relation to certain pre-established criteria and objectives should be done periodically to ensure the quality of the (Vocational) Teachers/Trainers.

Following parameters may be considered during the appraisal process:
- Participation in guidance and counseling activities conducted at Institutional, District and State level;
- Adoption of innovative teaching and training methods;
- Improvement in result of vocational students of Class X or Class XII;
- Continuous up-gradation of knowledge and skills related to the vocational pedagogy, communication skills and vocational subject;
- Membership of professional society at District, State, Regional, National and International level;
- Development of teaching-learning materials in the subject area;
- Efforts made in developing linkages with the Industry/Establishments;
- Efforts made towards involving the local community in Vocational Education
- Publication of papers in National and International Journals;
- Organisation of activities for promotion of vocational subjects;
- Involvement in placement of students/student support services.

Employability Skills

UNIT 1 : Communication Skills

Link from CBSE Website (Curriculum) :

https://cbseacademic.nic.in/web_material/Curriculum25/sec/EmployabilitySkills_X.pdf

LEARNING OUTCOMES	THEORY	PRACTICAL
1. Demonstrate knowledge of various methods of communication	1. Methods of communication - Verbal - Non-verbal - Visual	1. Writing pros and cons of written, verbal and non-verbal communication 2. Listing do's and don'ts for avoiding common body language mistakes
2. Provide descriptive and specific feedback	1. Communication cycle and importance of feedback 2. Meaning and importance of feedback 3. Descriptive feedback - written comments or conversations 4. Specific and non-specific feedback	1. Constructing sentences for providing descriptive and specific feedback
3. Apply measures to overcome barriers in communication	1. Barriers to effective communication – types and factors 2. Measures to overcome barriers in effective communication	1. Enlisting barriers to effective communication 2. Applying measures to overcome barriers in communication
4. Apply principles of communication	1. Principles of effective communication 2. 7 Cs of effective communication	1. Constructing sentences that convey all facts required by the receiver 2. Expressing in a manner that shows respect to the receiver of the message 3. Exercises and games on applying 7Cs of effective communication
5. Demonstrate basic writing skills	1. Writing skills to the following: - Sentence - Phrase - Kinds of Sentences - Parts of Sentence - Parts of Speech - Articles - Construction of a Paragraph	1. Demonstration and practice of writing sentences and paragraphs on topics related to the subject

Communication is the act of giving, receiving, and sharing information -- in other words, talking or writing, and listening or reading. Good communicators listen carefully, speak or write clearly, and respect different opinions.

Communication is defined as the imparting or exchanging of information by speaking, writing, or using some other medium

Communication skills allow you to understand and be understood by others. These can include but are not limited to effectively communicating ideas to others, actively listening in conversations, giving, and receiving critical feedback and public speaking.

Communication skills involve listening, speaking, observing, and empathizing. It is also helpful to understand the differences in how to communicate through face-to-face interactions, phone conversations, and digital communications like email and social media.

Communication helps people to know each other better. It helps in removing misunderstanding and certain meaning clarity of thought. Communication in any form written, oral, formal informal, visual, interpersonal, intrapersonal help in educating people and connecting them better.

The word 'communication' comes from the Latin word: commūnicāre, meaning 'to share'.

Communication Skills

Communication has three important parts:

1. Transmitting — The sender transmits the message through one medium or another.
2. Listening — The receiver listens or understands the message.
3. Feedback — The receiver conveys their understanding of the message to the sender in the form of feedback to complete the communication cycle.

Communication Process and Elements

Let us see the process of communication in detail.
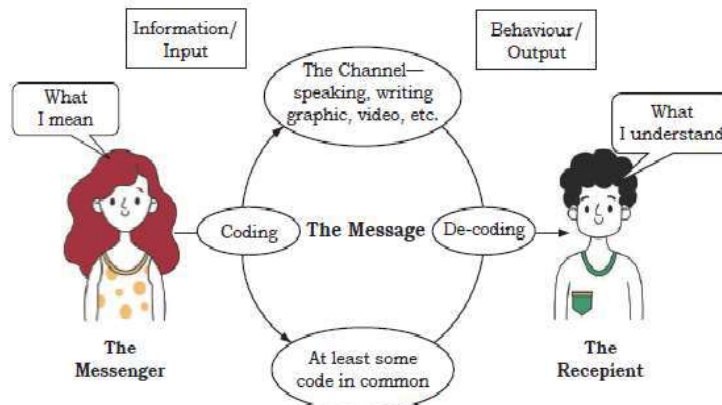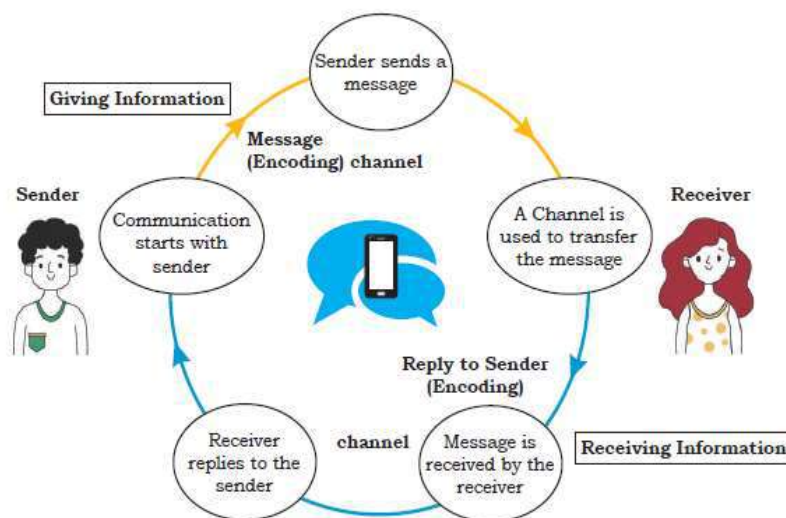
Fig. 1.1: Communication Process

Figure 1.2: Elements of Communication

Session 2 – Verbal Communication:

Verbal communication includes sounds, words, language, and speech. Speaking is one of the most effective and commonly used way of communicating. It helps in expressing our emotions in words. By improving your verbal communication skills, you will build rapport, and have a better connect.

Type of Verbal Communication	Examples	
Interpersonal Communication	This form of communication takes place between two individuals and is thus a one-on-one conversation. It can be formal or informal. *Examples* 1. A manager discussing the performance with an employee. 2. Two friends discussing homework. 3. Two people talking to each other over phone or video call.	
Written Communication	This form of communication involves writing words. It can be letters, circulars, reports, manuals, SMS, social media chats, etc. It can be between two or more people. *Examples* 1. A manager writing an appreciation e-mail to an employee. 2. Writing a letter to grandmother enquiring about health.	
Small Group Communication	This type of communication takes place when there are more than two people involved. Each participant can interact and converse with the rest. *Examples* 1. Press conferences 2. Board meetings 3. Team meetings	
Public Communication	This type of communication takes place when one individual addresses a large gathering. *Examples* 1. Election campaigns 2. Public speeches by dignitaries	

Advantages of Verbal Communication:

- It is an easy mode of communication in which you can exchange ideas by saying what you want and get a quick response.

- It enables you to keep changing your interaction as per the other person's response.

Disadvantages of Verbal Communication:

- Since verbal communication depends on written or spoken words, sometimes the meanings can be confusing and difficult to understand if the right words are not used.

Session 3 – Non-Verbal Communication:

Non-verbal communication is the expression or exchange of information or messages without using any spoken or written word. In other words, we send signals and messages to others, through expressions, gestures, postures, touch, space, eye contact and para language

Non-Verbal Communication		
Gestures	• Raising a hand to greet or say goodbye • Pointing your finger at someone	
Expressions	• Smiling when you are happy • Making a sad face when you are sad	
Body Language	Postures by which attitudes and feelings are communicated. Standing straight, showing interest.	

Session 4 – Communication Cycle and Feedback:

Communication is one of the most vital elements of society. People need people, and to interact, it's essential they be able to convey messages and understand each other. The communication cycle expresses how the system of conveying and understanding messages operates.

- Sender: the person or entity originating the communication.
- Message: the information that the sender wishes to convey.
- Encoding: how the sender chooses to bring the message into a form appropriate for sending.

Figure 1.5: Communication Cycle

- Channel: the means by which the message is sent.
- Receiver: the person or entity to whom the message is sent.
- Decoding: how the receiver interprets and understands the message.
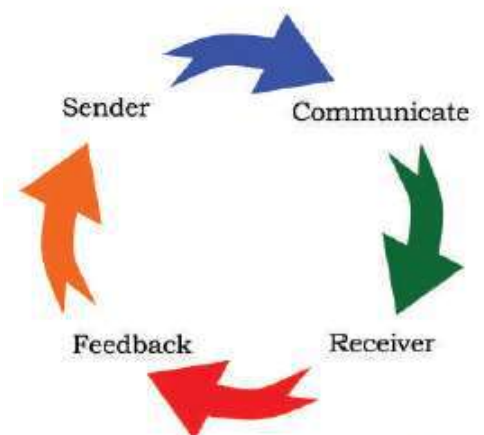- Feedback: the receiver's response to the message.

In the communication process, one person is a sender who convey message to another person or a group of persons) nose as the receiver. When the receiver gets the message, he acknowledges it and sends back a response. This leads to a cycle process known as the communication cycle. The cycle describe how can ideas, impression, or feeling is made no to others full stopper communication cycle includes resource such as e-mail threads social media outlets, VoIP message outlets. In the communication process, one person is a sender who convey message to another person (or a group of persons) nose as the receiver. When the receiver gets the message, he acknowledges it and sends back a response. This leads to a cycle process known as the communication cycle.

Feedback in Communication:

The term 'feedback' is taken from cybernetics, a branch of engineering concerned with self-regulating systems. The observation of the receiver's response is called feedback. In other words, the part of the receiver's response communicated back to the sender is called feedback. Actually, it is the amount of response of the receiver that reaches to the sender. It enables the sender to evaluate the effectiveness of the message. In the communication process, feedback refers to a response from the receiver which gives the communicator an idea of how the message is being received and whether it needs to be modified. Feedback ensures that the message has been successfully conveyed and the communication is effectively successful. Feedback is important in communication because it enables the sender to evaluate the effectiveness of its message. Without feedback, the communication process would be incomplete.

Importance of feedback in communication:
1. It completes the whole process of communication and makes it continuous.
2. It sustains communication process.
3. It makes one know if one is really communication or making sense.

4. It is a basis for measuring the effectiveness of communication.

5. It is a good basis for planning on what next to be done especially statistical report.

6. Communication will be useless without feedback.

7. Feedback paves way for new idea generation.

8. It is a process of effective listening.

9. It serves as basis of problem-solving.

10. It can motivate.

11. It can improve performance.

Type of Feedback	Examples	
Positive Feedback	• I noticed you finished the work perfectly. Great job! • I really appreciate you taking that call. Can you please also share the details?	POSITIVE FEEDBACK
Negative Feedback	• You keep forgetting to smile at the hotel guests when you talk to them. • You take really long to reply to e-mails! Are you always so busy?	NEGATIVE FEEDBACK
No Feedback	• It is also a feedback in itself which indicates disagreement of ideas.	NO FEEDBACK

Types of Feedback:

Feedback can be various form and of various types. Let us discuss different types of feedback used in communication.

1. Formal and informal feedback

2. Descriptive and non-descriptive feedback

3. Specific and nonspecific feedback

1. Formal and informal feedback

- ## Formal Feedback

A formal feedback follows a present format or structure using which the receiver frames feedback and sends it. Formal feedback covers many predefined points and has a specific blueprint. The receiver frames the feedback as per this blueprint and sends it. Formal feedback takes time to construct and hence, is not instant. Examples:

"Congratulations on scoring with A Grade in your final test performance. You are promoted to your next class."

"Please accept my apologies."

- ## Informal Feedback

Informal feedback, on the other hand, is spontaneously friendly and does not stick to a specific structure such as instant comments by the listener or audience. It does not take time to construct as it is immediately conveyed.

Examples: "Good job! ", "Congratulations!" "Sorry"

2. Descriptive and non-descriptive feedback

- ## Descriptive feedback:

A descriptive feedback on the contrary, provides meaningful information in a detailed, expressive manner that also contains some analysis or suggestion etc.

Examples

"All paragraphs should cover basically on Idea. Only one paragraph was as per this specification, other paragraphs convey multiple ideas and the information was also cohesively linked."

"In your article, the conclusion did not reiterate your observation and did not support the evidence your article talks about. You need to rewrite the conclusion by keeping this thing in mind."

- **Non-descriptive feedback:**

A non-descriptive feedback provides some specific information but does not give details descriptions. The feedback conveys meaningful specific response but does not come with descriptive analysis or suggestions.

Examples

"I only like your second paragraph. Others needs improvement."

"In your article, conclusion needs rework"

3. Specific and Non-specific Feedback:

- **Specific Feedback**

The specific feedback talks about a thing, particularly without talking about a General overview.

Example-:

"I like the way you described your grandfather's character. It makes me feel like I too know him".

"I like your portrayal of sibling rivalry, especially the part where you and your sister were fighting. I fight with my brother too, so it made it sound real to me. your story seemed related at all points."

- **Non-specific Feedback**

The Non-specific feedback, on the other hand, talks about the entire think while giving a General overview. it does not particularly pinpoint is specific think/ feature.

Examples:

"I like your story. It is good."

"I like it your topic of sibling rivalry."

Session 5: Barriers to Effective Communication

EFFECTIVE COMMUNICATION

Introduction: Effective communication is a two way communication process where both parties have right and convenience to express their messages opinions, facts and other information

Principles of Effective Communication:

Clarity -   Message conveyed should be in easily understandable language.

Attention -   The receiver should be fully attentive in a communication process.

Consistency - This principle implies that communication should always be consistent with the planned objective of message being conveyed

Adequacy -   The information conveyed should be complete in all respects.

Timelines -   The message conveyed should be at the proper time.

Feedback -   The communication must have feedback confirmation from the recipient whether the messages have been understood by the recipient

Economy -   The communication should take place in a way that costs optimally.

7Cs of Effective Communication

- Clear: While communicating one should be clear about what he / she say.
- Concise: Use simple words and say only what is needed.
- Concrete: Your arguments should be based on solid facts and opinions from credible sources and you should share reliable data to support your stand.

- Correct: It's essential that along with the factual information, the language and grammar you use are correct.

- Coherent: Your words should make sense .Along with that it should related with the main topic

- Complete: Your message should be complete .It should have all the needed information

- Courteous: Be respectful , honest and friendly throughout your communication

Barriers in communication

- Linguistic Barrier: Language at times can be a barrier to effective communication

- Physical Barrier: If the surroundings do not support proper communication, it can also act as a barrier to appropriate interaction.

- Cultural Barrier: Cultural differences hinder us from communicating properly.

- Interpersonal Barriers: It refers to the situations when the intended message is received incorrectly due to many personal reasons.

- Organizational Barriers: In an organization if there is no clarity about the roles,

- structures, responsibilities, it will hinder effective communication among the members of the organization.

Measures to Overcome Barriers of communication

- Overcoming Lingual Factors: To overcome this one need to prepare appropriately. One should carefully think about the language needs of the recipient.

- Overcoming Environmental Factors: Communicators should ensure that the message is delivered in a distraction free environment.
- Overcoming Barrier of Cultural Influence: Preparation to be made keeping the culture of the people you are addressing.
- Overcoming Interpersonal Barriers of Communication.
- Overcoming Organizational Barriers of Communication.

UNIT 2: Self-Management Skills
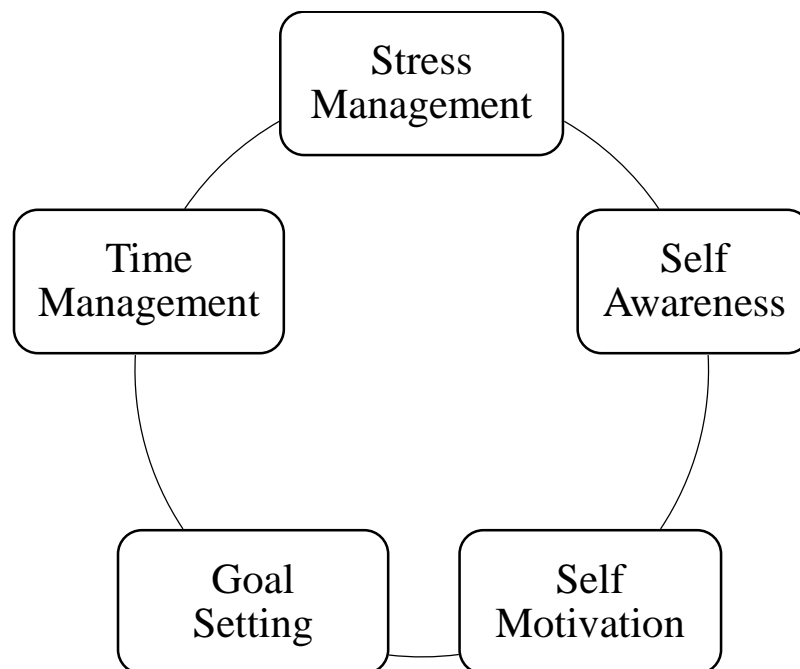
Self-Management:

Self-management is the ability to control one's emotions, thoughts and behaviour effectively in different situations.

Essential Skills for Success:

Discipline	Punctuality	Goal-setting	Teamwork	Problem Solving
	Responsibility	Adaptability	Professionalism	
		Dedication		
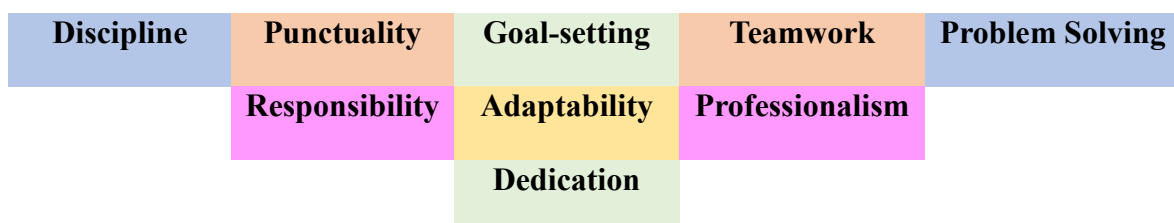
Importance of Self-Management:

♣ Self-sufficient and independent

♣ Ownership and accountability lead to self-confident

♣ Goal-oriented and strategy maker

♣ Self-monitoring and discipline reinforce good habits and behaviours

♣ Organise life and remove stress
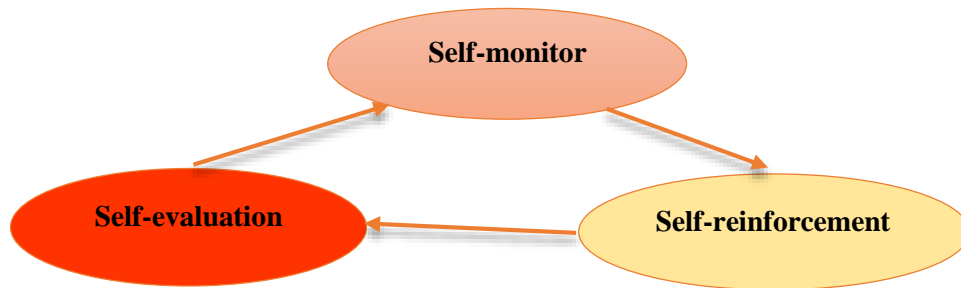
Fig: Self-Management Sycle

Methods of Self-Management

Stress: Stress can be defined as emotional, mental, physical and social reaction to any perceived demands or threats.

Symptoms of Stress:

Sign of Physical stress	Sign of Mental stress
Breathlessness	Irritation
Indigestion	Boredom
Fatigue	Mood swings
Cold hands and feet	Loneliness
Dry mouth or choking feeling	Anxiety
Nausea	
Sweaty palms	

Causes of Stress:

♦ Lack of confidence

♦ Work pressure

♦ Physical discomfort

♦ Conflict or rivalry,

♦ Meeting deadlines or expectations

♦ Change of routine

Effects of Stress:

- Deteriorates mental and physical health
- Lack of concentration and productivity in work
- Damage in personal and professional relationships

Stress Management:

Managing stress is about planning to cope effectively with daily pressures.

Advantages of Stress Management:

- ✓ Focus and Goal-setting
- ✓ Better planning
- ✓ Execute the work smoothly within deadline
- ✓ Better work-life balance

Methods of Stress Management:

A	B	C
Adversity	**Beliefs**	**Consequences**

- **Step 1:** Awareness about stress
- **Step 2:** Identify the cause of stress
- **Step 3:** Apply Stress management techniques

Stress Management Techniques:

1) Proper time management
2) Physical exercise, balanced diet, and healthy lifestyle
3) Maintain positive attitude and outlook
4) Organise schedule, complete all the works on time
5) Adequate sleep and relaxation
6) Spending quality time with friends and family.

Self-Awareness

1. Know Yourself: Belief, Background, Opinion, Choice, Values

2. Realising Strength and Weakness:

* Identify skills, abilities, interests, what you are good at and successful
* Identify shortcomings, apathies, where you face difficulty and defeat
* Consider honest feedback from others
* Continue practising skills
* Overcome weakness and improvise

SWOT Analysis: SWOT analysis is an important framework for identifying and analysing the *Strengths, Weaknesses, Opportunities,* and *Threats*.

Self-Motivation

Self-motivation is the internal force that drives one to act towards achievement of goals.

Types of Motivation:

| Internal Motivation | Self-interest and love for the work or hobby |

• Doing task of own interest makes one happy, healthy and feel good.

| External Motivation | Reward |

• Doing the task brings respect, recognition and appreciation

Qualities of Self-Motivated People:

* Aware of expectations from life
* Focussed towards goal
* Aware of importance of things
* Dedicated to fulfil dreams

Steps to Build Self-Motivation:
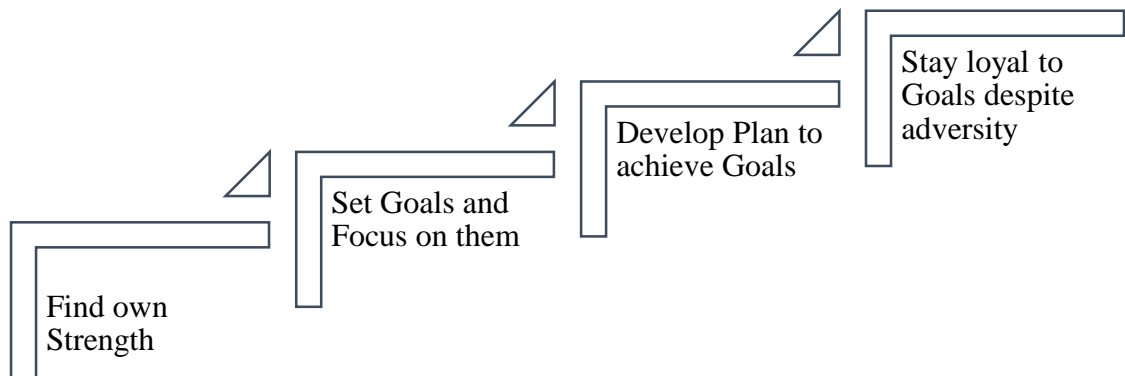
A. Goal Setting

➢ **Goals:** Goals are a set of dreams with a deadline to achieve them.

➢ **Goal Setting:** Goal setting is all about finding and listing one's goals in life and planning on achieving them.

➢ **Importance of Goal Setting:**

    o Helps to think and decide about future plans

    o Helps to prioritize things in life

    o Helps to focus on important tasks

➢ **Nature of Goals:** **SMART**

Specific	*Measurable*	*Achievable*	*Realistic*	*Time bound*
Who is involved in the goal?	How much?			
What do I want to do?				
Where do I start?	How many?	Breaking down big goals into smaller parts	Can be planned and work towards it for success	Definite time frame to achieve the goals
When do I start and finish?				
Which means do I use?	How to know about achieved results?			
Why am I doing this?				
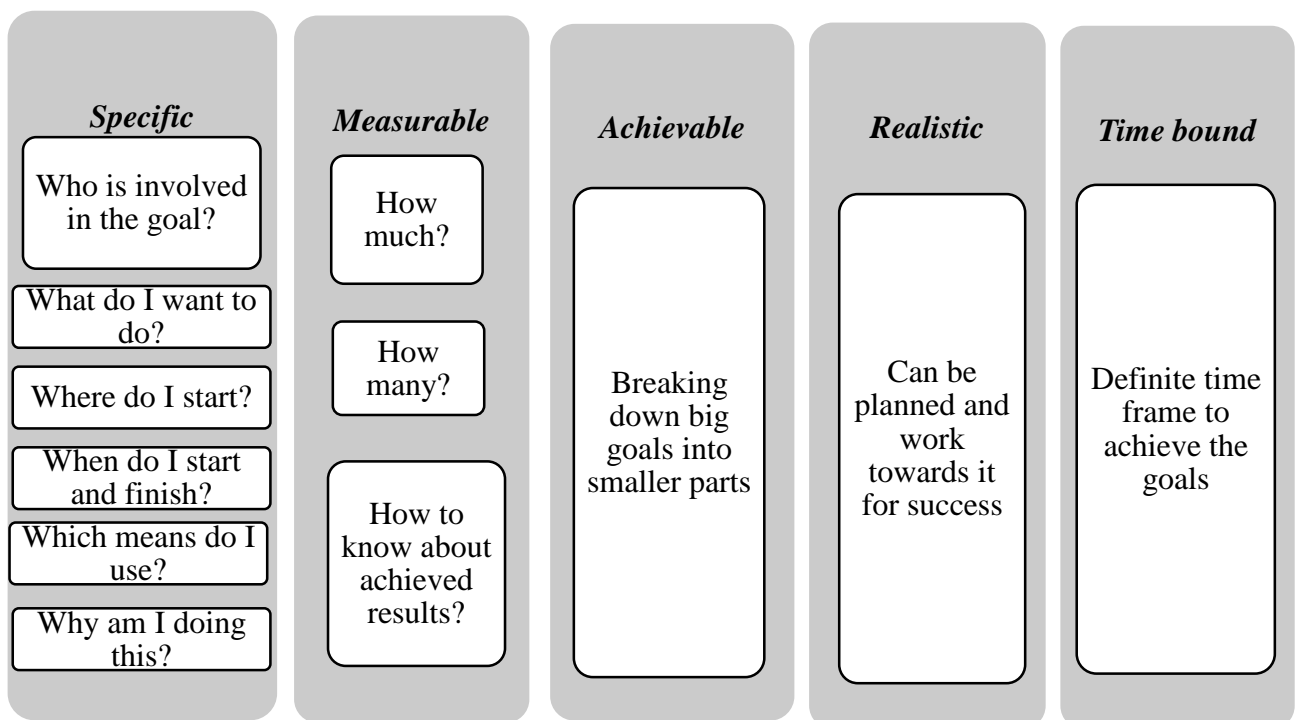
B. Time Management

Time management is the ability to plan and control on spending time in order to complete all the intended work.

❖ **Benefit of Time Management:**

♣ Timely completion of tasks

♣ Prepare and follow a daily timetable

♣ Correct estimation about duration of a work

♣ Correct utilisation of time

♣ Sense of accomplishment resulting satisfaction and happiness

❖ **Healthy habits for Time Management:**

♣ Avoid unnecessary delay or postpone of planned activity

♣ Organise the workplace to develop good working environment

♣ Utilise leisure and waiting time productively

♣ Prepare To-Do list and prioritise works

♣ Develop healthy habits and productive hobby

Steps for Effective Time Management:

Organise	• Plain daily Activities • Prepare timetable and follow it • Organise working area
Prioritise	• Prepare To-Do list of activities • Rank the activities as per priority
Control	• Gain control over activities and time utilisation • Avoid wasting time on useless things
Track	• Identify all the works done throughout the day and the amount of time spent on them • Analysis of time helps in better planning and execution of tasks and minimize time waste

Emotional Intelligence:

Emotional intelligence is the ability to identify and manage own and others' emotions.

Steps to Manage Emotions:

1. Understand emotions: Observe behaviour
2. Rationalise: Think judiciously, then decide and act
3. Control: Practice Yoga and meditation to keep calm

Self Confidence:

Self-confidence is to trust own capabilities and skills to achieve one's goal.

- ✓ **Factors influencing Self Confidence:**
  * Social: Healthy interaction and relationship with others strengthen self-confidence.
  * Cultural: Family values, moral values and belief system helps developing confidence.
  * Physical: Physical fitness and regular physical activities enhance self-confidence.
- ✓ **Different ways to develop Self Confidence:**
  * Positive approach towards problem solving
  * Set targets, make strategy and work towards achieving success
  * Physical exercise, Yoga, meditation etc regularly
  * Maintain healthy relationship with others
  * Dress up appropriately
- ✓ **Quality of a good Team Member:**
  * Work towards a common Goal set by the team
  * Selflessness - Help and Adjust with the group
  * Good interpersonal skills
  * Team spirit and group management skills
- ✓ **Quality of Independent workers**:
  * Self-awareness, self-monitoring and self-correcting
  * Awareness of Goal
  * Taking initiative
  * Recognising mistakes and self-performance analysis
  * Continuous learning

Personality Management:

Personality includes proper sense of dressing, personal hygiene, and good communication skills to have positive impression on others.

_____

Check Your Progress

|	
Q. 1 to 10 – 1 mark Question 10x1=10	
1.	_____ is the ability to identify and manage emotion of self and others. a. Natural Intelligence b. Emotional Intelligence c. Interpersonal Intelligence d. Spatial Intelligence
2.	Riya is feeling sweaty palm, irritation, and hyperactivity. She is feeling: a. Confident b. Excited c. Happy d. Stressed
3.	Vijay decided to study for 4 hours daily. His goal is: a. Unrealistic b. Not specific c. Time bound d. All of these
4.	Which of the following quality is not essential to work in group? a. Listening to all b. Guiding all c. Decision making ability d. Sharing confidential information with all
5.	Which of the following does not get along with Goal? a. Small b. Practical c. Deadline d. Achieve
6.	_____ part of time management analyses the time spend on each job and helps to reduce wastage of time. a. Organise b. Track c. Control d. Prioritise
Q. No. 7 – 8: State whether the following statements are True or False.	
7.	Joseph has been awarded for 100% attendance in school for entire the academic year last time. He feels honoured and this year also he is reporting to school regularly. This is an instance External Motivation.
8.	Talking more is one of the ways to build self-confidence.

Q. No. 9 – 10: ASSERTION (A) and REASONING (R) based questions.
     Mark the correct choice as:
     a. Both A and R are true and R is the correct explanation for A.
     b. Both A and R are true and R is not correct explanation for A.
     c. A is true but R is false.
     d. A is false but R is true.	

9.	Assertion (A): Stress management helps one to lead happy and healthy life. Reasoning (R): Timely completion of job reduces stress.
10.	Assertion (A): Self-confidence once lost cannot be gained back. Reasoning (R): Physical fitness increases self-confidence.

Q. No. 11 to 15 – 2 marks Question 5x2=10

11.	Why self-management is essential for the students?
12.	Mention two ways to develop confidence.
13.	Describe the steps of gaining self-motivation.
14.	Disha is going to start a new business with own investment. What qualities she should possess to work independently?
15.	Anish wants to set a list of goals to achieve in life before he is 25 year old. Explain the nature of a Goal.

Q. No. 16 and 17 – 4 marks questions 2x4=8

16.	Rahul says that he is feeling stressful. Before you understand and analyse Rahul's situation, answer the following questions: i. What do you mean by stress? ii. Mention any two symptoms of stress. iii. Write down some stress management techniques.
17.	Nisha is a hardworking girl. However, she always struggles to complete her assignments on time. Hence, she feels nervous. i. State the importance of effective time management. ii. Explain the techniques of managing time.

____

Solution

1. b	2. d	3. c	4. d	5. a
6. b	7. True	8. False	9. a	10. d
11.	i. Self-sufficient and independent in doing assignments and project work ii. Ownership and accountability of completion of work lead to self-confident iii. Set target for preparation and make strategy to achieve success iv. Self-monitoring and discipline reinforce good habits and behaviours			
12.	i. Positive approach towards problem solving ii. Set targets, make strategy and work towards achieving success			

	iii. Physical exercise, Yoga, meditation etc regularly iv. Maintain healthy relationship with others
13.	Step 1: Find own Strength Step 2: Set goal and focus Step 3: Plan and work Step 4: Stick to the goal
14.	• Self-awareness – Know strength, weakness, risk, opportunity • Define Goals, take initiative to plan and work • Self-performance analysis, recognising mistake • Continuous learning from surroundings
15.	A Goal should be SMART • Specific • Measurable • Achievable • Realistic • Time bound
16.	i. Stress is emotional, mental, physical and social reaction to any unforeseen situation, adversity or challenges. ii. Sweating, chocking feeling iii. • Proper time management - Organise schedule, complete all the works on time • Physical exercise, balanced diet, and healthy lifestyle
17.	i. Importance of time management: • Timely completion of tasks • Sense of accomplishment resulting satisfaction and happiness ii. Time management techniques: • Organise – Prepare Time table • Prioritise – Prepare To-Do list of activities • Control – Minimise time waste • Track – Analysis of the time spend over each activities and its effectiveness

UNIT 3: ICT SKILLS
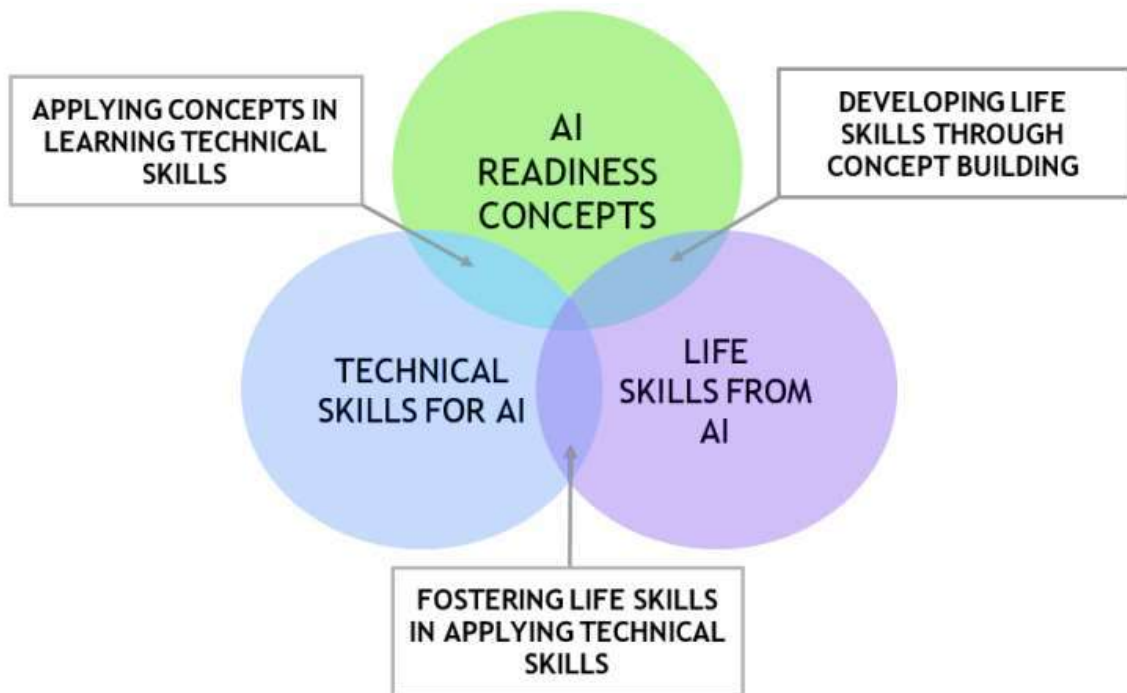
TYPES OF OPERATING SYSTEMS

An Operating System (OS) is an interface between a computer user and computer hardware. An operating system is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers.

Some popular operating systems are:

• DOS (Disk Operating System)

• Windows It is an operating system developed by Microsoft.

• Linux It is an operating system designed for personal computers. It is a free and Open
  Source Software

• Mobile operating Systems

    ✓ Android

    ✓ Symbian

    ✓ Windows Phone

    ✓ iOS

Following are some of important functions of an operating System.

- Memory Management
- Processor Management
- Device Management
- File Management
- Security
- Control over system performance
- Job accounting
- Error detecting aids
- Coordination between other software and users

The different types of operating systems are as follows:

Interactive (GUI-based) A graphical user interface is a user-friendly operating system in which commands can be entered by clicking/double-clicking/right-clicking a mouse. Windows operating system is an example of an interactive operating system.

Single-user, single-task operating system: This type of operating system allows only one user to do a task on the computer and one thing at a time.

Single-user, multi-task operating system: This type of operating system is used on Desktop computers, laptops, where a single user can operate on several programs at the same time. For example, Windows, Apple MacOS are examples of single-user multi task operating system.

Multi-user: A multi-user operating system enables multiple users to work on the same computer at different times or simultaneously.

Real Time: A real time operating system is used to control machinery, scientific instruments, like robots, in complex animations and computer controlled automated machines. A real-time operating system is a computing environment that reacts to input within a specific period of time. It manages the resources of the computer so that any particular operation is executed in the same amount of time every time it is executed.
Windows CE and Lynx OS are examples of real-time operating systems.

Distributed: A distributed operating system runs on a set of computers that are interconnected by a network. It combines the different computers in the network into a single integrated computer and storage location. Windows, UNIX, and LINUX are examples of distributed operating systems.

Windows 7 operating system:

Windows 7 is an operating system developed by Microsoft and is used on personal computers. After loading Windows 7, the first screen that appears on the monitor is called desktop. From the desktop, you can access different components of Windows 7.

By default, Windows 7 has a picture for the desktop background. This is called **wallpaper**.

Small pictures on the desktop are called **icons**. These icons represent files, folders, 31 applications, etc. At the bottom of the desktop is a long bar called the **Taskbar**. To the left of the taskbar is the Start button.

File Concept, File Operations, File Organization, Directory Structures And File System Structures

Everything you store on your computer is stored in the form of a file. There are specific naming conventions for naming files or folders, like characters that can be used, maximum number of characters, etc. Files can be separately placed into groups, called folders/directories. Each directory/folder can contain related files and/or sub-folders.
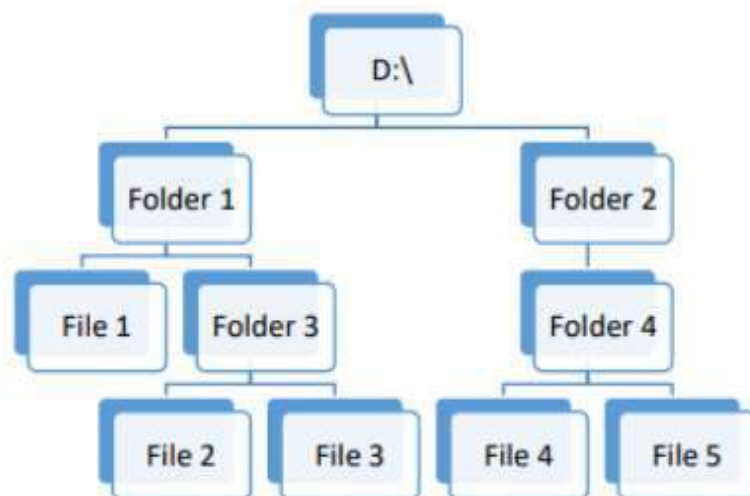
The steps to create a new folder are:

1. Double-click the Computer icon.

2. Select the drive in which you want to create a new folder. Say, Local Disk D:.

3. Window will open up showing files and folders in Local Disc D: Click New Folder on the toolbar.

4. A new folder is created with name New Folder highlighted

5. Type a name for the folder

To create a new file:

1. Right-click anywhere in the blank area of the right-column.

2. In the Shortcut menu, click New and select the type of the file you want to create.

To rename a file or a folder:

1. Right-click the file or the folder.

2. From the shortcut menu, select Rename option

3. Type the new name or edit the existing name and press the Enter key.

Or Just select the file/folder and press Function key F2.

To copy a folder or directory

You can copy a file or a folder in any one of the following ways:

1. Shortcut menu:

a. Right-click the file or the folder you want to copy.

b. Select Copy option from the Shortcut menu.

c. Select the drive or the folder where you want to make a copy of the selected file or folder.

d. Right-click and select Paste option from the Shortcut menu.

2. Drag and Drop method:

To copy a file or a folder, hold down the Ctrl key while dragging it to the new location.

3. Using Keyboard:

a. Select the file or the folder.

b. Press Ctrl + C to copy the file or the folder.

c. Open the destination folder.

d. Press Ctrl + V to paste the copied file.

To Move Files and folders

You can move a file or a folder in any one of the following ways:

1. Shortcut menu:

a. Right-click the file or the folder you want to copy

b. Select Cut option from the Shortcut menu.

c. Select the drive or the folder where you want to move the selected file or folder.

d. Right-click and select Paste option from the Shortcut menu.

2. Drag and Drop method:

To copy a file or a folder, select the file and drag it to a new location.

3. Using Keyboard:

a. Select the file or the folder.

b. Press Ctrl + X to cut the file or the folder.

c. Open the destination folder.

d. Press Ctrl + V to paste the copied file.

To permanently delete Files

You can permanently delete the contents of the Recycle Bin in any one of the following ways:

Right-click the Recycle Bin icon and then click Empty Recycle Bin

OR

1. Double-click the Recycle Bin icon.

2. The Recycle Bin window appears.

3. Click Empty the Recycle Bin.

To restore the files and folders

To recover a file from the Recycle Bin, right-click the file, and then click Restore.

Or

Select the file and click Restore this item

CARE AND MAINTENANCE OF COMPUTER

Regular maintenance of the computer system is very important.

Some of the maintenance activities are:

• Keep the components of the computer, like keyboard, mouse, monitor, etc. clean.

• Replace hardware that is not functioning properly

• Keep food items away from the computer

• Cables and chords should not be messed up

• Removing unauthorized software from the computer

• Take regular backup of the data

• Ensure backups are working properly by periodically restoring or checking of data. You should use external hard drive for backup of data on your computer.

• Run anti-virus periodically

• Keep anti-virus software up to date

• Do not overcharge the batteries

• Do not block the vents

• Always shut down the computer properly

Measures to protect Computer

• Regular scans should be done to check for viruses, malware, etc.

• An effective antivirus software should be installed in your computer.

• Always keep your anti-virus software updated so that it can detect new viruses. Full system scan should be done to periodically, preferably weekly to scan for viruses.

• A regular disk defragmentation should be done to remove all unnecessary information that slows down the computer.

• Disk defragmentation done at regular intervals helps the disc space to be used at an optimal level.

• Take regular backup of the data on your computer. In case the data is lost due to any reason.

• system failure, virus attack, etc., you can easily retrieve your data using backup files till your last update.

- System should be upgraded with new updates that were not there at the time of purchase, like, increasing RAM, to improve the performance. Also storage space should also be increased for storage of more information.
- If you are getting some disc errors, then make sure that temporary internet files are deleted from time to time.
- Software's should be updated regularly so that it works with maximum efficiency

ICT SKILLS
OBJECTIVE QUESTIONS

1.To recover a file from the Recycle Bin, right-click the file, and then click _____.
(a) Recover
(b) Restore
(c) Move
(d) Undelete
Answer: (b) Restore 60.

2. To restore a file from the Recycle Bin, select the file, and click _____.
(a) Recover this item
(b) Restore this item
(c) Move this item
(d) Undelete this item
Answer: (b) Restore this item

3.To paste a file/folder, right-click and select _____ option from the Shortcut menu.
(a) Stick
(b) Glue
(c) Paste
(d) Cream
Answer: (c) Paste

4. To copy a file/folder using Drag and Drop method, hold down the _____ key while dragging it to
the new location.
(a) Alt
(b) Shift
(c) Ctrl
(d) Alt + Ctrl
Answer: (c) Ctrl

5. What is the shortcut keys to copy something?
(a) Ctrl + X
(b) Ctrl + C
(c) Ctrl + Z

(d) Ctrl + V

Answer: (b) Ctrl + C

6. What is the shortcut keys to paste something?

(a) Ctrl + X   (c) Ctrl + Z

(b) Ctrl + C   (d) Ctrl + V

Answer: (d) Ctrl + V

7. When you _____ a file or a folder, a duplicate of the original file or folder is created at the new

location, and the original remains as it is.

(a) Copy

(b) Cut

(c) Rename

(d) Delete

Answer: (a) Copy

8. An _____ is a software that serves as an interface between the user and the computer.

a. operating system

b. application software

c. anti-virus software

d. microsoft word

Answer: a. operating system

9. Which software manages all the devices of a computer and keeps track of the status of the device,

whether it is busy or not?

a. operating system

b. application software

c. anti-virus software

d. microsoft word

Answer: a. operating system

10. Which software checks whether the device is functioning properly or not?

a. operating system

b. application software

c. anti-virus software

d. microsoft word

Answer: a. operating system

11. Which software controls software resources of the computer?

a. operating system

b. application software

c. anti-virus software

d. microsoft word

Answer: a. operating system

12. An _____ manages the computer memory and keeps track of which memory space is in use by which program and which space is free.
a. operating system
b. application software
c. anti-virus software
d. microsoft word
Answer: a. operating system

13. An _____ manages the computer memory and keeps track of which memory space is in use by which program and which space is free.
a. operating system
b. application software
c. anti-virus software
d. disk defragmentor
Answer: a. operating system

14. An _____ keeps track of the amount of disk space used by a specific file.
a. operating system
b. application software
c. anti-virus software
d. disk defragmentor
Answer: a. operating system

15. Which software allows you to create, copy, move and delete files?
a. operating system
b. application software
c. anti-virus software
d. disk defragmentor
Answer: a. operating system

16. Which of the following is not an operating system?
a. DOS
b. Windows
c. Linux
d. Disk Defragmentor
Answer: d. Disk Defragmentor

17. Which of the following is a free and open-source operating system?
a. DOS
b. Windows
c. Linux
d. None of these
Answer: c. Linux

18. Which of the following is not a mobile operating system?

a. Android
b. iOS
c. Windows Phone
d. Linux
Answer: d. Linux

19. Which of the following is not a mobile operating system?
a. iOS
b. Windows Phone
c. Android
d. None of these
Answer: d. None of these

20. Which of the following is not an interactive/GUI-based operating system?
a. Android   c. Windows
b. DOS   d. Linux
Answer: b. DOS

21. DOS stands for _____
(a) Disk Operating System
(b) Dot Operating System
(c) Disk Open System
(d) Disk Operating Secure
Answer: (a) Disk Operating System

22. Which of the following is Microsoft Product?
(a) DOS
(b) Windows
(c) Android
(d) Linux
Answer: (b) Windows

23. _____ operating system is an example of an interactive operating system.
(a) Windows
(b) DOS
(c) Linux
(d) None of the above
Answer: (a) Windows

24. GUI stands for _____
(a) Graphical User Interface
(b) Graphical User Interaction
(c) Graphical User Interactive
(d) None of the above
Answer: (a) Graphical User Interface

25. Which operating system allows only one user to do a task on the computer and one thing at a
time?
(a) Single-user, multi-task operating system
(b) Single-user , single-task operating system
(c) Multi-user
(d) None of the above
Answer: (b) Single-user, single-task operating system

26. Which Operating System is used to control machineries like robots in complex animations and
computer-controlled automated machines
(a) Real Time
(b) Multi-user
(c) Single-user, multi-task operating system
(d) Distributed
Answer: (a) Real Time

27. Examples of real-time operating systems is :
(a) Windows CE
(b) Lynx OS
(c) Both of the above
(d) None of the above
Answer: (c) Both of the above

28. Examples of distributed operating systems is
(a) Windows
(b) Unix
(c) Linux
(d) All of the above
Answer: (d) All of the above

29. _____ operating system enables multiple users to work on the same computer
simultaneously.
(a) Single-user , single-task operating system
(b) Single-user, multi-task operating system
(c) Multi-user
(d) None of the above
Answer: (c) Multi-user
30. Which Operating System enables single user to operate on several programs at the same
time.
(a) Single-user, multi-task operating system
(b) Multi-user
(c) Single-user , single-task operating system
(d) Real Time
Answer: (a) Single-user, multi-task operating system

31. Example of a Multi-Tasking Operating System is
(a) Windows
(b) Apple MacOS
(c) Both of the above
(d) None of the above
Answer: (c) Both of the above

32. An operating system in which commands can be entered by clicking/double-clicking/rightclicking a mouse is :
(a) GUI-based
(b) CUI-based
(c) TUI-based
(d) None of the above
Answer: (a) GUI-based

33. Examples of Mobile operating Systems is :
(a) Android
(b) Symbian
(c) iOS
(d) All of the above
Answer: (d) All of the above

34. The first screen that appears on monitor after loading OS is called _____
(a) Icons
(b) Desktop
(c) Wall paper
(d) None of the above
Answer: (b) Desktop

35. Small pictures on the desktop are called _____
(a) Desktop
(b) Symbols
(c) Icons
(d) Pictures
Answer: (c) Icons

36. Picture used for the desktop background is called _____
(a) Wallpaper
(b) Background image
(c) Wall image
(d) Desktop image
Answer: (a) Wallpaper

37. Start button is present on _____ side of the Taskbar.
(a) right
(b) left
(c) top
(d) bottom
Answer: (b) left

38. Bar present at the bottom of the desktop is called _____
(a) Status bar
(c) Taskbar
(b) Scroll bar
(d) None of the above
Answer: (c) Taskbar

39. Components of Windows 7 Desktop is/are :
(a) Desktop
(b) Wallpaper
(c) Taskbar
(d) All of the above
Answer: (d) All of the above

40. Which icons allows user to access all drives, files, and folders on the computer.
(a) Recycle Bin
(c) Application
(b) Computer
(d) Start button
Answer: (b) Computer

41. The main components of Taskbar is/are
(a) Start button
(b) Active Applications
(c) Date/Time icon
(d) All of the above
Answer: (d) All of the above

42. Deleted files and folders are stored in _____
(a) Recycle bin
(b) My Computer
(c) Control Panel
(d) None of the above
Answer: (a) Recycle bin

43. Everything we store in computer is stored in the form of a _____.
(a) Folder
(b) Sub folder
(c) File
(d) None of the above
Answer: (c) File

44. _____ is a way in which you give name to a file, store it and retrieve it.
(a) Operating System
(b) Formatting System
(c) File System
(d) None of the above
Answer: (c) File

45. Files can be separately placed into groups, called _____.
(a) Folders
(b) Directories
(c) Both a and b
(d) None of the above
Answer: (c) Both a and b

46. A _____ may contain one or more files and sub-folders within. This allows easy accessibility
of files.
(a) Folder
(b) Directory
(c) Sub-folder
(d) None of the above
Answer: (c) Sub-folder

47. A new folder is created with the default name _____.
(a) New Folder
(b) New Directory
(c) New
(d) None of these
Answer: (a) New Folder

48. A _____ menu is appearing, when you right-click in a blank area of the desktop.
(a) Shortcut Menu
(b) Context Menu
(c) Both (a) and (b)
(d) None of these
Answer: (c) Both (a) and (b)

49. What is the shortcut key to rename a file or folder in windows?
(a) Ctrl + R
(b) F2
(c) Alt + R
(d) Ctrl + F2
Answer: (b) F2

50. To restore a file from the Recycle Bin, select the file, and click _____.
(a) Recover this item
(b) Restore this item
(c) Move this item
(d) Undelete this item
Answer: (b) Restore this item

Descriptive Questions   (2 Marks)

1. What is ICT?

Answer – Information and Communication Technology (ICT) is an acronym for information and communication technology. ICT helps in the proper sharing, receiving, and processing of information, and an ICT device is a device that is used for processing, storing, and delivering information to others.

Examples of ICT devices are – Laptop, Desktop, Tablets and Smartphones.

2. Difference between Hardware and Software?

Answer – A computer system consists of two main parts – Hardware and Software

a. Hardware – Hardware is a physical part of a computer system. We can feel and touch the hardware devices. example – CPU, Mother Board, Hard Disk, Keyboard, Mouse, Printer etc.

b. Software – Software related to the programs which perform different types of tasks on the computer system. Program is a collection of Instructions. It also helps the computer to perform the specific task. Example – Open Office Base, Spreadsheet, Presentation etc.

3. How to increase Computer performance?

Answer – We frequently install a large number of applications, which slows down the computer.

Always attempt to uninstall unnecessary applications, temporary files, and antivirus software updates.

4. What is a Security Break?

Answer – Security break is leakage of information stored in a computer.

Your personal information can be lost or leaked in two ways –

We are not cautious when it comes to disclosing personal information via the internet. We share our account information and passwords on unsafe websites.

A person gets unauthorized access to our computer. This can happen at work if we don't log out before leaving the computer.

5. Differentiate between Hardware and Software ?

Ans.

Hardware: The physical components that we can see and touch.

Monitor, Keyboard are examples of Hardware

Software: It is a set of programs/instructions that perform a specific task

MS Paint, MS Word are examples of Software.

6. What do you mean by Operating System?

Ans. Operating System : It is a software that act as an interface between the user and the computer.

7. Give two examples of mobile operating system.

Ans. Two examples of mobile operating system :

a. Apple iOS   b. Google Android

8. Name two operating systems for laptops or desktop.
Ans. Two operating systems for laptops or desktop are:
a. Ubuntu
b. Microsoft Windows

9. Identify me
a. I am a physical part of computer.
b. I am a collection of instruction doing specific task.
c. I am the software that starts working as soon as we switch on a computer.
d. I am an input device used to type text, numbers etc
e. I am a small device that you can use to move, select and open items on your computer screen.
Ans. a. Hardware b. Software c. Operating System d. Keyboard e. Mouse

10. Expand BIOS?
Ans. BIOS stands for Basic Input/Output System

11. What do you mean by Input device? Give two examples.
Ans. Those devices which are used to feed data/command into the computer are called Input device.
for example Keyboard and Mouse.

12. List the various types of keys available on Keyboard.
Ans. The various types of keys available on Keyboard are :
a. Control keys
b. Function Keys
c. Alphabet Keys
d. Numeric Keys
e. Navigation Keys

13. When the _____ key is turned ON, it helps to overwrite characters to the right of the
cursor.
Ans. INSERT

14. Name two keys available on keyboard which are used to remove typed text or characters.
Ans. Delete and Backspace

15. _____ key helps to move the cursor to the beginning of a new line.
Ans. RETURN or ENTER

16. Pressing _____ key opens the Start menu.
Ans. Windows

17. Name any two file extensions.
Ans. Two file extensions are : a) .txt b) .doc c) .jpg d) .xls

18. List the various threats to a computer and its data.
Ans. The various threats to a computer and its data are:
1 Virus
2. Phishing
3. Online theft
4. Cyber crime
5. Hacking

Descriptive Questions   (4 Marks)

1. Objectives of Information and communication technology? Advantages and disadvantages of ICT.
Answer – Full form of ICT is Information and communication technology. The goal of ICT is to bridge the gap between parents, educators, and students by encouraging sustainable, cooperative, and transparent communication methods.

Advantages of ICT
a. Enhanced the modes of communication
b. Independent learning platforms Cost – efficient
c. Enhanced data and information security
d. Paperless – Eliminate the usage of paper
e. Better teaching and learning methods
f. Web – based LMS tools

Disadvantages of ICT
a. Traditional books and handwritten methods are at risk.
b. Managing courses online is difficult
c. Teachers require experience to handle ICT
d. Risk of cyber attacks and hacks
e. Misuse of technology

2 What are the threats?
Answer – Threats are ways in which personal information from a computer can be released without our knowledge.
a. Theft – Theft means stealing of information or hardware. These maybe of three types:
 i. Physical – Where a person may steal your desktop computer or laptop.

 ii. Identity – A hacker gets your personal information and uses it to impersonate you. The hacker can use this fake identity to get access to your account information or engage in illegal activity.

b. Software Piracy – This is stealing of software and includes using or distributing unlicensed and unauthorized copies of a computer program or software.

i. Virus – Viruses are computer programmes that can corrupt data and software applications, as well as steal data from computers. Worms and Trojan Horses are two major forms of viruses.
ii. Worms – Worms are viruses that replicate and spread to all files on a computer once they attack a computer. This makes it very difficult to remove them.

A Trojan Horse appears to be a useful software programme, but once it reaches a computer, it begins to behave like a virus and destroys the data.

iii. Online Predator – Online predators are persons who use the internet to trap you into unhealthy relationships. They could be older people appearing as your age who harass you into doing unlawful things online.
iv. Internet Scams – You may occasionally receive highly appealing offers claiming that you have won a large sum of money in a lottery and that you can claim your win by depositing a specific amount of money. When you deposit money with a credit card or through online banking, you not only lose the deposit money but your card / account information may be misused later.

What are the different types of keys in Keyboard?
Answer –
a. Function keys – F1 to F12 are function keys in the keyboard, function keys are used for specific purposes.

b. Control keys – SHIFT, CONTROL (CTRL),ALT, SPACEBAR, TAB AND CAPS LOCK are
known as a control key, these keys are used as per the demand.

c. Enter key – ENTER or RETURN keys are known as Enter key, depending on the brand of computer that you are using.

d. Punctuation keys – It includes keys for punctuation marks, such as colon (:), semicolon (;), question mark (?), single quotation marks (' '), and double quotation marks (" ").

e. Navigation keys – END, HOME, PAGE DOWN, PAGE UP and Arrow keys are known as navigation keys, these keys are used to move up, down, left or right in the document.

f. Command keys – BACKSPACE, INSERT (INS) and DELETE(DEL) are known as command keys. INSERT key allows you to overwrite characters to the right side.

The DELETE command key and BACKSPACE key are used to remove typed text, character, or any other objects from the right and left side of the cursor.

g. Windows key – Windows key is used to open the Start menu.

UNIT 4: Entrepreneurial Skills

MIND MAP:

Topic 1- Entrepreneurship and Society

Entrepreneurs' Contribution to Society

- Improve Standard of Living
- Wealth Creation
- Accelerate Economic Growth
- Create Jobs
- Bring efficiency in society
- Bring more choices to customers

Topic 2- Qualities and Functions of an Entrepreneur

Qualities	Functions
Confidence	Decision Making
Innovation	Business Management
Calculated Risk Taking	Financial Management
Creativity	Risk Analysis
Patience	Setting Vision for Organisation
Perseverance	Efficiency in Operations
Leadership	Sustenance of Business

Topic 3- Myths about Entrepreneurship

1. Every business idea needs to be unique or special.
2. A person needs a lot of money to start a business.
3. Only a person having a big business is an entrepreneur.
4. Entrepreneurs are born, not made.

Topic 4- Entrepreneurship as a career option

Advantages	Disadvantages
Independence	Risk
Ambition Fulfilment	Excessive Workload
Wealth Creation	Uncertainty
Work-Life Autonomy	Challenges

Topic 1- Entrepreneurship and Society

Contribution of Entrepreneurs towards Society

- **Fulfil Customer Needs**: Entrepreneurs find out what people want. Then, they use their creativity & innovation to come up with a business idea that will meet that demand and satisfy customer needs

- **Use Local Materials**: Entrepreneurs use locally sourced material and workforce available around them, to make products at least cost. This ensures business efficiency.

- **Create Jobs**: With the growth of a business, entrepreneurs look for more people to help them. They buy more material. They also hire more people to work for them, thereby providing livelihood opportunities to others.

- **Bring down cost of goods and services**: As more entrepreneurs sell the same product, the price of the product goes down due to innovation and market competition.

- **Improve Standard of Living**: With newer and better products, standard of living of common man rises and everyone experiences better life.

- **Increase Economic Pie**: As entrepreneurs grow their business, the people working for them and they themselves too become wealthy. This helps increase nation's economic growth.

Topic 2- Qualities and Functions of an Entrepreneur

Qualities of an Entrepreneur

- **They are confident:** Entrepreneurs are confident beings. They decide to take up a venture and it is their confidence that ensures survival and success of their idea.

- **They try new and innovative ideas**: Entrepreneurs introduce new and innovative ideas in the market. Sometimes, such ideas may even displace the inefficient players from the market.

- **They are creative:** Entrepreneurs are creative people. They always try to find opportunities for a better product/service through their creativity.

- **They show patience:** Entrepreneurs are resilient people. They wait till the venture succeeds. This quality also helps them deal effectively with their employees.

- **Perseverance:** Entrepreneurs show perseverance as any small hurdle doesn't stop them from achieving their ambitions. They keep on working towards fulfilment of their ambition.

- **Takes responsibility:** Entrepreneurs take responsibility to successfully execute the business idea into a full-fledged profit-making enterprise.

- **Have leadership Skills:** Entrepreneurs are leaders as well. They have the responsibility to lead the venture towards its Organisational Vision. Further, they also lead the team of employees and guide them to work effectively towards Organisational Goals.

- **Hard working:** Entrepreneurs work hard, especially in the initial phase of venture. This quality ensures that they keep on working with passion and dedication.

- **Take calculated risk:** Entrepreneurs take calculated risk, which pays them off well as they always keep in mend the Risk-Reward ratio.

- **Never Give Up spirit:** Entrepreneurs don't give up easily. This persist with their efforts and always try to turn things around.

Functions of an Entrepreneur

- **Making Decisions:** Decision making is part of everyday routine of an entrepreneur. Decision make include a Technical Decision, Managerial Decision, Administrative Decision or even a Strategic Decision. Decision making by entrepreneurs is often based on risk-reward ratio, feedback from market, customer demand and offerings by the competition.

- **Managing the Business:** Entrepreneurs often plan a vision for the venture and in order to achieve it, they try to manage the business well as only a well managed business can sustain in the long run.

- **Keep track of Finances:** Entrepreneur keeps track of whom to pay how much and what for. They pay the employees' salaries, service providers, suppliers' payments, etc.

- **Taking Risk:** Entrepreneurs take risk, though a calculated one. They factor-in all variables & risks before reaching to a decision. A calculated risk pays off well as its risk-reward ratio is not too skewed.

- **Create a New Method, Idea OR Product:** Entrepreneurs introduce new and innovative ideas in the market. Sometimes, such ideas may even displace the inefficient players from the market.

Topic 3- Myths about Entrepreneurship

What is a misconception?

A myth, or a misconception, is a false belief or opinion about something.

Misconception 1: Every business idea needs to be unique or special

- A person can take an idea that is already there in the market and do something different with it.
- For example: Cab Service named 'inDrive' simply introduced an option wherein a user can quote his/her fare and negotiate with cab driver. This is unlike stand Cab Service providers like 'Ola' and 'Uber'

Misconception 2: A person needs a lot of money to start a business

- Capital is important for starting. However, every business does not need a lot of capital to start. Moreover, today there is no dearth of credit and even venture capitalists are willing to provide funding.
- Depending on how much money you have or can borrow, you can start a business with that much money. Once you make more money, you can reinvest profits back into your business to make it bigger.
- For example: 'BTW' or "Bittoo Tikki Wala" initially started as a street seller and later on expanded based on reploughing of profits back into business.

Misconception 3: Only a person having a big business is an entrepreneur

- No business is big or small. If a person is running a business to fulfil a customer need, they are an entrepreneur from Day 1. Most businesses start small. It becomes big with hard work and creativity, over time.

Misconception 4: Entrepreneurs are born, not made.

- It is only a myth that some people have the talent for doing business. An entrepreneur is a person who does whatever it takes to make the business successful. Being an entrepreneur starts with a way of thinking. Moreover, entrepreneurial skills cam be developed too through training.

Topic 4- Entrepreneurship as a career option

A person who chooses to become an entrepreneur goes through a career process. This process is as follows:

- **Entry**: When an entrepreneur is starting, they are just entering the market to do business
- **Survival**: There are many entrepreneurs in the market. The entrepreneur has to survive in a competitive market. This is the most crucial phase for an entrepreneur.
- **Growth**: Once the business is stable, an entrepreneur thinks about expanding his or her business.

Advantages of choosing entrepreneurship as a career option are:

A) **Independence**

- An entrepreneur is not dependent on anyone for his/her livelihood. He/she is self-reliant

B) **Ambition Fulfilment**

- Entrepreneurship helps fulfil one's ambition and passion simultaneously. Hence, the entrepreneur feels self-satisfaction

C) **Wealth Creation**

- Entrepreneurs are the wealth creators in the economy. They help expand the economy of the nation through their innovative ideas.

D) **Work-Life Autonomy**

- An entrepreneur enjoys work-life autonomy as he/she is one's own boss and has full freedom to decide one's working hours.

Disadvantages of choosing entrepreneurship as a career option are:

A) **Risk:**

- Contrary to wage employment, one has to risk one's own savings, time and efforts

B) **Workload:**

- It takes serious hustle to get a new business up and running from scratch. While it can be an exciting time, full of possibility, it can also be exhausting for an entrepreneur.

C) **Challenges:**

- Being an entrepreneur is not without its challenges. One may face lonely weekends and late-night works. Further low funding in initial stages may also lower chances of success of the venture.

D) **Uncertainty**:

- Entrepreneurs often face headwinds from various quarters. Change in market dynamics, government policies or even consumer preferences, all can affect survival chances of a venture.

Questions

1 Marks MCQs

Q1. Which among these is NOT a step to start a business?

(a) Business idea conception

(b) Getting finances and material

(c) Understanding market needs

(d) Sharing profit with shareholders

Q2. Which of the following is an advantage of entrepreneurship as a career?

(a) Work-Life Autonomy

(b) Independence

(c) Ambition fulfilment

(d) All of these

Q3. Money required to initiate a business is known as_____?

(a) Business Money

(b) Hedge Fund

(c) Capital

(d) Commercial Money

Q4. What all do entrepreneurs achieve when they run business?

(a) Fulfil Customer Needs

(b) Source Local Raw Material

(c) Provide Jobs

(d) All of these

Q5. Which of these is NOT a characteristic of an entrepreneur?

    (a) Takes calculated risk   (b) Self-employed

    (c) Is afraid of disruptive ideas   (d) All of these

Q6. A Unicorn is a startup with valuation over

    (a) US $100 million   (b) US $1 billion

    (c) US $10 billion   (d) US $1 million

Q7. Which of the following is NOT a myth about entrepreneurship?

    (a) Every business idea needs to be unique or special

    (b) A person requires huge wealth to start a business

    (c) Entrepreneurs are born and entrepreneurship skill can't be developed

    (d) Anyone can develop traits of entrepreneurship over time

Q8. Qualities of entrepreneurs include:

    (a) Perseverance   (b) Leadership   (c) Confidence   (d) All of these

Q9. Which of the following terms is NOT related to startups?

    (a) Venture Capital   (b) Seed Fund   (c) Unicorn   (d) Mutual Fund

Q10. Who among these develops a business plan, launches and runs a business using innovation to meet customer needs and to make a profit?

    (a) Teacher   (b) Software Engineer (c) Entrepreneur   (d) Politician

Answers to MCQs

Q1. Option (d): Sharing profit with shareholders

Q2. Option (d): All of these

Q3. Option (c): Capital

Q4. Option (d): All of these

Q5. Option (c): Is afraid of disruptive ideas

Q6. Option (b): US $1 billion

Q7. Option (d): Anyone can develop traits of entrepreneurship over time

Q8. Option (d): All of these

Q9. Option (d): Mutual Fund

Q10. Option (c): Entrepreneur

2 Marks Questions

Question 1) Mention 4 advantages of choosing entrepreneurship as career option.

Answer 1) 4 Advantages of choosing entrepreneurship as a career option are:

A) Independence
   - An entrepreneur is not dependent on anyone for his/her livelihood. He/she is self-reliant
B) Ambition Fulfilment
   - Entrepreneurship helps fulfil one's ambition and passion simultaneously. Hence, the entrepreneur feels self-satisfaction
C) Wealth Creation
   - Entrepreneurs are the wealth creators in the economy. They help expand the economy of the nation through their innovative ideas.
D) Work-Life Autonomy
   - An entrepreneur enjoys work-life autonomy as he/she is one's own boss and has full freedom to decide one's working hours.

Question 2) Mention any 2 myths surrounding Entrepreneurship.

Answer 2) 2 Myths about Entrepreneurship are:

A) Entrepreneurs are born, not made
   - A prevailing myth regarding entrepreneurship is that entrepreneurial skills exist by birth and these can't be developed through training.
B) Every business idea needs to be unique or special
   - Many believe that only a unique or extraordinary idea can succeed. This myth has been busted in many cases as numerous simple and even non-unique ideas have done well in the market.

Question 3) Write about any 2 qualities of an entrepreneur.

Answer 3) 2 Qualities of an entrepreneur include:

A) Calculated risk-taking behavior
   - Entrepreneurs take calculated risk, which is the reason behind their success. They factor-in all variables & risks before reaching to a decision.
B) Leadership Skills
   - Entrepreneurs are leaders too as they have to manage business, while also guiding employees and ensuring profit generation. They also have a long term vision for the venture.

Question 4) What is Entrepreneurship? Name any 2 famous entrepreneurs that you know.

Answer 4) The process of developing a business plan, launching and running a business using innovation to meet customer needs and to make a profit is known as entrepreneurship.

2 famous entrepreneurs are Sachin Bansal and Binny Bansal who initiated Flipkart e-commerce website.

Question 5) How do entrepreneurs help the nation?

Answer 5) Entrepreneurs help the nation by

- Economic development: Entrepreneurs help fuel the economic growth of the nation by bringing in innovative goods and services at competitive prices. They are indeed the wealth creators in the economy.
- Providing better livelihood opportunities: Entrepreneurs are job givers instead of job seekers. They provide livelihood to their employees.

4 Marks Questions

Question 1) List 4 ways in which entrepreneurs affect society?

Answer 1) Ways in which entrepreneurs affect society are:

- **Fulfil Customer Needs**: Entrepreneurs find out what people want. Then, they use their creativity & innovation to come up with a business idea that will meet that demand and satisfy customer needs
- **Use Local Materials**: Entrepreneurs use locally sourced material and workforce available around them, to make products at least cost. This ensures business efficiency.
- **Create Jobs**: With the growth of a business, entrepreneurs look for more people to help them. They buy more material. They also hire more people to work for them, thereby providing livelihood opportunities to others.
- **Bring down cost of goods and services**: As more entrepreneurs sell the same product, the price of the product goes down due to innovation and market competition.
- **Improve Standard of Living**: With newer and better products, standard of living of common man rises and everyone experiences better life.

Question 2) Mention Pros and cons of choosing Entrepreneurship as career option.

Answer 2) Pros include:

- **Freedom**: One of the best parts of being an entrepreneur is the complete freedom do the things as one wishes to. No boss to report to, or managers peering over your shoulder, creating unnecessary work pressure.
- **Work-Life Autonomy**: Entrepreneurs enjoy Work-Life Autonomy and may work or enjoy life whenever they wish to.
- **Control**: Entrepreneurs enjoy control over their venture. They can both direction and vision to it.

Cons include:

- **Risk:** Contrary to wage employment, one has to risk one's own savings, time and efforts
- **Workload**: It takes serious hustle to get a new business up and running from scratch. While it can be an exciting time, full of possibility, it can also be exhausting for an entrepreneur.

- **Challenges**: Being an entrepreneur is not without its challenges. One may face lonely weekends and late-night works. Further low funding in initial stages may also lower chances of success of the venture.

UNIT 5: GREEN SKILLS – II

LEARNING OUTCOMES	THEORY	PRACTICAL
1. Demonstrate the knowledge of importance, problems and solutions related to sustainable development	1. Definition of sustainable development 2. Importance of sustainable development 3. Problems related to sustainable development	1. Identify the problem related to sustainable development in the community 2. Group discussion on the importance of respecting and conserving indigenous knowledge and cultural heritage 3. Discussion on the responsibilities and benefits of environmental citizenship, including the conservation and protection of environmental values 4. Preparing models on rain water harvesting, drip / sprinkler irrigation, vermin-compost, solar energy, solar cooker, etc.

Mind Map
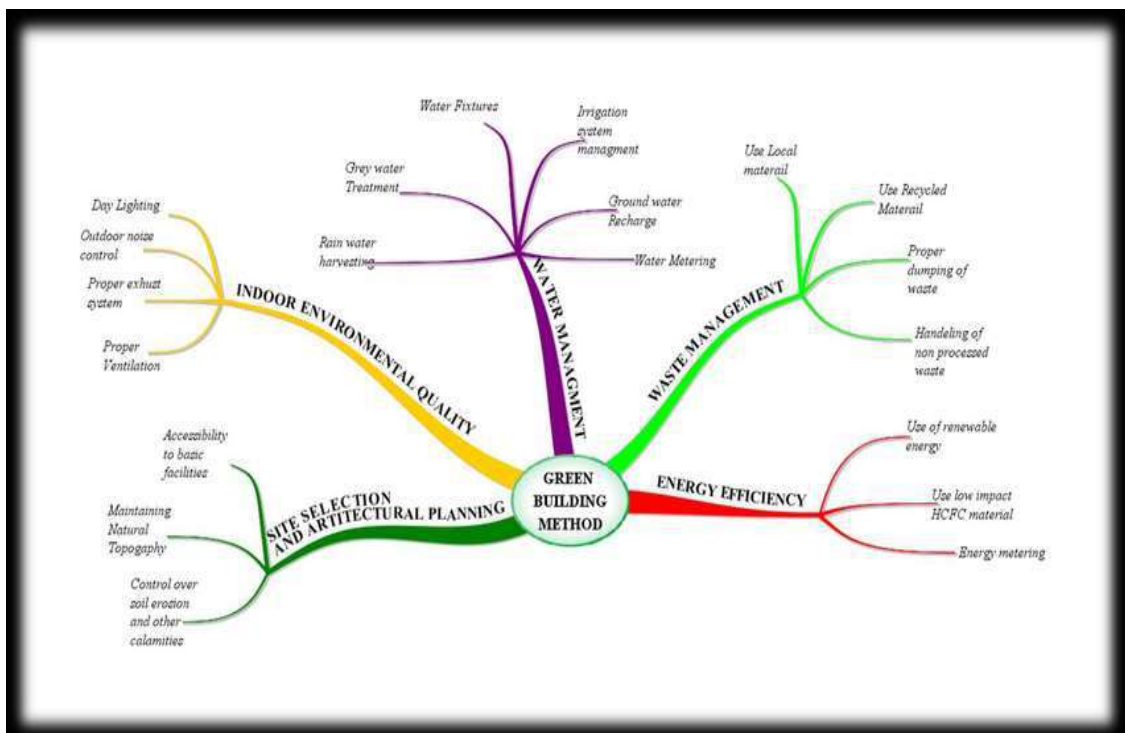
Society and Environment

Over the years, with economic development, there has been an increase in environmental pollution. For example, with the introduction of high input agriculture, we can grow more food by using fertilizers, pesticides and hybrid crops. But it has led to soil and environmental degradation. We need to plan the use of resources in a sustainable manner so that we and our future generations can enjoy a good environment.

What is Sustainable Development?

Sustainable development is the development that satisfies the needs of the present without compromising the capacity of future generations, guaranteeing the balance between economic growth, care for the environment and social well-being.

Importance of Sustainable Development

Sustainable development is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987

Problems Related to Sustainable Development

Three major problems related to sustainable development are:

(a) Food: The amount of rich, fertile land needed to grow crops, such as wheat, rice, etc., is becoming less as we are using up more and more land for other purposes. Soil nutrients are also getting depleted and lots of chemicals are spoiling the soil due to use of chemical fertilizers.

(b) Water: We use fresh water from rivers and ponds for drinking and cleaning but dump garbage into them. The rivers and ponds are getting polluted. This way after several years, we will have no clean water for our use.

(c) Fuel: We are using a lot of wood from trees as fuels and for construction of homes and furniture. As more and more trees are being cut, it is affecting the climate of the place. Extreme weather conditions, such as floods, extreme cold or heat, are seen in many places, which affect the people living there.

Sustainable development includes

• reducing excessive use of resources and enhancing resource conservation;

• recycling and reuse of waste materials;

• scientific management of renewable resources, especially bio-resources;

• planting more trees; green grassy patches and trees to be interspersed between concrete buildings;

• using more environment friendly material or biodegradable material and

• use of technologies, which are environmentally friendly and based on efficient use of resources.

Sustainable Development Goals

The Sustainable Development Goals (SDGs) are a universal call of action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. The Sustainable Development Goals (SDGs) were launched at the United Nations Sustainable Development Summit in New York in September 2015, forming the 2030 Agenda for Sustainable Development. It has set targets that the countries have to should work towards and achieve by 2030. The 17 SDGs have been made with the aim to take care of important issues facing businesses, governments and society. Some of these issues are poverty, gender equality, water use, energy, climate change and biodiversity. Countries are now making policies and regulations that will promote sustainable systems needed in all economic sectors to provide a secure, affordable and sustainable economy.

Fig. 5.1 Sustainable Development Goals

Our Role in Sustainable

Sustainable development can actually happen only when each one of us works towards it. We have to become responsible environment citizens who can protect the environment through our own efforts. Here are some basic ways in which people can help towards Sustainable Development Goals.

Quality Education

Education is the most important factors for sustainable development. Children who have gone to school will be able to do jobs so that they can take care of themselves and their families. Education helps us become aware of our role as a responsible citizen. We should

1. use the facilities present in our areas.

2. take our friends to school.

3. help friends study.

4. stop friends from dropping out of school.

Clean Water and Sanitation

We must make efforts to make India free of open defecation by building toilets and creating awareness

towards sanitation.

Affordable and Clean Energy

Using solar power i.e., power generated using the sun does not cause pollution as it does not require burning of non-renewable fuels, such as coal. We are making efforts to increase the solar power generation so that our electricity needs are met and at the same time we do not pollute the environment

Decent Work and Economic Growth

We can

(a) study and find good jobs to take care of ourselves and our families.

(b) work hard and contribute to society.

(c) learn and develop skills so that we get add value in our community.

Reduced Inequalities

To reduce inequalities, we can

1. be helpful to one another.

2. be friendly with everyone.

3. include everyone while working or playing.

4. help others by including everyone whether they are small or big, girl or boy, belong to any class or caste.

Sustainable Cities and Communities

Creating Sustainable Cities

1. Save energy by switching off lights and fans when not in use.

2. Use natural light as much as possible.

3. Use energy-efficient lights (LED bulbs) and appliances.

Responsible Consumers and Producers

We can become responsible about our own environment by

1. reusing paper, glass, plastic, water, etc.

2. taking cloth bags to market carrying fruits and vegetables.

3. donate things we do not use such as clothes, books, furniture, food, etc.

4. Buy and eat seasonal fruits and vegetables from local growers.

5. Repair leaking taps and pipes to avoid wasting water.

6. Sort and treat garbage before disposing.

Protect Life Below Water

Tons of plastic is found in the seas, which is killing marine life. Protecting marine life, saving our oceans from pollution is necessary to preserve the marine life.

Protect Life on Land

Cutting of trees is leading to soil erosion and making land dry and unusable for cultivation. Planting more tree to replace the ones that we have cut is an important step towards sustainable development.

1.Which of the following is NOT a characteristic of green skills?

    A) Environmentally friendly

    B) Renewable

    C) Focused on sustainable practices

    D) Intensive use of fossil fuels

2.Which sector emphasizes the use of green skills the most?

    A) Agriculture

    B) Manufacturing

    C) Information Technology

    D) Transportation

3.What is the primary goal of promoting green skills?

    A) Increasing pollution

    B) Maximizing resource depletion

    C) Achieving sustainability

    D) Enhancing energy consumption

4.Which of the following is an example of a green skill?

    A) Traditional farming techniques

    B) Use of chemical pesticides

    C) Efficient waste management

    D) Heavy reliance on non-renewable energy sources

5.How do green skills contribute to combating climate change?

    A) By promoting deforestation

    B) By encouraging sustainable practices

    C) By increasing carbon emissions

    D) By depleting natural resources faster

6. What are green skills primarily focused on?

    A) Maximizing pollution

    B) Environmental conservation and sustainability

C) Exploitation of natural resources

D) Industrial growth at any cost

7.Which of the following is an example of a green skill?

A) Wasteful consumption habits

B) Proper waste segregation and recycling

C) Uncontrolled deforestation

D) Excessive use of chemical fertilizers

8.How do green skills contribute to a healthier environment?

A) By encouraging unsustainable practices

B) By promoting the use of harmful chemicals

C) By reducing pollution and conserving resources

D) By accelerating climate change

9.Which sector is most likely to benefit from green skills training?

A) Mining

B) Agriculture

C) Heavy industry

D) None of the above

10.What is the ultimate goal of integrating green skills into education?

A) To ignore environmental concerns

B) To maximize resource exploitation

C) To foster a sustainable and eco-friendly mindset

D) To accelerate environmental degradation

Answers:

1. D) Intensive use of fossil fuels
2. A) Agriculture
3. C) Achieving sustainability
4. C) Efficient waste management
5. B) By encouraging sustainable practices
6. B) Environmental conservation and sustainability
7   B) Proper waste segregation and recycling
8. C) By reducing pollution and conserving resources
9. B) Agriculture
10. C) To foster a sustainable and eco-friendly mindset

Subjective Questions

Q1. What is Sustainable Development?

Ans. Sustainable development is the development that satisfies the needs of the present without compromising the capacity of future generations

Q2. What is SDGs

Ans. The Sustainable Development Goals (SDGs) are a universal call of action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

Q3. How many SDGs were given by United Nations to transform the world?

Ans. 17 SDGs were launched to transform the world.

Q4. Write any five SDGs.

Ans. Five SDGs are:

1. Poverty
2. Gender Equality
3. Water use
4. Energy
5. Climate Change

Q5. What is Organic Farming?

Ans. Organic farming is where farmers do not use chemical pesticides and fertilizers to increase their production.

Q6. Name the organization which made the Sustainable Development Goals.

Ans. United Nations

Q7. What are the advantages of using 'Kulhads' in place of plastic cups?

Ans. Advantages of using 'Kulhads are:

1. reduce cutting of tree for making paper cups.

2. job creation for potters, which contributes to economy.

3. reduce plastic waste

Q8. Define the term Environment.

Ans. The surroundings or conditions in which a person lives is called environment.

Q9. Write two issues which arises due to exploitation of environment.

Ans. Global Warming, Climate Change

Q10. Write five man-made disruptions that cause ecological imbalance.

Ans. Five man-made disruptions that cause ecological imbalance are:

1. Deforestation

2. Degradation of Land and Soil Erosion.
3. Overexploitation of Resources.
4. Industrial and Atmospheric Pollution.
5. Faulty Mining Practices

Q11. What is Deforestation?

Ans. Cutting of large number of trees for human activities is called deforestation.

Q12. Write two problems which arises due to deforestation.

Ans. Two problems which arises due to deforestation are:

1. Soil Erosion

2. Degrading quality of land.

Q13. Name two types of pollution which increases due to industrialization.

Ans. Two types of pollution which increases due to industrialization are:

1. Air Pollution

2. Water Pollution

Q14. Name any two natural resources.

Ans. Air and Water

Q15. How an individual can contribute in controlling air pollution?

Ans. Individual can contribute in controlling air pollution by:

a) Using public transport

b) Pollution check and maintenance of vehicles at regular interval.

Q16. What are 4R's in reference to management of waste?

Ans. 4R's are

REFUSE ➝ REDUCE ➝ REUSE ➝ RECYCLE

Q17. What is Upcycle?

Ans. Upcycle is a new concept wherein old, used material is modified and a new product is created to share with needy/interested people.

Q18. Name two renewable sources of energy.

Ans. Wind energy and Water energy

Introduction to AI

Mind Map

1. **Intelligence**
   - Components (Interacting with the real world, Reasoning and Planning, Learning and Adaptation)

2. **Artificial Intelligence (AI)**
   - Characteristics
   - Types of AI Machines

3. **Types of Intelligence**
   - Mathematical Logical Reasoning
   - Linguistic Intelligence
   - Spatial Visual Intelligence
   - Kinesthetic Intelligence
   - Musical Intelligence
   - Intrapersonal Intelligence
   - Existential Intelligence
   - Naturalist Intelligence
   - Interpersonal Intelligence

4. **Decision Making**
   - Basis of decision making
   - What is AI and what is not AI

5. **Introduction to AI, ML, DL**
   - Artificial Intelligence
   - Machine Learning
   - Deep Learning

6. **AI Domains**
   - Data Sciences
   - Computer Vision
   - Natural Language Processing

7. **AI Applications**
   - Healthcare
   - Content Creation
   - Chatbots and Virtual Assistants

- Autonomous vehicles
- GPS
- Sales and Marketing
- Logistics and Supply Chain
- Gaming
- Agriculture
- Robotics

8. **AI Ethics**
- Examples of AI ethical issues
- AI Bias
- Reducing and Mitigating AI Bias

Intelligence

Intelligence refers to the ability to think, perceive information and apply knowledge within the behavioral environment.

Intelligence can be defined as :

- Ability to interact with the real-world – To perceive, understand and act
- Reasoning and Planning – Modeling the external world, given input
- Learning and Adaptation – Continuous learning and adapting graph

What is artificial intelligence?

Artificial intelligence refers to human made interface to mimic human like intelligence i.e reasoning, knowledge interpretation.

Any device that can perform the above, can be termed as intelligent device.

When a machine possesses the ability to mimic human traits i.e make decisions, predict the future, learn and improve on its own by collecting data, understand it, analyse it , learn from it and improve it, it is said to have Artificial Intelligence. Machines become intelligent once they are trained with data and algorithm.

Types of Intelligence

Mathematical Logical Reasoning: A person's ability to regulate, measure, and understand numerical symbols, abstraction and logic.

Linguistic Intelligence: Language processing skills both in terms of understanding or implementation in writing or verbally.

Spatial Visual Intelligence: It is defined as the ability to perceive the visual world and the relationship of one object to another.

Kinesthetic Intelligence: Ability that is related to how a person uses his limbs in a skilled manner.

Musical Intelligence: As the name suggests, this intelligence is about a person's ability to recognize and create sounds, rhythms, and sound patterns.

Intrapersonal Intelligence: Describes how high the level of self-awareness someone has is. Starting from realizing weakness, strength, to his own feelings.

Existential Intelligence: An additional category of intelligence relating to religious and spiritual awareness.

Naturalist Intelligence: An additional category of intelligence relating to the ability to process information on the environment around us.

Interpersonal intelligence: Interpersonal intelligence is the ability to communicate with others by understanding other people's feelings & influence of the person.
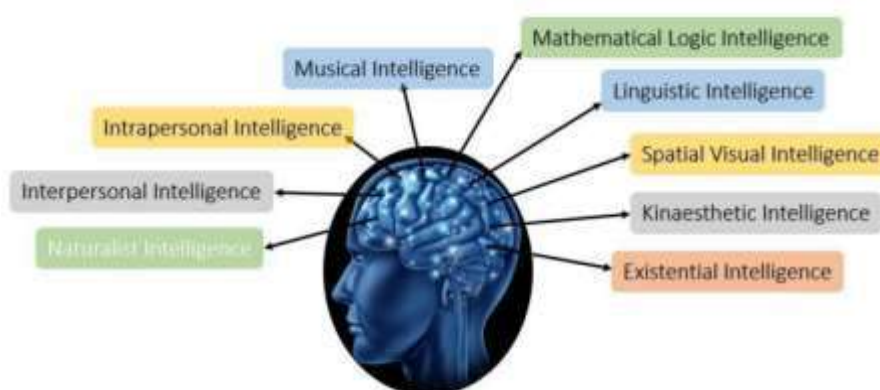
How do you make decisions?

The basis of decision making depends upon the availability of information and how we experience and understand it. For the purposes of this article, 'information' includes our past experience, intuition, knowledge, and self-awareness.

<u>**What is artificial intelligence? And what is not?**</u>

A machine is said to be artificially intelligent if it can make decision on its own, if the machines requires human intervention in performing it is not an artificially intelligent machine.

AI Machine	Not AI Machine
AI machines are trained with data and alogorithm	Smart machines which are not AI, does not require training data, they work on algorithms only
AI machines learn from mistakes and experience. They try to improvise on their next iterations	Smart machines work on fixed algorithms and they always work with the same level of efficiency, which is programmed into them.
AI machines can analyse the situation and can take decisions accordingly.	Machines which are not AI cannot take decisions on their own.

<u>**Introduction to AI, ML, DL**</u>

Artificial Intelligence (AI): Refers to any technique that enables computers to mimic human intelligence. It gives the ability to machines to recognize a human's face; to move and manipulate objects; to understand the voice commands by humans, and also do other tasks. The AI-enabled machines think algorithmically and execute what they have been asked for intelligently.
Example: Smart Home devices.

Machine Learning (ML) It is a subset of Artificial Intelligence which enables machines to improve at tasks with experience (data). The intention of Machine Learning is to enable machines to learn by themselves using the provided data and make accurate Predictions/ Decisions. Example: Speech recognition

Deep Learning (DL)

It enables software to train itself to perform tasks with vast amounts of data. In Deep Learning, the machine is trained with huge amounts of data which helps it in training itself around the data. Such machines are intelligent enough to develop algorithms for themselves. Example: Virtual assistants

Introduction to AI Domains :

Artificial Intelligence becomes intelligent according to the training which it gets. For training, the machine is fed with datasets. According to the applications for which the AI algorithm is being developed, the data which is fed into it changes. With respect to the type of data fed in the AI model, AI models can be broadly categorized into three domains.
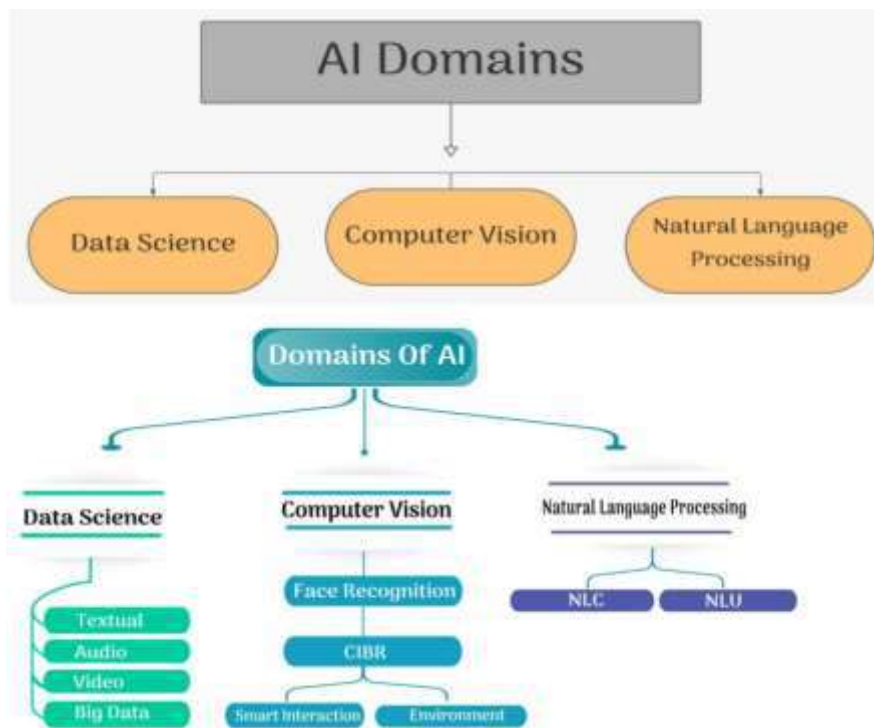
Data Sciences

Data sciences is a domain of AI related to data systems and processes, in which the system collects numerous data, maintains data sets and derives meaning/sense out of them. The information extracted through data science can be used to make a decision about it.

Example: Price comparing websites.

Computer Vision

Computer Vision, abbreviated as CV, is a domain of AI that depicts the capability of a machine to get and analyse visual information and afterwards predict some decisions about it. The entire process involves image acquiring, screening, analysing, identifying and extracting information.

Computer vision related projects translate digital visual data into descriptions. This data is then turned into computer-readable language to aid the decision-making process. The main objective of this domain of AI is to teach machines to collect information from pixels.

Examples of Computer Vision

1) Self-Driving cars/ Automatic Cars
2) Face Lock in Smartphones

Natural Language Processing

Natural Language Processing, abbreviated as NLP, is a branch of artificial intelligence that deals with the interaction between computers and humans using the natural language. The ultimate objective of NLP is to read, decipher, understand, and make sense of the human languages in a manner that is valuable.

Example: E-mail filters, Smart assistants, Siri, Alexa.

AI applications

1. **AI in healthcare**: AI's ability with data has revolutionised healthcare by suggesting timely treatment, predicting ailments, future medical needs and so on.

2. **AI in Content Creation** : It can generate text content in the form of articles, blogs etc, video content, images and graphics, music content etc.

3. **AI in chatbots and Virtual Assistants**: A virtual assistant is an application program that understands natural language voice commands and completes tasks for the user.
   A chatbot is an artificial intelligence product or software which can simulate a real-life conversation on the chat which happens between the user and the company.

4. **AI in Autonomous vehicles:** Autonomous vehicles or drivereless vehicles , which uses computer vision and data to accomplish It.

5. AI in GPS (Global Positioning System): AI is helping navigation very efficient considering other data such as weather, environment, electromagnetic interferences, so on.

6. **AI in sales and marketing:** These days online shopping is so common that we keep on purchasing from online sites. Based on our purchase history of past purchase and

searches, these sites/apps keep recommending us items which are due for purchase or are of our liking.

7. **AI in logistics and Supply chain:** When we buy physical items online they are delivered to us through a supply chain. AI helps in warehouse management through computer vision, can provide optimized routes for transportation of goods, can predict demand as per seasons and thereby requirement of warehouses for such things and so on.

8. **AI in Gaming:** AI is taking gaming experience to next level by making the game having better visual experience with high end graphics and giving immersive and interactive game experience.

9. **AI in agriculture:** The harvesting robots are available that can harvest crops at a considerably higher volume and faster pace than humans.

10. **AI in robotics:** AI and robotics are a powerful combination for automating tasks inside and outside of the factory setting, introducing flexibility and learning capabilities in previous applications.

AI Ethics

AI ethics is a set of values, principles and techniques that are accepted standards of right or wrong to guide moral conduct in development of AI technologies.

Following are the examples of AI ethical issues

1. **Bias and Fairness:** Ethically an AI system should be free from all types of biases and be fair eg:, an AI system designed for picking candidates for a job must not be biased against any gender, race, color etc.

2. **Accountability:** AI learns and evolves over time and data. What if an evolved algorithm makes one big mistake? Who would be accountable for it? Eg: Self driving car hits some one who will be accountable?

3. **Transparency:** Transparency means nothing is hidden and everything AI performs is explainable.

   Transparency ensures that there is full information and knowledge about these:

   i)   Data used, its range, interval and sources etc.

   ii)   Models used are appropriate for the context make sense.

   iii)   Models are thoroughly tested.

   iv)   Why particular decisions are made.

4. **Safety:** Al technology, tools and practices should be so implemented such that they cause no direct or indirect harm to data, people and the outcomes. Al practices must be safe to ensure the well being of individual persons and the public welfare. Al practices must uphold public trust through the responsible use of technologies.

5. **Human Al Interaction:** Al must not deceive humans or other living beings and it must not threaten or human dignity in any way.

6. **Trust, Privacy and Control:** Improved Al "faking" technologies make what once was reliable evidence into unreliable evidence - this has already happened to digital photos, sound recordings, and video. Thus, it is the ethical responsibility of the creator and user of Al to ensure that these are not misused.

7. **Cyber Security and Malicious use:** It is the ethical responsibility of an organisation to have human control over Al usage in terms of its span and control so that it is not available to hackers for malicious use.

8. **Automation and Impact over Jobs:** Al does not mean that jobs are reduced, it just means that the nature of jobs and work is predominantly changing. It is the ethical responsibility of an organization to upgrade the skill set of its workers so that they upgrade their skillset and be ready for futuristic Al oriented jobs. It is ethical responsibility of governments too (equally and even more) to bring appropriate changes.

9. **Human Rights in the Age of Al:** Al has generated new form of threats
   • huge risk to data privacy and protection - violates human right to privacy.
   • biased decision and violates human right to faps chance and justice.

AI Bias

AI bias is an anomaly (irregularity of abnormality/descrmination) in the result produced through AI based programs and algorithms because of prejudices (discriminatory) assumption made during the algorithm development process or prejudices in the training data.

Reasons for AI Bias in Data

1. Human bias in decisions
2. Flawed and unbalanced data collection
3. Under or over representation of specific features
4. Wrong assumptions

5. No proper bias testing

6. No bias mitigation (i.e reducing the severity of bias)

Reducing and Mitigating Al Bias

Let us now learn how the Al people can reduce the Al biases in data collections and decisions

1. **Thorough Research** : The data collector must research their users or subjects in advance about which the data are being collected.

2. **Diversity of Team** : The team working for data collection or algorithm development must be diverse so that one person or team does not have major influence on data and algorithm of decision-making.

3. **Data Diversity** : Combine inputs from multiple sources to ensure data diversity.

4. **Standardised Data Labelling** : The team must have standardised way of labelling so that accurate, consistent and standardised data labels are used in data collection.

5. **Identify Bias-proneness (susceptibility)** : The team should identify the possible occurrences of biases among data sets and use multi-pass annotations (note) to minimise the possible bias.

6. **Data Review** : Enlist someone from outside to see biases that the team has overlooked.

7. **Regular Data Analysis :** The team should keep track of errors and problem areas so as to resolve them quickly.

8. **Regular Bias Testing** : The team must test the collected data, training data and the overall performance of the algorithm against biases and use approaches and tools to mitigate the biases.

1 Mark Questions

1. _____ are made with the intent of accomplishing tasks which either too tedious for humans or which are time-consuming.
   a) **Machines**
   b) Gadgets
   c) Equipment
   d) Tools

2. _____ refers to the ability to perceive or infer information, and to retain it as knowledge to be applied toward adaptive behaviors within an environment or context.
   a) Behavior
   b) Nature
   c) Habits
   d) **Intelligence**

3. Ms. Rani is intelligent in performing calculations and logical reasoning. This ability refers to
   a) Lingustic Intelligence
   b) Spatial Visual Intelligence
   c) **Mathematical Intelligence**
   d) Existential Intelligence

4. Speech recognition, Image recognition, and the ability to take action are examples of
   a) **to perceive, understand, and act**
   b) reasoning and planning
   c) learning and adaption
   d) none of these

5. _____ includes our past experience, intuition, knowledge, and self-awareness
   a) habits
   b) behaviour
   c) **information**
   d) nature

6. When a machine possesses the ability to mimic human traits like making decisions, predicting the future, learning, and improving on its own said to have
   a) Informative Intelligence
   b) Knowledge Intelligence
   c) **Artificial Intelligence**
   d) Emotional Intelligence

7. In AI-based machines which of the following term is important?

    a) doing

    b) **training**

    c) sorting

    d) analyzing

8. AI systems are made up of

    a) **machines, hardware and software**

    b) only software

    c) only hardware

    d) only machine

9. The core idea of developing AI is building machines and algorithms to

    a) functions like anything

    b) **perform computation tasks and functions like a human brain**

    c) perform only arithmetic tasks

    d) perform logical comparisons only

10. Which of the following AI domain collects data, maintain the datasets, and derives the meaning out of it?

    a) **Data Science**

    b) Computer Vision

    c) Natural Language Processing

    d) Neural Network

2 Marks Questions

1. Define Artificial Intelligence.

Ans. A machine is artificially intelligent when it can accomplish tasks by itself - collect data, understand it, analyze it, learn from it, and improve it.

2. Mention four examples of artificially intelligent applications in our smartphones.

Ans. Phone Smart Lock / Snapchat filter / Shopping websites / Netflix / YouTube / Face Detection / Google Maps / Emotions recognition / Google assistant / Natural language recognition / image detection / beauty filters etc.

3. How does a machine become Artificially Intelligent?

Ans. A machine becomes intelligent by training with data and algorithm. AI machines keep updating their knowledge to optimize their output. OR Machines also become intelligent

once they are trained with some information which helps them achieve their tasks. AI machines also keep updating their knowledge to optimize their output.

4. Mention four examples of machines that are smart but not AI.

Ans. Automatic gates in shopping malls / remote control drones/ a fully automatic washing machine/ Air Conditioner/ Refrigerator/ Robotic toy cars/ Television etc.

5. Explain how has AI changed the gaming world?

Ans. AI has changed the world of gaming by making the game more intelligent by providing them the ability to learn using machine learning algorithms. Games these days try to understand human patterns and give responses on the basis of it and also give new difficulty levels.

4 Marks Questions

1. How intelligent robots are helping us in accomplishing dangerous jobs?

Ans. Robots let humans avoid some hurtful work:

(i) Lifting up heavy material at the construction site.

(ii) Stirring and mixing metals or liquids at a high temperature.

(iii) Collecting and packaging of radioactive waste.

(iv) Working in contaminated and dusty environments.

2. How AI helps in giving you personalized experience online?

Ans. AI based recommendations: AI uses advanced machine learning algorithms to analyze browser history, page clicks, social interactions (likes, shares), past purchases, the duration for which a page was viewed, location, etc. to gauge customer interests and preferences. AI can help deliver product recommendations based on frequently bought items, or related products. It can even help customize web pages and elements to suit a customer's needs. For instance, Netflix does intense behavior analysis based on behavior and demographic data to determine the content that will resonate with their customers.

Chatbots and Automated Messaging: AI-powered chatbots and messaging agents can enhance the customer experience across channels. They can answer simple queries, engage customers, efficiently handle multiple interactions.

Automated Service Interactions: AI-driven programs can send automated messages to customers regarding a pending service, a part replacement, or a regular order.

Curating Select Products: Amazon has come up with the concept of the Amazon 4-star retail store. Products that have received a multitude of 4-star ratings will be offered in this physical store. Amazon will use its product recommendation engine to identify trending products and customers' favorites and bring them to a brick and mortar setting.

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AI PROJECT CYCLE

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What is an AI Project Cycle?

Project Cycle is a step-by-step process to solve problems using proven scientific methods and drawing inferences about them.

Let us take some daily examples as projects, requiring steps to solve the

problem. Creating a birthday card.

1. Checking the factors like budget, etc which will help us decide the next steps and understanding the Project.

2. Acquiring data from different sources like online, with friends etc for Designs and ideas.

3. Making a list of the gathered data.

4. Creating or modelling a card on the basis of the data collected.

5. Showing it to Parents or cousins to let them check it or evaluate it.

Components of AI Project Cycle?

Components of the project cycle are the steps that contribute to completing the Project. The Components of AI Project Cycle are: -

❖ **Problem Scoping** - Understanding the problem

❖ **Data Acquisition** - Collecting accurate and reliable data

❖ **Data Exploration** - Arranging the data uniformly

❖ **Modelling** - Creating Models from the data

❖ **Evaluation** - Evaluating the project

1.   Problem Scoping

Problem Scoping refers to understanding a problem, finding out various factors which affect the problem, define the goal or aim of the project.

Sustainable Development Goals   **Sustainable Development: To Develop for the present without exploiting the resources of the future.**

- o   17 goals announced by United Nations.
- o   Aim to achieve them by 2030.
- o   Pledge taken by all the member nations of the UN.

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity.

4 W's of Problem Scoping

Problem Statement Template

The 4W's of Problem Scoping are Who, What, Where, and Why.

This W's helps in identifying and understanding the problem in a better and efficient manner.

- ❖ **Who** - "Who" part helps us in comprehending and categorizing who all are affected directly

  and indirectly with the problem and who are called the Stake Holders.

- ❖ **What** - "What" part helps us in understanding and identifying the nature of the problem and under this block, you also gather evidence to prove that the problem you have selected exists.

- ❖ **Where** - "Where" does the problem arise, situation, context, and location?

- ❖ **Why** - "Why" is the given problem worth solving?

The Problem Statement Template helps us to summarize all the key points into one single template. So that in the future, whenever there is a need to look back at the basis of the problem, we can take a look at the Problem Statement Template and understand its key elements of it.

Have a look at Problem Statement Template.

The	Stakeholder	Who
Have a problem	Issue/Problem	What
When/While	Context/Situation/Location	Where
Ideal Solution	How the solution will help the stakeholders	Why

2. Data Acquisition

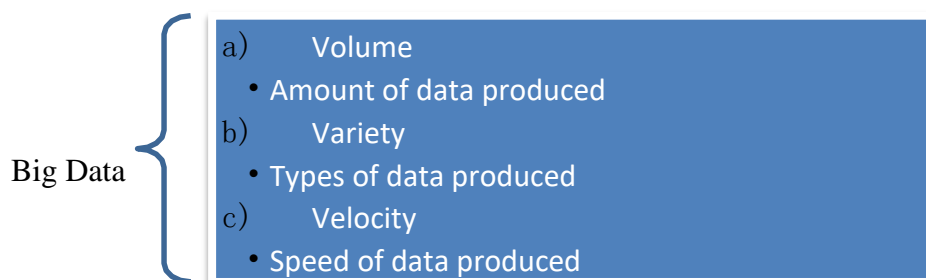The process of collecting accurate and reliable data to work with.Two types of Data Sets

Base	Training set	Testing set
Use	Used for Training the model	Used for Testing the model after it is trained
Size	Is allot bigger than testing data and constitutes about 70% to 80%	It is smaller than Training set and constitutes about 20% to 30%

Data Features

- o Refer to the type of data you want to collect.
- o Eg: Salary amount, increment percentage, increment period, bonus etc.

Big data

- o It includes data with sizes that exceed the capacity of traditional software to process within an acceptable time and value.
- o The main focus is on unstructured type of data

Big Data

a)   Volume
 • Amount of data produced
b)   Variety
 • Types of data produced
c)   Velocity
 • Speed of data produced

- ❖ Web Scraping
  - ● Web Scraping means collecting data from web using some technologies.
  - ● We use it for monitoring prices, news and etc.
  - ● Example: Web Scrapping using beautiful soup in python.
- ❖ Sensors
  - ● Sensors are very important but very simple to understand.
  - ● Sensors are the part of IoT (Internet of things)
  - ● Sensors collect the physical data and detect the changes.
- ❖ Cameras
  - ● Camera captures the visual information and then that information which is called image is used as a source of data.
  - ● Cameras are used to capture raw visual data.
- ❖ API
  - ● Application Programming interface.
  - ● API is a messenger which takes requests and tells the system about requests and gives the response.
  - ● Ex: Twitter API, Google Search API
- ❖ Observations
  - ● When we observe something carefully, we get some information
  - ● For ex: Scientists Observe creatures to study them.
  - ● Observations are a time-consuming data source.
- ❖ Surveys
  - ● The survey is a method of gathering specific information from a sample of people.
  - ● Example, a census survey for analysing the population

Data Exploration

In this stage of project cycle, we try to interpret some useful information out of the data we have acquired. For this purpose, we need to explore the data and try to put it uniformly for a better understanding. This stage deals with validating or verification of the collected data and to analyze that:

- ➢ The data is according to the specifications decided.
- ➢ The data is free from errors.

> ➤ The data is meeting our needs This stage is divided into 2 sub stages.
>   1）Data Cleaning
>   2）Data Visualization.

1) Data Cleaning

Data cleaning helps in getting rid of commonly found errors and mistakes in a data set. These are the 3 commonly found errors in data.
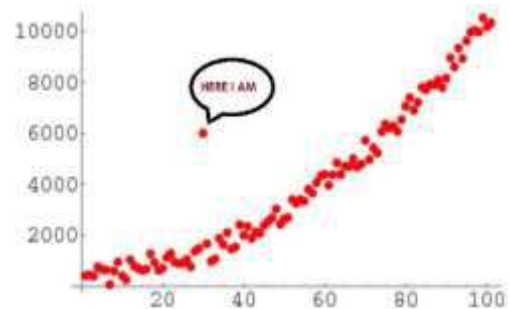
1） Outliers: Data points existing out of the range.

2） Missing data: Data points missing at certain places.

3） Erroneous data: Incorrect data points.

Outliers

An outlier is a data point in a dataset that is distant from all other observations.

or

An outlier is something that behaves differently from the combination/ collection of the data.

Missing Data

What do these NaN values indicate? They are the missing values in the data set. We can handle them in two ways:

1. By eliminating the rows of missing values. (Generally, not recommended as it might reduce the data set to some extent leading to less data to be trained)

2. By Using an Imputer to find the best possible substitute to replace missing values.

Erroneous Data:

Erroneous data is test data that falls outside of what is acceptable and should be rejected by the system.

Student Name	Class
RIYA GEORGE	X A
JOSHUA SAM	X A
APARNA BINU	X A
SIDHARDH V R	X A
NITHILA M	57
ATHULYA M S	X A
ANUJA MS	X B
KEERTHI KRISHNANATH	X B

2) Data Visualization

Why we need to explore data through visualization?

1) We want to quickly get a sense of the trends, relationships, and patterns contained within the data.

2) It helps us define strategy for which model to use at a later stage.

3) Visual representation is easier to understand and communicate to others. Example:


Data Visualization Techniques

1. Area Graphs

Area Graphs are Line Graphs but with the area below the line filled in with a certain colour or texture. Like Line Graphs, Area Graphs are used to display the

76
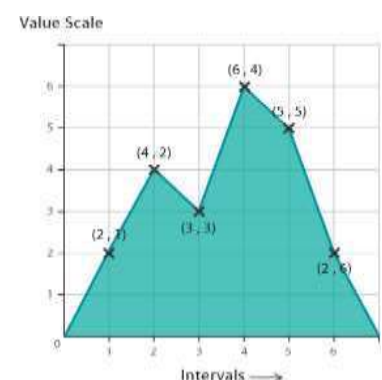
development of quantitative values over an interval or time period. They are most commonly used to show trends, rather than convey specific values.

2. Bar Charts

The classic Bar Chart uses either horizontal or vertica bars (column chart) to show discrete, numerical comparisons across categories. Bars Charts are distinguished from Histograms, as they do not display continuous developments over an interval. Bar Chart's discrete data is categorical data and therefore answers the question of "how many?" in each category.
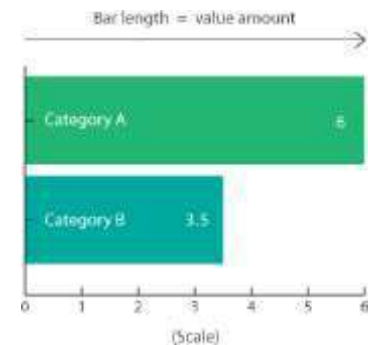

3. Histogram

A Histogram visualizes the distribution of data over a continuous interval or certain time period. Each bar in a histogram represents the tabulated frequency at each interval/bin. Histograms help give an estimate as to where values are concentrated, what the extremes are and whether there are any gaps or unusual values.
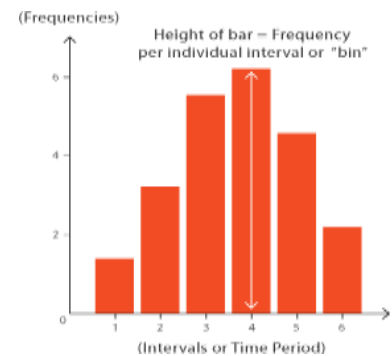
4. Line Graphs

Line Graphs are used to display quantitative values over a continuous interval or time period. A Line Graph is most frequently used to show trends and analyze how the data has changed over time. Line Graphs are drawn by first plotting data points on a Cartesian coordinate grid, then connecting a line between all of these points.
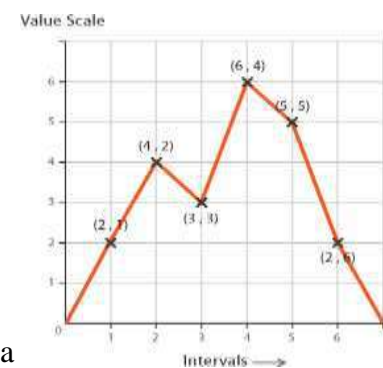
Typically, the y-axis has a quantitative value, while the x-axis is a timescale or a sequence of intervals. Negative values can be displayed below the x-axis.

5. Scatterplots

Scatterplots use a collection of points placed using Cartesian Coordinates to display values from two variables. By displaying a variable in each axis, you can detect if a

77
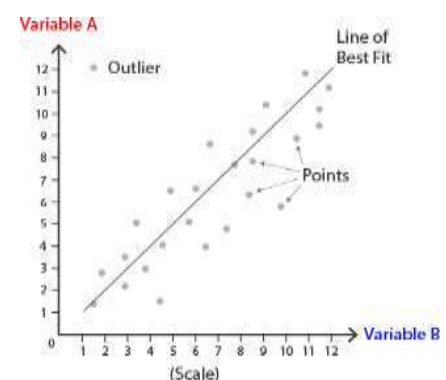
relationship or correlation between the two variables exists.

6. Pie Charts

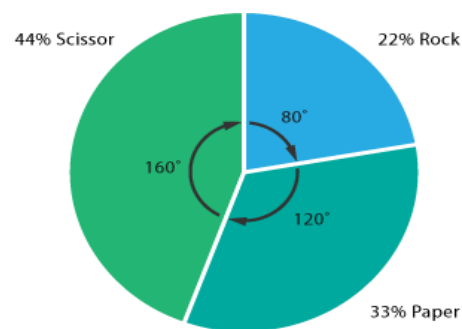Pie Charts help show proportions and percentages between categories, by dividing a circle into proportional segments. Each arc length represents a proportion of each category, while the full circle represents the total sum of all the data, equal to 100%. Pie Charts are ideal for giving the reader a quick idea of the proportional distribution of the data.

Data			
Rock	Paper	Scissor	TOTAL
2	3	4	9
To calculate percentages			
2/9=22%	3/9=33%	4/9=44%	100%
Degrees for each "pie slice"			
(2/9) x 360 = 80°	(3/9) x 360 = 120°	(4/9) x 360 = 160°	360°

7. Flow Charts

This type of diagram is used to show the sequential steps of a process. Flow Charts map out a process using a series of connected symbols, which makes process easy to understand and aids in its communication to other people. Flow Charts are useful for explaining how a complex and/or abstract procedure, system, concept or algorithm work. Drawing a Flow Chart can also help in planning an developing a process or improving an existing one.
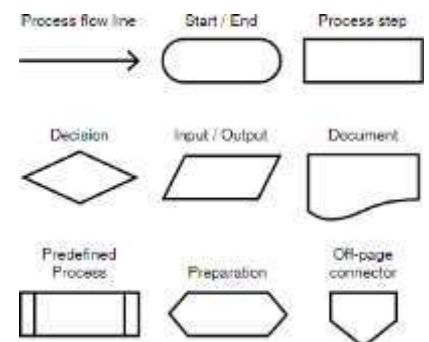
4. Modelling

It's the fourth stage of AI project cycle. In previous stage, i.e. graphical representation makes the data understandable for humans as we can discover trends and patterns out of it. But when it comes to machines accessing and analyzing data, it needs the data in the most basic form of numbers (which is binary – 0s and 1s) and when it comes to discovering patterns and trends in data, the machine goes in for mathematical representations of the same.

The ability to mathematically describe the relationship between parameters is

the heart of every AI model.

Generally, AI models can be classified as follows:
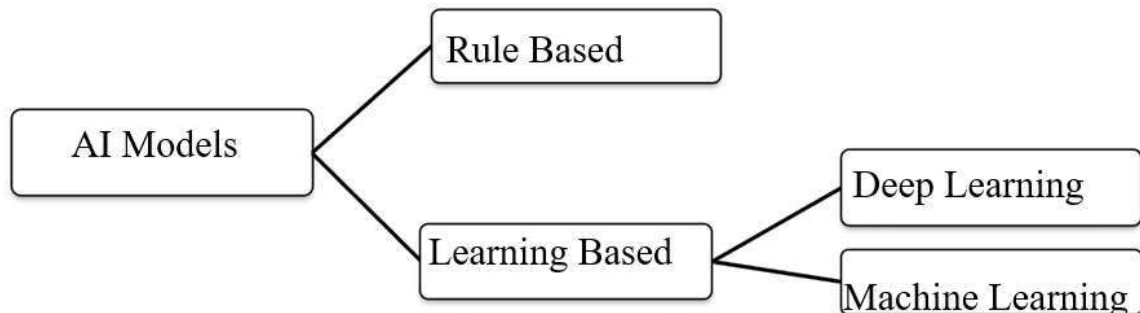
Rule Based Approach

In this approach, the rules are defined by the developer. The machine follows the rules or instructions mentioned by the developer and performs its task accordingly. So, it's a static model. i.e. the machine once trained, does not take into consideration any changes made in the original training dataset.
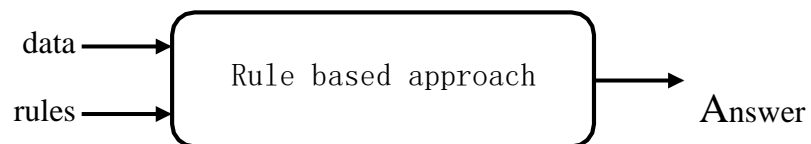
Thus, machine learning gets introduced as an extension to this as in that case, the machine adapts to change in data and rules and follows the updated path only, while a rule-based model does what it has been taught once.

Learning Based Approach

It's a type of AI modelling where the machine learns by itself. Under the Learning Based approach, the AI model gets trained on the data fed to it and then is able to design a model which is adaptive to the change in data. That is, if the model is trained with X type of data and the machine designs the algorithm around it, the model would modify itself according to the changes which occur in the data so that all the exceptions are handled in this case.

```
Data  ────►  ┌─────────────────────────┐
             │  Learningbasedapproach  │  ────►  Answers
Rules ────►  └─────────────────────────┘
```
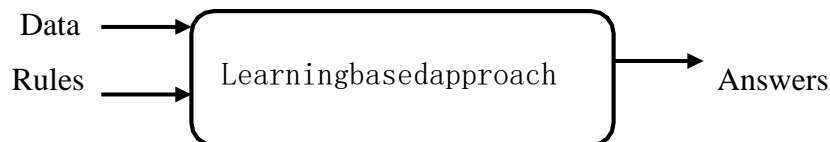
After training, the machine is now fed with testing data. Now, the testing data might not have similar images as the ones on which the model has been trained. So, the model adapts to the features on which it has been trained and accordingly predicts the output.

In this way, the machine learns by itself by adapting to the new data which is flowing in. This is the machine learning approach which introduces the dynamicity in the model. Generally, learning based models can be classified as follows:

```
                        ┌──────────────────────┐
                        │ MachineLearningModels │
                        └──────────────────────┘
                                   │
          ┌────────────────────────┼──────────────────────┐
          │                        │                       │
   ┌────────────┐          ┌──────────────┐       ┌──────────────┐
   │ SupervisedL │          │ UnsupervisedL │       │ ReinforcementL │
   │   earning   │          │    earning    │       │    earning     │
   └────────────┘          └──────────────┘       └──────────────┘
          │                        │
    ┌─────┴─────┐            ┌──────┴────────┐
    │           │            │               │
┌──────────┐ ┌──────────────┐ ┌──────────┐ ┌────────────────┐
│Regression│ │Classification│ │Clustering│ │ Dimensionality │
│          │ │              │ │          │ │   Reduction    │
└──────────┘ └──────────────┘ └──────────┘ └────────────────┘
```
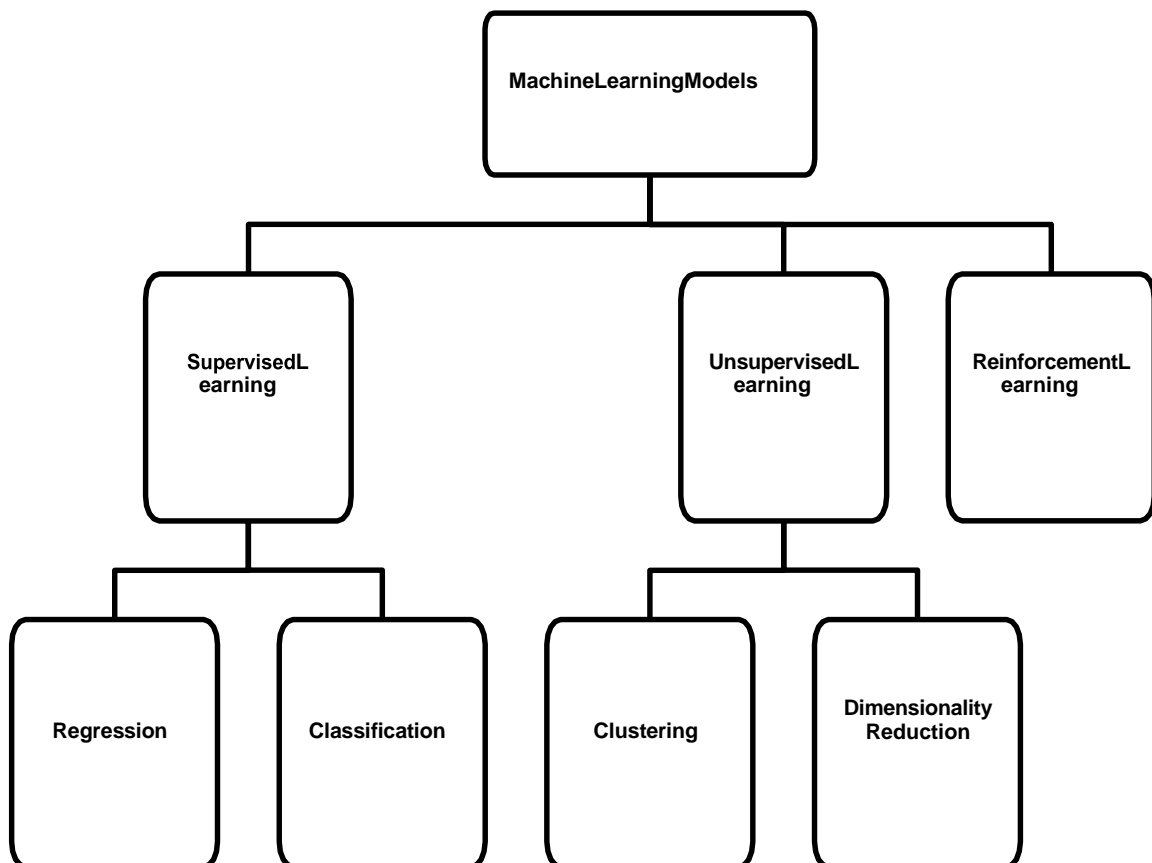
Ⅰ. **Supervised Learning**

In a supervised learning model, the dataset which is fed to the machine is labelled. In other words, we can say that the dataset is known to the person who is training the machine only then he/she is able to label the data. A label is some information which can be used as a tag for data. For example, students get grades according to the marks they secure in examinations. These grades are labels which categorize the students according to their marks.

There are two main types of supervised learning models:
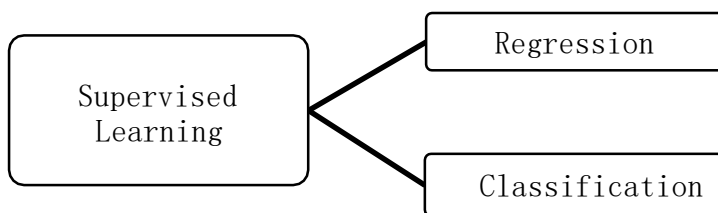
a) **Classification**

In this model, data is classified according to the labels. For example, in the grading system, students are classified on the basisof the grades they obtain with respect to their marks in the examination. This model works on discrete dataset which means the data need not be continuous.
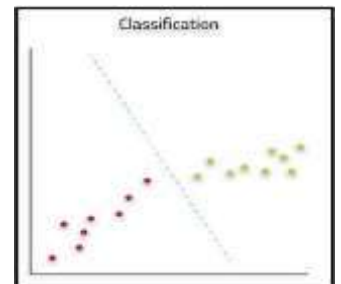
b) **Regression**

This model work on continuous data. For example, if you wish to predict your next salary, then you would put in the data of your previous salary, any increments, etc., and would train the model. Here, the data which has been fed to the machine is continuous.
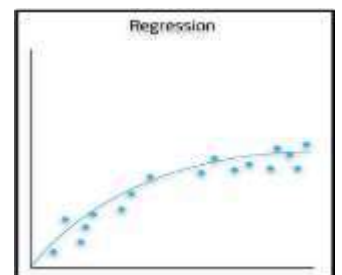
Ⅱ. **Unsupervised Learning**

An unsupervised learning model works on unlabeled dataset. This means that the data which is fed to the machine is random and there is a possibility that the person who is training the model does not have any information regarding it. The unsupervised learning models are used to identify relationships, patterns and trends out of the data which is fed into it. It helps the user in understanding what the data is about and what are the major features identified by the machine in it.

For example, you have a random data of 1000 dog images and you wish to understand some pattern out of it, you would feed this data into the unsupervised learning model and would train the machine on it. After training, the machine would come up with patterns which it was able to identify out of it. The Machine might come up with patterns which are already known to the user like colour or it might even come up with something very unusual like the size of the dogs.

There are two main types of unsupervised learning models:
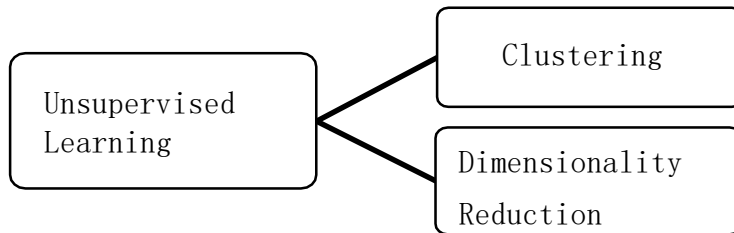
a) Clustering

It refers to the unsupervised learning algorithm which can cluster the unknown data according to the patterns or trends identified out of it. The patterns observed might be the ones which are known to the developer or it might even come up with some unique patterns out of it.
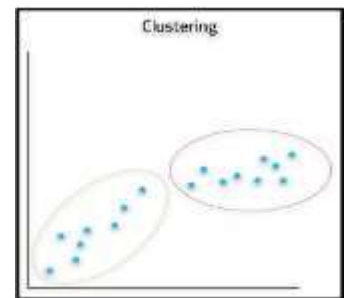

b) Dimensionality Reduction

We humans are able to visualize up to 3Dimensions only but according to a lot of theories and algorithms, there are various entities which exist beyond 3-Dimensions. For example, in Natural language Processing, the words are considered to be N-Dimensional entities. Which means that we cannot visualize them as they exist beyond our visualization ability. Hence, to make sense out of it, we need to reduce their dimensions. Here, dimensionality reduction algorithm is used.
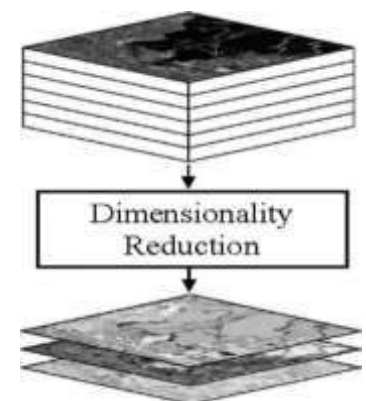
III. **Reinforcement Learning**

It a type of machine learning technique that enables an agent(model) to learn in an interactive environment by trial and error using feedback from its own actions and experiences. Though both supervised and reinforcement learning use mapping

between input and output, unlike supervised learning where feedback provided to the agent(model) is correct set of actions for performing a task, reinforcement learning uses rewards and punishment as signals for positive and negative behavior. Reinforcement learning is all about making decisions sequentially.
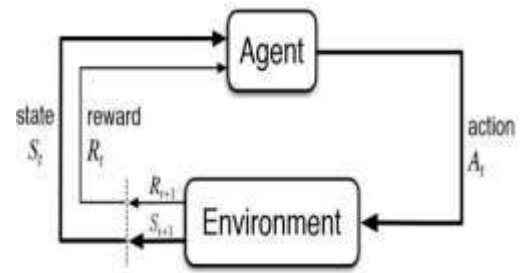
5. Evaluation

Evaluation is a process of understanding the reliability of any AI model, based on outputs by feeding the test dataset into the model and comparing it with actual answers. i.e. oonce a model has been made and trained, it needs to go through proper testing so that one can calculate the efficiency and performance of the model. Hence, the model is tested with the help of Testing Data (which was separated out of the acquired dataset at Data Acquisition stage.

The efficiency of the model is calculated on the basis of the parameters mentioned below:

1. Accuracy

   Accuracy is defined as percentage of the correct predictions out of all the observations.

2. Precision

Precision is defined as the percentage of true positive cases versus all the cases where the prediction is true.

3. Recall

Recall is defined as the fraction of positive cases that are correctly Identified.

4. F1 score

The F1 score is a number between 0 and 1 and is the harmonic mean of precision and recall

1 mark Questions

1) Which of the following is correct about the rule-based approach?

    a. We cannot provide enough rules to the machine.

    b. A drawback/feature for this approach is that the learning is static.

    c. Once the rules are fed into the system, it takes into consideration any changes made in the original training dataset.

    d. It can improve itself based on the feedbacks.

2) Choose the five stages of AI project cycle in correct order

    a. Evaluation -> Problem Scoping -> Data Exploration -> Data Acquisition ->Modelling

    b. Problem Scoping -> Data Exploration -> Data Acquisition -> Evaluation ->Modelling

    c. Data Acquisition -> Problem Scoping -> Data Exploration -> Modelling ->Evaluation

    d. Problem Scoping -> Data Acquisition -> Data Exploration -> Modelling ->Evaluation

3) A business problem wherein we categorize whether an observation is "Safe," "At Risk," or "Unsafe" is an example of

    a. Classification   c. Regression

    b. Clustering   d. Dimensionality Reduction

4) **Assertion (A):** We can use histograms when data is in categories (such as ("Pop","Rock", "Jazz", "Hip-Hop" etc.)

 Reason (R): We use bar charts when we have continuous data (such as a person's height or weight)

    a. (A) is false but (R) is true

    b. (A) is true but (R) is false

    c. Both (A) and (R) are true

    d. Both (A) and (R) are false

5) Choose the correct option

    a. Unsupervised learning ->labelled dataset, Regression

b. Supervised learning -> labelled data set, Regression

c. Unsupervised learning ->unlabelled dataset, Classification

d. Supervised learning -> unlabelled data set, Regression

6) Data about the houses such as square footage, number of rooms, features, whether a house has a garden or not, and the prices of these houses, i.e., the corresponding labels are fed into an AI machine. By leveraging data coming from thousands of houses, their features and prices, we can now train the model to predict a new house's price. This is an example of

a) Reinforcement learning

b) Supervised learning

c) Unsupervised learning

d) None of the above

7) _____ is defined as the percentage of correct predictions out of all the observations.

a) Predictions

b) Accuracy

c) Reality

d) F1 Score

8) In_____, the machine is trained with huge amounts of data which helps it in training itself around the data.

a) Supervised Learning

b) Deep Learning

c) Classification

d) Unsupervised Learning

9) What is the role of modelling in an NLP based AI model?

a) Modelling in NLP helps in processing of AI model

b) Modelling is required to make an AI model

c) In NLP, modelling requires data pre-processing only after which the data is fed to the machine.

d) Modelling is used in simplification of data acquisition

10) Recall-Evaluation method is

a) defined as the fraction of positive cases that are correctly identified.

b) defined as the percentage of true positive cases versus all the cases where the prediction is true.

c) defined as the percentage of correct predictions out of all the observations.

d) comparison between the prediction and reality 11)Give 2 examples of Supervised Learning models.

a) Classification and Regression

b) Clustering and Dimensionality Reduction

c) Rule Based and Learning Based

d) Classification and Clustering

12) Define Machine Learning.

a) Machine learning is the study of computer algorithms that improve automatically through experience.

b) Refers to any technique that enables computers to mimic human intelligence.Machine learning refers to computer systems (both machines and software) enables machines to perform tasks for which it is programmed.

c) Machine Learning refers to projects that allow the machine to work on a particular logic.

13) Differentiate between Prediction and Reality.

a) Prediction is the input given to the machine to receive the expected result of the reality.

b) Prediction is the output given to match the reality.

c) The prediction is the output which is given by the machine and the reality is the real scenario in which the prediction has been made.

d) Prediction and reality both can be used interchangeably.

14) Which of the following statements is true for the term Evaluation?

   a) Helps in classifying the type and genre of a document.

   b) It helps in predicting the topic for a corpus.

   c) Helps in understanding the reliability of any AI model

   d) Process to extract the important information out of a corpus.

15) Which of the following is not part of the AI Project Cycle?

   a) Data Exploration

   b) Modelling

   c) Testing

   d) Problem Scoping

16) _refers to the AI modelling where the machine learns by itself.

   a) Learning Based

   b) Rule Based

   c) Machine Learning

   d) Data Sciences

17) Define the term Machine Learning. Also give 2 applications of Machine Learning in our daily lives.

18) Differentiate between Classification and Regression.

19) Which of these is NOT used for visualization in AI?

   a) Pie Chart

   b) Scatter plot

   c) Ruler

   d) Bar chart

20) Which of the following is an example of rule-based approach?

   a) Pixel it activity

   b) Histogram

   a) Decision trees

   c) Illustration diagram

21) Match the best choice of graph for the data below.

 1. Chart to show the number of students in a school over past 5 years.

 2. Chart to show the temperature on each day of the week.

 3. Chart to show percentage of each sale of ticket type at a concert
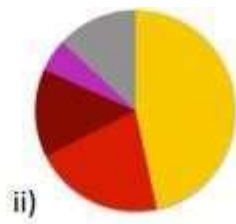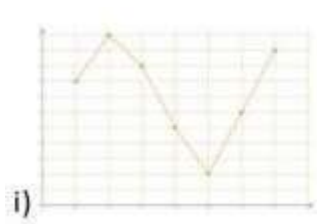
a) 1 -> i) ; 2 -> ii) ; 3 -> iii)

c) 1 -> iii) ; 2 -> i) ; 3 -> ii)

b) 1 -> ii) ; 2 -> iii) ; 3 -> i)

d) 1 -> iii) ; 2 -> ii) ; 3 -> i)

22) Name all the stages of an AI Project cycle.

23) What are Data features?

24) Mention the types of learning approaches for AI modeling

25) What is the objective of evaluation stage?

26) _____is not a learning-based approach where AI model gets trained on the data fed to it and then is able to design a model which is adaptive to the change in data. **[CBSE TERM-1 2021]**

    a) Supervised Learning

    b) Unsupervised Learning

    c) Reinforcement Learning

    d) Enforcement Learning

27) Unsupervised learning is divided into the following two categories. Identify the correct one. **[CBSE TERM-1 2021]**

    a) Rule based and learning based

    b) Classification and clustering

    c) Clustering and dimensionality reduction

    d) Classification and regression

28) _ is one of the types supervised learning model, where data is classified according labels and data need not be continuous. [CBSE TERM-1 2021]

    a) Regression

    b) Clustering

    c) Classification

    d) Dimensionality reduction

29) In_____design is adaptive to change in data, which results in dynamicity of a model. **[CBSE TERM-1 2021]**

    a) Learning based approach

    b) Rule-based approach

    c) Data Acquisition

    d) Data modelling

30) Drawbacks of Rule based approach is/are: **[CBSE TERM-1 2021]**

  I.   The learning is static

  II.   Any changes made to the original data will not be considered

  III.   Once trained the model cannot improvise on the basis of feedback

    a) All of the above statements are correct

    b) Statements i and ii are correct

    c) Statements ii and iii are correct

    d) Statements i and iii are correct

31) Evaluation is the process of understanding the reliability of any AI model, based on outputs by feeding test dataset into the model and comparing with actual answers. Therefore, it must be followed by: **[CBSE TERM-1 2021]**

    a) Problem Scoping   c) Data Acquisition

    b) Data Exploration   d) Modelling

32) Classification and regression are_____, and approach followed is _____ [CBSE TERM-1 2021]

a) Supervised, Learning

c) Reinforcement, Learning

b) Unsupervised, Learning

d) Supervised, rule-based

33) _ refers to the unsupervised learning algorithm which can cluster the unknown data according to the patterns or trends identified out of it.

[CBSE TERM-1 2021]

a) Regression

c) Clustering

b) Classification

d) Dimensionality reduction

34) Accuracy, Recall, Precision, F1 Score are the parameters to calculate the efficiency under _____ [CBSE TERM-1 2021]

a) Data Acquisition

c) Data Testing

b) Data Evaluation

d) Data Modelling

35. Assertion(A): The training data should be authentic and relevant to the problem statement scoped. **[CBSE TERM-1 2021]**

Reason(R): It increases the AI project efficiency.

a. Both A and R are true, and R is the correct explanation of A.

b. Both A and R are true, but R is not the correct explanation of A.

c. A is false but R is true.

d. A is true but R is false.

2Mark Questions

1. Define the two different approaches for AI modelling?

2. Draw the graphical representation of Classification AI model. Explain in brief.

3. Draw the graphical representation of Regression AI model. Explain in brief

4. Draw the graphical representation of Clustering AI model. Explain in brief.

5. Explain Data Exploration stage

6. Differentiate between Training dataset and Testing dataset.

7. What is stainable development.

8. What is Problem statement template.

9. Define the terms:

a) Big data   b)Web scrapping

4 Mark questions

1. Differentiate between rule-based and learning-based AI modelling approaches.

2. Explain the following:

   a.Supervised Learning b. Unsupervised Learning

3. Differentiate between classification and clustering algorithms with the help of suitable examples.

4. Explain the sources of Data acquisition stage.

5. Explain 4W's of Problem scoping.

6. Explain the components of AI Project cycle.

7. Explain Modelling stage

8. Explain Evaluation stage.

Mind Map
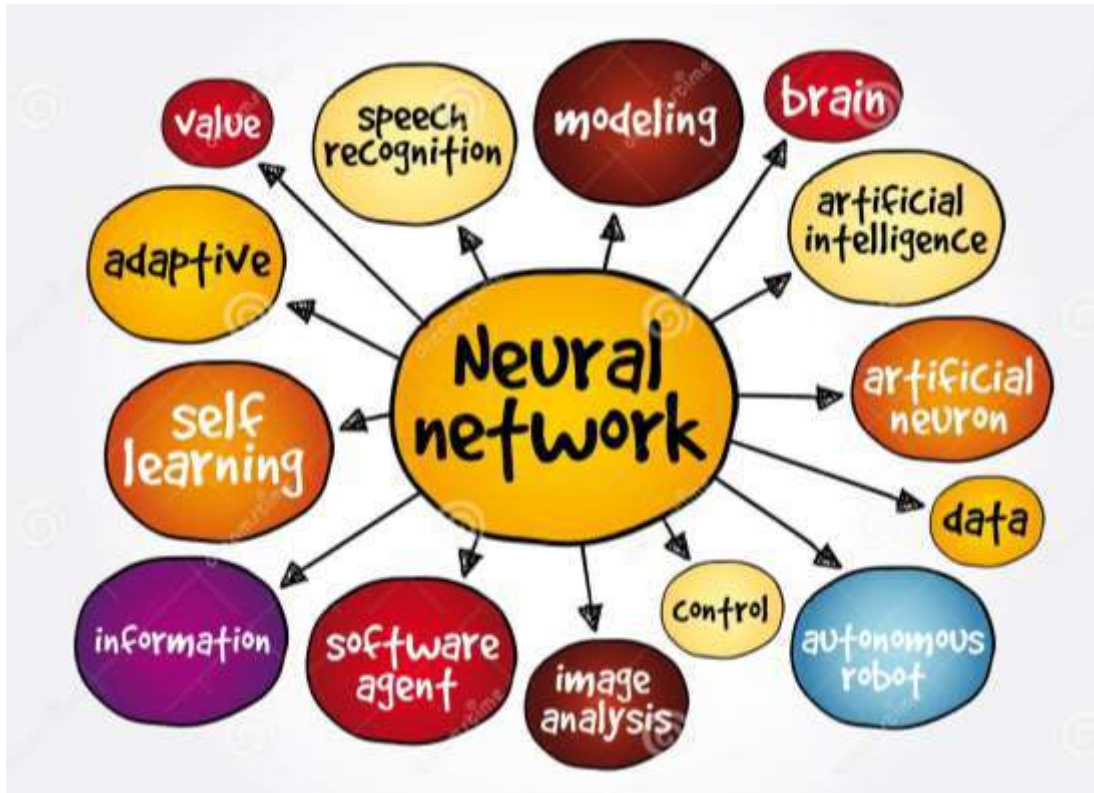
Neural Networks are series of networks of independent **Neurons** just like in our brain, but in computers, neurons are not the living tissue it is just a algorithm which give output based on given data.

The key advantage of **Neural Networks**, are that they are able to extract data features automatically without needing the input of the programmer.
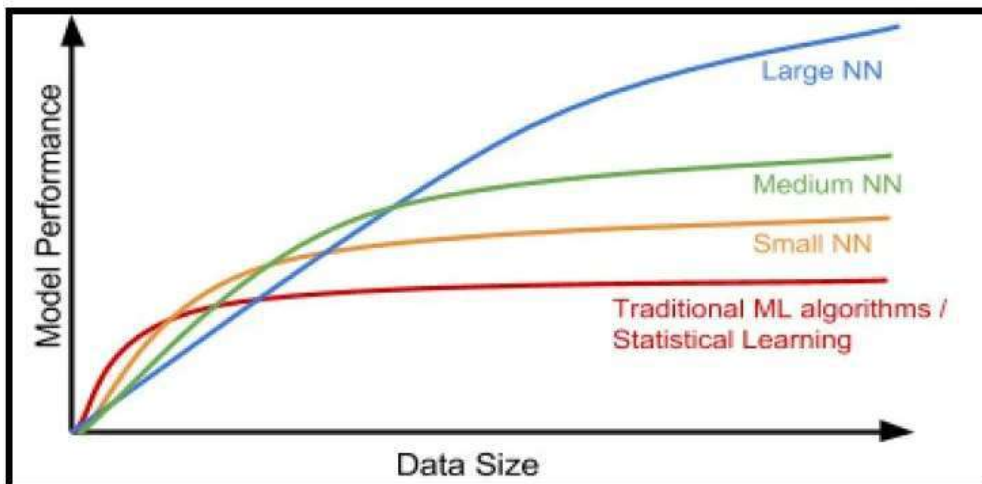
A Neural Network is essentially a system of organizing machine learning algorithms to perform certain

tasks. It is a fast and efficient way to solve problems for which the dataset is very large, such as in images.

This is a representation of how neural networks work. A Neural Network is divided into multiple layers and each layer is further divided into several blocks called nodes.

Each node has its own task to accomplish which is then passed to the next layer.
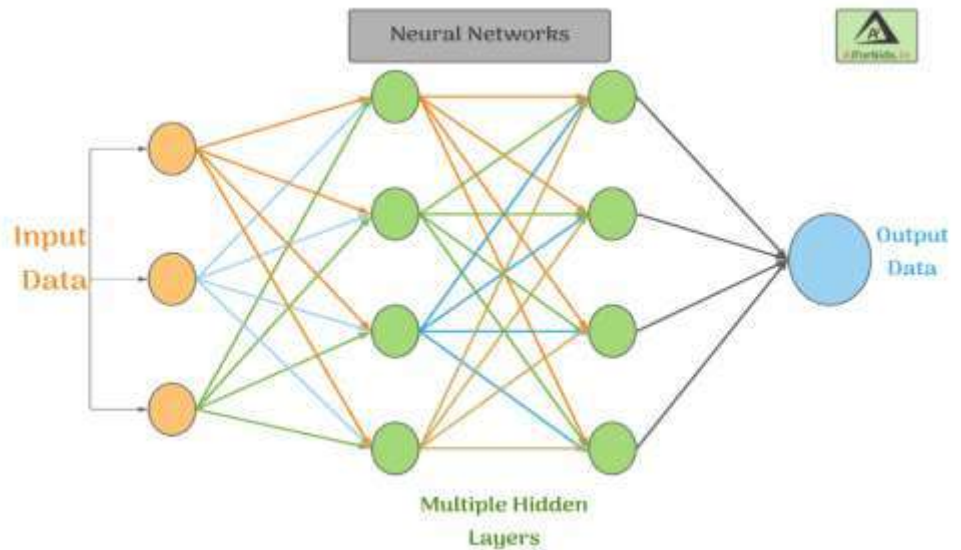
Processing Layers in Neural Networks.

Input Layer :

The input layer of a neural network is composed of artificial input neurons, and brings the initial data into the system for further processing by subsequent layers of artificial neurons.
The input layer is the very beginning of the workflow for the artificial neural network.

Hidden Layer :

A hidden layer in an artificial neural network is a layer in between input layers and output layers, where artificial neurons take in a set of weighted inputs and produce an output through an activation function.
It is a typical part of nearly any neural network in which engineers simulate the types of activity that go on in the human brain.

Output Layer :

The output layer is responsible for producing the final result. There must always be one output layer in a neural network.

The output layer takes in the inputs which are passed in from the layers before it, performs the calculations via its neurons and then the output is computed.

- Neural Network systems are modelled on the human brain and nervous system.
- They are able to automatically extract features without input from the programmer.
- Every neural network node is essentially a machine learning algorithm.
- It is useful when solving problems for which the data set is very large.

Neural Networks vs Human Nervous System
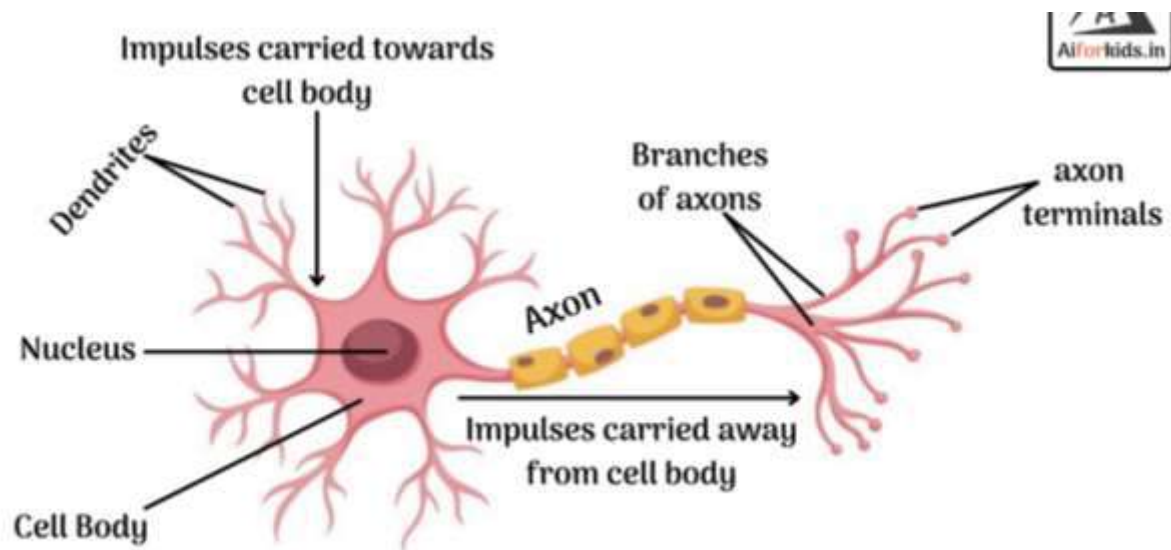
Applications of neural networks

Neural networks have broad applicability to real-world business problems. In fact, they have already been successfully applied in many industries.

Since neural networks are best at identifying patterns or trends in data, they are well suited for prediction or forecasting needs including:

sales forecasting

industrial process control

customer research

data validation

risk management

target marketing

But to give you some more specific examples; ANN is also used in the following specific paradigms: recognition of speakers in communications; diagnosis of hepatitis; recovery of telecommunications from faulty software; interpretation of multi-meaning Chinese words; undersea mine detection; texture analysis; three-dimensional object recognition; hand-written word recognition; and facial recognition.

Neural networks in medicine

Neural Networks in business

<mark>**Important Questions A Neural Network AI Class 10**</mark>

Objective type questions (OTQs)

1. A _____ is the technique to create computer programs to learn from data and aimed to functions like the human brain. (Ans. **neural network**)
2. The neural network is also known as _____. (Ans. Artificial Neural Network)
3. Which of the following is the feature of a neural network?
    - o Extract information without any programming
    - o Provide the filtered information without input
    - o Learn itself and produced the trained data
    - o **All of these**
4. Neural networks learn from the processing numerous _____.
   (Ans. **labeled examples**)
5. The labeled examples are provided in the process of training. (**True**/False)
6. The traditional Machine Learning algorithm cannot improve the performance of the model after certain levels and then saturation will start. (**True**/False)

7. Large ANN performs better than as Medium and Small Neural Network datasets.
   (True/**False**)

8. The first layer of the neural network is known as _____ layer. (Ans. **input**)

9. The actual processing occurs in which of the following layer?
   - input layers
   - **hidden layers**
   - output layers
   - None of these

10. A neural network is used to solve problems using a large data set. (**True**/False)

11. In which of the following type of learning networks are trained to provide the correct output using several example units?
    - **Supervised learning**
    - Unsupervised learning
    - Reinforcement learning
    - All of these

12. In _____ learning only inputs provided but no output related data.
    (Ans. **Unsupervised**)

13. Reinforcement learning relies on output-related information. (True/**False**)

Subjective Type Questions (STQs)

In this section, we will talk about subjective type questions on the topic Neural Network AI class 10. These questions can be asked in 2 marks or 4 marks questions.

1. **What do you mean by the neural network?**
   - The neural network is a model that works as neurons works in human brains.
   - It is also known as ANN (Artificial Neural Networks)
   - It copies the mechanism as working in human brains.
   - It can extract the information without any code or programming.
   - In a neural network, the machine can learn, recognize and make decisions like human beings.
   -

2. **Where the neural network used?**

   o A neural network is used in many fields where a large data set is required..

   o It can be used in the following:

     ▪ Voice Recognition

     ▪ Character Recognition

     ▪ Signature Verification Applications

     ▪ Human face recognition

3. **How does the neural network work?**

   o The input layers inputs or fed data

   o The hidden layers process these data and assign weight to each layer randomly

   o Every layer process has its own block which accomplishes the task and passes to the next layer.

   o Then it comes to the output layer where machine learning executes the data received from input layers.

   o Finally, the processed data passed to the output layer.

4. **What are the features of a neural network?**

   o The model of the neural network follows the mechanism of the human brain

   o It extracts information without any input from the user

   o It basically works on a mathematical way with machine algorithms

   o Suitable for large datasets

   o The top layers are input layers to fed data, hidden layers process the data, and the output layer generates output from the processed data

5. **Compare the three types of neural network learning.**

   o The three types of neural network learning are as following:

Supervised Learning	Unsupervised Learning	Reinforcement Learning
The data needs to be trained with respect to output.	It works only on input without any output specifications.	It learning from experience.

Supervised Learning	Unsupervised Learning	Reinforcement Learning
It provides the correct output only if the given input is correct.	It produces the output from a given input.	It learns from its own experience and produces the results.
It takes some example units of input.	It does not require any specific type of input.	It just assesses the data fed into the system directly.
Traditional software is an example of supervised learning.	This method used for solving clustering problems, estimation problems, self-organizing maps etc.	It is employed by various software and machines to find the best possible behaviour or path it should take in a specific situation.

DATA SCIENCE

*Introduction***:** As we have discussed earlier in class 9, Artificial Intelligence is a technology which completely depends on data. It is the data which is fed into the machine which makes it intelligent. And depending upon the type of data we have; AI can be classified into three broad domains:

Each domain has its own type of data which gets fed into the machine and hence has its own way of working around it. Talking about Data Sciences, it is a concept to unify statistics, data analysis, machine learning and their related methods in order to understand and analyze actual phenomena with data. It employs techniques and theories drawn from many fields within the context of Mathematics, Statistics, Computer Science, and Information Science.

Now before we get into the concepts of Data Sciences, let us experience this domain with the help of the following game:

Rock, Paper & Scissors

Go to this link https://www.twoplayergames.org/game/rock-paper-scissors and try to play the game of Rock, Paper Scissors against an AI model. The challenge here is to win 20 games against AI before AI wins them against you.

Applications of Data Sciences: Data Science is not a new field. Data Sciences majorly work around analyzing the data and when it comes to AI, the analysis helps in making the machine intelligent enough to perform tasks by itself. There exist various applications of Data Science in today's world. Some of them are:

Fraud and Risk Detection: The earliest applications of data science were in Finance. Companies were fed up of bad debts and losses every year. However, they had a lot of data which use to get collected during the initial paperwork while sanctioning loans. They decided to bring in data scientists in order to rescue them from losses.

Over the years, banking companies learned to divide and conquer data via customer profiling, past expenditures, and other essential variables to analyze the probabilities of risk and default. Moreover, it also helped them to push their banking products based on customer's purchasing power

Genetics & Genomics: Data Science applications also enable an advanced level of treatment personalization through researching genetics and genomics. The goal is to understand the impact of the DNA on our health and find individual biological connections between genetics, diseases, and drug response. Data science techniques allow integration of different kinds of data with genomic data in disease research, which provides a deeper understanding of genetic issues in reactions to particular drugs and diseases. As soon as we acquire reliable personal genome data, we will achieve a deeper understanding of the human DNA. The advanced genetic risk prediction will be a major step towards more individual care.

Internet Search: When we talk about search engines, we think 'Google'. Right? But there are many other search engines like Yahoo, Bing, Ask, AOL, and so on. All these search engines (including Google) make use of data science algorithms to deliver the best result for our searched query in the fraction of a second. Considering the fact that Google processes more than 20 petabytes of data every day, had there been no data science, Google wouldn't have been the 'Google' we know today.

Targeted Advertising: If you thought Search would have been the biggest of all data science applications, here is a challenger – the entire digital marketing spectrum. Starting from the display banilrs on various websites to the digital billboards at the airports, almost all of them are decided by using data science algorithms. This is the reason why digital ads have been able to get a much higher CTR (Call-Through Rate) than traditional advertisements. They can be targeted based on a user's past behaviour.
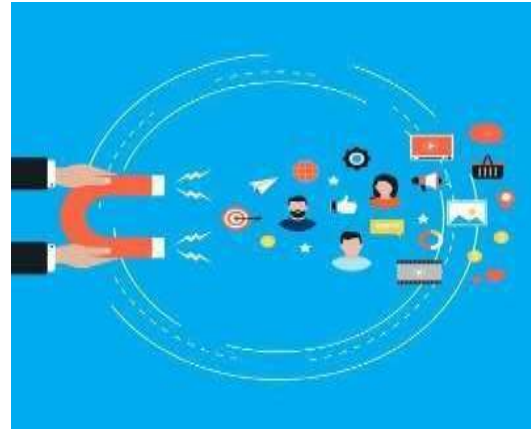
Website Recommendations*:* Aren't we all used to the suggestions about similar products on Amazon? They not only help us find relevant products from billions of products available with them but also add a lot to the user experience. A lot of companies have fervidly used this engine to promote their products in accordance with the user's interest and relevance of information. Internet giants like Amazon, Twitter, Google Play, Netflix, LinkedIn, IMDB and many more use this system to improve the user experience. The recommendations are made based on previous search results for a user.

Airline Route Planning*:* The Airline Industry across the world is known to bear heavy losses. Except for a few airline service providers, companies are struggling to maintain their occupancy ratio and operating profits. With high rise in air-fuel prices and the need to offer heavy discounts to customers, the situation has got worse. It wasn't long before airline companies started using Data Science to identify the strategic areas of improvements. Now, while using Data Science, the airline companies can:

Predict flight delay

- Decide which class of airplanes to buy
- Whether to directly land at the destination or take a halt in between (For example, A flight can have a direct route from New Delhi to New York. Alternatively, it can also choose to halt in any country.)
- Effectively drive customer loyalty programs

Getting Started : Data Sciences is a combination of Python and Mathematical concepts like Statistics, Data Analysis, probability, etc. Concepts of Data Science can be used in developing applications around AI as it gives a strong base for data analysis in Python.

Revisiting AI Project Cycle *:* But, before we get deeper into data analysis, let us recall how Data Sciences can be leveraged to solve some of the pressing problems around us. For this, let us understand the AI project cycle framework around Data Sciences with the help of an example.

Do you remember the AI Project Cycle? **Fill in all the stages of the cycle here:**

The Scenario

1.3 BILLION
TONNES OF FOOD PRODUCTION
ARE WASTED EVERY YEAR

That's one-third
of world food
production

MORE THAN

820 million
PEOPLE DO NOT HAVE
ENOUGH TO EAT TODAY.

Waste happens all along the
supply chain, from the
production stage to
final household consumption.

@AJLabs
Source: FAO, UN | October 16, 2019

ALJAZEERA
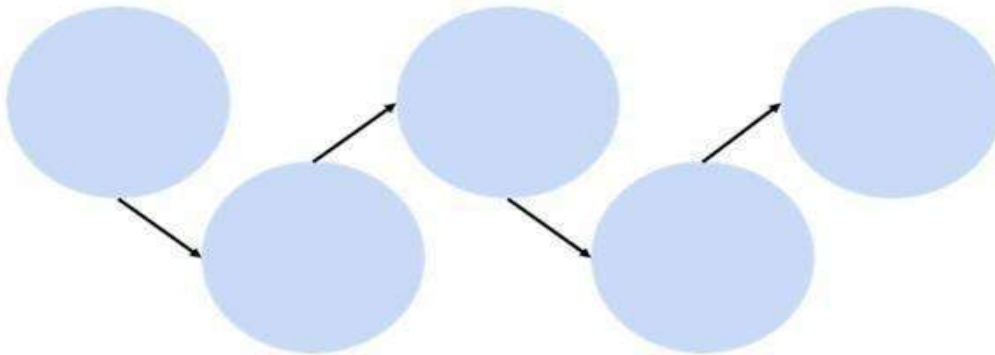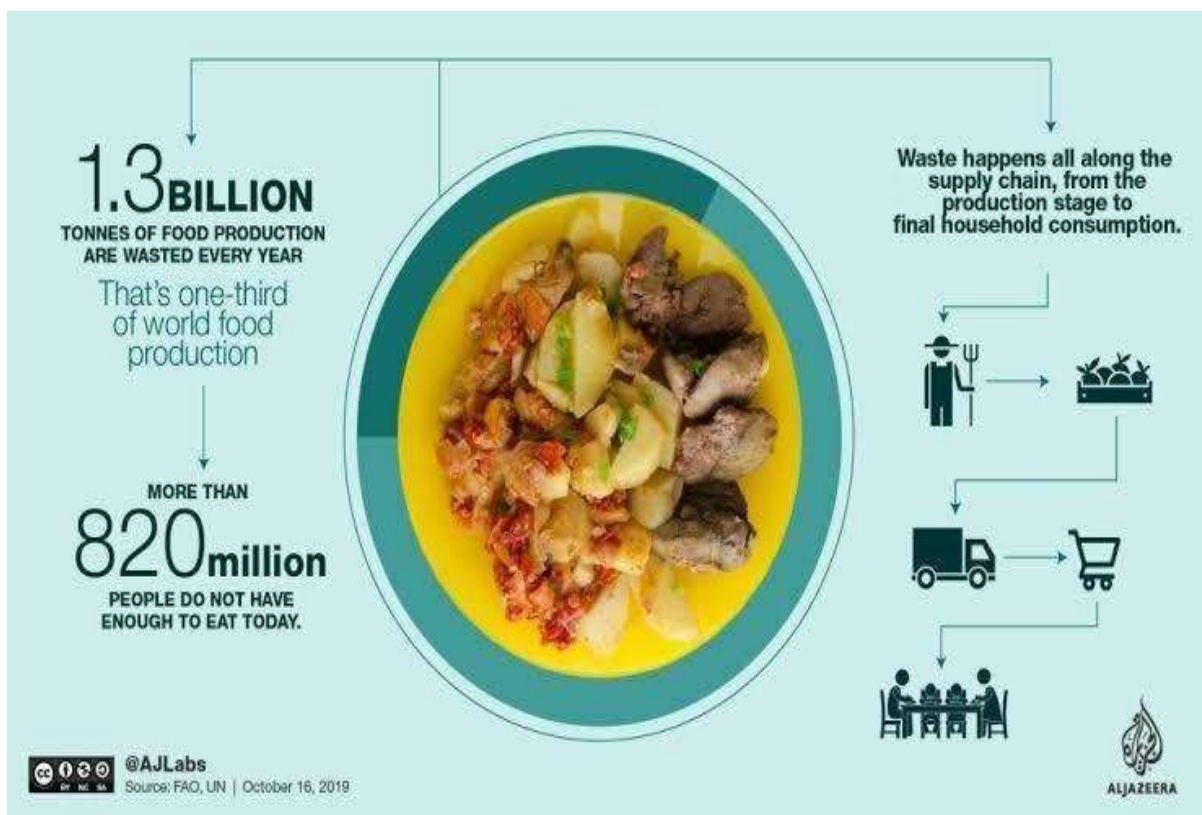
Humans are social animals. We tend to organize and/or participate in various kinds of social gatherings all the time. We love eating out with friends and family because of which we can find restaurants almost everywhere and out of these, many of the restaurants arrange for buffets to offer a variety of food items to their customers. Be it small shops or big outlets, every restaurant prepares food in bulk as they expect a good crowd to come and enjoy their food. But in most cases, after the day ends, a lot of food is left which becomes unusable for the restaurant as they do not wish to serve stale food to their customers the next day. So, every day, they prepare food

in large quantities keeping in mind the probable number of customers walking into their outlet. But if the expectations are not met, a good amount of food gets wasted which eventually becomes a loss for the restaurant as they either have to dump it or give it to hungry people for free. And if this daily loss is taken into account for a year, it becomes quite a big amount.

Problem Scoping : Now that we have understood the scenario well, let us take a deeper look into the problem to find out more about various factors around it. Let us fill up the 4Ws problem canvas to find out.

Who Canvas – Who is having the problem?

Who are the stakeholders?	• Restaurants offering buffets • Restaurant Chefs
What do we know about them?	• Restaurants cook food in bulk every day for their buffets to meet their customer needs. • They estimate the number of customers that would walk into their restaurant every day.

What Canvas – What is the nature of their problem?

What is the problem?	• Quite a large amount of food is leftover everyday unconsumed at the restaurant which is either thrown away or given for free to needy people. • Restaurants have to bear everyday losses for the unconsumed food.
How do you know it is a problem?	o Restaurant Surveys have shown that restaurants face this problem of food waste.

Where Canvas – Where does the problem arise?

Why? – Why do you think it is a problem worth solving?

What would be of key value to the stakeholders?	If the restaurant has a proper estimate of the quantity of food to be prepared every day, the food waste can be reduced.
How would it improve their situation?	• Less or no food would be left unconsumed. • Losses due to unconsumed food would reduce considerably.

Now that we have noted down all the factors around our problem, let us fill up the problem statement template.

Our	Restaurant Owners	Who?
Have a problem of	Losses due to food wastage	What?
While	The food is left unconsumed due to improper estimation	Where?
ideal solution would	Be to be able to predict the amount of food to be prepared for every day consumption	Why

The Problem statement template leads us towards the goal of our project which can now be stated as:

"To be able to predict the quantity of food dishes to be prepared for everyday consumption in restaurant buffets."

Data Acquisition we need to understand what kind of data is to be collected to work towards the goal. In our scenario, various factors that would affect the quantity of food to be prepared for the next day consumption in buffets would be:

Here is the System map for our problem statement.

In this system map, you can see how the relationship of each element is defined with the goal of our project. Recall that the positive arrows determine a direct relationship of elements while the negative ones show an inverse relationship of elements.

For this problem, a dataset covering all the elements mentioned above is made for each dish prepared by the restaurant over a period of 30 days. This data is collected offline in the form of a regular survey since this is a personalized dataset created just for one restaurant's needs.
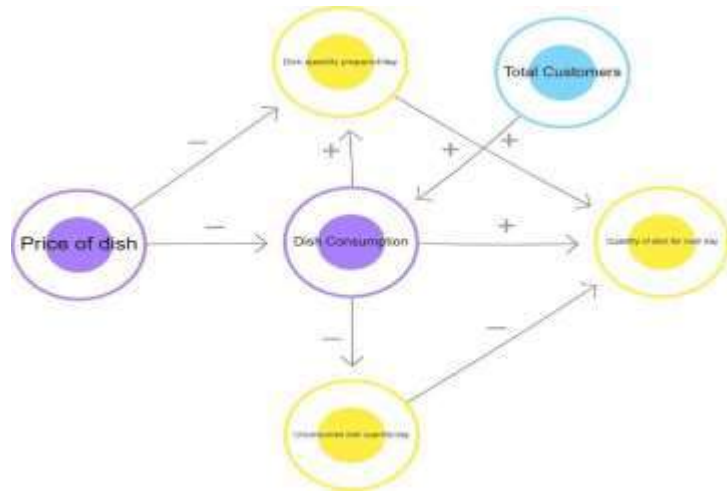
Specifically, the data collected comes under the following categories: Name of the dish, Price of the dish, Quantity of dish produced per day, Quantity of dish left unconsumed per day, Total number of customers per day, fixed customers per day, etc.

Data Exploration : **After creating the database, we now need to look at the data collected and understand what is required out of it. In this case, since the goal of our project is to be able to predict the quantity of food to be prepared for the next day, we need to have the following data:**

Thus, we extract the required information from the curated dataset and clean it up in such a way that there exist no errors or missing elements in it.

Modelling: Once the dataset is ready, we train our model on it. In this case, a regression model is chosen in which the dataset is fed as a data frame and is trained accordingly. Regression is a Supervised Learning model which takes in continuous values of data over a period of time. Since in our case the data which we have is a continuous data of 30 days, we can use the regression model so that it predicts the next values to it in a similar manner. In this case, the dataset of 30

days is divided in a ratio of 2:1 for training and testing respectively. In this case, the model is first trained on the 20-day data and then gets evaluated for the rest of the 10 days.

Evaluation : Once the model has been trained on the training dataset of 20 days, it is now time to see if the model is working properly or not. Let us see how the model works and how is it tested.

Step 1: The trained model is fed data regards the name of the dish and the quantity produced for the same.

Step 2: It is then fed data regards the quantity of food left unconsumed for the same dish on previous occasions.

Step 3: The model then works upon the entries according to the training it got at the modelling stage.

Step 4: The Model predicts the quantity of food to be prepared for the next day.

Step 5: The prediction is compared to the testing dataset value. From the testing dataset, ideally, we can say that the quantity of food to be produced for next day's consumption should be the total quantity minus the unconsumed quantity.

Step 6: The model is tested for 10 testing datasets kept aside while training.

Step 7: Prediction values of testing dataset is compared to the actual values.

Step 8: If the prediction value is same or almost similar to the actual values, the model is said to be accurate. Otherwise, either the model selection is changed or the model is trained on more data for better accuracy.

Once the model is able to achieve optimum efficiency, it is ready to be deployed in the restaurant for real-time usage.

Data Collection : Data collection is nothing new which has come up in our lives. It has been in our society since ages. Even when people did not have fair knowledge of calculations, records were still maintained in some way or the other to keep an account of relevant things. Data collection is an exercise which does not require even a tiny bit of technological knowledge. But

when it comes to analyzing the data, it becomes a tedious process for humans as it is all about numbers and alpha-numerical data. That is where Data Science comes into the picture. It not only gives us a clearer idea around the dataset, but also adds value to it by providing deeper and clearer analyses around it. And as AI gets incorporated in the process, predictions and suggestions by the machine become possible on the same.

Now that we have gone through an example of a Data Science based project, we have a bit of clarity regarding the type of data that can be used to develop a Data Science related project. For the data domain-based projects, majorly the type of data used is in numerical or alpha-numerical format and such datasets are curated in the form of tables. Such databases are very commonly found in any institution for record maintenance and other purposes. Some examples of datasets which you must already be aware of are:

Banks: Databases of loans issued, account holder, locker owners, employee registrations, bank visitors, etc.

ATM Machines: Usage details per day, cash denominations transaction details, visitor details, etc.

Movie Theatre: Movie details, tickets sold offline, tickets sold online, refreshment purchases. etc As we can see, all the type of data which has been mentioned above will be in the form of tables. Tables which contain numeric or alpha-numeric data. But this leads to a very critical dilemma: are these datasets accessible to all? Should these databases be accessible to all? What are the various sources of data from which we can gather such databases? Let's find out!

Sources of Data: There exist various sources of data from where we can collect any type of data required and the data collection process can be categorized in two ways: Offline and Online.

Offline Data Collection	Online Data Collection
Sensors	Government Portals
Surveys	Websites
Interviews	World Organizations' open-sourced statistical websites
Observations	

While accessing data from any of the data sources, following points should be kept in mind:

1. Data which is available for public usage only should be taken up.
2. Personal datasets should only be used with the consent of the owner.
3. One should never breach someone's privacy to collect data.
4. Data should only be taken form reliable sources as the data collected from random sources can be wrong or unusable.
5. Reliable sources of data ensure the authenticity of data which helps in proper training of the AI model.

Types of Data : For Data Science, usually the data is collected in the form of tables. These tabular datasets can be stored in different formats. Some of the commonly used formats are:

1. <u>CSV</u>: CSV stands for comma separated values. It is a simple file format used to store tabular data. Each line of this file is a data record and reach record consists of one or more fields which are separated by commas. Since the values of records are separated by a comma, hence they are known as CSV files.
2. <u>Spreadsheet</u>: A Spreadsheet is a piece of paper or a computer program which is used for accounting and recording data using rows and columns into which information can be entered. Microsoft excel is a program which helps in creating spreadsheets.
3. <u>SQL</u>: SQL is a programming language also known as Structured Query Language. It is a domain- specific language used in programming and is designed for managing data held in different kinds of DBMS (Database Management System) It is particularly useful in handling structured data.

Data Access : After collecting the data, to be able to use it for programming purposes, we should know how to access the same in a Python code. To make our lives easier, there exist various Python packages which help us in accessing structured data (in tabular form) inside the code. Let us take a look at some of this package.

NumPy : NumPy, which stands for Numerical Python, is the fundamental package for Mathematical and logical operations on arrays in Python. It is a commonly used package when it comes to working around numbers. NumPy gives a wide range of arithmetic operations

around numbers giving us an easier approach in working with them. NumPy also works with arrays, which is nothing but a homogenous collection of Data.

An array is nothing but a set of multiple values which are of same data type. They can be numbers, characters, Booleans, etc. but only one data type can be accessed through an array. In NumPy, the arrays used are known as ND-arrays (N-Dimensional Arrays) as NumPy comes with a feature of creating n- dimensional arrays in Python.

An array can easily be compared to a list. Let us take a look at how they are different:

NumPy Arrays	Lists
1. Homogenous collection of Data.	1. Heterogeneous collection of Data.
2. Can contain only one type of data, hence not flexible with data types.	2. Can contain multiple types of data, hence flexible with data types.
3. Cannot be directly initialized. Can be operated with Numpy package only.	3. Can be directly initialized as it is a part of Python syntax.
4. Direct numerical operations can be done. For example, dividing the whole array by 3 divides every element by 3.	4. Direct numerical operations are not possible. For example, dividing the whole list by 3 cannot divide every element by 3.
5. Widely used for arithmetic operations.	5. Widely used for data management.
6. Arrays take less memory space.	6. Lists acquire more memory space.
7. Functions like concatenation, appending, reshaping etc are not trivially possible with arrays.	7. Functions like concatenation, appending, reshaping, etc are trivially possible with lists.
8. Example: To create a NumPy array 'A':	8. Example: To create a list:
import numpy	**A = [1,2,3,4,5,6,7,8,9,0]**
A=numpy.array([1,2,3,4,5,6,7,8,9,0])	

Pandas : Pandas is a software library written for the Python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series. The name is derived from the term "panel data", an econometrics term for data sets that include observations over multiple time periods for the same individuals.

Matplotlib : Matplotlib is an amazing visualization library in Python for 2D plots of arrays. Matplotlib is a multi- platform data visualization library built on NumPy arrays. One of the greatest benefits of visualization is that it allows us visual access to huge amounts of data in easily digestible visuals. Matplotlib comes with a wide variety of plots. Plots helps to understand trends, patterns, and to make correlations. They're typically instruments for reasoning about quantitative information. Some types of graphs that we can make with this package are listed below:

| Bar Graph | Histogram | Scatter Plot | Area Plot | Pie Plot |

B*asic Statistics with Python:* We have already understood that Data Sciences works around analyzing data and performing tasks around our day to day life.

- **M** • Mean: The average value of a sequence.
- **M** • Median: 50th percentile value of a sequence.
- **M** • Mode: Most frequent value of the sequence.
- **SD** • Standard Deviation: Measures the spread of the sequence around its average value.
- **V** • Variance: Average of the squared differences from the mean.
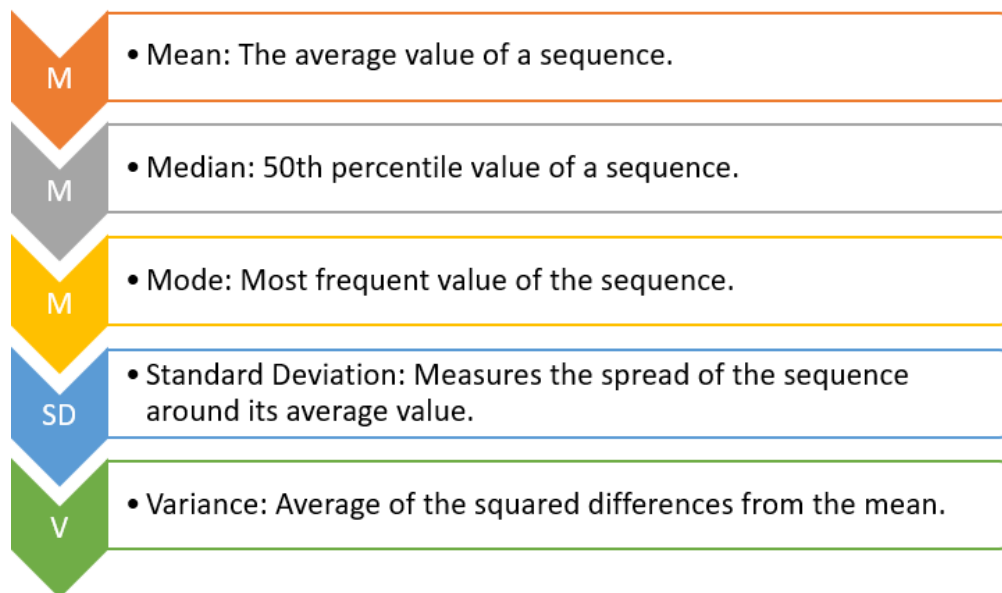
Data Visualisation : While collecting data, it is possible that the data might come with some errors. Let us first take a look at the types of issues we can face with data:

Erroneous Data: There are two ways in which the data can be erroneous:

- *Incorrect values*: The values in the dataset (at random places) are incorrect. For example, in the column of phone number, there is a decimal value or in the marks column, there is a name mentioned, etc. These are incorrect values that do not resemble the kind of data expected in that position.
- *Invalid or Null values*: At some places, the values get corrupted and hence they become invalid. Many times you will find NaN values in the dataset. These are null values which do not hold any meaning and are can't be processed. That is why, these values (as and when encountered) are removed from the database.

Missing Data: In some datasets, some cells remain empty. The values of these cells are missing and hence the cells remain empty. Missing data cannot be interpreted as an error as the values here are not erroneous or might not be missing because of any error.

Outliers: Data which does not fall in the range of a certain element are referred to as outliers. To understand this better, let us take an example of marks of students in a class. Let us assume that a student was absent for exams and hence has got 0 marks in it. If his marks are taken into account, the whole class's average would go down. To prevent this, the average is taken for the range of marks from highest to lowest keeping this particular result separate. This makes sure that the average marks of the class are true according to the data.

In Python, Matplotlib package helps in visualising the data and we can plot various kinds of graphs :

Scatter Plot : Scatter plots are used to plot discontinuous data; that is, the data which does not have any continuity in flow is termed as discontinuous. There exist gaps in data which introduce discontinuity. A 2D scatterplot
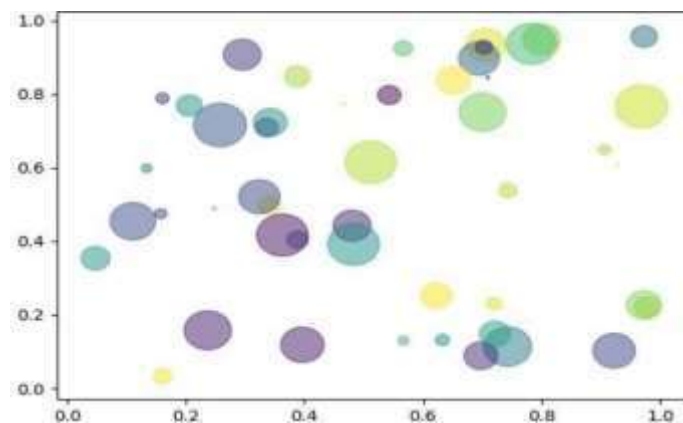
can display information maximum up to 4 parameters In this scatter plot, 2 axes (X and Y) are two different parameters. The colour of circles and the size both represent 2 different parameters. Thus, just through one coordinate on the graph, one can visualise 4 different parameters all at once.

Bar Chart : It is one of the most commonly used graphical methods. From students to scientists, everyone uses bar charts in some way or the other. It is a very easy to draw yet informative graphical representation. Various versions of bar chart exist like single bar chart, double bar chart, etc.
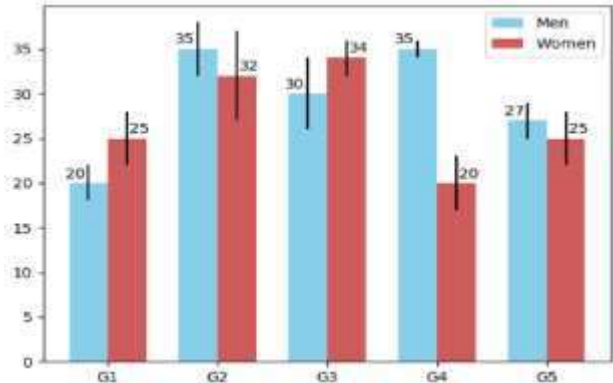
This is an example of a double bar chart. The 2 axes depict two different parameters while bars of different colours work with different entities (in this case it is women and men). Bar chart also works on discontinuous data and is made at uniform intervals

Histogram : Histograms are the accurate representation of a continuous data. When it comes
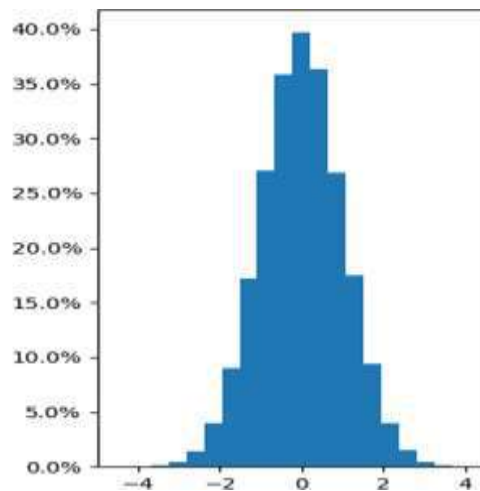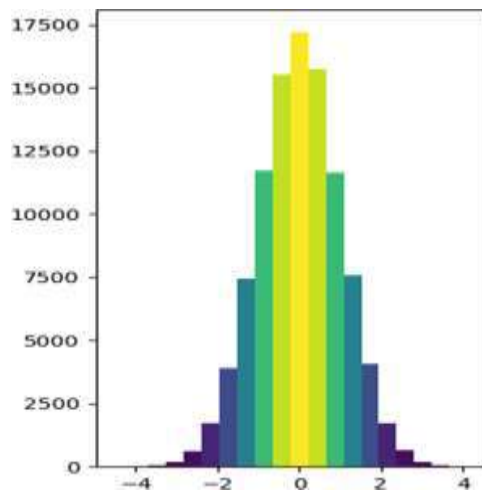
to plotting the variation in just one entity of a period of time, histograms come into the picture. It represents the frequency of the variable at different points of time with the help of the bins.

In the given example, the histogram is showing the variation in frequency of the entity plotted with the help of XY plane. Here, at the left, the frequency of the element has been plotted and it is a frequency map for the same. The colours show the transition from low to high and vice versa. Whereas on the right, a continuous dataset has been plotted which might not be talking about the frequency of occurrence of

MCQ:

1. **Data science is the process of diverse set of data through?**

A.   Organizing data

B.   Processing data

C.   Analysing data

D.   All
of the above

Answer : D

Explanation: Data science is the field which includes organizing data, processing data and analysing data to extract valuable information from data for business decision-making, strategic planning, etc. So, All of the above is correct.

2. **Point out the correct statement.**

A.   Raw data is original source of data

B.   Preprocessed data is original source of data

C.   Raw data is the data obtained after processing steps

D.   None of the above

Answer: A

Explanation: Raw data is original source of data is the correct answer. So, option A is correct.

3. **How do we perform Bayesian classification when some features are missing?**

   A. We integrate the posteriors probabilities over the missing features

   B. We ignore the missing features

   C. We assuming the missing values as the mean of all values

   D. Drop the features completely

   Answer: A

Explanation: When some features are missing, while performing Bayesian classification we don't use general methods of handling missing values but we integrate the posteriors probabilities over the missing features for better predictions. So, option A is correct.

4. The modern conception of data science as an independent discipline is sometimes attributed to?

A.   John McCarthy

B.   Arthur Samuel

C.   William S.

D.   Dennis Ritchie

Answer: C

5.   _____graph displays information as a series of data points connected by straight line segments.

A.   Bar

B.   Scatter

C.   Histogram

D.   Line

Answer: D

Explanation: A line graph displays information as a series of data points connected by straight line segments.

6. Data fishing is sometimes referred to as

A.   Data bagging

B.   Data dredging

C.   Data merging

D.   None of the mentioned

Answer: B

Explanation: Data fishing is sometimes referred to as Data dredging so option B is correct.

7. Which is one of the significant data science skills?

A.   Statistics

B.   Data Visualization

C.   Machine Learning

D.   All of the above

Answer: D

8. **A method used to make vector of repeated values?**

    A. read()

    B. data()

    C. rep()

    D. view()

    Answer: B

Explanation: data() method used to make vector of repeated values.

9. **Which of the following step is performed by the data scientist after acquiring the data?**

    A.   Data Replication

    B.   Data Integration

    C.   Data Cleansing

    D.   All of the Mentioned

    Answer : C

Explanation: Data cleansing, data cleaning or data scrubbing is the process of detecting and correcting (or removing) corrupt or inaccurate records from a database, table, or record set and it is generally performed by data scientist after acquiring the data.

10. **Which of the following is good way of performing experiments in data science?**

    A. Measure variability

    B. Generalize to the problem

    C. Have Replication

    D. All of the above

    Answer: D

Explanation: Measure variability, generalize to the problem, have Replication all of the mentioned is good way of performing experiments in data science

SHORT AND LONG QUESTION AND ANSWER:

1. **All of us use Smartphone's. When we install a new app, it asks us for several permissions to access our phone's data in different ways. Why do apps collect such data?**

ANS: 1. To provide customized notifications and recommendations.

    2. To improve the efficiency and accuracy of the app.

2. **Sirisha and Divisha want to make a model which will organize the unlabeled input data into groups based on features. Which learning model should they use and why?**

ANS: Clustering model/Unsupervised learning is used to organize the unlabeled input data into groups based on features. Clustering is an unsupervised learning algorithm which can cluster unknown data according to the patterns or trends identified out of it. The patterns observed might be the ones which are known to the developer or it might even come up with some unique patterns out of it.

3. **Ajay wants to access data from various sources. Suggest him any two points that he needs to keep in mind while accessing data from any data source.**

ANS: While accessing data from any of the data sources, following points should be kept in mind:

1. Data which is available for public usage only should be taken up.

2. Personal datasets should only be used with the consent of the owner.

3. One should never breach someone's privacy to collect data.

4. Data should only be taken from reliable sources as the data collected from random sources can be wrong or unusable.

5. Reliable sources of data ensure the authenticity of data which helps in the proper training of the AI model.

6. Data should be relevant to the problem

4. **What is Data science? Give an example of it.**

ANS: Data sciences is a domain of AI related to data systems and processes, in which the system collects numerous data, maintains data sets and derives meaning/sense out of them. The information extracted through data science can be used to make a decision about it.

OR

Data science is the field of study that combines domain expertise, programming skills, and knowledge of mathematics and statistics to extract meaningful insights from data.

OR

Data Sciences, it is a concept to unify statistics, data analysis, machine learning and their related methods in order to understand and analyses actual phenomena with data.

For example: a company that has petabytes of user data may use data science to develop effective ways to store, manage, and analyze the data.

5. Where do we collect data from?

ANS: Data can be collected from various sources like –

a. Surveys

b. Sensors

c. Observations

d. Web scrapping (Internet)

e. Interviews

f. Documents and records.

g. Oral histories

6. **Why do we need to collect data?**

ANS: Data to a machine is similar to food for human being to function. The world of Artificial Intelligence revolves around Data. Every company whether small or big is collecting data from as many sources as possible. Data is called the New Gold today. It is through data collection that a business or management has the quality information they need to make informed decisions from further analysis, study, and research. Data collection allows them to stay on top of trends, provide answers to problems, and analyze new insights to great effect.

7. **What is data mining? Explain with example.**

ANS: Data mining is the process of analyzing large data sets and extracting the useful information from it. Data mining is used by companies to turn raw data into useful information. It is an interdisciplinary subfield of computer science and statistics with an overall goal to extract information

OR

Data mining is an automatic or semi-automatic technical process that analyses large amounts of scattered information to make sense of it and turn it into knowledge. It

looks for anomalies, patterns or correlations among millions of records to predict results, as indicated by the SAS institute, a world leader in business analytics.

Example:

Price Comparison websites- They collect data about a product from different sites and then analyze trends out of it and show up the most appropriate results.

Data mining is also known as Knowledge Discovery

in Data (KDD)

8. **What do you understand by Data Privacy?**

ANS: The world of Artificial Intelligence revolves around Data. Proper and ethical handling of own data or user data is called data privacy. It is all about the rights of individuals with respect to their personal information.

Data privacy or information privacy is a branch of data security concerned with the proper handling of data – consent, notice, and regulatory obligations. More specifically, practical data privacy concerns often revolve around: Whether or how data is shared with third parties

9. **Is data which is collected by various applications ethical in nature? Justify your answer.**

ANS: Yes, most of the times, the data collected by various applications is ethical in nature as the users agree to it by clicking on allow when the application asks for various permissions. They ask for our data for various facilities like - to show us personalized recommendations and advertisements and to make their app more accurate   and   efficient.

COMPUTER VISION
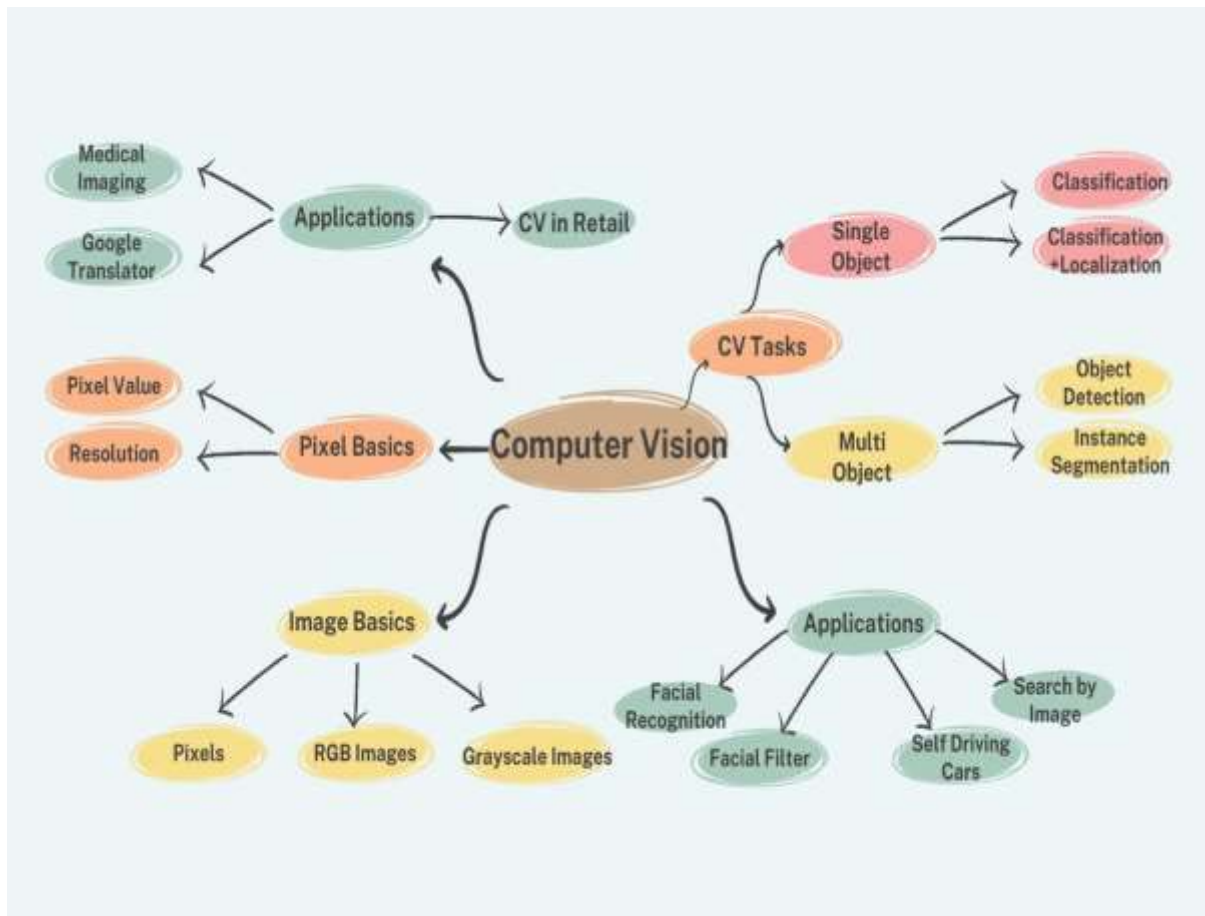
Computer Vision, abbreviated as CV, is a domain of AI that depicts the capability of a machine to get and analyse visual information and afterwards predict some decisions about it. The entire process involves image acquiring, screening, analysing, identifying and extracting information. In computer vision, Input to machines can be photographs, videos and pictures from thermal or infrared sensors, indicators and different sources.

Applications of Computer Vision

- Facial Recognition: This application finds its use in smartphones, social media, School attendance systems etc

- Face Filters : This application is used in modern-day apps like Instagram and Snapchat . Through the camera the machine or the algorithm is able to identify the facial dynamics of the person and applies the facial filter selected

- Google's Search by Image : This feature of Google uses Computer Vision as it compares different features of the input image to the database of images and give us the search result while at the same time analysing various features of the image.

- Computer Vision in Retail : Retailers can use Computer Vision techniques to track customers' movements through stores, analyse navigational routes and detect walking patterns. Inventory Management uses Computer Vision that analyses images of a security camera to estimate the items available in stores.

- Self-Driving Cars : In Self-Driving cars Computer Vision helps in the process of identifying the objects, getting navigational routes and also at the same time environment monitoring.

- Medical Imaging : CV helps physicians in creating and analysing images as well as becomes an assistant and helps them in interpretation.

- Google Translate App : This application helps in capturing text from images and translating the text to any preferred language.

Computer Vision Tasks

The tasks used in computer vision are :

For Single Objects	For Multiple Objects
Classification	Object Detection
Classification + Localisation	Instance Segementation
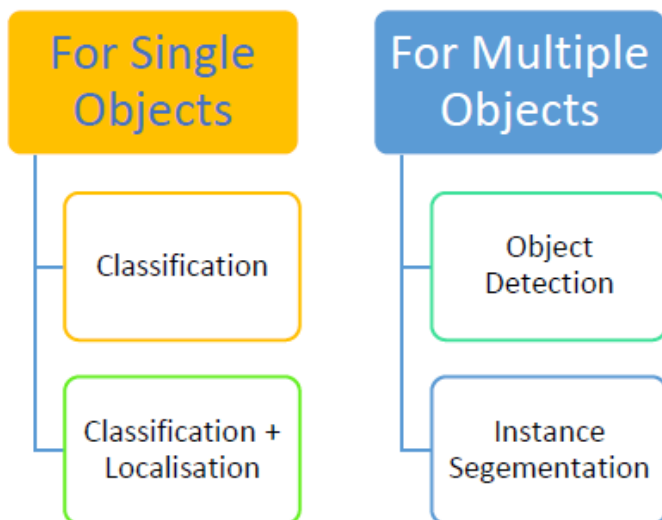
1. **For single Object :**

   a. Classification : Image Classification problem is the task of **assigning an input image one label from a fixed set of categories.**

   (assume given set of discrete labels) {dog, cat, truck, plane, ...}

   → cat

   b. Classification + Localisation : This is the task which involves both processes of **identifying what object is present** in the image and at the same time **identifying at what location** that object is present in that image

   Classification + Localization

   CAT

2. **For Multiple Objects :**

   a. Object Detection: Object detection is the process of **finding instances of real-world objects such as faces, bicycles, and buildings in images or videos. It** typically uses extracted features and learning algorithms to recognize instances of an object category. It is commonly used in applications such as image retrieval and automated vehicle parking systems.

   Object Detection
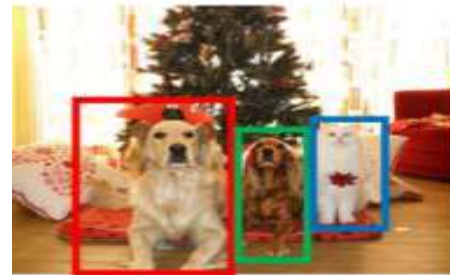
   DOG, DOG, CAT

   b. Instance Segmentation: Instance Segmentation is the process of detecting instances of the objects, giving them a category and then giving each pixel a label on the basis of that. A segmentation algorithm takes an image as input and outputs a collection of regions (or segments).
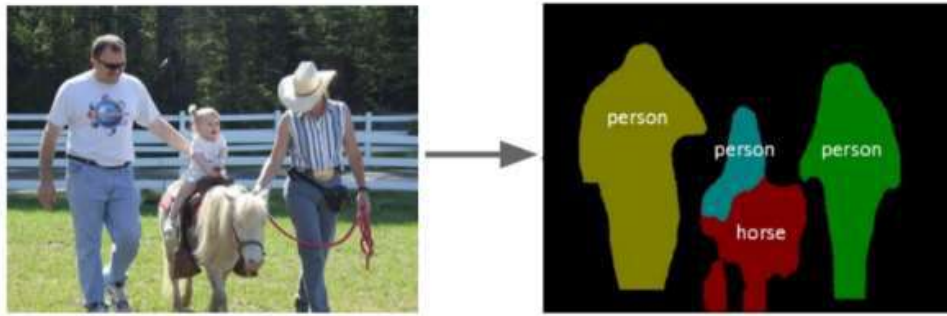
Image Basics

- **Pixels :** The word "pixel" means a picture element. They are the smallest unit of information that make up a picture. The more pixels the image will be sharper.

- **Resolution :** The number of pixels in an image is called Resolution.

  Resolution can be expressed as width by height . Eg: a monitor resolution of 1280×1024 .

  Resolution can also be expressed using a single number that denotes number of pixels Eg: 5 Mega Pixel Camera. [1 Mega Pixel =Million Pixels]

- **Pixel Value :** A pixel value generally is a byte image ie stored as an 8 bit integer with range starting from 0-255.

  0 is for Black Colour and 255 is for white colour

- **Grayscale Images** : Grayscale images are images which have a range of shades of gray without apparent colour. The value of pixels are within the range of 0-255.

- **RGB Images** : RGB Images are coloured images made up of three primary colours Red, Green and Blue. All the colours that are present can be made by combining different intensities of red, green and blue. Every RGB image is stored in the form of three different channels called the R channel, G channel and the B channel. In a RGB image, each pixel has a set of three different values which together give colour to that particular pixel.

  Eg: Black Colour - > R=0 , G=0 ,B=0

      White Colour -> R=255, G=255, B=255

- **Image Features** : A **feature** is a piece of information which is relevant for solving the computational task related to a certain application. Features may be specific structures in the image such as points, edges or objects.

Difference between a Grayscale and RGB Image

Grayscale	RGB
Grayscale images are black-and-white images that contain only shades of gray	RGB images are color images that consist of three color channels: red, green, and blue.
Each pixel in a grayscale image is represented by a single intensity value ranging from 0 (black) to 255 (white).	Each pixel in an RGB image is represented by three intensity values, one for each channel.
The absence of color channels simplifies grayscale images.	The combination of these three channels creates a wide spectrum of colors.
Grayscale images are often used for medical imaging, edge detection, and basic image processing	RGB images are commonly used for displaying full-color photographs, graphics, and videos.
For example, a pixel with an intensity value of 128 would appear as a mid-gray shade.	For example, a pixel with intensity values (255, 0, 0) would be a bright red color.

Questions on Computer Vision

One Mark Questions	
Q.No	Question
	Emoji Scavenger Hunt game is based on _____ technology
2.	A _____ is a computer vision-based technology that identifies or verifies or matches a digital image of a human face against a database of stored face image.
3.	The _____ domain of Artificial Intelligence, enables machines to see through images or visual data, process and analyse them on the basis of algorithms and methods in order to analyse actual phenomena with images.
4.	_____ app allows you to point your phone's camera at the words and tell you what it means in your preferred language almost instantly.

5.	_____ is the fundamental technology behind developing autonomous vehicles.
6.	Which feature of Computer Vision can be seen in apps like Snapchat and Instagram?
7.	What is the primary function of the Computer Vision domain in Artificial Intelligence? a. To enable machines to communicate with humans b. To allow machines to see and analyze visual data using algorithms c. To enable machines to perform complex calculations d. To allow machines to control other machines
8.	In computer vision which of the following tasks is used for multiple objects? a. Classification b. Classification + Localisation c. Instance Segmentation d. Localisation
9.	The concept of ___ is used to apply face filters on various social media platforms. a. NLP b. Computer Vision c. Data Science d. Block chain Technology
10.	The Google Translate App is a tool that falls under which technological category: a. Internet of Things b. Computer Vision c. Blockchain Technology d. Quantum Computing
11.	What is the primary function of the Google Translate App when reading signs in a foreign language? a. To provide dictionary definitions b. To teach grammar rules c. To translate text into your preferred language almost instantly d. To convert voice to text

12.	How does Google's search by image function work?
	 a. It searches for images based on text descriptions.
	 b. It compares features of the input image to a database of images.
	      c. It uses color matching to find similar images.
	      d. It translates image content into text for searching.

13.	Statement I : Object Detection is the process of finding instances of real world objects in images
	 Statement II : Object Detection falls under Computer Vision Tasks for single objects.
	      a. Both Statement I and Statement II are True
	 b. Statement I is True and Statement II is False
	      c. Statement I is False and Statement II is True
	      d. Both Statement I and Statement II are False

14.	_____ means a picture element which is the smallest unit of information that makes up a picture.
	      a. Vision
	      b. Pics
	      c. Pixel
	 d. Piskel

15.	A .... represents the smallest piece of the screen that can be controlled individually in terms of colour and intensity
16.	Image .... refers to the quality and size of an image in terms of the number of pixels it contains, typically as 'width x height'.
17.	RGB value .... represents black colour
18.	RGB value ....represents white colour.
19.	An .... is a measurable piece of data in your image which is unique to this specific object, such as a distinct colour, specific shape or an image segment.
20.	How many channels does a colour image have?
	Assertion Reasoning Questions
21.	Assertion (A): The term used to refer to the number of pixels in an image is resolution. Reason (R): Resolution in an image denotes the total number of pixels it contains, usually represented as width *height. a. Both (A) and (R) are true and (R) is the correct explanation for (A). b. Both (A) and (R) are true and (R) is not the correct explanation of (A). c. (A) is true, but (R) is false.

	d. A is false. but (R) is true.
22.	Assertion (A): In computer vision, single object classification is used when an image contains only one object of interest, while multiple object classification is applied to images containing several objects of different classes. Reason (R): Single object classification assigns one label to the entire image, whereas multiple object classification involves identifying and labelling each object present in the image. a. Both (A) and (R) are true and (R) is the correct explanation for (A). b. Both (A) and (R) are true and (R) is not the correct explanation of (A). c. (A) is true, but (R) is false. d. A is false. but (R) is true.
23.	Assertion (A): Grayscale images are made up of one channel at each pixel, having a range of shades of Gray. Reason (R): RGB images are made by three color channels (Red, Green, and Blue) at each pixel, resulting in a coloured image. a. Both (A) and (R) are true and (R) is the correct explanation for (A). b. Both (A) and (R) are true and (R) is not the correct explanation of (A). c. (A) is true, but (R) is false. d. A is false. but (R) is true.
	Subjective Questions-2 marks
	Define Computer Vision and mention any two applications of computer vision.
	How does computer vision help in the Retail industry?
26.	What are the differences between Grayscale Images and RGB images?
27.	Explain two computer vision tasks for identifying multiple objects.
28.	Define the terms Resolution with an example
	Subjective Questions-4 marks
29.	Explain CV tasks in detail
30.	Explain any four applications of Computer vision in detail.

Answers

Q.No	Answer
	Computer Vision
	Facial Recognition application
3.	Computer Vision
4.	Google Translate App
5.	Computer Vision
6.	Face Filters
7.	b) To allow machines to see and analyze visual data using algorithms
8.	c)Instance Segmentation
9.	b)Computer Vision
10.	b)Computer Vision
11.	c)To translate text into your preferred language almost instantly
12.	b)It compares features of the input image to a database of images.
13.	b)Statement I is True and Statement II is False
14.	Pixel
15.	Pixel
16.	Resolution
17.	(0,0,0)
18.	(255,255,255)
19.	Image Feature

20.	3 channels (R,G,B)
21.	a)Both (A) and (R) are true and (R) is the correct explanation for (A).
22.	a)Both (A) and (R) are true and (R) is the correct explanation for (A).
23.	b)Both (A) and (R) are true and (R) is not the correct explanation of (A).
24.	The Computer Vision domain of Artificial Intelligence, enables machines to see through images or visual data, process and analyse them on the basis of algorithms and methods in order to analyse actual phenomena with images. Applications: Facial Recognition, Face Filters
25.	Retailers can use CV techniques to track customer movements through stores, analyse navigational routes and detect walking patterns. CV also helps in Inventory management. Through security camera image analysis, a Computer Vision algorithm can generate a very accurate estimate of the items available in the store. Also, it can analyse the use of shelf space to identify suboptimal configurations and suggest better item placement.

26.		
	Grayscale	**RGB**
	Grayscale images are black-and-white images that contain only shades of gray	RGB images are color images that consist of three color channels: red, green, and blue.
	Each pixel in a grayscale image is represented by a single intensity value ranging from 0 (black) to 255 (white).	Each pixel in an RGB image is represented by three intensity values, one for each channel.

27.	Object Detection: Object detection is the process of finding instances of real-world objects such as faces, bicycles, and buildings in images or videos Instance Segmentation: Instance Segmentation is the process of detecting instances of the objects, giving them a category and then giving each pixel a label on the basis of that
28.	Resolution of an image refers to the number of pixels in an image, across the width and height. For example a monitor resolution of 1280×1024. This means there are 1280 pixels from one side to the other, and 1024 from top to bottom.

29.	**Single Object Task**
	• Classification : Image Classification problem is the task of assigning an input image one label from a fixed set of categories
	• Classification + Localization: This is the task which involves both processes of identifying what object is present in the image and at the same time identifying at what location that object is present in that image
	Multiple Object Tasks
	• Object Detection : Object detection is the process of finding instances of real-world objects such as faces, bicycles, and buildings in images or vide
	• Instance Segmentation : Instance Segmentation is the process of detecting instances of the objects, giving them a category and then giving each pixel a label on the basis of that. A segmentation algorithm takes an image as input and outputs a collection of regions (or segments).
30.	• **Facial Recognition : T**his technology enhances security by permitting entry solely to verified individuals. It is widely implemented in various systems such as smartphones and school attendance mechanisms, among others.
	• **Face Filters :** Face Filters are used in apps like Snapchat and Instagram. Through the camera the machine or the algorithm is able to identify the facial dynamics of the person and applies the facial filter selected.
	• **Google Translate App :** This app uses optical character recognition to see the image and uses augmented reality to overlay an accurate translation, this is a convenient tool that uses Computer Vision
	• **Self Driving Cars :** Computer Vision is the fundamental technology behind developing autonomous vehicles.This involves the process of identifying the objects, getting navigational routes and also at the same time environment monitoring.

NATURAL LANGUAGE PROCESSING

INTRODUCTION

Computers can understand the structured form of data like spreadsheets and the tables in the database, but human languages, texts, and voices form an unstructured category of data, and it gets difficult for the computer to understand it, and there arises the need for Natural Language Processing.

Natural Language Processing, or NLP, is the sub-field of AI that is focused on enabling computers to understand and process human languages. AI is a subfield of Linguistics, Computer Science, Information Engineering, and Artificial Intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to process and analyze large amounts of natural language data

In NLP, we can break down the process of understanding English for a model into a number of small pieces.

A usual interaction between machines and humans using Natural Language Processing could go as follows:

- Humans talk to the computer
- The computer captures the audio
- There is an audio to text conversion
- Text data is processed Data is converted to audio
- The computer plays the audio file and responds to humans

Applications of Natural Language Processing

1.Chatbots

Chatbots are a form of artificial intelligence that is programmed to interact with humans in such a way that they sound like humans themselves. Chatbots are created using Natural Language Processing and Machine Learning, which means that they understand the complexities of the English

language and find the actual meaning of the sentence and they also learn from their conversations with humans and become better with time. Chatbots work in two simple steps.

First, they identify the meaning of the question asked and collect all the data from the user that may be required to answer the question. Then they answer the question appropriately.

2. Autocomplete in Search Engines

 Have you noticed that search engines tend to guess what you are typing and automatically complete your sentences? For example, On typing "game" in Google, you may get further suggestions for "game of thrones", "game of life" or if you are interested in maths then "game theory". All these suggestions are provided using auto complete that uses Natural Language Processing to guess what you want to ask. Search engines use their enormous data sets to analyze what their customers are probably typing when they enter particular words and suggest the most common possibilities. They use Natural Language Processing to make sense of these words and how they are interconnected to form different sentences.

3.Voice Assistants

 These days voice assistants are all the rage! Whether its Siri, Alexa, or Google Assistant, almost everyone uses one of these to make calls, place reminders, schedule meetings, set alarms, surf the internet, etc. These voice assistants have made life much easier. But how do they work? They use a complex combination of speech recognition, natural language understanding, and natural language processing to understand what humans are saying and then act on it.

4.Language Translator

 Want to translate a text from English to Hindi but don't know Hindi? Well, Google Translate is the tool for you! While it's not exactly 100% accurate, it is still a great tool to convert text from one language to another. Google Translate and other translation tools as

well as use Sequence to sequence modeling that is a technique in Natural Language Processing. It allows the algorithm to convert a sequence of words from one language to another which is translation.

5.Sentiment Analysis

Almost all the world is on social media these days! And companies can use sentiment analysis to understand how a particular type of user feels about a particular topic, product, etc. They can use natural language processing, computational linguistics, text analysis, etc. to understand the general sentiment of the users for their products and services and find out if the sentiment is good, bad, or neutral. Companies can use sentiment analysis in a lot of ways such as to find out the emotions of their target audience, to understand product reviews, to gauge their brand sentiment, etc. And not just private companies, even governments use sentiment analysis to find popular opinion and also catch out any threats to the security of the nation.

6.Grammar Checkers

Grammar and spelling is a very important factor while writing professional reports for your superiors and even assignments for your lecturers. After all, having major errors may get you fired or failed! That's why grammar and spell checkers are a very important tool for any professional writer. They can not only correct grammar and check spellings but also suggest better synonyms and improve the overall readability of your content. And guess what, they utilize natural language processing to provide the best possible piece of writing! The NLP algorithm is trained on millions of sentences to understand the correct format. That is why it can suggest the correct verb tense, a better synonym, or a clearer sentence structure than what you have written. Some of the most popular grammar checkers that use NLP include Grammarly, WhiteSmoke, ProWritingAid, etc

7.Email Classification and Filtering

Emails are still the most important method for professional communication. However, all of us still get thousands of promotional Emails that we don't want to read. Thankfully, our emails are

automatically divided into 3 sections namely, Primary, Social, and Promotions which means we never have to open the Promotional section! But how does this work? Email services use natural language processing to identify the contents of each Email with text classification so that it can be put in the correct section. This method is not perfect since there are still some Promotional newsletters in Primary, but it's better than nothing. In more advanced cases, some companies also use specialty anti-virus software with natural language processing to scan the emails and see if there are any patterns and phrases that may indicate a phishing attempt on the employees.

8.Text Summarization

Text summarization is the process of creating a shorter version of the text with only vital information and thus, helps the user to understand the text in a shorter amount of time. The main advantage of text summarization lies in the fact that it reduces user's time in searching the important details in the document

9.Text Classification

Texts are a form of unstructured information that possesses very prosperous records inside them. Text Classifiers categorize and arrange exceptionally a great deal with any form of textual content that we use currently. Text classification makes it possible to assign predefined categories to a document and organize it to help you find the information you need or simplify some activities.

INTRODUCTION TO CHATBOTS

Chatbots is a computer program designed to simulate conversation with human users, especially over the internet powered by Artificial intelligence.

Eg:

	Mitsuku Bot https://www.pandorabots.com/mitsuku/

	AskDISHA 2.0 (Digital Interaction To Seek Help Anytime) is **an Artificial Intelligence and Machine learning based Chatbot**, that answers queries pertaining to various services offered by IRCTC and even help users perform various transactions like end to end ticket booking, and more.
	CleverBot* https://www.cleverbot.com/
	Rose* http://ec2-54-215-197-164.us-west-1.compute.amazonaws.com/speech.php
	Ochatbot* https://www.ometrics.com/blog/list-of-fun-chatbots/

Types of Chatbots

- ✪ Simple Chatbot (Script bots)
- ✪ Smart Chatbots (AI based Smart bots)

Script Bot	Smart Bot
Script bots are easy to make	Smart bots are flexible and powerful
Script bots work around a script that is programmed in them i.e. Rule based chatbot	Smart bots work on bigger databases and other resources directly and follow a learning-based approach.
Mostly they are free and are easy to integrate into a messaging platform	Smart bots learn with more data
No or little language processing skills Task based rules Limited functionality	Coding is required to take this up on board. Works on AI algorithms, Context based AI Wide functionality

Example: the bots which are deployed in the customer care section of various companies	Example: Google Assistant, Alexa, Cortana, Siri, etc.

HUMAN LANGUAGE VS COMPUTER LANGUAGE

Human Language	Computer Language
1. Our brain keeps on processing the sounds that it hears around itself and tries to make sense of them all the time Example: In the classroom, as the teacher delivers the session, our brain is continuously processing everything and storing it someplace. Also, while this is happening, when your friend whispers something, the focus of your brain automatically shifts from the teacher's speech to your friend's conversation. So now, the brain is processing both the sounds but is prioritizing the one on which our interest lies.	1. Computers understand the language of numbers. Everything that is sent to the machine has to be converted to numbers. Binary code is a system by which numbers, letters and other information are represented using only two symbols, or binary digits. The binary definition to a computer is a 1s and 0s code arranged in ways that the computer can read, understand, and act upon
2. The sound reaches the brain through a long channel. As a person speaks, the sound travels from his mouth and goes to the listener's eardrum. The sound striking the eardrum is converted into neuron impulses, gets transported to the brain, and then gets processed.	2. While typing, if a single mistake is made, the computer throws an error and does not process that part. The communications made by the machines are very basic and simple.

3. After processing the signal, the brain gains an understanding of its meaning of it. If it is clear, the signal gets stored. Otherwise, the listener asks for clarity from the speaker. **This is how human languages are processed by humans**.	3. Now, if we want the machine to understand our language, how should this happen? What are the possible difficulties a machine would face in processing natural language? Let us take a look at some of them here:

There are rules in human language. There are nouns, verbs, adverbs, and adjectives. A word can be a noun at one time and an adjective some other time. There are rules to provide structure to a language.

Besides the matter of arrangement, there's also meaning behind the language we use. Human communication is complex. There are multiple characteristics of the human language that might be easy for a human to understand but extremely difficult for a computer to understand.

Let's understand Semantics and Syntax with some examples:

Different syntax, same semantics: 2+3 = 3+2

Here the way these statements are written is different, but their meanings are the same that is 5.

Different

output of 1.5.

Multiple Meanings of a word semantics, same syntax: 2/3 (Python 2.7) $\neq$ 2/3 (Python 3)

Here the statements written have the same syntax but their meanings are different. In Python 2.7, this statement would result in 1 while in Python 3, it would give an

To understand let us have an example of the following three sentences:

His face turned red after he found out that he had taken the wrong bag

What does this mean? Is he feeling **ashamed** because he took another person's bag instead of his? Is he feeling **angry** because he did not manage to steal the bag that he has been targeting?

The red car zoomed past his nose

Probably talking about the **colour of the car**, that travelled close to him in a flash.

His face turns red after consuming the medicine.

Sample Questions

1. Which of these chatbots is/are not AI based   1

    a) Script bot   b) Smart bot   c) Hybrid bot d) None of these

2 Give one example of Script bot   1

3 Give 4 examples for Smart Bot   2

Answers

1 A) Script bot   2 AskDISHA 2.0   3. Google Assistant, Alexa, Cortana, Siri,

Text processing/Data processing, Bag of words, TFIDF, NLTK

Since we all know that the language of computers is Numerical, the very first step that comes to our mind is to convert our language to numbers. This conversion takes a few steps to happen. The first step to it is Text Normalisation. Since human languages are complex, we need to first of all simplify them in order to make sure that the understanding becomes possible. Text Normalisation helps in cleaning up the textual data in such a way that it comes down to a level where its complexity is lower than the actual data.

Let us go through Text Normalisation in detail.

Text Normalisation is a process to reduce the variations in text's word forms to a common form when the variation means the same thing. Text normalisation simplifies the text for further processing

He visited Goa

he visited goa

HE VISITED GOA

hE vISItED GoA

Normalize Text

he visited goa
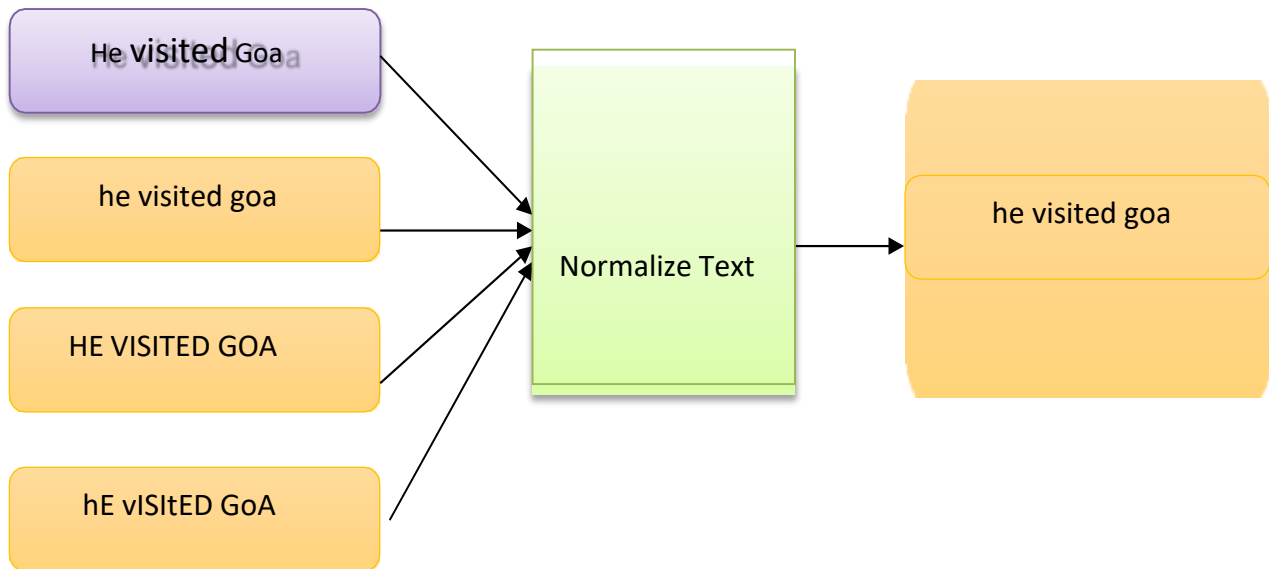
In Text Normalisation, we undergo several steps to normalize the text to a lower level. Textual data from multiple documents altogether is known as corpus. Let us take a look at the steps of Text Normalization:

Sentence Segmentation

Under sentence segmentation, the whole text is divided into individual sentences. Eg

Hello world. AI is fun to know. It has started impacting our lives in many ways. Many more revolutionary technologies will soon evolve out of it.

- Hello world.
- AI is fun to know.
- It has started impacting our lives in many ways.
- Many more revolutionary technologies will soon evolve out of it.

Tokenisation

After segmenting the sentences, each sentence is then further divided into tokens. Tokens is a term used for any word or number or special character occurring in a sentence. Under tokenisation, every word, number and special character is considered separately and each of them is now a separate token.
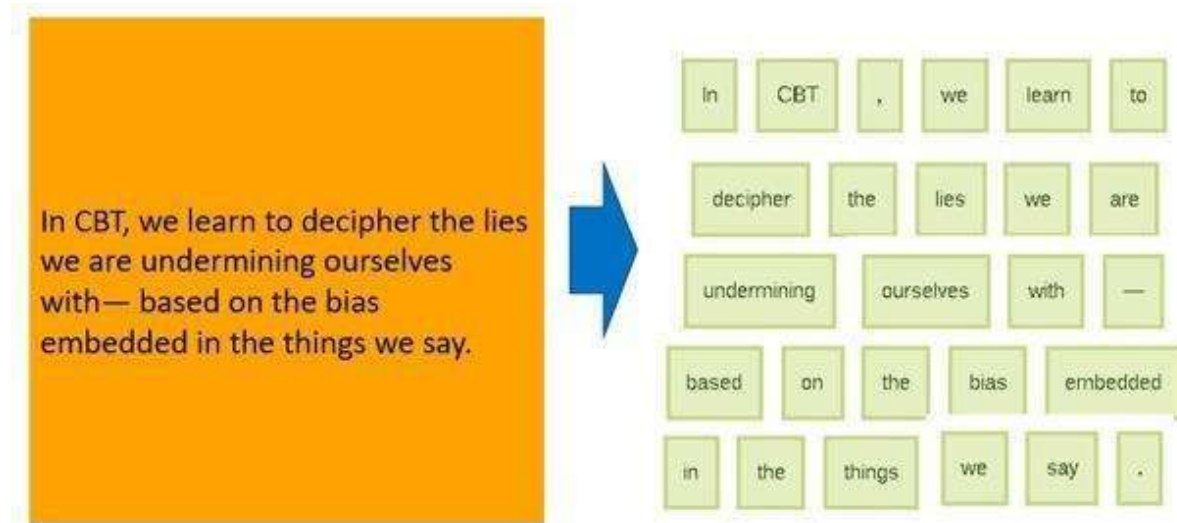
Removing Stop words, Special characters and Numbers

In this step, the tokens which are not necessary are removed from the token list. What can be the possible words which we might not require?

Stop words are the words in any language which do not add much meaning to a sentence. They can safely be ignored without sacrificing the meaning of the sentence

Humans use grammar to make their sentences meaningful for the other person to

understand.
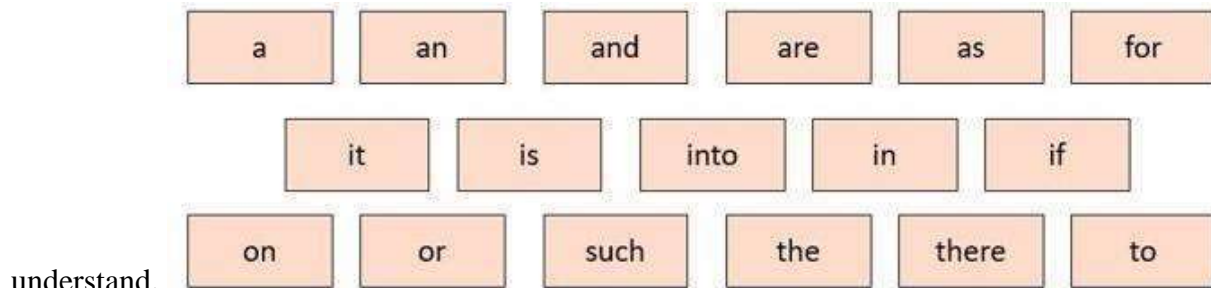
But grammatical words do not add any essence to the information which is to be transmitted through the statement hence they come under stop words. Some examples of stop words are:

These words occur the most in any given sentence but talk very little or nothing about the context or the meaning of it. Hence, to make it easier for the computer to focus on meaningful terms, these words are removed.

Along with these words, the sentence might have special characters and/or numbers. Now it depends on the type of sentence in the documents that we are working on whether we should keep them in it or not. For example, if you are working on a document containing email IDs, then you might not want to remove the special characters and numbers whereas in some other textual data if these characters do not make sense, then you can remove them along with the stop words.

Converting text to a common case

After the stop words removal, we convert the whole text into a similar case, preferably lower case. This ensures that the case-sensitivity of the machine does not consider same words as different just because of different cases.
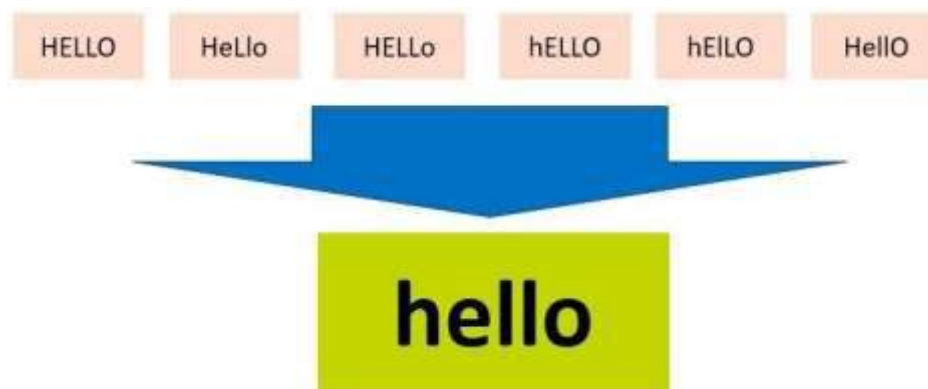
Here in this example, the all the 6 forms of hello would be converted to lower case and hence would be treated as the same word by the machine.

<u>Stemming</u>

In this step, the remaining words are reduced to their root words. In other words, stemming is the process in which the affixes of words are removed and the words are converted to their base form.

Note that in stemming, the stemmed words (words which are we get after removing the affixes) might not be meaningful. Here in this example as you can see: healed, healing and healer

Word	Affixes	Stem
healed	-ed	heal
healing	-ing	heal
healer	-er	heal
studies	-es	studi
studying	-ing	study

all were reduced to heal but studies was reduced to studi after the affix removal which is not a meaningful word. Stemming does not take into account if the stemmed word is meaningful or not. It just removes the affixes hence it is faster.

Lemmatization

Stemming and lemmatization both are alternative processes to each other as the role of both the processes is same – removal of affixes. But the difference between both of

Word	Affixes	lemma
healed	-ed	heal
healing	-ing	heal
healer	-er	heal
studies	-es	**study**
studying	-ing	study

them is that in lemmatization, the word we get after affix removal (also known as lemma) is a meaningful one. Lemmatization makes sure that lemma is a word with meaning and hence it takes a longer time to execute than stemming.

As you can see in the same example, the output for studies after affix removal has become study instead of studi.

Difference between stemming and lemmatization can be summarized by this example:
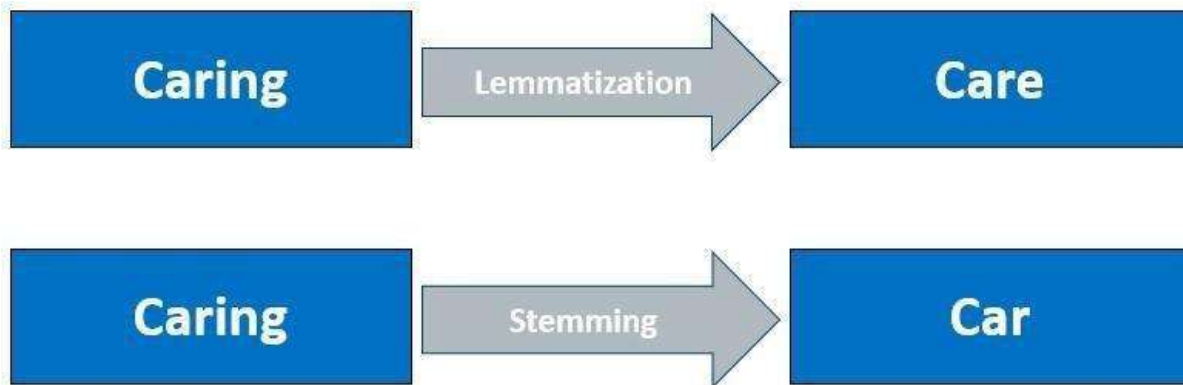
With this we have normalised our text to tokens which are the simplest form of words. Now it is time to convert the tokens into numbers. For this, we would use the Bag of Words algorithm

Bag of words (BOW)

Bag of Words is a Natural Language Processing model which helps in extracting features out of the text which can be helpful in machine learning algorithms. In bag of words, we get the occurrences of each word and construct the vocabulary for the corpus.
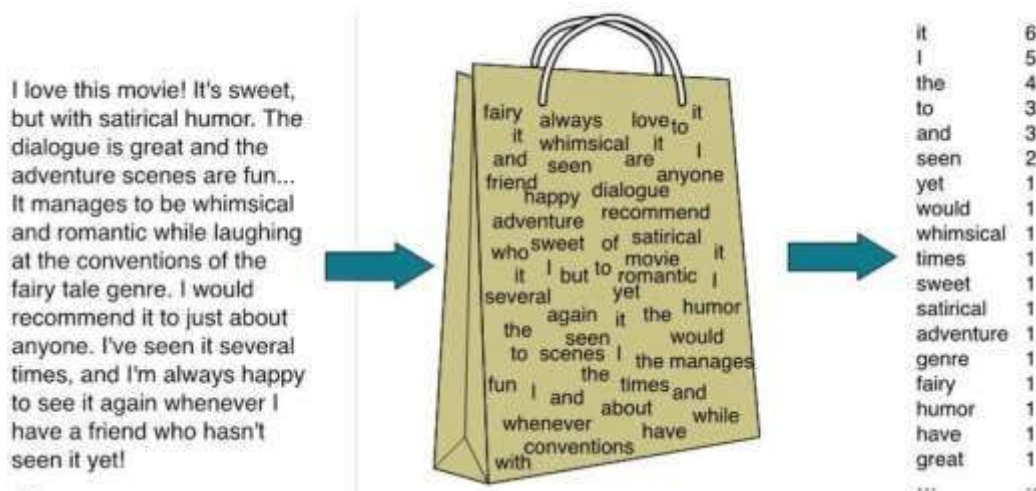
This image gives us a brief overview about how bag of words works.. As you can see at the right, it shows us a list of words appearing in the corpus and the numbers corresponding to it shows how many times the word has occurred in the text body. Thus, we can say that the bag of words gives us two things:

- **A vocabulary of words for the corpus**

- **The frequency of these words (number of times it has occurred in the whole corpus).**

Here calling this algorithm "bag" of words symbolises that the sequence of sentences or tokens does not matter in this case as all we need are the unique words and their frequency in it.

Here is the step-by-step approach to implement bag of words algorithm:

Text Normalisation: Collect data and pre-process it

Create Dictionary: Make a list of all the unique words occurring in the corpus. (Vocabulary)

Create document vectors: For each document in the corpus, find out how many times the word from the unique list of words has occurred.

Create document vectors for all the documents. Let us go through all the steps with an example:

Step 1: Collecting data and pre-processing it.

 Document 1: Aman and Anil are stressed

 Document 2: Aman went to a therapist

 Document 3: Anil went to download a health chatbot

Here are three documents having one sentence each. After text normalisation, the text becomes:

 Document 1: [aman, and, anil, are, stressed]

 Document 2: [aman, went, to, a, therapist]

 Document 3: [anil, went, to, download, a, health, chatbot]

Note that no tokens have been removed in the stop words removal step. It is because we have very little data and since the frequency of all the words is almost the same, no word can be said to have lesser value than the other.

Step 2: Create Dictionary

Go through all the steps and create a dictionary i.e., list down all the words which occur in all three documents:

Dictionary

aman	and	anil	are	stressed	went
download	health	chat	the	d	
			rap		
		ist		a	to
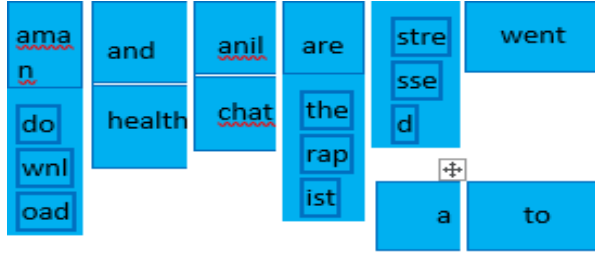
Note that even though some words are repeated in different documents, they are all written just once as while creating the dictionary, we create the list of unique words.

Step 3: Create document vector

In this step, the vocabulary is written in the top row. Now, for each word in the document, if it matches with the vocabulary, put a 1 under it. If the same word appears again, increment the previous value by 1. And if the word does not occur in that document, put a 0 under it.

aman	and	anil	are	stressed	went	to	a	therapist	download	health	chatbot
1	1	1	1	1	0	0	0	0	0	0	0

Since in the first document, we have words: aman, and, anil, are, stressed. So, all these words get a value of 1 and the rest of the words get a 0 value.

Step 4: Repeat for all documents

Same exercise has to be done for all the documents. Hence, the table becomes:

aman	and	anil	are	stressed	went	to	a	therapist	download	health	chatbot
1	1	1	1	1	0	0	0	0	0	0	0
1	0	0	0	0	1	1	1	1	0	0	0
0	0	1	0	0	1	1	1	0	1	1	1

In this table, the header row contains the vocabulary of the corpus and three rows correspond to three different documents. Take a look at this table and analyze the positioning of 0s and 1s in it.

Finally, this gives us the **document vector table** for our corpus. But the tokens have still not converted to numbers. This leads us to the final steps of our algorithm: TFIDF.

TFIDF: Term Frequency & Inverse Document Frequency

Bag of words algorithm gives us the frequency of words in each document we have in our corpus. It gives us an idea that if the word is occurring more in a document, its value is more for that document. For example, if I have a document on air pollution, air and pollution would be the words which occur many times in it. And these words are valuable too as they give us some context around the document. But let us suppose we have 10 documents and all of them talk about different issues. One is on women empowerment, the other is on unemployment and so on. Do you think air and pollution would still be one of the most occurring words in the whole corpus? If not, then which words do you think would have the highest frequency in all of them?

And, this, is, the, etc. are the words which occur the most in almost all the documents. But these words do not talk about the corpus at all. Though they are important for humans as they make the statements understandable to us, for the machine they are a complete waste as they do not provide us with any information regarding the corpus. Hence, these are termed as stopwords and are mostly removed at the pre-processing stage only.
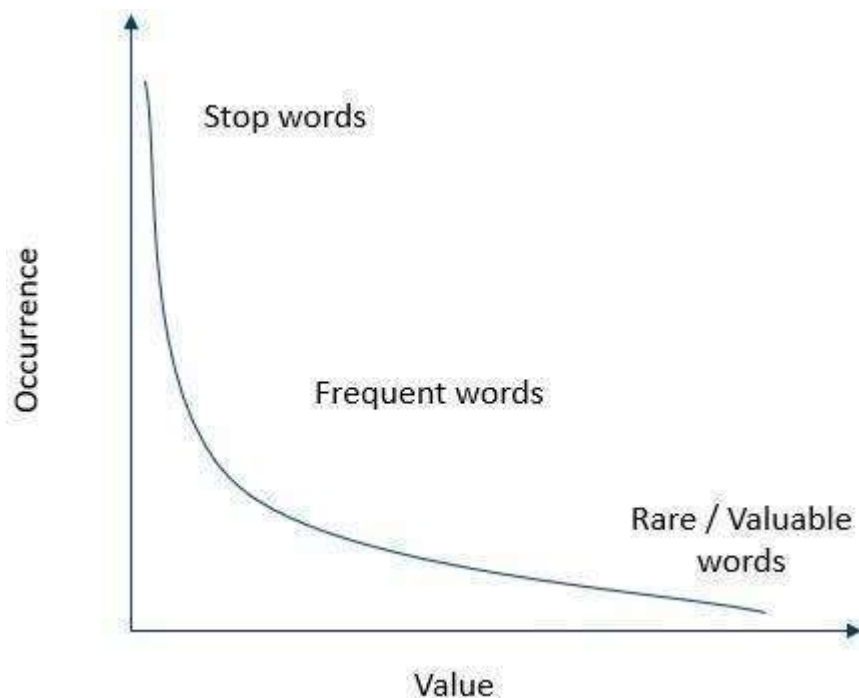
Take a look at this graph. It is a plot of occurrence of words versus their value. As you can see, if the words have highest occurrence in all the documents of the corpus, they are said to have negligible value hence they are termed as stop words. These words are mostly removed at the pre-processing stage only. Now as we move ahead from the stop words, the occurrence level drops drastically and the words which have adequate occurrence in the corpus are said to have some amount of value and are termed as frequent words. These words mostly talk about the document's subject and their occurrence is adequate in the corpus. Then as the occurrence of words drops further, the value of such words rises. These words are termed as rare or valuable words. These words occur the least but add the most value to the corpus. Hence, when we look at the text, we take frequent and rare words into consideration.

TFIDF stands for Term Frequency and Inverse Document Frequency. TFIDF helps in identifying the value for each word.

Term Frequency

Term frequency is the frequency of a word in one document. Term frequency can easily be found from the document vector table as in that table we mention the frequency of each word of the vocabulary   in

aman	and	anil	are	stressed	went	to	a	therapist	download	health	chatbot
1	1	1	1	1	0	0	0	0	0	0	0
1	0	0	0	0	1	1	1	1	0	0	0
0	0	1	0	0	1	1	1	0	1	1	1

each document.

Here, you can see that the frequency of each word for each document has been recorded in the table. These numbers are nothing but the Term Frequencies!

Inverse Document Frequency

Now, let us look at the other half of TFIDF which is Inverse Document Frequency. For this, let us first understand what does document frequency mean. Document Frequency is the number of documents in which the word occurs irrespective of how many times it has occurred in those documents. The document frequency for the exemplar vocabulary would be:

aman	and	anil	are	stressed	went	to	a	therapist	download	health	Chatbot
2	1	2	1	1	2	2	2	1	1	1	1

Here, you can see that the document frequency of 'aman', 'anil', 'went', 'to' and 'a' is 2 as they have occurred in two documents. Rest of them occurred in just one document hence the document frequency for them is one.

Talking about inverse document frequency, we need to put the document frequency in the denominator while the total number of documents is the numerator. Here, the total number of documents are 3, hence inverse document frequency becomes:

aman	and	anil	are	stressed	went	to	a	therapist	download	health	chatbot
3/2	3/1	3/2	3/1	3/1	3/2	3/2	3/2	3/1	3/1	3/1	3/1

Finally, the formula of TFIDF for any word W becomes:

TFIDF(W) = TF(W) * log(IDF(W))

Here, log is to the base of 10. Don't worry! You don't need to calculate the log values by yourself. Simply use the log function in the calculator and find out!

Now, let's multiply the IDF values to the TF values. Note that the TF values are for each document while the IDF values are for the whole corpus. Hence, we need to multiply the IDF values to each

row   of   the   document   vector   table.

aman	and	anil	are	stress	went	to	a	therapist	download	health	chatbot
1*log(3/2)	1*log(3)	1*log(3/2)	1*log(3)	1*log(3)	0*log(3/2)	0*log(3/2)	0*log(3/2)	0*log(3)	0*log(3)	0*log(3)	0*log(3)
1*log(3/2)	0*log(3)	0*log(3/2)	0*log(3)	0*log(3)	1*log(3/2)	1*log(3/2)	1*log(3/2)	1*log(3)	0*log(3)	0*log(3)	0*log(3)
0*log(3/2)	0*log(3)	1*log(3/2)	0*log(3)	0*log(3)	1*log(3/2)	1*log(3/2)	1*log(3/2)	0*log(3)	1*log(3)	1*log(3)	1*log(3)

Here, you can see that the IDF values for Aman in each row is the same and similar pattern is followed for all the words of the vocabulary. After calculating all the values, we get

aman	and	anil	are	stress	went	to	a	therapist	download	health	chatbot
0.176	0.477	0.176	0.477	0.477	0	0	0	0	0	0	0
0.176	0	0	0	0	0.176	0.176	0.176	0.477	0	0	0
0	0	0.176	0	0	0.176	0.176	0.176	0	0.477	0.477	0.477

Finally, the words have been converted to numbers. These numbers are the values of each for each document. Here, you can see that since we have less amount of data, words like 'are' and 'and' also have a high value. But as the IDF value increases, the value of that word decreases. That is, for example:

Total Number of documents: 10

Number of documents in which 'and' occurs: 10

Therefore, IDF(and) = 10/10 = 1

Which means: log (1) = 0. Hence, the value of 'and' becomes 0.

On the other hand, number of documents in which 'pollution' occurs: 3

IDF(pollution) = 10/3 = 3.3333…

Which means: log (3.3333) = 0.522; which shows that the word 'pollution' has considerable value in the corpus.

Summarising the concept, we can say that:

Words that occur in all the documents with high term frequencies have the least values and are considered to be the stop words.

For a word to have high TFIDF value, the word needs to have a high term frequency but less document frequency which shows that the word is important for one document but is not a common word for all documents.

These values help the computer understand which words are to be considered while processing the natural language. The higher the value, the more important the word is for a given corpus.

Applications of TF-IDF

Document Classification: TF-IDF helps in classifying the type and genre of a document by looking at the frequencies of words in the text. Based on the TF-IDF values, it is easy to classify emails as spam or ham, to classify news as real or fake and so on.

Topic Modelling: It helps in predicting the topic for the corpus. Topic modelling refers to a method of identifying short and informative descriptions of a document in a large collection that can further be used for various text mining tasks such a summarisation, document classification etc.

Key word Extraction: It is also useful for extracting keywords from text.

Information Retrieval System: To extract the important information out of a corpus.

Stop word Filtering: It helps in removing unnecessary words out of a text body.

NTLK:

NLTK is a leading platform for building Python programs to work with human language data. It provides easy-to-use interfaces to over 50 corpora and lexical resources such as WordNet, along with a suite of text processing libraries for classification, tokenization, stemming, tagging, parsing, and semantic reasoning, wrappers for industrial-strength NLP libraries, and an active discussion forum.

NLTK is suitable for linguists, engineers, students, educators, researchers, and industry users alike. NLTK is available for Windows, Mac OS X, and Linux. Best of all, NLTK is a free, open source, community-driven project.

NLTK has been called "a wonderful tool for teaching, and working in, computational linguistics using Python," and "an amazing library to play with natural language."

[Natural Language Processing with Python](#) provides a practical introduction to programming for language processing. Written by the creators of NLTK, it guides the reader through the fundamentals of writing Python programs, working with corpora, categorizing text, analyzing linguistic structure, and more.

Installing NLTK

1.   Install NLTK: run `pip install --user -U nltk`

2.   Install Numpy (optional): run `pip install --user -U numpy`

3.   Test installation: run `python` then type `import nltk`

For older versions of Python it might be necessary to install setuptools

(see https://pypi.python.org/pypi/setuptools) and to install pip (`sudo easy_install pip`).

NLTK requires Python versions 3.7, 3.8, 3.9 or 3.10

32-bit binary installation

Install Python 3.8: https://www.python.org/downloads/ (avoid the 64-bit versions)

Install Numpy (optional): https://www.scipy.org/scipylib/download.html

Install NLTK: https://pypi.python.org/pypi/nltk

Test installation: Start>Python38, then type `import nltk`

Installing NLTK Data

After installing the NLTK package, please do install the necessary datasets/models for specific work.

NLTK data, on the command line type `python -m nltk.downloader popular`, or in the Python interpreter `import nltk; nltk.download('popular')`

Question Banks – MCQs :

1. What is NLTK tool in Python ?

(a) Natural Linguistics Tool (b) **Natural Language Toolkit**

(c) Neutral Language Kit (d) Neutral Language Toolkit

2. TF-IDF in NLP is defined as :

(a) Term Frequency and Definite Frequency

(b) Term Frequency and Indefinite Frequency

(c) **Term Frequency and Inverse Document Frequency**

(d) Term Frequency and Integrated Document Frequency

3. What do we call the process of dividing a string into component words ?

(a) Regression

(b) **Word Tokenization**

(c) Classification

(d) Clustering

4. What is the stem of the word "Making" ?

(a) **Mak** (b) Make (c) Making (d) Maker

5. What is the Lemma of the word "Making" ?

(a) Mak (b) **Make** (c) Making (d) Maker

6. Which of these is not a stop word ?

(a) This (b) **Things** (c) Is (d) Do

7. The higher the value, the more important the word in the document – this is true of which model ?

(a) **Bag of Words** (b)TF-IDF (c) YOLO (d) SSD

8. Which of these is not an NLP library ?

(a) NLTK (b) **NLP Kit** (c) Open NLP (d) NLP Suite

9. What is a chatbot called which uses simple FAQs without any intelligence ?

(a) Smart Chatbot (b) **Script Chatbot**

(c) AI Chatbot (d) ML Chatbot

10. What is the process of extracting emotions within a text data using NLP called?

(a) **Sentiment Analysis**

(b) Emotional Data Science

(c) Emotional Processing

(d) Emotional Classification

Subjective Type Questions 2 Marks:

1. Explain the key steps of NLP – based text analysis.
    i)   Sentence Segmentation
    ii)   Tokenization
    iii)   Removing Stop words, Special Characters and Numbers
    iv)   Stemming
    v)   Converting Text to common Case
    vi)   Lemmatization

2. Compare Bag of words and TF-IDF and share your finding.

Bag of Words is a Natural Language Processing model which helps in extracting features out of the text which can be helpful in machine learning algorithms. In bag of words, we get the occurrences of each word and construct the vocabulary for the corpus. Bag of Words just creates a set of vectors containing the count of word occurrences in the document (reviews). Bag of Words vectors are easy to interpret.
TFIDF is commonly used in the Natural Language Processing domain.

Some of its applications are:

· Document Classification - Helps in classifying the type and genre of a document.

· Topic Modelling - It helps in predicting the topic for a corpus.

· Information Retrieval System - To extract the important information out of a corpus.
Stop word filtering - Helps in removing the unnecessary words out of a text body.

3. What are some of the applications of chatbots in health care ?

The most valuable features of using chatbots in healthcare include:

· **Monitoring**: Awareness and tracking of user's behavior, anxiety, and weight changes to encourage developing better habits.

· **Anonymity:** Especially in sensitive and mental health issues.

· **Personalization**: Level of personalization depends on the specific application. Some applications make use of measurements of:

. **Physical vitals** (oxygenation, heart rhythm, body temperature) via mobile sensors.

. **Patient behavior** via facial recognition.

· **Real time interaction**: Immediate response, notifications, and reminders.

· **Scalability**: Ability to react with numerous users at the same time.

4. Explain the difference between Stemming and Lemmatization.

Stemming: Stemming is a rudimentary rule-based process of stripping the suffixes ("ing", "ly", "es", "s" etc) from a word.

Stemming is a process of reducing words to their word stem, base or root form (for example, books — book, looked — look).

Lemmatization: Lemmatization, on the other hand, is an organized & step by step procedure of obtaining the root form of the word, it makes use of vocabulary (dictionary importance of words) and morphological analysis (word structure and grammar relations).

5. What is the difference between how humans interpret communication and how NLP interpret?

The communications made by the machines are very basic and simple. Human communication is complex. There are multiple characteristics of the human language that might be easy for a human to understand but extremely difficult for a computer to understand.

For machines it is difficult to understand our language. Let us take a look at some of them here:

Arrangement of the words and meaning - There are rules in human language. There are nouns, verbs, adverbs, adjectives. A word can be a noun at one time and an adjective some other time. This can create difficulty while processing by computers.

Analogy with programming language- Different syntax, same semantics: 2+3 = 3+2 Here the way these statements are written is different, but their meanings are the same that is 5. Different semantics, same syntax: 2/3 (Python 2.7) ≠ 2/3 (Python 3) Here the statements written have the same syntax but their meanings are different. In Python 2.7, this statement would result in 1 while in Python 3, it would give an output of 1.5. Multiple Meanings of a word - In natural language, it is important to understand that a word can have multiple meanings and the meanings fit into the statement according to the context of it.

Subjective type questions 4 Marks

1. **Through a step-by-step process, calculate TFIDF for the given corpus and mention the word(s) having highest value.**

   Document 1: We are going to Mumbai

   Document 2: Mumbai is a famous place.

Document 3: We are going to a famous place.

Document 4: I am famous in Mumbai.

Term Frequency

Term frequency is the frequency of a word in one document. Term frequency can easily be found from the document vector table as in that table we mention the frequency of each word of the vocabulary in each document.

We	Are	Going	to	Mumbai	is	a	famous	Place	I	am	in
1	1	1	1	1	0	0	0	0	0	0	0
0	0	0	0	1	1	1	1	1	0	0	0
1	1	1	1	0	0	1	1	1	0	0	0
0	0	0	0	1	0	0	1	0	1	1	1

Inverse Document Frequency

The other half of TFIDF which is Inverse Document Frequency. For this, let us first understand what does document frequency mean. Document Frequency is the number of documents in which the word occurs irrespective of how many times it has occurred in those documents. The document frequency for the exemplar vocabulary would be:

We	Are	Going	to	Mumbai	is	a	famous	Place	I	am	in
2	2	2	2	3	1	2	3	2	1	1	1

Talking about inverse document frequency, we need to put the document frequency in the denominator while the total number of documents is the numerator. Here, the total number of documents are 3, hence inverse document frequency becomes:

We	Are	Going	to	Mumbai	is	a	famous	Place	I	am	in
4/2	4/2	4/2	4/2	4/3	4/1	4/2	4/3	4/2	4/1	4/1	4/1

 The formula of TFIDF for any word W becomes:

TFIDF(W) = TF(W) * log (IDF(W))

We	Are	Going	to	Mumbai	is	a	famous	Place	I	am	in
1*log(4/2)	1*log(4/2)	1*log(4/2)	1*log(4/2)	1*log(4/3)	0*log(4/1)	0*log(4/2)	0*log(4/3)	0*log(4/2)	0*log(4/1)	0*log(4/1)	0*log(4/1)
0*log(4/2)	0*log(4/2)	0*log(4/2)	0*log(4/2)	1*log(4/3)	0*log(4/1)	1*log(4/2)	1*log(4/3)	1*log(4/2)	0*log(4/1)	0*log(4/1)	0*log(4/1)
1*log(4/2)	1*log(4/2)	1*log(4/2)	1*log(4/2)	0*log(4/3)	0*log(4/1)	1*log(4/2)	1*log(4/3)	1*log(4/2)	0*log(4/1)	0*log(4/1)	0*log(4/1)
0*log(4/2)	0*log(4/2)	0*log(4/2)	0*log(4/2)	1*log(4/3)	0*log(4/1)	0*log(4/2)	1*log(4/3)	1*log(4/2)	1*log(4/1)	1*log(4/1)	1*log(4/1)

After calculating all the values, we get

We	Are	Going	to	Mumbai	is	a	famous	Place	I	am	in
0.301	0.301	0.301	0.301	0.124	0	0	0	0	0	0	0
0	0	0	0	0.124	0.602	0.301	0.124	0.301	0	0	0
0.301	0.301	0.301	0.301	0	0	0.301	0.124	0.301	0	0	0
0	0	0	0	0.124	0	0	0.124	0	0.602	0.602	0.602

Finally, the words have been converted to numbers. These numbers are the values of each for each document. Here, you can see that since we have less data, words like 'I','am', 'in' and 'is' also have a high value. But as the IDF value increases, the value of that word decreases.

2.   Normalize the given text and comment on the vocabulary before and after the normalization:

Raj and Vijay are best friends. They play together with other friends. Raj likes to play football but   Vijay prefers to play online games. Raj wants to be a footballer. Vijay wants to become an online gamer.

Normalization of the given text:
Sentence Segmentation:
1.   Raj and Vijay are best friends.
2.   They play together with other friends.
3.   Raj likes to play football but Vijay prefers to play online games.
4.   Raj wants to be a footballer.
5.   Vijay wants to become an online gamer.

Tokenization:

Raj, and , vijay, are, best, friends, they,play, together, with, other,likes, to,football, but,prefers,online, games,wants,be,a,footballer,become, an,gamer

Removing Stop words, Special Characters and Numbers:

In this step, the tokens which are not necessary are removed from the token list. So, the words and, are, to, an, (Punctuation) will be removed.

Converting text to a common case:

After the stop words removal, we convert the whole text into a similar case, preferably lower case.

Here we don't have words in different case so this step is not required for given text.

Stemming:

In this step, the remaining words are reduced to their root words. In other words, stemming is the process in which the affixes of words are removed and the words are converted to their base form.

Word	Affixes	Stem
Likes	-s	Like
Prefers	-s	Prefer
Wants	-s	Want

In the given text Lemmatization is not required.

Given Text

Raj and Vijay are best friends. They play together with other friends. Raj likes to play football but Vijay prefers to play online games. Raj wants to be a footballer. Vijay wants to become an online gamer.
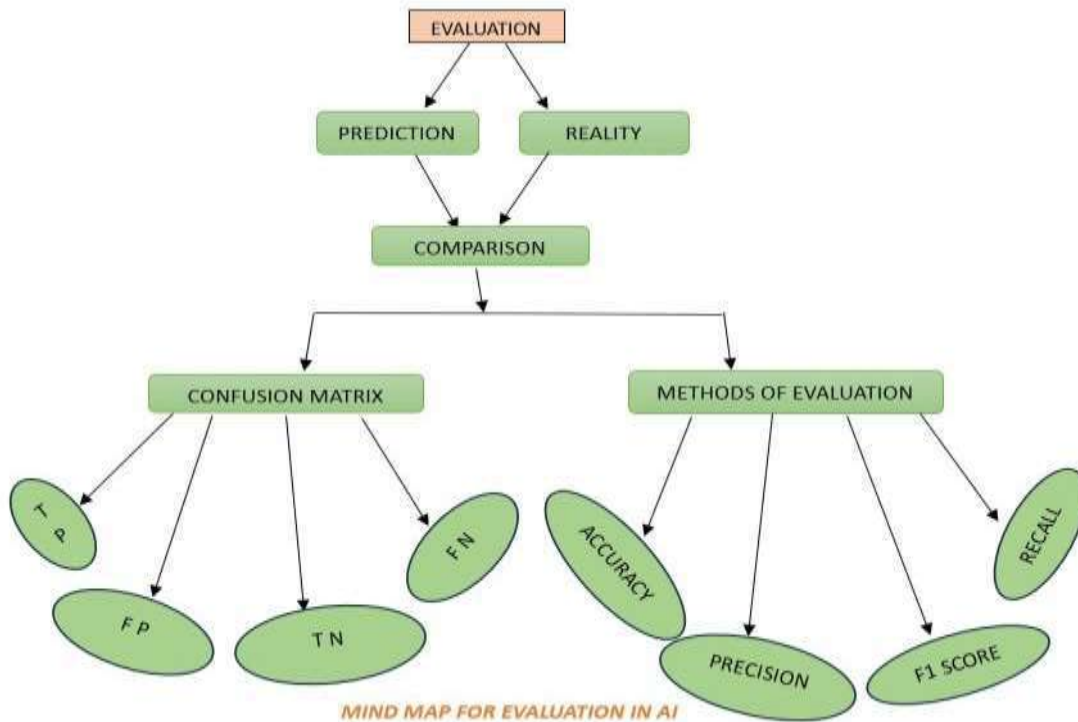
Normalized Text

Raj and Vijay best friends They play together with other friends Raj likes to play football but Vijay prefers to play online games Raj wants to be a footballer Vijay wants to become an online gamer.

EVALUATION

MIND MAP FOR EVALUATION IN AI

Problem Scoping ----- > Data Acquisition ---- > Data Exploring ------ > Modelling ---- > Evaluation.

▢Evaluation is the final stage in AI Project Cycle. Once a model has been made and trained, it needs to go through proper testing so that one can calculate the *efficiency* and *performance* of the model. Hence, the model is tested with the help of Testing Data.

▢Evaluation is the process of understanding the reliability and final performance of any AI model by giving the test data set into the model and comparing it`s output with actual answers.

Why do we need evaluation?

While in modelling, we make different types of models. Then a decision to be taken which model is better than another. So for that proper testing and evaluation is needed to calculate the efficiency and performance of a model.

An efficient evaluation model proves helpful in selecting the most suitable modelling method that would represent our data.

We must keep in mind that it is not advisable to use the data that we used to create the model to evaluate it. Why?

Ans-Training data must not be used for evaluation purposes because a model simply remembers the whole of training data, therefore always predicts the correct output for any point in the training set whenever training data is fed again. But it gives very wrong answers if a new dataset is introduced to the model. This situation is known as *overfitting.*

Evaluation is basically done by two things:

1. Prediction   The output given by the machine after training and testing the data is known as Prediction. (Output of the machine)

2. Reality   Reality is the real situation and real scenario where prediction has been made by the machine. (Reality or truth)

We will consider many scenarios for evaluation. Then *what is Scenario?*

Consider an AI based prediction model which is deployed to identify Football or a soccer ball. Objective is to find out whether the given image is a football. Now there exists two conditions as discussed above-

Prediction- output given by the machine

Reality- real scenario about image shown when prediction is done.

There are various combination based on these two conditions:

1. Case 1

Is this a Football?

1. Prediction = **YES**
2. Reality = **YES**
3. **True Positive**

Here, we can see in the picture that it's a football. The model's prediction is Yes which means it's football. The Prediction matches Reality. Hence, this condition is termed as **True Positive**.

2. *Case 2*

Is this a Football?

1. Prediction = **NO**
2. Reality = **NO**
3. **True Negative**

Here this is Not an image of Football hence the reality is No. In this case, the machine has predicted it correctly as a No. Therefore, this condition is termed as **True Negative**.

3. Case 3

Is this a Football?

1. Prediction = **YES**
2. Reality = **NO**
3. **False Positive (Type 1 Error)**

Here the reality is that it is not Football. But the machine has incorrectly predicted that this is Football. This case is termed **False Positive**.

Another example- You predicted that India won the cricket match series against England but they lost.

4.Case 4

Is this a Football?

1. Prediction = **NO**
2. Reality = **YES**
3. **False Negative (Type 2 Error)**

Here, a Football has been in a different look because of which the Reality is Yes but the machine has incorrectly predicted it as a No which means the machine predicts that it is not Football. Therefore, this case becomes **False Negative**.

Now these combinations are done by using different metrics. One of them is the Confusion Matrix.

1. The comparison between the results of Prediction and reality is called the Confusion Matrix.

2. It is a record that helps in evaluation.

3. It is not a calculation; it is a performance measurement for machine learning classification problems where output can be two or more classes.

Now again consider the example of football:

Result of comparison between prediction and reality can be recorded in a confusion matrix.
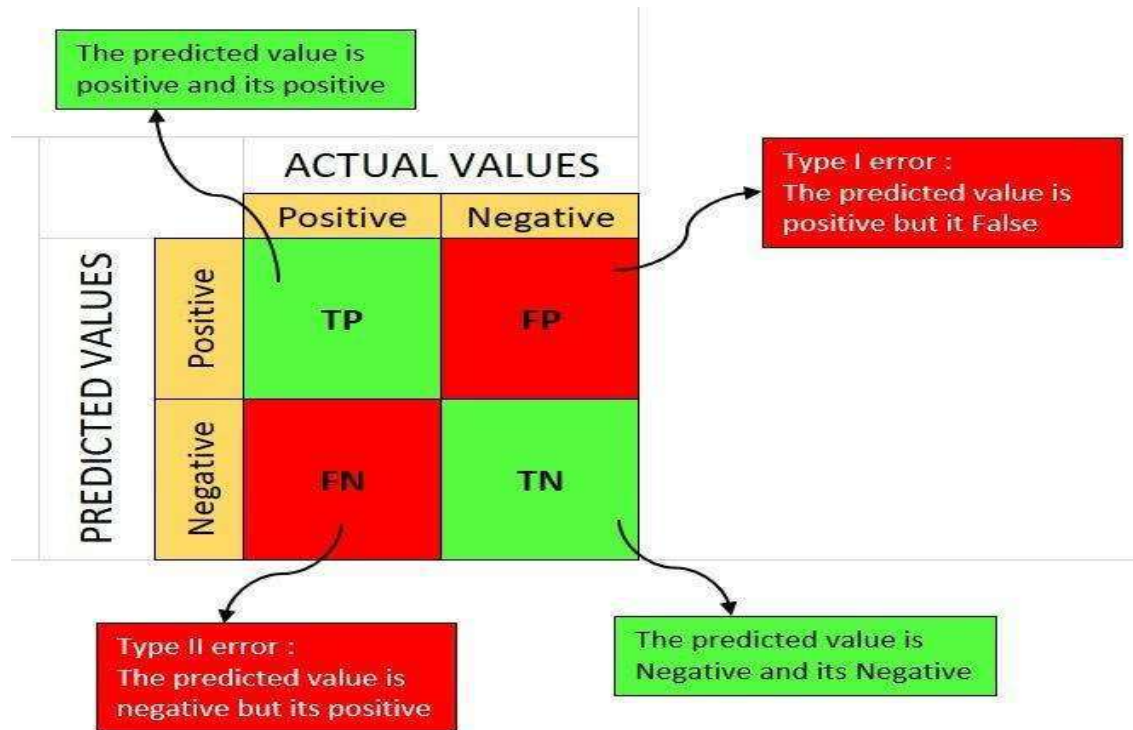
Parameters to evaluate the Model-

There are four methods to evaluate the model.

1. Accuracy- It is the percentage of correct predictions out of all the observations.

A prediction is correct if it matches the reality.

All True positive and True Negative are the cases in which the Prediction matches with reality.

Accuracy Formula

$$Accuracy = \frac{correct\ Prediction}{Total\ Cases} * 100\%$$

OR

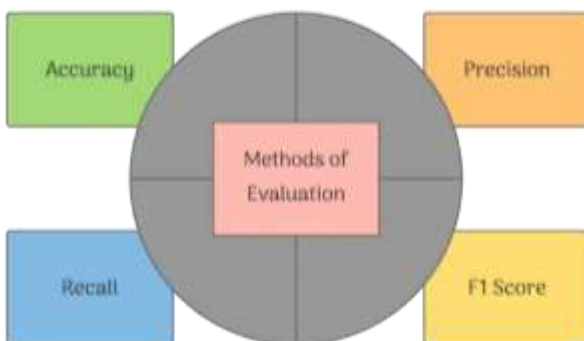$$Accuracy = \frac{(TP + TN)}{(TP + TN + FP + FN)} * 100\%$$

Here Total cases/observations= TP+TN+FP+FN

EXAMPLE-

Let us again take the football example.

Assume that the model always predicts that object is **not football**. But in reality, there is a **5% chances of object being a football**. In this case, for 95 cases, the model will be right but for 5 cases in which the object was a football, the model predicted it to be not a football. Here,

1. True Positives = **0**
2. True Negatives = **95**
3. Total cases = **100**
4. Therefore, accuracy becomes:
   95+0/100 = 95%

2. Precision Parameter-

It is defined as the percentage of true positive cases versus all the cases where the prediction is true. It takes True Positives and False Positives.

$$Precision = \frac{True\ Positive}{All\ Predicted\ Positives} * 100\%$$ $$Precision = \frac{TP}{TP + FP} * 100\%$$

Going back to the football example, in this case, assume that the model always predicts that object is a Football irrespective of the reality. In this case, all the Positive conditions would be taken into account that is,

- True Positive (Prediction = Yes and Reality = Yes)
- False Positive (Prediction = Yes and Reality = No)

In this case, the Players will check for the ball all the time to see if it is Football or not (which means if the reality is True or False).

If Precision is high, this means the True Positive cases are more, giving lesser False predictions.

3. Recall Parameter

It is the fraction of positive cases that are correctly identified. It takes into account the true reality cases where in Reality, there was a football but the machine either detected it correctly or didn`t. That is, it considers True Positive (There was a football in reality and the model predicted a football) and False Negative (object is a football and model predicts it is not).

$$Recall = \frac{True\ Positive}{True\ Positive + False\ Negative}$$ $$Recall = \frac{TP}{TP + FN}$$

We can see that the Numerator in both Precsion and Recall is same; True Positive . But in the denominator, Precision counts the False Positive while Recall takes False Negative into consideration.

Which one is more important than another, Precision or Recall?

1. Choosing between Precision and Recall depends on the condition in which the model has been deployed. In a case like Forest Fire, a False Negative can cost us a lot and is risky too. Imagine no alert being given even when there is a Forest Fire. The whole forest might burn down.

2. Another case where a False Negative can be dangerous is Viral Outbreak. Imagine a deadly virus has started spreading and the model which is supposed to predict a viral outbreak does not detect it. The virus might spread widely and infect a lot of people.

3. On the other hand, there can be cases in which the False Positive condition costs us more than False Negatives. One such case is Mining. Imagine a model telling you that there exists treasure at a point and you keep on digging there but it turns out that it is a false alarm. Here, the False Positive case (predicting there is a treasure but there is no treasure) can be very costly

.

4. Consider a model that predicts whether a mail is spam or not. If the model always predicts that the mail is spam, people would not look at it and eventually might lose important information. Here also False Positive condition (Predicting the mail as spam while the mail is not spam) would have a high cost.

- If we want to know if our model`s performance is good, we need these two measures: Precision and Recall. For some cases, you might have High precision but Low Recall or Low Precision but High Recall. But since both the measures are important, there is a need for a parameter which takes both Precision and Recall into account.

4. F1 Score

It can be defined as the measure of balance between precision and recall.

$$F1\ Score = 2 * \frac{Precision * Recall}{Precision + Recall}$$

An ideal situation is there when we have a value of 1 for both Precsion and Recall. Then F1 score would also be 1(100%). It is known as the perfect value for F1 Score. A model is having a good performance if F1 Score is high.

F1 Score Table

Precision	Recall	F1 Score
Low	Low	Low
Low	High	Low
High	Low	Low
High	High	High

1 Mark questions

1. _____ is the process of understanding the reliability of any AI model based on output by feeding the test dataset.

a. Data Reliability

b. Data feed

c. Model Evaluation

d. None of these

2. It is the percentage of correct predictions out of all observations.

a. Prediction   c. F1 Score

b. Accuracy   d. None of these

3. _____ is defined as the percentage of true positive cases versus all the cases where the prediction is true.

a. Precision   c. F1 Score

b. Accuracy.   d. None of these

4. It is the measure of balance between precision and recall.

a. Accuracy

b. F1 Score

c. Precision

d. None of these

5. The result of comparison between the prediction and reality is recorded in

a. F1 Score

b. Confusion matrix

c. Evaluation Model

d. All of these

6. While evaluating a model`s performance, recall parameter considers_____

i. False positive   ii. True Positive

iii. False negative   iv. True negative

Choose the correct option:

a. only (i)   **b. (ii) and (iii)**

c. (iii) and (iv)   d. (i) and (iv)

7. Two conditions when prediction matches with the reality are True Positive and _____.

Ans. **True Negative**

8. Which of the following talks about how true the predictions are by any model?

a. Accuracy

b. Reliability

c. Recall

d. F1 Score

9. With reference to evaluation process of understanding the reliability of any AI model, define the term True Positive.

Ans- A true positive is an outcome where the model correctly predicts the positive class.

10. The output given by the AI machine is known as _____ (Prediction/ Reality).

Ans- Prediction

11. Amit was learning the conditions that make up the confusion matrix. He came across a scenario in which the machine that was supposed to predict an animal was always predicting not an animal. What is this condition called?

(a) False Positive

(b) True Positive

(c) False Negative

(d) True Negative

12. Which of the following statements is not true about overfitting models?

(a) This model learns the pattern and noise in the data to such extent that it harms the performance of the model on the new dataset

(b) Training result is very good and the test result is poor

(c) It interprets noise as patterns in the data

(d) The training accuracy and test accuracy both are low

13. Siya was confused with the terms used in the evaluation stage. Suggest her the term used for the percentage of correct predictions out of all the observations.

(a) Accuracy

(b) Precision

(c) Recall

(d) F1 Score

14. In spam email detection, which of the following will be considered as " False negative" ?

a. When a legitimate email is accurately identified as not spam.

b. When a spam email is mistakenly identified as legitimate.

c. When an email is accurately recognised as spam.

d. When an email is inaccurately labelled as important.

15. Statement 1 : Confusion Matrix is an evaluation metric.

Statement 2: Confusion Matrix is a record which helps in evaluation.

a. Both Statement 1 and Statement 2 are correct.

b. Both Statement 1 and Statement 2 are incorrect.

c. Statement 1 is correct and Statement 2 is incorrect.

d. Statement 2 is correct and Statement 1 is incorrect.

16. Statement 1: To evaluate a model`s performance, we need either precision or recall.

Statement 2 : When the value of both Precision and Recall is 1 , the F1 score is 0.

a. Both statement1 and statement 2 are correct.

b. Both statement1 and statement 2 are incorrect.

c. Statement 1 is correct but statement 2 is incorrect.

d. Statement 1 is incorrect but statement 2 is correct.

1. What is the purpose of Evaluation stage of AI project cycle? Discuss briefly.

Ans- The primary purpose of evaluation in the AI project cycle is to check the reliability of the AI model. It helps determine if the model is performing as expected and if it can make accurate predictions or classifications based on the test dataset.

2. With reference to evaluation stage of AI project cycle, explain the term Accuracy. Also give the formula to calculate it.

Ans- Accuracy is a metric that measures how often a machine learning model correctly predicts the outcome. You can calculate accuracy by dividing the number of correct predictions by the total number of predictions. [Formula]

3. Define Confusion Matrix.

Ans- A confusion matrix is a performance evaluation tool in machine learning, representing the accuracy of a classification model. Result of comparison between prediction and reality can be recorded in a confusion matrix. [Matrix table]

4. Explain the concept of overfitting with respect to AI model evaluation.

Ans- Overfitting is a problem where the evaluation of machine learning algorithms on training data is different from unseen data.

5. What is Recall? Mention it`s formula.

Ans- It is the fraction of positive cases that are correctly identified. It takes into account the true reality cases. [Formula]

6. How do you suggest which evaluation metric is more important for any case?

Ans- F 1 Evaluation metric is more important in any case. F1 score sort maintains a balance between the precision and recall for the classifier. If the precision is low, the F1 is low and if the recall is low again F1 score is low. The F1 score is a number between 0 and 1 and is the harmonic mean of precision and recall .

7. Give the possible reasons for an AI model not being efficient? Explain.

Ans- Reasons of an AI model not being efficient:

1. Lack of Training Data: If the data is not sufficient for developing an AI Model, or if the data is missed while training the model, it will not be efficient.

2. Unauthenticated Data / Wrong Data: If the data is not authenticated and correct, then the model will not give good results.

3. Inefficient coding / Wrong Algorithms: If the written algorithms are not correct and relevant, Model will not give desired output. Not Tested: If the model is not tested properly, then it will not be efficient**.**

<mark>4 Mark Questions</mark>

1. Consider a scenario in which a lot of times people face the problem of sudden downpour. People wash clothes and put them out to dry but due to unexpected rain, their work gets wasted. Thus, an AI model has been created which predicts if there will be rain or not. The confusion matrix for the same is the Confusion Matrix

CONFUSION MATRIX		REALITY	
		YES	NO
PREDICTED	YES	50	10
	NO	60	40

Ans- To solve the scenario, one can use machine learning algorithms to improve the accuracy of the rain prediction model. This can help people prepare better for sudden downpours, reducing the amount of clothes wasted—

Calculate Accuracy, Precision, Recall and F1 Score using Formulas and above confusion matrix.

2. Recently the country was shaken up by a series of earthquakes which has done a huge damage to the people as well as the infrastructure. To address this issue, an AI model has been created which can predict if there is a chance of an earthquake or not. The confusion matrix for the same is as below:

calculate Accuracy, precision, recall and F1 score.

CONFUSION MATRIX		REALITY	
		YES	NO
PREDICTED	YES	70	15
	NO	35	30

3. A binary classification model has been developed to classify news articles as either "Fake News" or "Real News". The model was tested on a dataset of 500 news articles, and the resulting confusion matrix is as follows:

calculate Accuracy, precision, recall and F1 score.

CONFUSION MATRIX		REALITY	
		YES	NO
PREDICTED	YES	45	15
	NO	20	420

Introduction to Python

Jupyter Notebook

The Jupyter Notebook is an incredibly powerful tool for interactively developing and presenting AI related projects. The Jupyter project is the successor to the earlier IPython and it is an interactive way of running python code in the terminal using the REPL model. (Read Eval Print Loop)

Jupyter Notebook is an open-source, web-based interactive environment, which allows you to create and share documents that contain live code, mathematical equations, graphics, maps, plots, visualizations, and narrative text. It integrates with many programming languages like Python, PHP, R, C#, etc.

Advantages of Jupyter Notebook

1. **All in one place:** As you know, Jupyter Notebook is an open-source web-based interactive environment that combines code, text, images, videos, mathematical equations, plots, maps, graphical user interface and widgets to a single document.

2. **Easy to convert:** Jupyter Notebook allows users to convert the notebooks into other formats such as HTML and PDF. It also uses online tools and nbviewer which allows you to render a publicly available notebook in the browser directly.

3. Easy to share: Jypyter Notebooks are saved in the structured text fies(JSON format), which makes them easily shareable.

4. **Language independent:** Jupyter Notebook is platform-independent because it is represented as JSON (JavaScript Object Notation) format, which is a language independent, text-based file format. Another reason is that the notebook can be processed by any programing language, and can be converted to any file formats such as Markdown, HTML, PDF, and others

5. **Interactive code:** Jupyter notebook uses **ipywidgets** packages, which provide many common user interfaces for exploring code and data interactivity

Installing Jupyter Note Book

1. **Installation using Anaconda**

The easiest way to install and start using Jupyter Notebook is through Anaconda. Anaconda is the most widely used Python distribution for data science and comes pre-loaded with all the most popular libraries and tools. With Anaconda, comes the Anaconda Navigator through which we can scroll around all the applications which come along with it. Jupyter notebook can easily be accessed using the Anaconda Prompt with the help of a local host.

2. **Installation using pip:**

Jupyter note book can be installed also using the following code in command prompt

```
>python-m pip install jupyter
```

Kernels in Jupyter Notebook

A kernel provides programming language support in Jupyter. IPython is the default kernel for Jupyter Notebook. Therefore, whenever we need to work with Jupyter Notebook in a virtual environment, we first need to install a kernel inside the environment in which the Jupyter notebook will run.
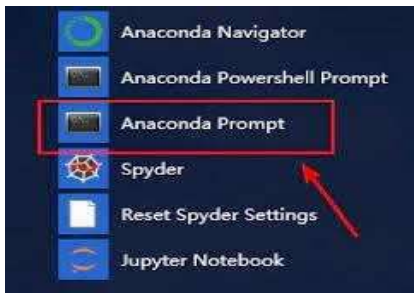
Virtual environment

A virtual environment is a tool that helps to keep dependencies required by different projects separated, by creating isolated Python virtual environments for them. This is one of the most important tools that most of the Python developers use.

Imagine a scenario where we are working on two Python-based projects and one of them works on Python 2.7 and the other uses Python 3.7. In such situations virtual environment can be really useful to maintain dependencies of both the projects as the virtual environments will make sure that these dependencies are not conflicting with each other and no impact reaches the base environment at any point in time. Thus, different projects developed in the system might have another environment to keep their dependencies isolated from each other.

Creating virtual environments is an easy task with Anaconda distribution. Steps to create one are:

1. Open Anaconda prompt.

2. As we open the Anaconda prompt, we can see that in the beginning of the prompt message, the term (base) is written. This is the default environment in which the anaconda works. Now, we can create our own virtual environment and use it so that the base does not get affected by anything that is done in the virtual environment.
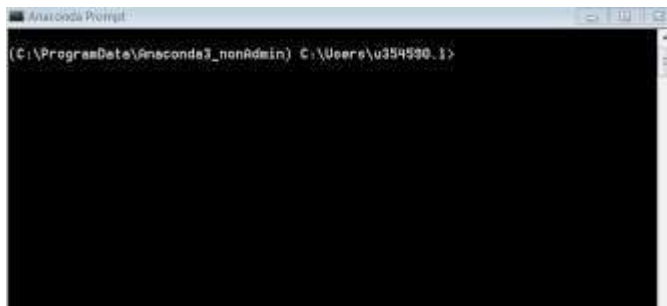
3. Let us now create a virtual environment named env. To create the environment, write conda create -n env python=3.7
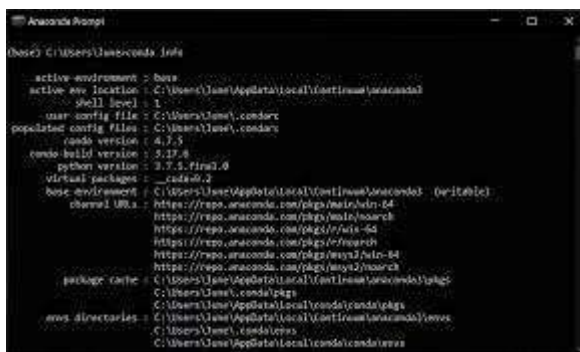
4. After some processing, the prompt will ask if we wish to proceed with installation or not. Type y on it and press enter. Once we press enter, the packages will start getting installed in the environment.

5. Depending upon the internet speed, the downloading of packages might take varied time.

6. Once all the packages are downloaded and installed, we will get a message.

7. This shows that our environment called env has been successfully created. Once an environment has been successfully created, we can access it by writing the following:

Conda active env

This would activate the virtual environment and we can see the term written in brackets has changed from (base) to (env).Now our virtual environment is ready to be used. But, to open and work with jupyter notebooks in this environment, we need to install the packages which help in working with jupyter notebook. These packages get installed by default in the base environment when anaconda gets installed. To install Jupyter Notebook dependencies, we need to activate our virtual environment env and write Conda insatll ipykernal nb_cond jupyter It will again ask if we wish to proceed with the installation, type Y to begin the installation. Once the installations are complete, we can start working jupyter notebooks in this environment.

Introduction to Python

Python is a programming language which was created by Guido Van Rossum . It can be used to follow both procedural approach and object-oriented approach of programming. Python has a lot of functionalities which makes it so popular to use.

Why Python for AI?

Artificial intelligence is the trending technology of the future. We can see so many applications around us. If we as individuals would also like to develop an AI application, we will need to know a programming language. There are various programming languages like Lisp, Prolog, C++, Java and Python, which can be used for developing applications of AI. Out of these, Python gains a maximum popularity because of the following reasons:

1. **Easy to learn, read and maintain**: Python has few keywords, simple structure and a clearly defined syntax. A program written in Python is fairly easy to maintain.

2. **A Broad Standard Library**: Python has a huge bunch of libraries with plenty of built in functions to solve variety of problems.

3. **Interactive mode**: Python has support for an interactive mode which allow interactive testing and debugging of snippets of code.

4. **Portability and compatibility**: Python can run on a wide variety of operating systems and hardware platforms, has the same interface on all platforms.

5. **Extendable**: We can add low level modules to the python interpreter. These modules enable programmers to customize their tools to be more efficient.

6. **Database and scalable** : Python provides interfaces to all major open source and commercial databases along with a better structure and support for large programs than shell scripting.

Applications of Python There exist a wide variety of applications when it comes to Python. Some of the applications are:

PYTHON BASICS

❖ **Comments**

Comments are the statements which are incorporated in the code to give a better understanding of code statements to the user. There are two types of comments in python.

1. Single Line 2. Multi Line

• **Single Line comment**
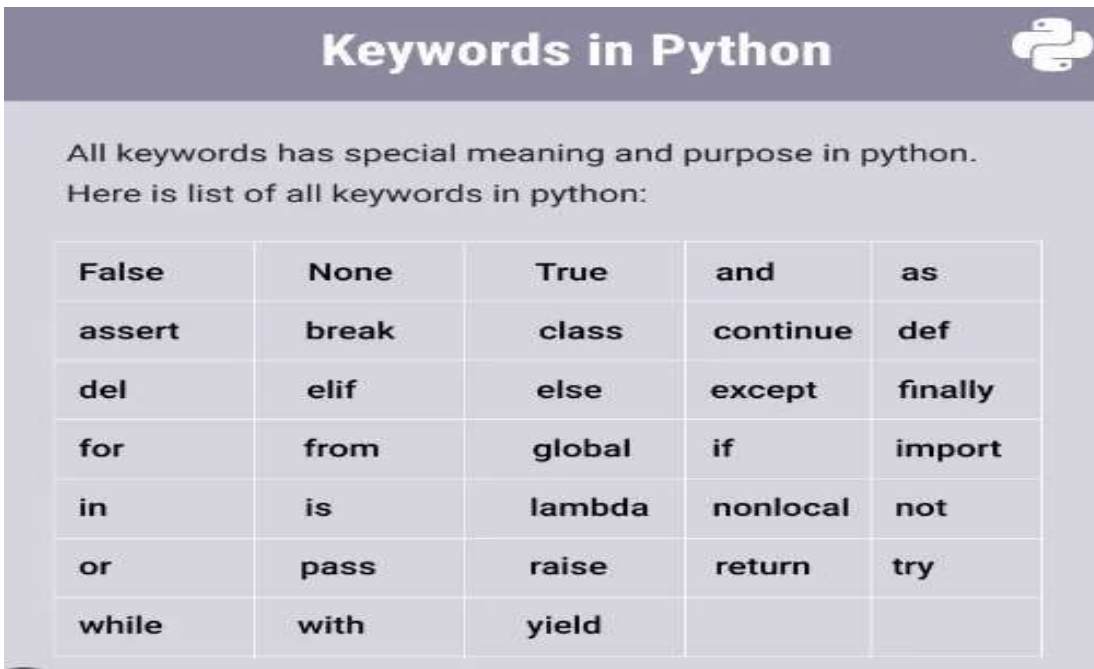
 A single-line comment is used to add some explanatory text in the program for better understanding of the next line. A # sign is used to write a single line comment in the python program For example, # statement to add two numbers res = 6 + 7 #Print the result print(res)

• **Multiline comments**

 The multiline comments are written in python using triple quotes. You can write number lines starting with triple quotes and end with triple quotes. For example, '''Write a python program to display the difference between two numbers, the first number should be larger than second number''' n1=5 n2=2

res=n1 - n2 print(res) Keywords (Reserved Words) Keywords are the reserved words or pre-defined words with a special meaning to the machine by default. So the user cannot use them anywhere else or it cannot be changed or modified in the entire program. They are always case-sensitive.

❖ **Keywords in Python**

Keywords in Python

All keywords has special meaning and purpose in python.
Here is list of all keywords in python:

False	None	True	and	as
assert	break	class	continue	def
del	elif	else	except	finally
for	from	global	if	import
in	is	lambda	nonlocal	not
or	pass	raise	return	try
while	with	yield		

❖ **Identifiers**

Identifiers are names used in programs to identify small units of programs such as variables, objects, classes, functions etc. Identifiers defined by the following few rules as follows: 1. It can be a combination of numbers and letters 2. It must start alphabets or underscore 3. Special characters are not allowed in identifiers name except underscore 4. Spaces are not allowed in identifier names, underscore can be used to separate two words 5. Upper Case and Lower Case letters are treated differently.

Valid Identifiers: total_student, mydata, num1, result etc

Invalid Identifiers: break, 1num, total student etc

❖ **Variables**

A variable is a named location used to store data in the memory. It is helpful to think of variables as a container that holds data which can be changed later throughout programming.

For example, a=10 b=20

These declarations make sure that the program reserves memory for two variables with the names a and b. The variable names stand for the memory location.

Note:

Assignment operator is used in Python to assign values to variables. For example, a = 5 is a simple assignment operator that assigns the value 5 on the right to the variable a on the left.

❖ **Datatypes**

In program, you have a choice to use any type of data such as real numbers, numbers with decimals, numbers without decimals, text, etc. These type of data is defined by datatype in Python. The python interprets the type of the variable according to the value stored in the variable. Follow the below-given link to know more about data types.

Datatypes in Python					
Numbers	None	Sequence	Sets	Mapping	Boolean
Integer		String		Dictionary	
Floating Point		tuple			
Complex		List			

❖ **Python Input and Output**

We use the **print()** function to output data to the standard output device (screen). We can also output data to a file. An example is given below. a = "Hello World!" print(a)

The output of the above code will be: Hello World!

Example Code	Output
a = 30 **b = 20** **print(a + b)**	50
print(5 + 10)	15
print("My name is Sudhanshu")	**My name is Sudhanshu**
name= 'Sudhanshu ' **print("My name is ",name)**	**My name is Sudhanshu**
n=5 **print("I have",n,"Apples !")**	**I have 5 Apples !**

❖ **input()** function

The input() function is used to accept values from the user at runtime. This function accepts and returns the text data by default. Therefore, you need to specify the data type if you want to use numbers or any other datatype. This process is known as typecasting Str = input() # Python expects the input to be of string datatype

Number = int(input()) # Input string gets converted to an integer value before assignment

Value = float(input()) # Input string gets converted to a decimal value before assignment.

❖ **Python Operators**

Operators are special symbols which represent computation. They are applied on operand(s), which can be values or variables. Same operators can behave differently on different data types. Operators when applied on operands form an expression. Operators are categorized as Arithmetic, Relational, Logical and Assignment operators. Values and variables when used with operators are known as operands.

1. Arithmetic Operators

Operator	Meaning	Expression	Result
+	Addition	10+20	30
-	Subtraction	20-10	10
*	Multiply	10*20	200
/	Divide	20/10	2
//	Integer division/floor division	15//2	7
**	Power	3**3	27
%	Remainder	15%2	1

2. Conditional Operators

Operator	Meaning	Expression	Result
>	Greater Than	10>15	false
<	Less Than	10<15	true
>=	Greater than equal to	10>=10	true
<=	Less than equal to	15<=10	false
==	Equal to	10==15	false
!=	Not equal to	10!=15	true

3. Logical operators

Operator	Meaning	Expression	Result
and	and operator	true and false	false
or	or operator	true or false	true
not	not operator	not true	false

4. Assignment Operators

Operator	Meaning	Equivalent
=	X=5	X=5
+=	X+=5	X=X+5
-=	X-=5	X=X-5
*=	X*=5	X=X*5
/=	X/=5	X=X/5

❖ **Conditional Statements**

While coding in Python, sometimes we need to take decisions. For example, if a person needs to create a calculator with the help of a Python code, he/she needs to take in 2 numbers from the user and then ask the user about which function he/she wishes to operate. Now, according to the user's choice, the selection of function would change. In this case, we need the machine to understand what should happen when. This is where conditional statements help. Conditional statements help the machine in taking a decision according to the condition which gets fulfilled. There exist different types of conditional statements in Python.

There are three types of conditional statements.

1. if statements

2. if-else statements

3. if elif statement

- **Simple if:**

The statement inside the if block are executed only when condition is true, otherwise not.

Syntax

if <condition>:

    Statement(s)

Example:

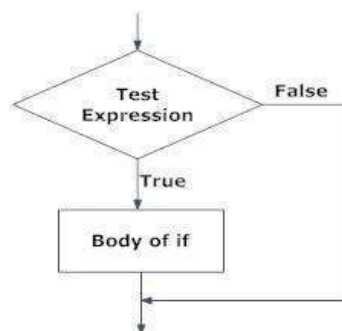if a < b :

    print('a is greater')

Fig: Operation of if statement

- **if-else statement**

The statements inside the if block are executed only when condition is true, otherwise the statements in the else block are executed.

Syntax

if <condition>:

    Statement(s)

else:

    statements

Example:

if a < b :

    print('a is greater')

else:

    print('b is greater')
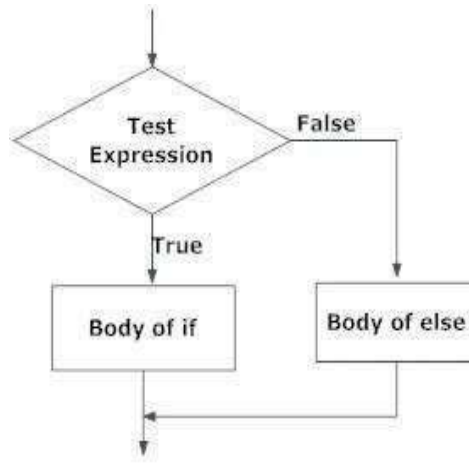
Fig: Operation of if...else statement

- **if elif statement**

The if...elif...else statement allows you to check for multiple test expressions and execute different codes for more than two conditions.

Syntax

if <condition>:

    Statement(s)

elif <condition>:

    Statement(s)

Example

Fig: Operation of if..elif..else statement

```
print('****program to find greatest of 3 numbers****')

num1=int(input('enter first number: '))

num2=int(input('enter second number: '))

num3=int(input('enter third number: '))

 if num1 > num2 and num1 > num3:

        print('The greatest of the three nos. is : ',num1)

elif num2 > num3 and num2 > num1:
```

print('The greatest of the three nos. is : ',num2)

elif num3 > num1 and num3 > num2:

print('The greatest of the three nos. is :',num3)

else:

print('any two nos are equal')

Nested if-else Statements

```
#Check leap year / divisibility

year = int(input("Enter a year: "))

if (year % 4) == 0:

   if (year % 100) == 0:

      if (year % 400) == 0:

         print("{0} is a leap year".format(year))

      else: print("{0} is not a leap year".format(year))
```

Iteration statements (loop)

These are used to execute a block of statements as long as the condition is true. Loops statements are used when we need to run same code again and again.
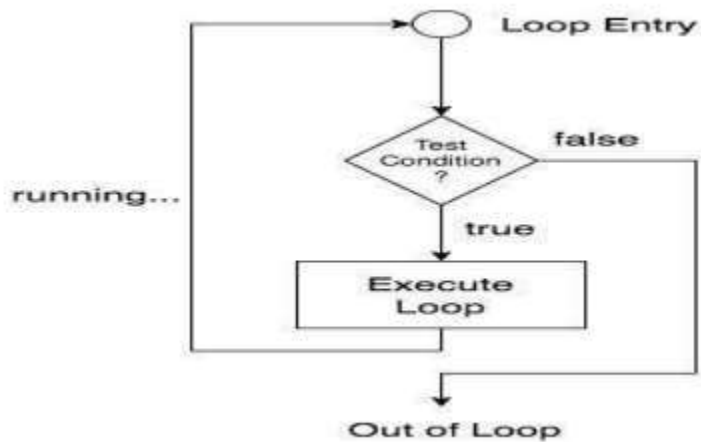
Python Iteration (Loops) statements are of two type :-

1. for Loop

2. while Loop

For Loop

It is used to iterate over items of any sequence, such as a list or a string. Syntax for val in sequence: #here val will take value of each element in the sequence statements

Example:

for I in [1,2,3,4,5]:

    print(I*5)

 OUTPUT:

5

10

 15

 20

 25

range() Function

This function generates a sequence of numbers based on the parameters passed.

Parameters

start: Starting number of the sequence.

stop: Generate numbers up to, but not including this number.

step(Optional): Determines the increment between each numbers in the sequence. Python use range() function in three ways:

a. range(stop)

b. range(start,stop)

c. range(start,stop,step)

Note:

> ➢ All parameters must be integers.
> ➢ All parameters can be positive or negative.

a. **range(stop):** By default, It starts from 0 and increments by 1 and ends upto stop, but not including stop value.

                3

b. **range(start,stop)** : It starts from the start value and upto stop, but not including stop value.

c. **range(start, stop, step):** Third parameter specifies to increment or decrement the value by adding or subtracting the value.

Example: (i)   (ii)

```
for x in range(4):

    print(x)
```

Output:

0

1

2

3

Use with for loop:

```
for i in range(1,5):
    print(i)
```
OUTPUT:

1

2

3

4

```
for i in range(5,3,-1):
    print(i)
```
Output

5

4

 # program of python to print first n natural number and its sum.

```
num=int(input('Enter number'))

sum=0

for i in range(1,n+1):

    print(i)

    sum=sum+i

print('Sum of numbers', sum)
```

While Loop

It is used to execute a block of statement if a given condition is true and when the condition become false, the control will come out of the loop. The condition is checked every time at the beginning of the loop.

Syntax

```
        while (condition):

            [statements]

            Update expression
```

example

```
Counter=0 #initiation stmt

while Counter < 5: #test condition

        print(Counter)

        Counter += 2    #increment stmt

OUTPUT:

0

2
```

Python Packages

A package is nothing but a space where we can find codes or functions or modules of similar type. There are various packages readily available to use for free (perks of Python being an open-sourced language) for various purposes.

To use any package in Python, we need to install it. Installing Python packages is easy. Steps for package installation are:

1. Open Anaconda Navigator and activate your working environment.

2. Let us assume we wish to install the numpy package. To install this package, simply write:

    conda install numpy

3. It will ask us to type Y if we wish to proceed with the installations. As soon as we type Y, the installations will start and our package will be installed in our selected environment.

 4. We can also install multiple packages all at once by mentioning all of them in one line. For example, if we wish to install numpy, pandas and matplotlib package in our working environment. For this, simply write:

conda install numpy pandas matplotlib

This code will install these three packages altogether in our environment. Now, once the packages are installed, we can start using them by importing them in the file where they are required. As soon as we open our Jupyter Notebook, include the package in the notebook bywriting the import command. Importing a package can be done in various ways:

import numpy

Meaning: Import numpy in the file to use its functionalities in the file to which it has been imported.

from numpy import array

Meaning: import only one functionality (array) from the whole numpy package. While this gives faster processing, it limits the package's usability.

from numpy import array as arr

Meaning: Import only one functionality (array) from the whole numpy package and refer to it as arr wherever it is used.

Some of the readily available packages are:

- ➢ **NumPy**
- ➢ **OpenCV**
- ➢ **Matplotlib**
- ➢ **NLTK**
- ➢ **Pandas**

CLASS 10 ARTIFICIAL INTELLIGENCE (417) SUGGESTED PRACTICAL LIST 2024-25

Activity 1: To print personal information like Name, Father's Name, Class, School Name.

Code:

```
print("My Name is:","Rajesh Kumar")

print("My  Father Name is:","Rakesh Kumar")

print("My class is 10-A")

print("My School is","PM SHRI KENDRIYA VIDYALAYA")
```

o/p:

My Name is: Rajesh Kumar

My Father Name is: Rakesh Kumar

My class is 10-A

My School is PM SHRI KENDRIYA VIDYALAYA

Activity 2: Write a Python code to calculate Simple Interest if the principle_amount = 2000 rate_of_interest = 8 time = 10

Code:

```
P=2000

T=10

R=8

SI=(P*T*R)/100              # calculates simple interest

print "Simple Interest is",SI)
```

o/p:

Simple Interest is 1600.0

Activity 3: Write a Python code to calculate Area of a triangle with Base and Height

Code:

```
B=int(input("Enter Base of a rectangle"))    # reading base value of the rectangle

H=int(input("Enter Height of a rectangle"))  # reading  height of the rectangle

print("Area of a rectangle is",0.5*B*H)        # displays are of the rectangle
```

o/p:

Enter Base of a rectangle5

Enter Height of a rectangle4

Area of a rectangle is 10.0

Activity 4: Write a Python code to check whether a person is eligible to vote or not.

Code:

```
Age=int(input("Enter person's age"))
if Age>=18:                    # checking the condition
      print("Person is Eligible to vote")
else:
      print("Person is not Eligible to vote")
```

o/p:

Enter person's age 21

Person is Eligible to vote

Activity 5: Write a Python code to print sum of first 10 natural numbers.

Code:

```
S=0
for i in range(1,11):
        S=S+i
print("Sum of first 10 natural numbers is",S)
```

o/p:

Sum of first 10 natural numbers is 55

Activity 6: Write a Python code to assign the Grade based on the given percentage:

Code:

```
per=float(input("Enter students percentage"))
if per>=90:                #checking the condition
        grade="A"       # assigning grade
elif per>=70 :
```

```
            grade="B"
    elif per>=50:
            grade="C"
    elif per>=33:
            grade="D"
    else:
            grade="E"
    print("Perntage is",per)
    print("Grade is",grade)
 o/p:        Enter students percentage89
            Perntage is 89.0
            Grade is B
```

Activity 7: **Write a program to create a list and display list elements.**

Code:

```
l=[]
n=int(input("Enter length of the list"))
for i in range(n):
    a=eval(input("Enter list element"))
    l.append(a)
print("Created list is",l)
o/p:
Enter length of the list5
Enter list element10
Enter list element20.5
Enter list element45
Enter list element78
Enter list element23
```

Created list is [10, 20.5, 45, 78, 23]

Activity 8: Write a program to add the elements of the two lists.

Code:

```
l1=[20,30,40]
l2=[30,50,10]
l3=l1+l2
print("Addition of",l1,"and",l2,"is",l3)
```
o/p:

Addition of [20, 30, 40] and [30, 50, 10] is [20, 30, 40, 30, 50, 10]

Activity 9: Write a program to calculate mean, median and mode using Numpy

Code:

```
import numpy as np

import statistics as st

l=[30,20,50,60,20]

l1=np.array(l)

print("Mean of",l1,"is",st.mean(l1))

print("Median of",l1,"is",st.median(l1))

print("Mode of",l1,"is",st.mode(l1))
```
o/p:

Mean of [30 20 50 60 20] is 36

Median of [30 20 50 60 20] is 30

Mode of [30 20 50 60 20] is 20

Activity 10: Write a program to display line chart from (2,5) to (9,10).

Code:

```
import matplotlib.pyplot as plt
```

```
x=(2,9)

y=(5,10)

plt.plot(x,y)

plt.title("Line chart")

plt.show()
```

o/p:
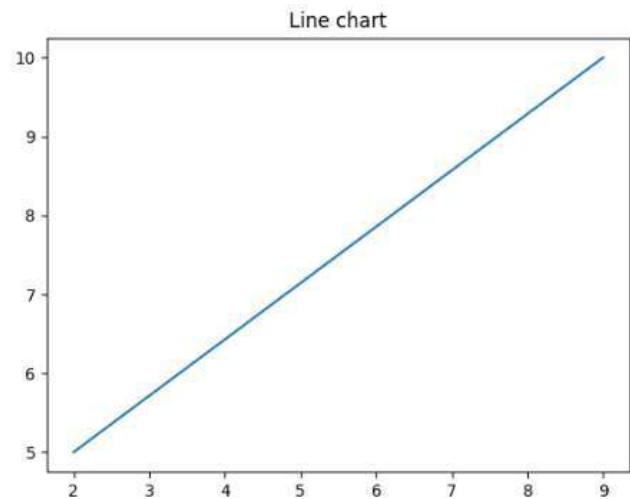
Line chart

Activity 11: Write a program to display a scatter chart for the following points (2,5), (9,10),(8,3),(5,7),(6,18).

Code:

```
import matplotlib.pyplot as plt

x=[2,9,8,5,6]

y=[5,10,3,7,18]

plt.scatter(x,y)

plt.title("Line chart")

plt.show()
```


Scatter chart

o/p:
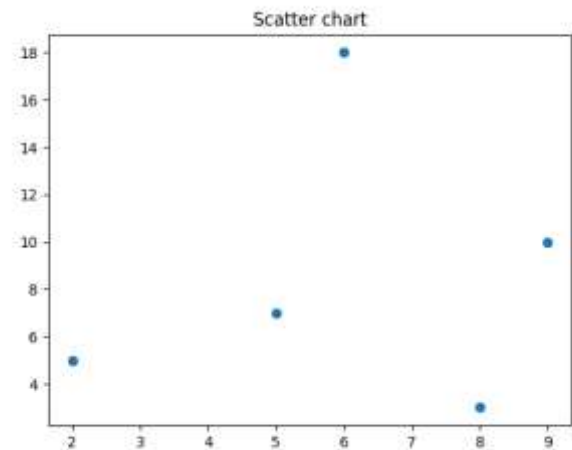
Activity 12: Write a program to display bar chart for the following data with appropriate titles:

Subjects=["Eng","Sci","Soc","Maths","AI"]

Marks=[89,87,78,90,99]

Code:

190

```
import matplotlib.pyplot as plt
Sub=["Eng","Sci","Soc","Maths","AI"]
Marks=[89,87,78,90,99]
plt.bar(Sub,Marks)
plt.title("Term-1 Performance")
plt.xlabel("Subjects")
plt.ylabel("Marks")
plt.show()
```

0/p:
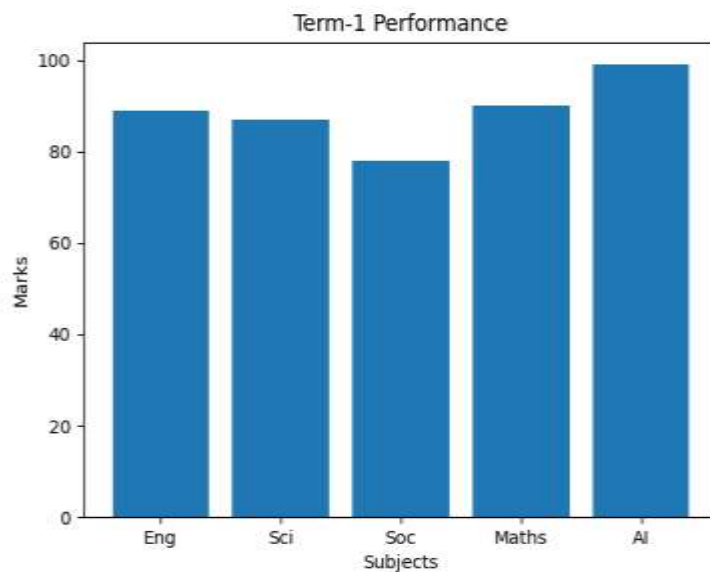
Activity 13: Write a program to display histogram for the following data with appropriate titles:

stu=[5,14,17,23,34,50,20,34,24,56,45,34,23,34,32,9,8,22,24,34,55,66,23,23]

  Code:

```
import matplotlib.pyplot as plt
stu=[5,14,17,23,34,50,20,34,24,56,45,34,23,34,32,9,8,22,24,34,55,66,23,23]
```

```
plt.hist(stu,bins=[0,10,20,30,40,50,60,70])

plt.xlabel("Marks")

plt.ylabel("No.Of Students")

plt.title("Marks Obtained by the Students")

plt.show()
```

o/p:
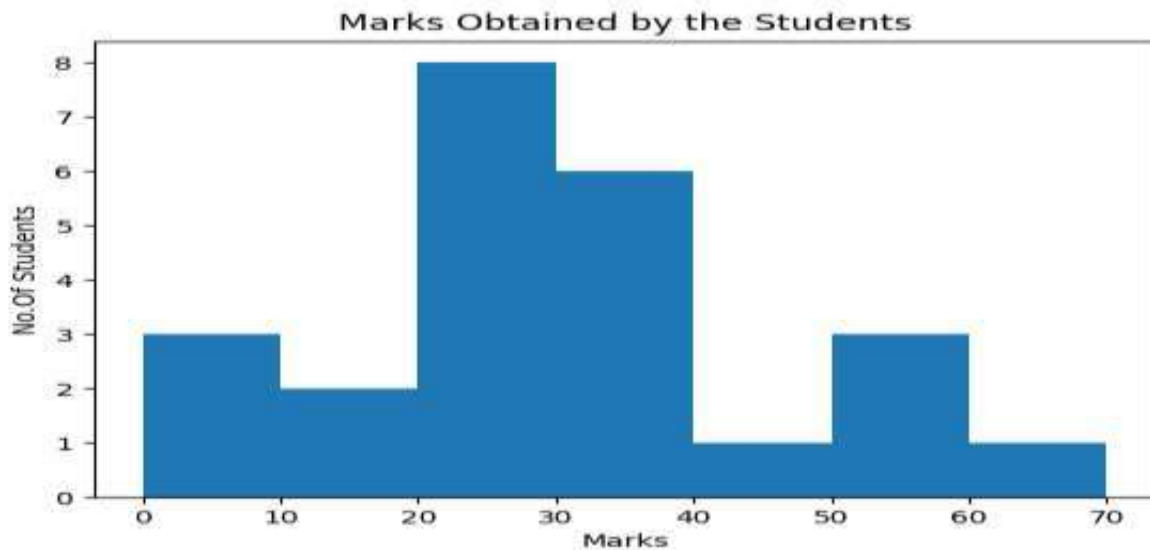
Activity 14: **Write a program to display Pie-chart for the following data with appropriate titles:**

Code:

```
import matplotlib.pyplot as plt

x=["Food","Rent","Shopping","Educcation","others"]

values=[20,30,25,35,50]

plt.pie(values,labels=x)

plt.title("Expenditure")
```

plt.show()
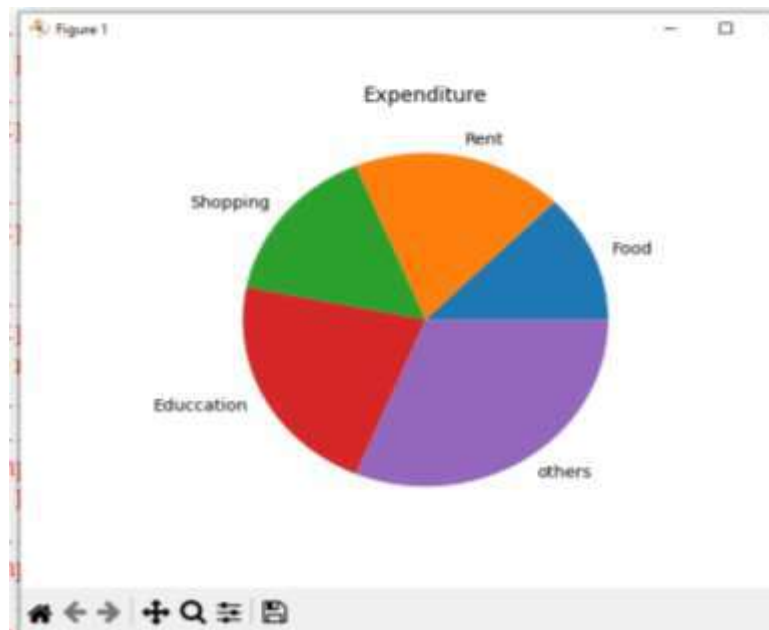
Activity 15: **Read CSV file saved in your system and display 5 rows**

Code:

```
import pandas as pd

df=pd.read_csv(r"C:\Users\ADMIN\Desktop\abc.csv",nrows=10)

print(df)
```

o/p:

RNO   NAME MARKS

0   1   HARI   67

1   2   RAMESH   89

2 3 SOMESH   56

3 4 RAJESH   78

4 5 BHIMESH   45

Activity 16: Read CSV file saved in your system and display its information

Code:

```
import pandas as pd
df=pd.read_csv(r"C:\Users\ADMIN\Desktop\abc.csv",nrows=10)
print(df)
```

o/p:

RNO   NAME MARKS

0 1   HARI   67

1 2 RAMESH   89

2 3 SOMESH   56

3 4 RAJESH   78

4 5 BHIMESH   45

5 6 SRIKANTH   67

6 7 SRINIVAS   89

7 8 SANDHYA   90

8 9 SADANA   56

9 10   RAJU   45

Activity 17: Write a program to read an image and display using Python

Code:

```
import cv2
img=cv2.imread("abc.jpg")
cv2.imshow('Image',img)
cv2.waitKey(0)
```

o/p:

Activity 18: Write a program to read an image and display image shape and size using Python

Code:

```
import cv2

img=cv2.imread(r"C:\Users\ADMIN\Desktop\abc.jpg")

cv2.imshow('myimg',img)

print("The shape of the image is",img.shape)

print("The Size of the image is",img.size)

cv2.waitKey(0)
```

o/p:

The shape of the image is (148, 259, 3)

The Size of the image is 114996

CLASS X SAMPLE AI PROJECTS

PROJECT-1:   ROCK PAPER SCISSORS GAME

In this project you will train a machine to identify your hand gesture and play a rock paper scissor game against a computer.

PROJECT DESCRIPTION

Rock paper scissors is a hand game in which each player simultaneously forms one of three moves with an outstretched hand. These moves are 'rock", "paper", and "scissors" as shown in the image.

Each move wins against one shape and loses to another.

- Rock 'crushes' scissors but is 'covered' by paper Paper
- 'covers' rock but is 'cut' by scissors Scissors is
- 'crushed' by rock but 'cuts' paper
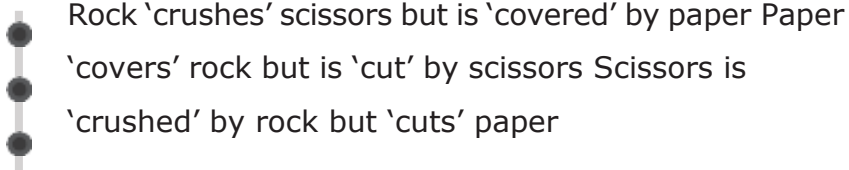
PREREQUISITES

Compatible platforms:

1. Machine Learning for Kids
2. Cognimates
3. PictoBlox

THE SOLUTION

The Flow Chart

The following flow chart shows the overview of the program required to implement Rock Paper Scissors Game in the compatible platforms. You can find various graphical blocks in the compatible platforms to make the game. Go ahead!

```
                    Start the Game

        Set Player and AI Score to 0 &
            Start the Camera Feed

          Get text from audio file

        Is AI Score = 3 or              Is AI score = 3              AI won the match
        Player Score = 3         Yes                        Yes

              No                          No

        Recognise player move from     Is Player  score =            Player won the match
            camera feed                    3              Yes

          Get random move from AI

          Check for round winner


          Check for round winner

                    Is
          Player move is Rock and AI
              mover is Scissor
                    OR                          Player won the round &
          Player move is Paper & AI             Increase Player score by 1
              move is Rock
                    OR
          Player move is Scissor & AI
              move is Paper

                    Is
          AI move is Rock and Player
              mover is Scissor
                    OR                          AI won the round & Increase AI
          AI move is Paper & Player             score by 1
              move is Rock
                    OR
          AI move is Scissor & Player
              move is Paper

          Check for round winner
```
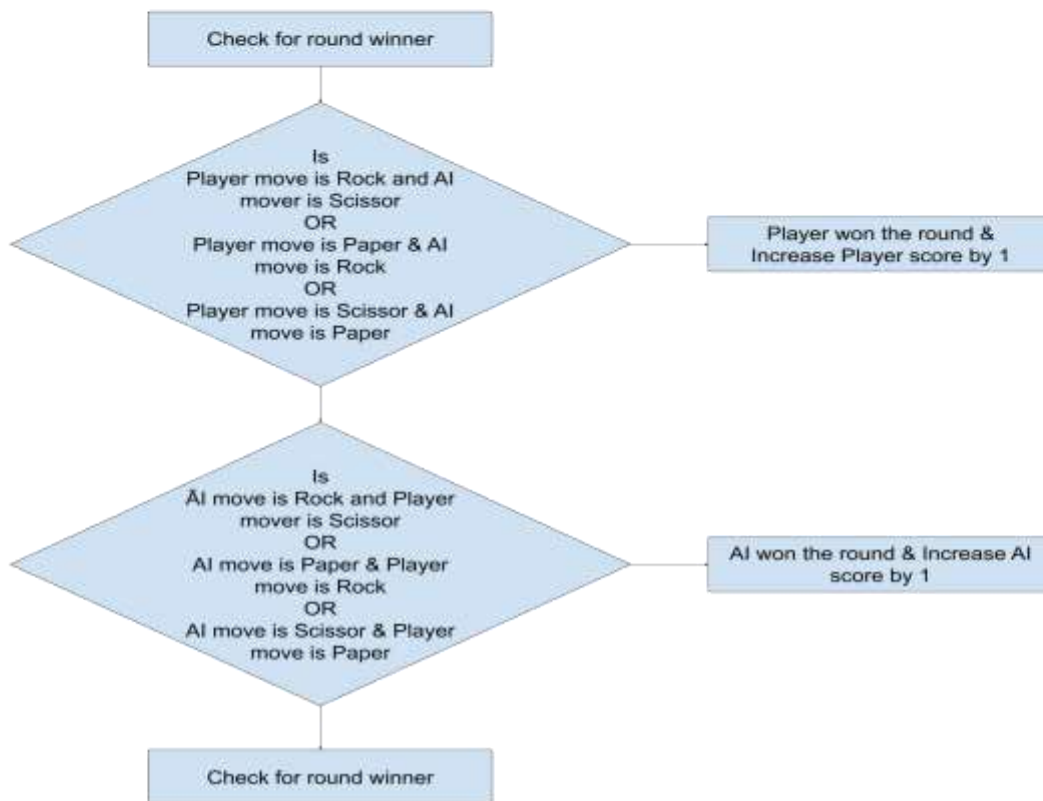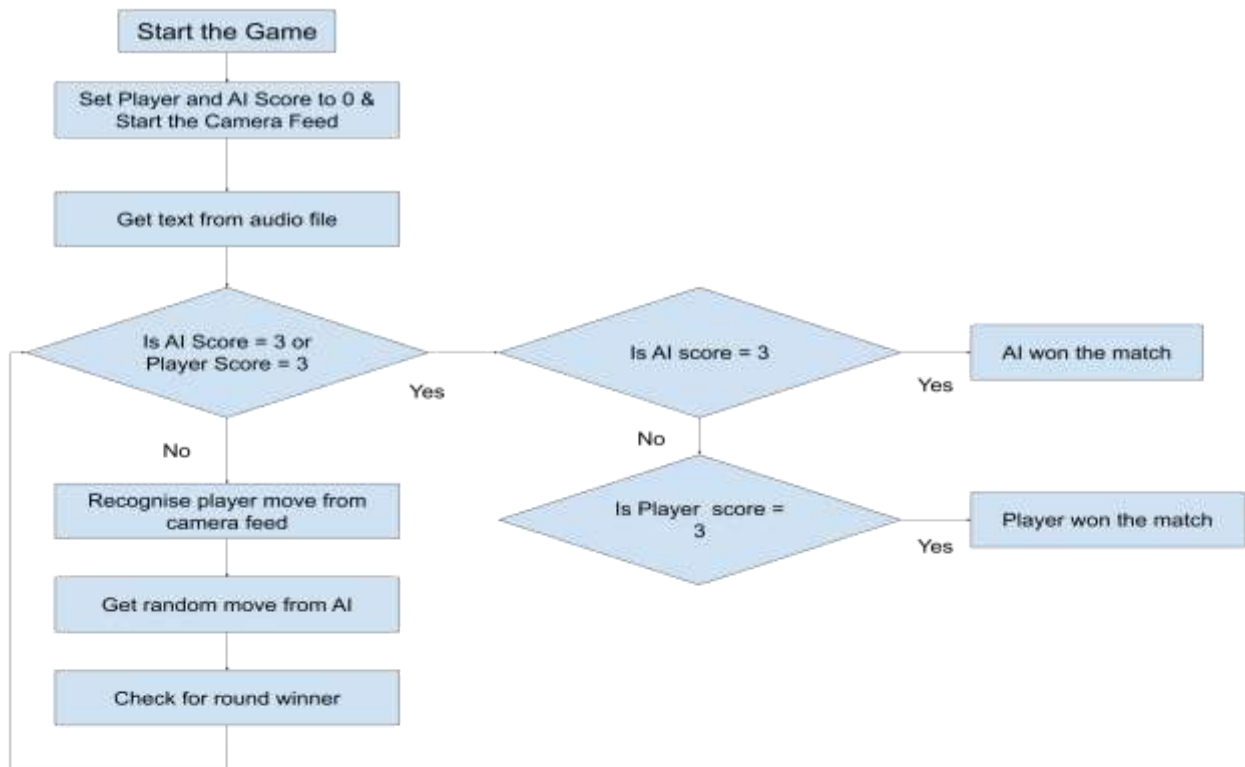
199

Task:

Your task is to create this project using Scratch. train an image model that can detect hand signs of Rock, Paper, and Scissors. Once the model is trained, create a script using that. Set the initial scores to zero and then detect the player's move using the camera/webcam. Next, randomly generate the machine's move and match it with the player's move to find out the result and accordingly assign the points. Whoever from the two i.e. the player or the computer scores 3 points first, will win the match.

PROJECT -2:   ML WITH HARDWARE

So far, you have made many interesting projects using AI and ML, but it's not just about software or apps. We can control robots and many other hardware related things as well with ai and ml. Let's make a gesture controlled robot using arduino or micro:bit.

PROJECT DESCRIPTION

You have to control a robot by identifying different hand gestures from the camera. You made mobile robots and have controlled it using your keyboard, smartphone,

joystick and what not. But, this time let's level up and control the 2-Wheel Drive Robot

using the hand gestures. The
controls are:

1. If we keep our palm straight, the robot should move forward.

2. If we tilt our hand in the left direction, the robot should turn left.

3. If we tilt our hand in the right direction, the robot should turn right.

4. If we close the fist, the robot should stop moving.
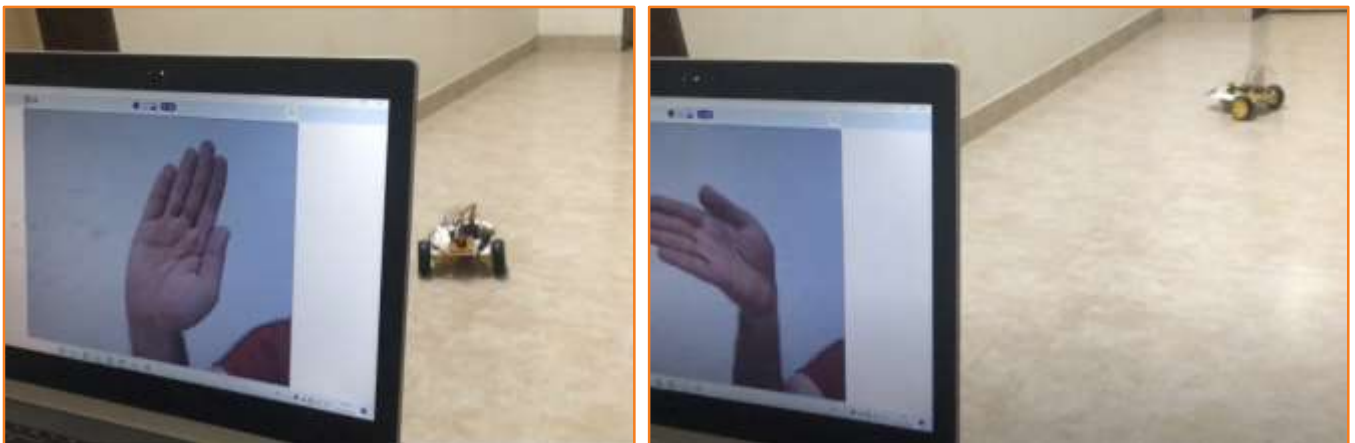
Learning Outcomes:

1. Physical interaction of ML

2. Controlling robot using Bluetooth

PREREQUISITES

1. Arduino Uno OR micro:bit
2. SN7544one motor driver
3. 7805 Power IC
4. HC-05 bluetooth module,
5. 2 (or 4) Dual Shaft Motor
6. 2 (or 4) Wheels
7. Spacers
8. Castor Wheel,
9. 2 Cell Battery
10. Battery Holder
11. Jumper Cables
12. Nuts and Bolts for mounting
13. Laptop with a good internet connection.

Compatible platforms

1. PictoBlox (for arduino or microbit)
2. Makecode (for microbit)
3. Scratch 3.0 (for microbit)

ASSEMBLY & CIRCUITRY

Option 1 - Making the Robot using Arduino

*Option 2 - Making the Robot using Micro:bit*

EXPLORE

TRAINING THE MACHINE LEARNING MODEL

You will need to train the model with four classes for turning the robot towards the right, left, moving straight and stop it with four unique hand gestures like turning the palm towards right, left, keeping straight and fist closed respectively as shown in the starting of the project using a teachable machine

FLOW CHART

The following flow chart shows the overview of the program required to implement Gesture controlled Robot using Arduino or Micro:Bit in the compatible platforms. You can find various graphical blocks in the compatible platforms to make the face expression recognizer. Go ahead!
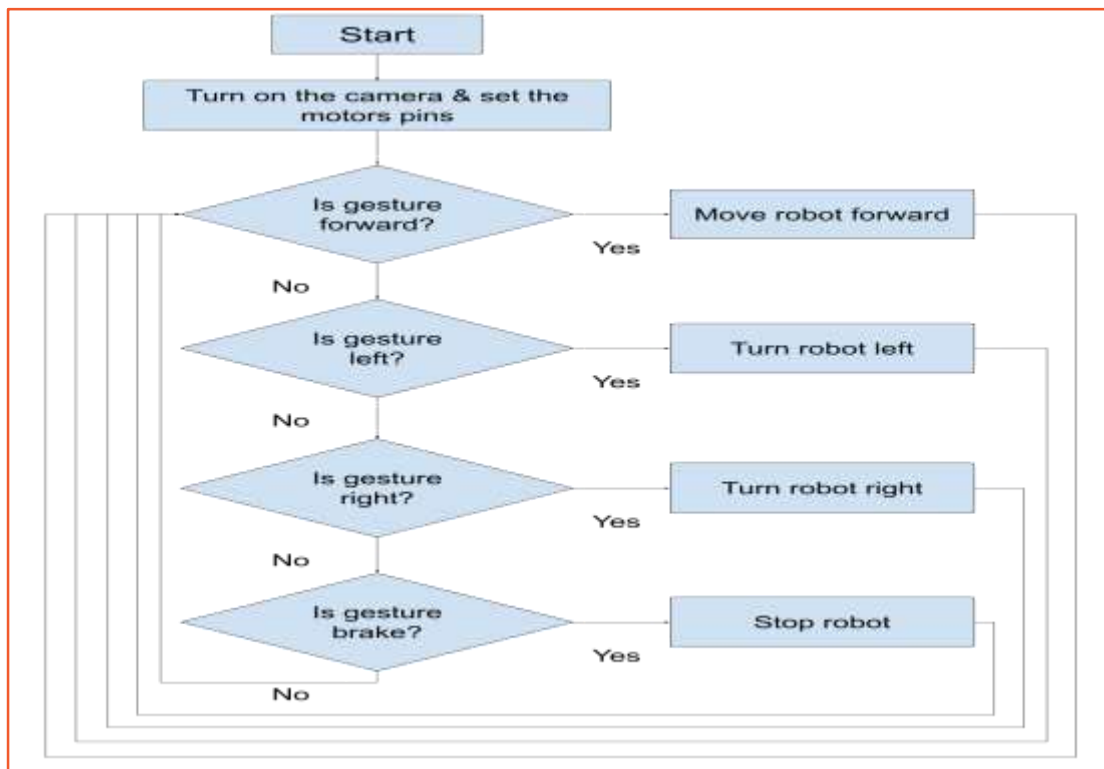
Option 1 - Code for Arduino Robot

The following code snippets show a sample code of PictoBlox for making the Gesture controlled Arduino Robot.

1. Blocks for moving straight:

2. Blocks for turning left and right:

3. Blocks for stopping the robot:

4. Main code to control the robot:
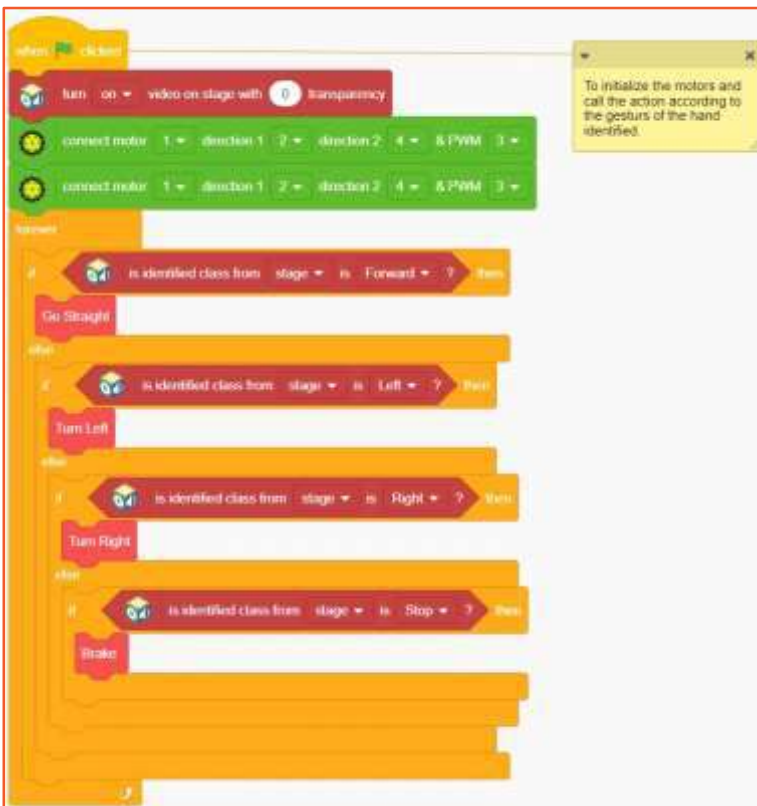
This project shows how we can even control robots with gestures using Machine Learning.

Option 2 - Code for Micro:bit Robot

Following is the sample code for MicroBit Robot:

1. Blocks for moving straight:

2. Blocks for turning left:

3.   Blocks for turning right:
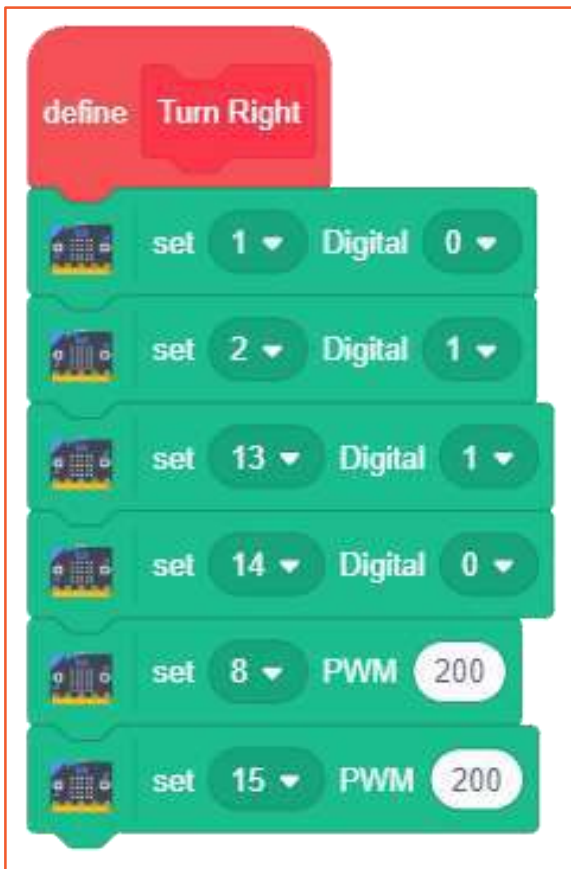
4.   Blocks for stopping the robot:
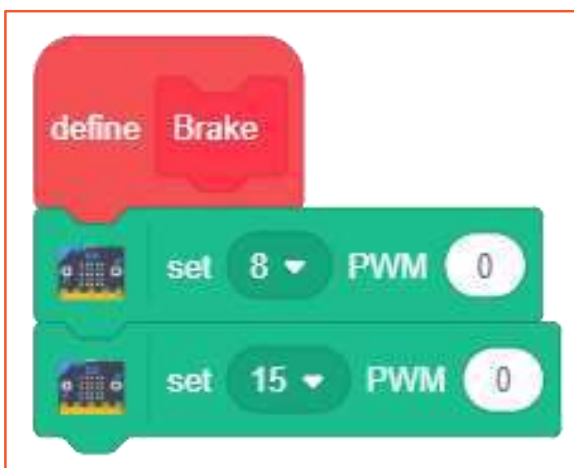
5. Main code to control the robot:
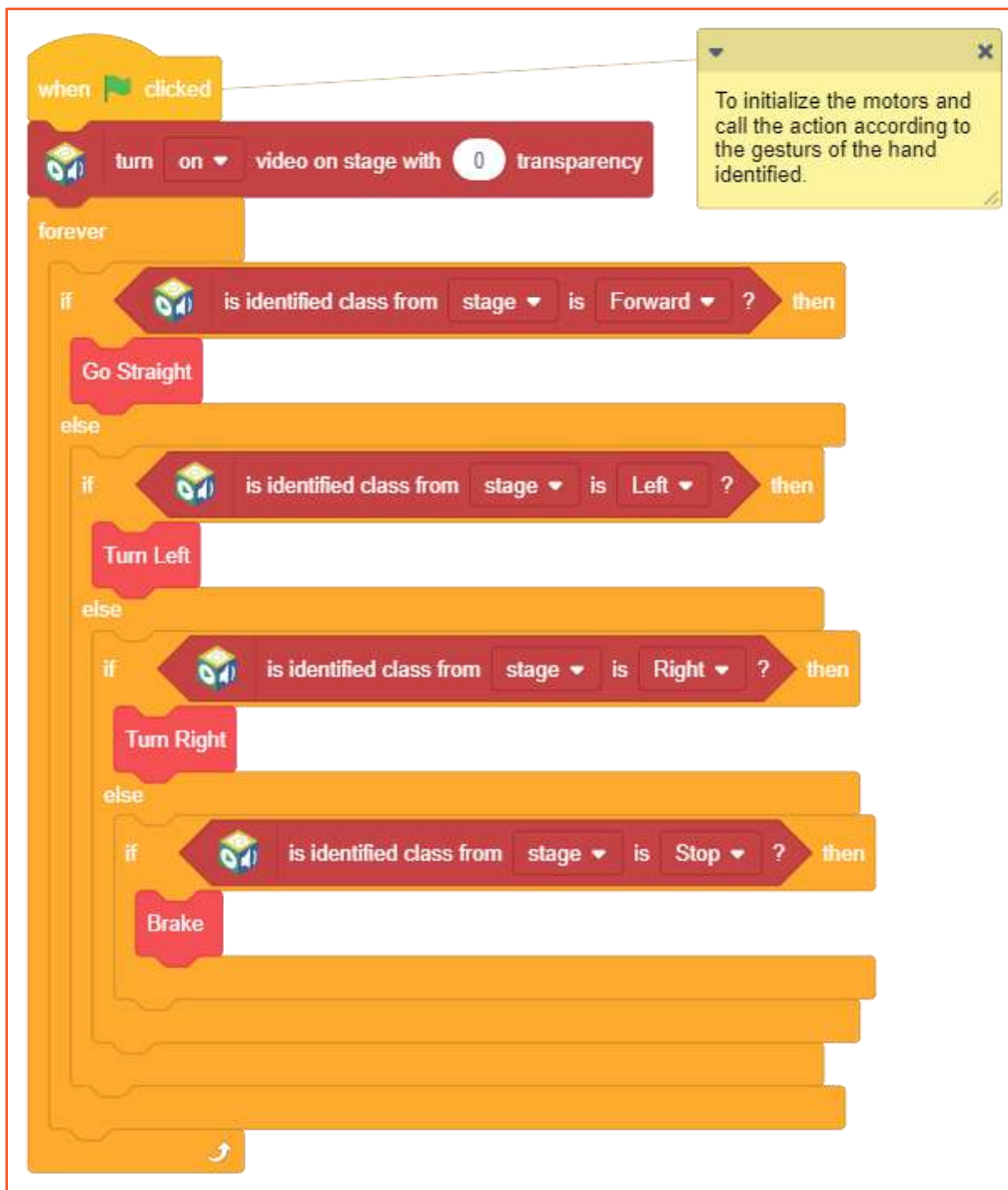
HOW DOES IT WORK?

Let's understand the logic behind it i.e. how it works.

First we train an image model that can detect hand signs/gestures. Once the model is trained and exported, we will create a script using that. In the beginning, we need to define the various pins of the motor driver and then we will continuously detect the class from the stage where webcam/camera feed is available. The robot will perform certain actions i.e. moving forward, turning left or right, or getting stopped as per the class detected.

EXPLORE MORE

We challenge you to create an AI based robot that can solve a real-world problem. It can be a healthcare warrior or an agribot or a modern warfare robot. Brainstorm on various ideas and come up with exciting ideas.

EXPLORE

You can explore option 1 more at:

https://bit.ly/ArduinoRobotAI

EXPLORE

You can explore option 2 more at:

https://tinkercademy.com/tutorials/krazy-kar-v2/

PROJECT -3: CONVERSATIONAL AI INTERFACE

A chatbot is an AI tool that allows users to type their questions, make orders, and solve problems. Users type their questions or requests for the AI tool, and the AI tool responds similarly to a human by providing the request or asking for additional information. We are going to use AWS to build an AI chatbot in the cloud. AWS has a service called Amazon Lex that allows us to develop conversational chatbots using Amazon Alexa technology.

THE PROBLEM

A new pizza restaurant is opening up in town. They want to make it simple for customers to place orders. They feel the easier it is to order the pizza, the more likely customers will be to return to the restaurant. You will take on the role of AI designer and design a chatbot for customers to use to order pizza.

GOALS OF THE PROJECT

At the end of the project, the student will be able to

5. create a custom chatbot for users to order a pizza and an advertisementusing Amazon Lex to create the bot and the Amazon Management Console to test the bot.

PRE-REQUISITE

Signup in aws educate.

Step:1

Go to:

https://www.awseducate.com/Registration

Choose "Student" as your role and click "Next"

Step 2: Enter your information into the fields. Click the icons on the right for more detailed

information. Enter your country of residence, your first name and your last name (surname).

Enter your institution (school) issued email address: e.g. St u dent@amazonu.edu .

If you do not have an institution issued email address, additional verification may be required. You will receive further instructions in your email.

Enter your birth month and year, your institution name, your expected graduation, or program completion date. If you have a valid promo code* you can apply it in the bottom field. After completing the CAPTCHA, click "Next".

Step 3: Please review AWS Educate's Terms and Conditions. Selecting "Agree" allows you to proceed.

Step 4: Check your email to follow the automated email verification process.

Step 5: After email verification, you will be prompted to set a password to log into the student portal. Make sure your password meets the required security level.

Now you are able to log in!

(The AWS Educate Starter Account (ESA) offers you free access to AWS cloud resources without requiring a credit card for payment. With an ESA, you will receive $100 in preloaded credits at member institutions, or $30 in preloaded credits at non-member institutions.Your AWS Educate Starter Account will renew on an annual basis as long as you are an active student and a member of AWS Educate. Account credit is automatically added to your AWS Educate Starter Account once every 12 months from the date your application is approved until your graduation/ program completion date.)

THE SOLUTION

How to proceed towards a solution:

Let's start building our chatbot! Follow along closely with the instructions. We will walk through the steps of getting set up together, and then you'll have the chance to build your chatbot on your own.

Project the steps on the screen using the teacher computer. Model each step for the students using the teacher computer and projector.

Step 1. Log in to AWS Educate.

- Go to awseducate.com.
- Log in to your AWS Educate starter account.
- Click Login to AWS Educate and sign in using your AWS Educate account.
- Students should have an AWS Educate login from the "Introduction to AWS Educate" module. If not, please review that activity and create an account.
- Once logged in to the AWS Educate portal, select AWS Account.

Step 2. On the new screen, select AWS Educate Starter Account in the center of the screen

Step 3. On the next new screen, click on AWS Console.
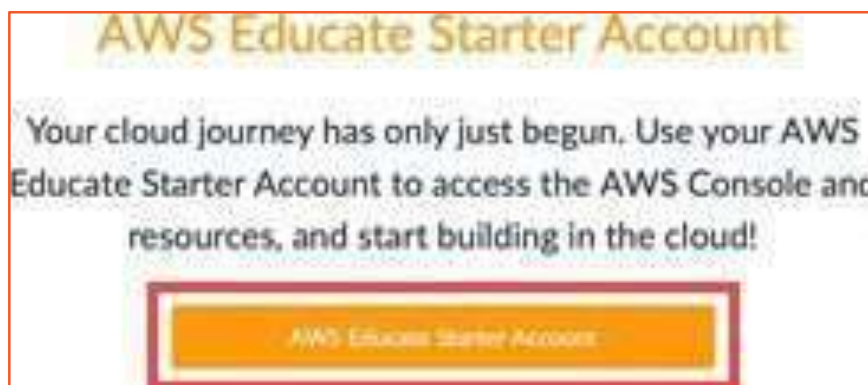
The AWS Management Console will now be displayed. This is a menu for all cloud services AWS provides.

Step 4. Navigate to Amazon Lex. Click the search bar and search for and then click   Amazon Lex.
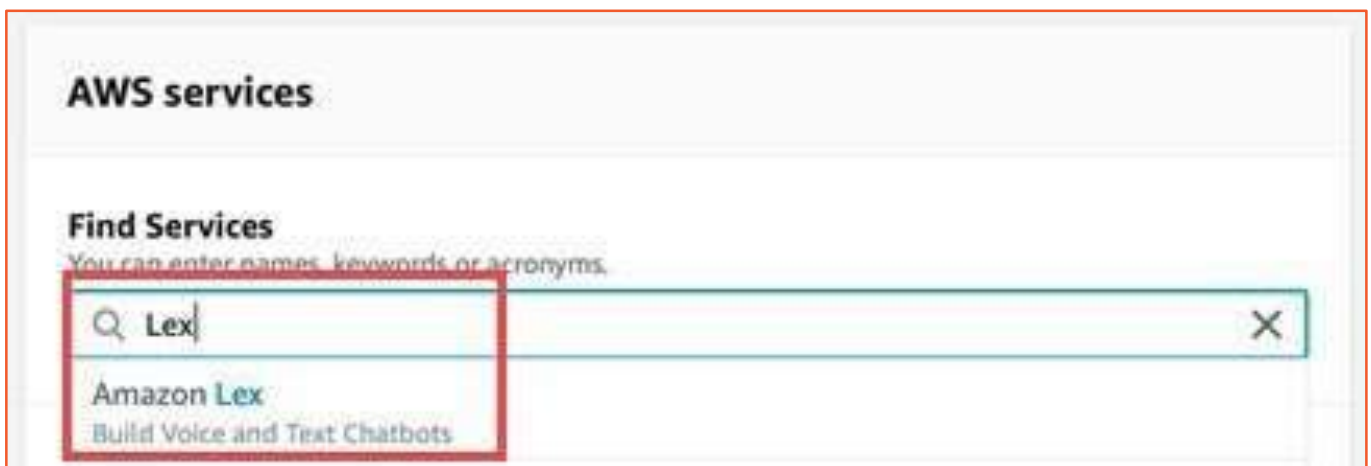
- You can also click Machine Learning and then click Amazon Lex. The Amazon Lex product page will now be displayed.

- This page provides more information about Amazon Lex.

- Read the Amazon Lex description above the Get Started button on the bottom of the page as a class.

- Review the key vocabulary:

- Intent: The intent is the goal that the user wants to achieve. "Why did I start this chatbot? What do I want the chatbot to be able to do?"

- Utterances: These are phrases that the user types or speaks to the chatbot. For example, "Alexa, what's the weather? Alexa, what time is it?"

- Prompts: These are questions the chatbot will ask the user to gather more information. For example, if you ask Alexa what the weather is, she will need to know where you are.

- Slots: These represent data the user provides to the chatbot in response to prompts.

- Confirmations: These confirm the information the user has input; each typically requires a yes/no response from the user.

- Fulfillment: This is the logic needed to complete the intent.

- Click the Get Started button.

Step 5. Set up your chatbot. Click Custom Bot on the left side of the main menu.

CREATE YOUR OWN

Custom bot
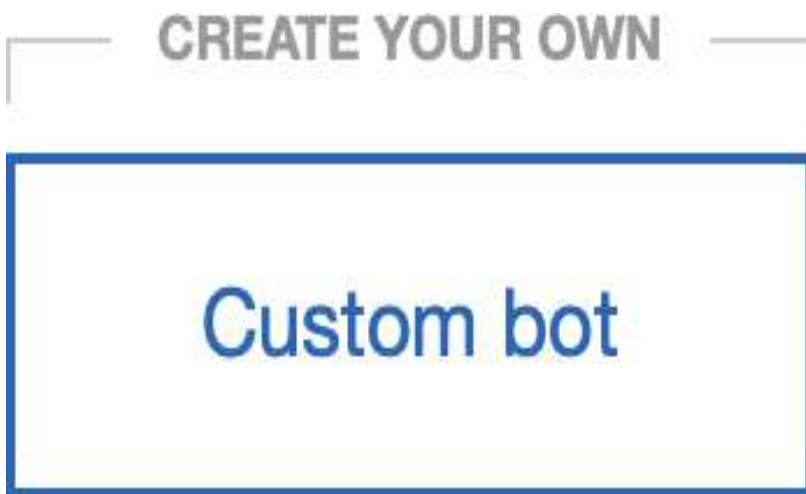
- Name the bot OrderPizza. (Note: There are no spaces in the name.) Make the following initial settings:

- o Select None for voice output. Students can change this later on their own if they so choose.

- o Select 5 Minutes for the session timeout. This is how long the bot should wait before ending the chat session.

- o Select No under "COPPA: Please indicate if your use of this bot is subject to the Children's Online Privacy Protection Act (COPPA)." (Note: We are not creating a bot that will gather private information on children younger than 13.)

- Click the blue Create button.

Step 6. Create your first intent.
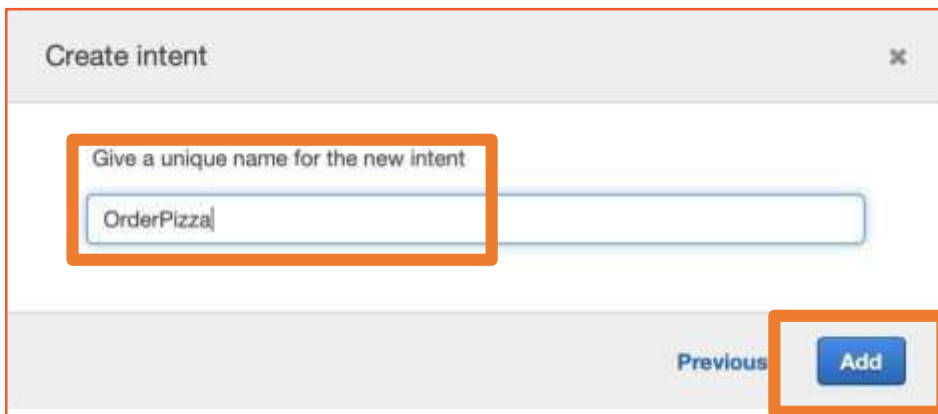
- Click the blue + Create Intent button.
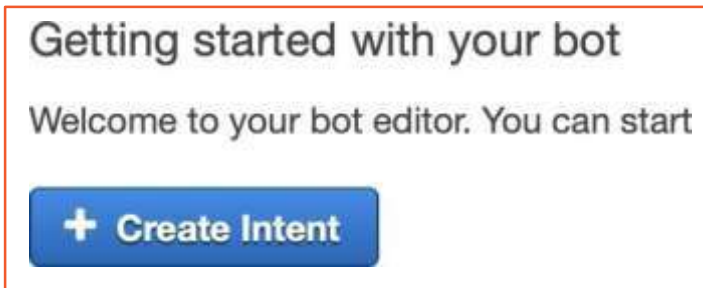
- A new pop-up window will appear.
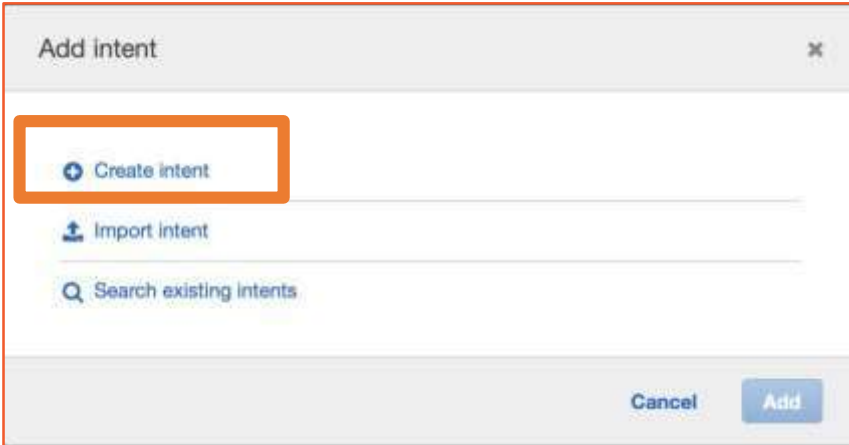
- Click + Create intent.
- Title the intent OrderPizza (no spaces). Click
- the blue Add button.

Step 7. Build your utterances. These are phrases the user will use to start the conversation with the chatbot.

- Think about what the intent means. Use those brainstorms as we build utterances, slots, and fulfillments.

  Type the following utterances:

  o I'd like to Order Pizza

  o I want pizza

  o Pizza Please

- Create one or two more utterances of your choice.

Step 8. Build your first slot.

◑ Look at the left side of the console in the editor. Click
◑ + next to Slot types.

Intents ⊕

OrderPizzaNew

Slot types ⊕

No slots created

◑ Click + Create slot type.

Add slot type ✕

⊕ Create slot type

⬆ Import slot type

Cancel | Add
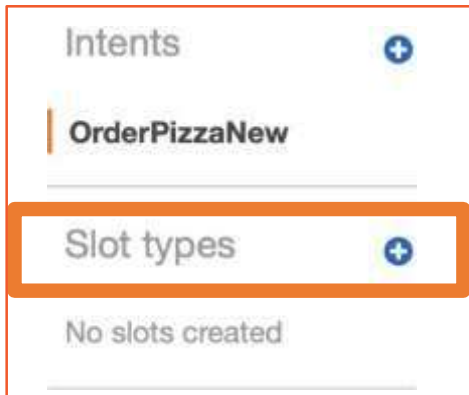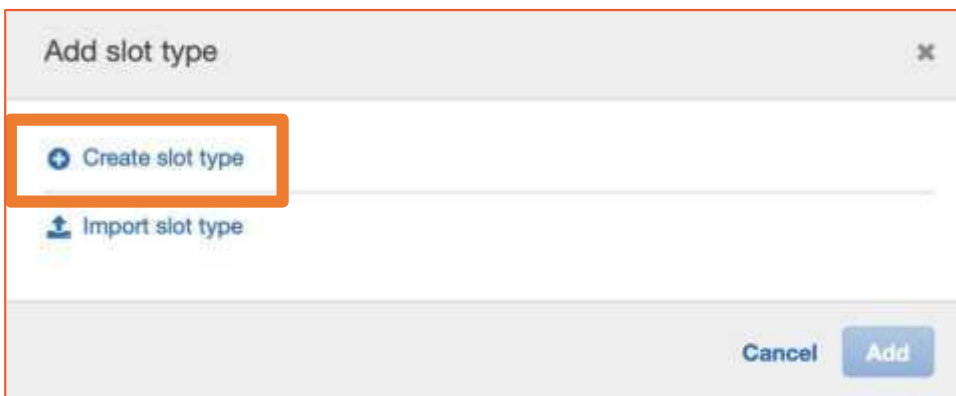
◑ Title the slot PizzaType (no spaces). Describe
◑ the slot as Types of pizza.

Slot type name

PizzaType

Description

Types of Pizza

- Keep the default Expand Values selected.

Slot Resolution

◉ Expand Values ⓘ

◯ Restrict to Slot values and Synonyms ⓘ

- Add additional values in the Value section by hitting the + sign to add additional rows. These are the different types of pizza users can order.

Value ⓘ

Pepperoni ⊕

Cheese ⊗

Sausage ⊗

Veggie ⊗

- o Cheese
- o Pepperoni
- o Veggie
- o Chicken
- o One or two more types of pizza
- o Click Add slot to intent.

Add slot to intent

- You should see your slot added to the intent under the slot heading in the dashboard as slotOne.
- Click in the box with slotOne to rename this PizzaType (no spaces).
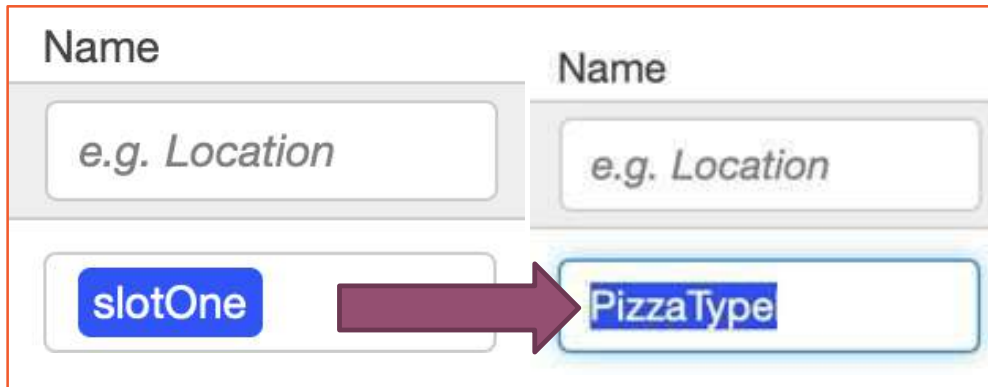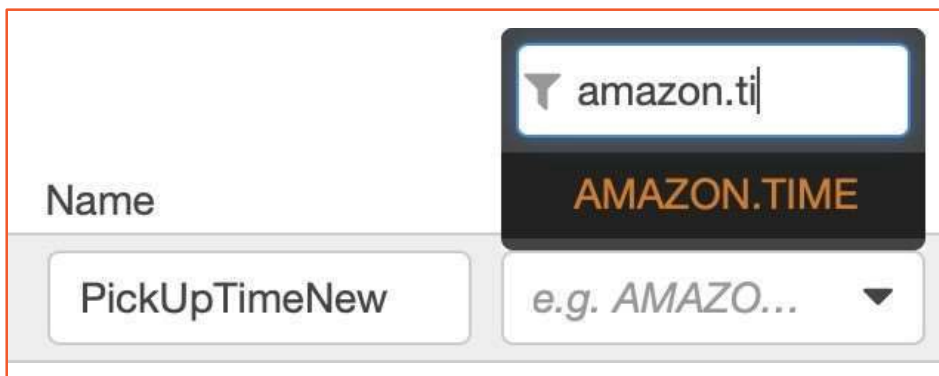
- Change the prompt from "What city?" to "What type of pizza would you like?" This is telling the chatbot to ask the user what type of pizza they would like when they type the original utterance.

Step 9. Build your second slot.
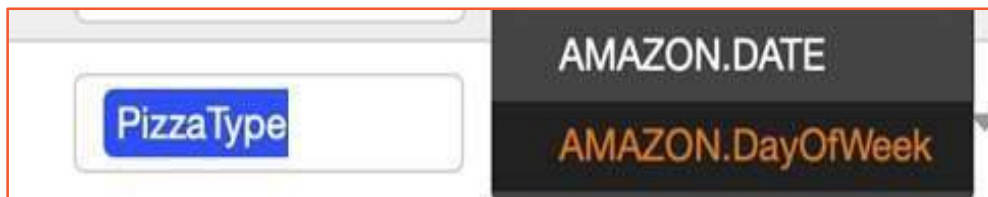
- Scroll down on the screen to see your first slot.
- In the gray box above your first slot, type a new title for your second slot.
- Title the slot PickupDate (no spaces).
- Select the dropdown menu under Slot Type.
- Scroll down to choose AMAZON.DATE from the dropdown menu. You can also search.
- Type the prompt "When would you like your pizza?"
- Click the blue + button at the end of the row to add the slot.

Step 10. Build your third slot.

- Scroll down on the screen to see your first slot.

- In the gray box above your first slot, type a new title for your third slot.

- Title the slot PickUpTimeNew (no spaces).

- Choose AMAZON.TIME from the dropdown menu.

- Type the prompt "What time would you like to pick up your pizza?" Click

- the blue + button at the end of the row to add the slot.

- Make all three slots required by clicking the Required checkbox next to each slot.

Step 11. Create a confirmation prompt. This lets the user know that the action they have requested has been completed.

Scroll down under Slots to the Confirmation prompt section. Select the checkbox next to Confirmation prompt.
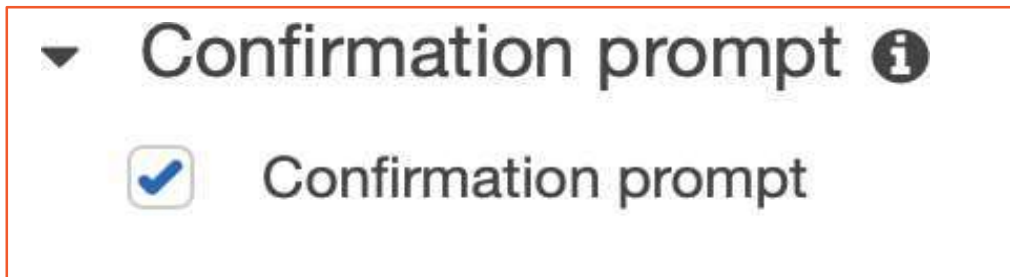
Use the names of the slots you created: PizzaType, PickupDate, and PickupTime. Type "Is this correct: you would like to order {PizzaType} pizza on {PickupDate} at {PickupTime}?"
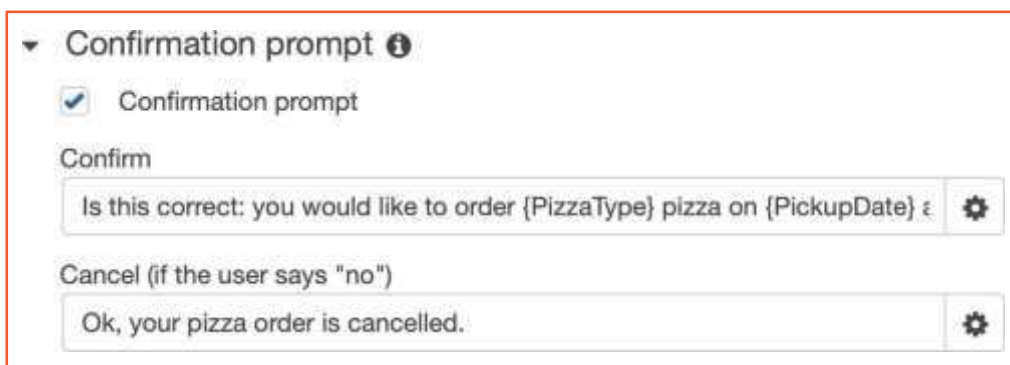
Note: Be sure to type the slot names exactly as they are typed in the slots section. All words, capitalizations, and spacings must match exactly between confirmation and slots.

Set the "No" answer to a response of Ok, your pizza order is cancelled.

Leave all other settings at their defaults.

Save your intent by clicking Save Intent at the bottom of the screen.

Save Intent

Build your bot by clicking Build in the upper-right corner.

Build   Publish   ❓
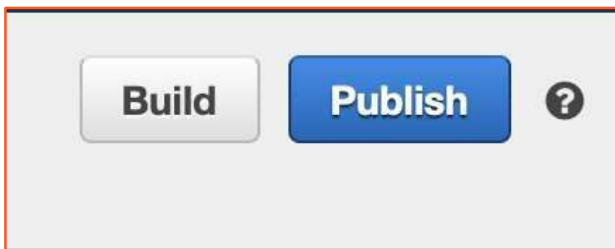
The build process could take a minute. Test your bot.

Click Test Chatbot on the far-right side of the screen—a new side pane will open

to test the bot.

Have a partner test your bot by typing in the new side pane. Note:

Be sure to type out the entire date (for example, May 31, 2019). Be sure to type out the time (for example, four p.m. or noon).

Be aware of these troubleshooting tips and tricks:

Be sure to save each slot and intent immediately, or the data will be lost.

The confirmation command must have slots typed exactly as they are in slots. Be sure all words are consistent in upper and lowercase letters and spacings

Sample Question Paper for Class X (Session 2023-2024)

ARTIFICIAL INTELLIGENCE(417)

Max. Time: 2 Hours   **Max. Marks: 50**

General Instructions:

1. Please read the instructions carefully.

2. This Question Paper consists of **21 questions** in two sections: Section A & Section B.

3. Section A has Objective type questions whereas Section B contains Subjective type questions.

4. **Out of the given (5 + 16 =) 21 questions, a candidate has to answer (5 + 10 =) 15 questions in the allotted (maximum) time of 2 hours.**

5. All questions of a particular section must be attempted in the correct order.

6. **SECTION A - OBJECTIVE TYPE QUESTIONS (24 MARKS):**

    i.   This section has 05 questions.

    ii.   Marks allotted are mentioned against each question/part.

    iii. There is no negative marking.

    iv.   Do as per the instructions given.

7. **SECTION B – SUBJECTIVE TYPE QUESTIONS (26 MARKS):**

    i.   This section has 16 questions.

    ii.   A candidate has to do 10 questions.

    iii. Do as per the instructions given.

    iv.   Marks allotted are mentioned against each question/part.

Q. 1	Answer any 4 out of the given 6 questions on Employability Skills (1 x 4 = 4 marks)	
i.	Pranavi gets up at 5 am and goes to her badminton classes. Then she comes home and finishes her homework before going to school. She does this all by herself. No one tells her to do it. This is an example of (a) Self-motivation (c) Both self and external motivation (b) External motivation (d) Not any specific type of motivation	1
ii.	What is the term used when you quickly click the left mouse button twice? (a) Hover (c) Drag and drop (b) Double clicking (d) Moving	1

iii.	Assertion(A): A Teacher works for a renowned School.
	 Reason (R): The statement given above is an example of wage employment.
	      (a) Both A and R are correct and R is the correct explanation of A
	      (b) Both A and R are correct but R is NOT the correct explanation of A
	      (c) A is correct but R is not correct
	      (d) A is not correct but R is correct
		1

iv.	_____ means determine the order for dealing with (a series of items or tasks) according to their relative importance (a) planner (b) Prioritize (c) Schedule (d) Task	1
v.	People of different cultures are unable to understand each other's customs, resulting in inconveniences and difficulties. This what type of barrier? (a) Cultural barrier (b) Physical barrier (c) Organisational barrier (d) Linguistic barrier	1
vi.	Which of these is non-renewable source of energy? (a) Wind Power (b) Solar power (c) Hydroelectricity (d) Coal	1

Q. 2	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**	
i.	Assertion (A): One can be a good dancer while the other can be a great athlete. Reason(R): Humans possess different types of intelligences but at different levels. (a) Both A and R are correct and R is the correct explanation of A (b) Both A and R are correct but R is not the correct explanation of A (c) A is correct but R is not correct (d) A is not correct but R is correct.	1
ii.	Ananya has recently bought a robot to do cleaning including mopping. The robot senses the dirty floor, calculates the average time taken to mop, senses the obstacle and changes the direction, also goes for auto charging. Her housemaid was feeling insecure as if she would not be required in the near future. This is problem related to: (a) AI Ethics (b) AI creating unemployment (c) AI Bias (d) Data Privacy	1
iii.	Statment1: There are three layers in a neural network. Statement2:The first layer of the neural network is known as the input layer. (a) Both Statement1 and Statement2 are correct (b) Both Statement1 and Statement2 are incorrect (c) Statement1 is correct but Statement2 is incorrect (d) Statement2 is correct but Statement1 is incorrect	1
iv.	_____ are modeled on the human brain, it is essentially a machine learning algorithm, useful for solving problems when dataset is large (a) Computer vision (b) Data Science (c) Natural Language Processing (d) Neural Network	1
v.	Which of the following shortcut key is used to paste a file? (a) Ctrl+c	1

	(b) Ctrl+v (c) Ctrl+z (d) Ctrl+y	
vi.	_____ helps to communicate with humans and abilities to make human lives easier 　(a) Google Assistant 　(b) Cortana 　(c) Siri 　(d) All of the above	**1**

Q. 3	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**	
i.	Which of the following is not an AI domain? 　(a) Deep learning 　(b) Machine learning 　(c) Computer vision 　(d) Computer Aided Design	**1**
ii.	_____ is not the characteristics of an entrepreneur 　(a)hardworking　　　(c) Dependent 　(b) Self confident　　(d) Positive	**1**
iii.	Which of the following is not an application of data science? 　(a) Determine the best route to supply material to the destination 　(b) Determining the product demand for festive season 　(c) Picking the topper of a test 　(d) Recommending the proposed items for a set of users	**1**
iv.	Object detection is the _____ 　(a) process of finding instances of real-world objects in images or videos. 　(b) process of classifying objects. 　(c) Finding the objects 　(d) Image segmentation	**1**
v.	Pick the odd one out : 　a) Snap Chat Filter 　b) Face Lock in Phone 　c) Chatbot 　d) Image search Option	**1**
vi.	Which of the parameter is not used to test data and efficiency of the model 　(a) Accuracy 　(b) Recall 　(c) F1 Score 　(d) Reality	**1**

Q. 4	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**	
i.	_____ AI enables machines to automatically learn and improve at tasks with experience , by the use of data 　(a) Machine learning 　(b) Deep learning 　(c) Flat learning	**1**

		(d) Device learning	

ii.	The process of understanding the reliability of any AI model, based on outputs by feeding test dataset into model and comparing with actual answer
	    (a) Evaluation
	    (b) Problem Scoping
	    (c) Data Acquisition
	    (d) Data Exploration
		1	

iii.	Efforts are made to increase the solar power generation so that our electricity needs are met and at the same time we do not pollute the environment or use up natural resources." Which SDG can you relate this statement to?
	    (a) Life on land
	    (b) Clean water and sanitation
	    (c) Affordable and clean energy
	    (d) Reduced inequalities
		1	

iv.	A _____ represents the smallest piece of the screen that can be controlled individually in terms of colour and intensity
	    (a) picele
	    (b) picment
	    (c) pictel
	    (d) pixel
		1	

v.	Which of these is not a phase for an NLP project?
	    (a) Problem Scoping
	    (b) Data acquisition
	    (c) Data Exploration
	    (d) Data Summarization
		1	

vi.	Sonal wants to identify relationships, patterns and trends out of the random data. Which of the following learning model is suitable for her?
	    a) Unsupervised
	    b) Supervised
	    c) Reinforcement
	    d) None of the above
		1	

Q. 5	Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)	

i.	Virtual assistants like Siri, Alexa, Cortona are based on _____ technology of AI
	    (a) Machine Learning
	    (b) Data Science
	    (c) Natural Language Processing
	    (d) Big Data
		1

ii.	When both predicted value of the AI model and actual value are positive it is called _____
	    (a) True Positive
	    (b) True Negative
	    (c) False Positive
	    (d) False Negative
		1

iii.	RGB value _____ represents black colour
	    (a) (0,0,0)
	    (b) (1,1,1)
	    (c) (255,255,255)
	    (d) (127,127,127)
		1

iv.	_____ are a mutable sequence of values of any type, and are indexed by integers. They enclosed in []. (a) String (b) Lists (c) Tuples (d) All of the above	1
v.	_____ the work is all about identifying and noting how we spent our time, and analysing how to spend our time effectively. (a) Organising (b) Prioritising (c) Controlling (d) Tracking	1
vi.	What is True Positive? (a) The predicted value matches the actual value, The actual value was positive and the model predicted a positive value (b) The predicted value matches the actual value ,The actual value was negative and the model predicted a negative value (c) The predicted value was falsely predicted ,The actual value was negative but the model predicted a positive value (d) The predicted value was falsely predicted,The actual value was positive but the model predicted a negative value	1

SECTION B: SUBJECTIVE TYPE QUESTIONS

	Answer any 3 out of the given 5 questions on Employability Skills (2 x 3 = 6 marks) **Answer each question in 20 – 30 words.**	
Q. 6	List two barriers in effective communication.	2
Q. 7	What is SMART goal setting?	2
Q. 8	What is computer Virus? How it is harmful?	2
Q. 9	Write any 2 qualities of successful enterpreneurs?	2
Q. 10	What is sustainable development?	2

	Answer any 4 out of the given 6 questions in 20 – 30 words each (2 x 4 = 8 marks)	
Q. 11	How do you understand whether a machine/application is AI based or not? Explain with the help of an example.	2
Q. 12	If you do an image search for vacations on a popular search engine, the first few searches mostly return the picture of beaches. What is the concern here? Explain.	2

Q. 13	Samarth attended a seminar on Artificial Intelligence and has now been asked to write a report on his learnings from the seminar. Being a non-technical person, he understood that the AI enabled machine uses data of different formats in many of the daily based applications but failed to sync it with the right terminologies and express the details. Help Samarth define Artificial Intelligence, list the three domains of AI	2
Q. 14	What is evaluation in AI?	2
Q. 15	What are the 4Ws problem canvas which helps in identifying the key elements related to the problem	2
Q. 16	The Result of comparison between the prediction and reality can be recorded in _____ and _____ is defined as the percentage of correct predictions out of all the observations a) Confusion Matrix, Accuracy b) Data Acquisition, Precision c) Accuracy, Overfitting d) Accuracy, Confusion Matrix	2
	Answer any 3 out of the given 5 questions in 50– 80 words each (4 x 3 = 12 marks)	
Q. 17	Your friend wants to know about chatbot. Explain him about chatbot and how it is useful?	4
Q. 18	What are the stages of Ai project cycle? Explain	4
Q. 19	Neural networks are said to be modelled the way how neurons in the human brain behave. A similar system is mimicked by the AI machine to perform certain tasks. Explain how neural networks work in an AI model and mention any three features of Neural Networks.	4
Q. 20	Sushmitha, a student of class X, was exploring the Natural Language Processing domain. She got stuck while performing the text normalization. Help her to normalize the text on the segmented sentences given below: Document 1: Akash and Ajay are best friends.	4

Q. 21	Automated trade industry has developed an AI model which predicts the selling and purchasing of automobiles. During testing, the AI model came up with the following predictions. (i) How many total tests have been performed in the above scenario? (ii) Calculate precision, recall and F1 Score.	4

		Reality	
		Yes	No
Prediction	Yes	60	25
	No	05	10

ARTIFICIAL INTELLIGENCE(417)

Max. Time: 2 Hours   Max. Marks: 50

General Instructions:

8. Please read the instructions carefully.

9. This Question Paper consists of **21 questions** in two sections: Section A & Section B.

10. Section A has Objective type questions whereas Section B contains Subjective type questions.

11. **Out of the given (5 + 16 =) 21 questions, a candidate has to answer (5 + 10 =) 15 questions in the allotted (maximum) time of 2 hours.**

12. All questions of a particular section must be attempted in the correct order.

13. **SECTION A - OBJECTIVE TYPE QUESTIONS (24 MARKS):**

    i.   This section has 05 questions.

    ii.   Marks allotted are mentioned against each question/part.

    iii.   There is no negative marking.

    iv.   Do as per the instructions given.

14. **SECTION B – SUBJECTIVE TYPE QUESTIONS (26 MARKS):**

    i.   This section has 16 questions.

    ii.   A candidate has to do 10 questions.

    iii.   Do as per the instructions given.

    iv.   Marks allotted are mentioned against each question/part.

Q. 1	**Answer any 4 out of the given 6 questions on Employability Skills (1 x 4 = 4 marks)**	

i.	Pranavi gets up at 5 am and goes to her badminton classes. Then she comes home and finishes her homework before going to school. She does this all by herself. No one tells her to do it. This is an example of
	  (c) **Self-motivation** (c) Both self and external motivation
	  (d) External motivation (d) Not any specific type of motivation
		1

ii.	What is the term used when you quickly click the left mouse button twice?
	  (c) Hover (c) Drag and drop
	  (d) **Double clicking** (d) Moving
		1

iii.	Assertion(A): A Teacher works for a renowned School.
	Reason (R): The statement given above is an example of wage employment.
	  (e) Both A and R are correct and R is the correct explanation of A
	  (f) Both A and R are correct but R is NOT the correct explanation of A
	  (g) A is correct but R is not correct
	  (h) A is not correct but R is correct
		1

iv.	_____ means determine the order for dealing with (a series of items or tasks) according to their relative importance	1

		(e) planner **(f) Prioritize** (g) Schedule (h) Task	
v.	People of different cultures are unable to understand each other's customs, resulting in inconveniences and difficulties. This what type of barrier? **(e) Cultural barrier** (f) Physical barrier (g) Organisational barrier (h) Linguistic barrier		1
vi.	Which of these is non-renewable source of energy? (e) Wind Power (f) Solar power (g) Hydroelectricity **(h) Coal**		1

Q. 2	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**	
i.	Assertion (A): One can be a good dancer while the other can be a great athlete. Reason(R): Humans possess different types of intelligences but at different levels. **(e) Both A and R are correct and R is the correct explanation of A** (f) Both A and R are correct but R is not the correct explanation of A (g) A is correct but R is not correct (h) A is not correct but R is correct.	1
ii.	Ananya has recently bought a robot to do cleaning including mopping. The robot senses the dirty floor, calculates the average time taken to mop, senses the obstacle and changes the direction, also goes for auto charging. Her housemaid was feeling insecure as if she would not be required in the near future. This is problem related to: (e) AI Ethics **(f) AI creating unemployment** (g) AI Bias (h) Data Privacy	1
iii.	Statment1: There are three layers in a neural network. Statement2:The first layer of the neural network is known as the input layer. **(e) Both Statement1 and Statement2 are correct** (f) Both Statement1 and Statement2 are incorrect (g) Statement1 is correct but Statement2 is incorrect (h) Statement2 is correct but Statement1 is incorrect	1
iv.	_____ are modeled on the human brain, it is essentially a machine learning algorithm, useful for solving problems when dataset is large (e) Computer vision (f) Data Science (g) Natural Language Processing **(h) Neural Network**	1
v.	Which of the following shortcut key is used to paste a file? (e) Ctrl+c **(f) Ctrl+v** (g) Ctrl+z	1

	(h) Ctrl+y	
vi.	_____ helps to communicate with humans and abilities to make human lives easier (e) Google Assistant (f) Cortana (g) Siri **(h) All of the above**	**1**

Q. 3	Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)	
i.	Which of the following is not an AI domain? (e) Deep learning (f) Machine learning (g) Computer vision **(h) Computer Aided Design**	**1**
ii.	_____ is not the characteristics of an entrepreneur (a)hardworking (c) **Dependent** (b) Self confident (d) Positive	**1**
iii.	Which of the following is not an application of data science? **(e) Determine the best route to supply material to the destination** (f) Determining the product demand for festive season (g) Picking the topper of a test (h) Recommending the proposed items for a set of users	**1**
iv.	Object detection is the _____ **(e) process of finding instances of real-world objects in images or videos.** (f) process of classifying objects. (g) Finding the objects (h) Image segmentation	**1**
v.	Pick the odd one out : a) Snap Chat Filter b) Face Lock in Phone **c) Chatbot** d) Image search Option	**1**
vi.	Which of the parameter is not used to test data and efficiency of the model (e) Accuracy (f) Recall (g) F1 Score **(h) Reality**	**1**

Q. 4	Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)	
i.	_____ AI enables machines to automatically learn and improve at tasks with experience , by the use of data **(e) Machine learning** (f) Deep learning (g) Flat learning (h) Device learning	**1**

ii.	The process of understanding the reliability of any AI model,based on outputs by feeding test dataset into model and comparing with actual answer
	    (e) Evaluation
	    (f) Problem Scoping
	    (g) Data Acquisition
	    (h) Data Exploration
		1

iii.	Efforts are made to increase the solar power generation so that our electricity needs are met and at the same time we do not pollute the environment or use up natural resources." Which SDG can you relate this statement to?
	    (a) Life on land
	    (b) Clean water and sanitation
	    (c) **Affordable and clean energy**
	    (d) Reduced inequalities
		1

iv.	A _____ represents the smallest piece of the screen that can be controlled individually in terms of colour and intensity
	    (e) picele
	    (f) picment
	    (g) pictel
	    (h) pixel
		1

v.	Which of these is not a phase for an NLP project?
	    (e) Problem Scoping
	    (f) Data acquisition
	    (g) Data Exploration
	    (h) Data Summarization
		1

vi.	Sonal wants to identify relationships, patterns and trends out of the random data. Which of the following learning model is suitable for her?
	    e) Unsupervised
	    f) Supervised
	    g) Reinforcement
	    h) None of the above
		1

Q. 5	**Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)**	

i.	Virtual assistants like Siri, Alexa, Cortona are based on _____ technology of AI
	    (e) Machine Learning
	    (f) Data Science
	    (g) Natural Language Processing
	    (h) Big Data
		1

ii.	When both predicted value of the AI model and actual value are positive it is called ____
	    (e) True Positive
	    (f) True Negative
	    (g) False Positive
	    (h) False Negative
		1

iii.	RGB value _____ represents black colour
	    (e) (0,0,0)
	    (f) (1,1,1)
	    (g) (255,255,255)
	    (h) (127,127,127)
		1

iv.	_____ are a mutable sequence of values of any type, and are indexed by integers. They enclosed in []. (a) String **(b) Lists** (c) Tuples (d) All of the above	**1**
v.	_____ the work is all about identifying and noting how we spent our time, and analysing how to spend our time effectively. (e) Organising (f) Prioritising (g) Controlling **(h) Tracking**	**1**
vi.	What is True Positive? **(e) The predicted value matches the actual value, The actual value was positive and the model predicted a positive value** (f) The predicted value matches the actual value ,The actual value was negative and the model predicted a negative value (g) The predicted value was falsely predicted ,The actual value was negative but the model predicted a positive value (h) The predicted value was falsely predicted,The actual value was positive but the model predicted a negative value	**1**

SECTION B: SUBJECTIVE TYPE QUESTIONS

	Answer any 3 out of the given 5 questions on Employability Skills (2 x 3 = 6 marks) **Answer each question in 20 – 30 words.**	
Q. 6	List two barriers in effective communication. **• Linguistic Barrier: Language at times can be a barrier to effective communication** **• Physical Barrier: If the surroundings do not support proper communication, it can also act as a barrier to appropriate interaction.** **• Cultural Barrier: Cultural differences hinder us from communicating properly.** **• Interpersonal Barriers: It refers to the situations when the intended message is received incorrectly due to many personal reasons.** **• Organizational Barriers: In an organization if there is no clarity about the roles,**	**2**
Q. 7	What is SMART goal setting? **SMART is an acronym that stands for Specific, Measurable, Achievable, Realistic, and Timely. Therefore, a SMART goal incorporates all of these criteria to help focus your efforts and increase the chances of achieving your goal.**	**2**

Q. 8	What is computer Virus? How it is harmful?	2
	A computer virus is a type of malicious software, or malware, that spreads between computers and causes damage to data and software. Computer viruses aim to disrupt systems, cause major operational issues, and result in data loss and leakage.	
Q. 9	**Write any 2 qualities of successful entrepreneurs?**	2
	1. **Self-motivation: The ability to self-motivate is very essential for entrepreneurs. It plays a crucial role in pushing entrepreneurs towards success.** 2. **Curiosity: Being curious helps entrepreneurs to function differently that helps in doing things outside their comfort zone.** 3. **Taking Risks: Entrepreneurs are risk takers because success can be achieved only by taking risks in business.** 4. **Perseverance: Entrepreneurs should have the characteristics of perseverance. Sticking to the goal in spite of delay in achieving success is one of the hallmarks of entrepreneurs.**	
Q. 10	What is sustainable development?	2
	Sustainable development means development that meets the needs of the present without compromising the ability of future generations to meet their own needs.	

	Answer any 4 out of the given 6 questions in 20 – 30 words each (2 x 4 = 8 marks)	
Q. 11	How do you understand whether a machine/application is AI based or not? Explain with the help of an example.	2
	Any machine that has been trained with data and can make decisions/ predictions on its own can be termed as AI. Eg: The bot or the automation machine is not trained with any data is not an AI while a chatbot that understands and processes human language is an AI	
Q. 12	If you do an image search for vacations on a popular search engine, the first few searches mostly return the picture of beaches. What is the concern here? Explain.	2
	In the given scenario, we are concerned about the bias. When we talk about a machine, we know that it is artificial and cannot think on its own. It can have intelligence, but we cannot expect a machine to have any biases of its own. Any bias can transfer from the developer to the machine while the algorithm is being developed.	

	Answer any 3 out of the given 5 questions in 50– 80 words each (4 x 3 = 12 marks)	
Q. 17	Your friend wants to know about chatbot. Explain him about chatbot and how it is useful?	4
	A chatbot is an application that can imitate a real conversation with a user in their natural language. Chatbots enable communication via text or audio on websites, messaging applications, mobile apps, or telephone	

Q. 13	Samarth attended a seminar on Artificial Intelligence and has now been asked to write a report on his learnings from the seminar. Being a non-technical person, he understood that the AI enabled machine uses data of different formats in many of the daily based applications but failed to sync it with the right terminologies and express the details. Help Samarth define Artificial Intelligence, list the three domains of AI **Artificial Intelligence (AI) refers to any technique that enables computers to mimic human intelligence i.e., make decisions, predict the future, learn and improve on its own. With respect to the type of data fed in the AI model, AI models can be broadly categorised into three domains** **1. Data sciences** **2. Computer vision** **3. Natural Language Processing Data Science takes input in the form of numeric and alphanumeric data. Computer Vision takes input in the form of images and videos**.	2
Q. 14	What is evaluation in AI? **Evaluation is a process of understanding the reliability of any AI model, based on outputs by feeding the test dataset into the model and comparing it with actual answers**	2
Q. 15	**What are the 4Ws problem canvas which helps in identifying the key elements related to the problem** **The 4Ws Problem canvas helps in identifying the key elements related to the problem** **Who - "Who" part helps us in comprehending and categorizing who all are affected directly and indirectly with the problem and who are called the Stake Holders**	2
	What - "What" part helps us in understanding and identifying the nature of the problem and under this block, you also gather evidence to prove that the problem you have selected actually exists. Where - "Where" does the problem arises, situation, and the location. Why - "Why" is the given problem worth solving.	
Q. 16	The Result of comparison between the prediction and reality can be recorded in _____ and _____ is defined as the percentage of correct predictions out of all the observations e) Confusion Matrix, Accuracy f) Data Acquisition, Precision g) Accuracy, Overfitting h) Accuracy, Confusion Matrix **Confusion Matrix, Accuracy**	2

Q. 18	What are the stages of AI project cycle? Explain	4
	Components of the project cycle are the steps that contribute to completing the Project.	
	The Components of AI Project Cycle are: -	
	Problem Scoping - Understanding the problem **Data Acquisition - Collecting accurate and reliable data** **Data Exploration - Arranging the data uniformly** **Modelling - Creating Models from the data** **Evaluation - Evaluating the project**	
Q. 19	Neural networks are said to be modelled the way how neurons in the human brain behave. A similar system is mimicked by the AI machine to perform certain tasks. Explain how neural networks work in an AI model and mention any three features of Neural Networks.	4
	Neural networks are loosely modelled after how neurons in the human brain behave. The features of a neural network are : 1. They are able to extract data features automatically without needing the input of the programmer. 2. A neural network is essentially a system of organizing machine learning algorithms to perform certain tasks. 3. It is a fast and efficient way to solve problems for which the dataset is very large, such as in images	
Q. 20	Sushmitha, a student of class X, was exploring the Natural Language Processing domain. She got stuck while performing the text normalization. Help her to normalize the text on the segmented sentences given below:	4
	Document 1: Akash and Ajay are best friends.	
	Document 2: Akash likes to play football but Ajay prefers to play online games	
	1. Tokenisation Akash, and, Ajay, are, best, friends Akash, likes, to, play, football, but, Ajay, prefers, to, play, online, games	
	2. Removal of stopwords Akash, Ajay, best, friends Akash, likes, play, football, Ajay, prefers, play, online, games	
	3. converting text to a common case akash, ajay, best, friends akash, likes, play, football, ajay, prefers, play, online, games	
	4. Stemming/Lemmatisation akash, ajay, best, friend akash, like, play, football, ajay, prefer, play, online, game	

| Q. 21 | Automated trade industry has developed an AI model which predicts the selling and purchasing of automobiles. During testing, the AI model came up with the following predictions. | 4 |

(iii) How many total tests have been performed in the above scenario?

(iv) Calculate precision, recall and F1 Score.

		Reality	
		Yes	No
Prediction	Yes	60	25
	No	05	10

(i)   **TP=60, TN=10, FP=25, FN=5**

60+25+5+10=100 total cases have been performed.

(ii)   **(Note: For calculating Precision, Recall and F1 score, we need not multiply the formula by 100 as all these parameters need to range between 0 to 1) Precision =TP/(TP+FP)**

= 60/(60+25)

= 60/85

= 0.7

Recall=TP/(TP+FN)

= 60/(60+5)

= 60/65

= 0.92

F1 Score=2*Precision*Recall/ (Precision+Recall)

= 2*0.7*0.92/(0.7+0.92)

= 0.7

Max. Time: 2 Hours   **Max. Marks: 50**

General Instructions:

1. Please read the instructions carefully.

2. This Question Paper consists of 21 questions in two sections: Section A & Section B

3. Section A has Objective type questions whereas Section B contains Subjective type questions.

4. Out of the given (5 + 16 =) 21 questions, a candidate has to answer (5 + 10 =) 15 questions in the allotted (maximum) time of 2 hours.

5. All questions of a particular section must be attempted in the correct order.

6. SECTION A - OBJECTIVE TYPE QUESTIONS (24 MARKS): i. This section has 05 questions. ii. Marks allotted are mentioned against each question/part. iii. There is no negative marking. iv. Do as per the instructions given.

7. SECTION B – SUBJECTIVE TYPE QUESTIONS (26 MARKS): i. This section has 16 questions. ii. A candidate has to do 10 questions. iii. Do as per the instructions given. iv. Marks allotted are mentioned against each question/part

SECTION A: OBJECTIVE TYPE QUESTION		
Q. 1	**Answer any 4 out of the given 6 questions on Employability Skills**	**1 x 4 = 4**
(i)	What is the primary purpose of active listening in communication? (a) To formulate a response while the other person is speaking (b) To understand the speaker's message fully and accurately (c) To interrupt and ask clarifying questions immediately (d) To dominate the conversation with personal experiences	1
(ii)	Adam is in a meeting where he disagrees with the proposed strategy. How should he communicate his disagreement effectively? (a) Raise his voice to emphasize his point (b) Wait until after the meeting to share his concerns privately (c) Interrupt the speaker to express his disagreement (d) Use diplomatic language and provide constructive feedback during the discussion	1
(iii)	)Which of the following is a key aspect of time management? (a) Procrastination and delaying tasks (b) Prioritizing tasks based on urgency and importance (c) Taking on more tasks than can be realistically completed (d) Ignoring deadlines and commitments	1
(iv)	You are training employees on safe computing practices to avoid cyber threats. What steps would you take while using public Wi-Fi networks? (a) Disable firewall protection	1

	(b) Avoid accessing sensitive websites (c) Use a Virtual Private Network (VPN) (d) Share Wi-Fi login credentials with others	
(v)	What is a key characteristic of successful entrepreneurs? (a) Avoiding risks and playing it safe (b) Focusing solely on short-term profits (c) Being adaptable and willing to learn from failures (d) Rejecting new ideas and sticking to traditional methods	1
(vi)	Ecotech Solutions is a company specializing in green technologies. They are planning to expand their operations globally. What strategies can they adopt to ensure their expansion aligns with green principles? (a) Prioritizing cost-cutting measures over environmental concerns (b) Implementing renewable energy sources in their production facilities (c) Disregarding local environmental regulations for faster growth (d) Promoting excessive consumption of their products without considering sustainability	1
Q.2.	**Answer any 5 questions out of 6**	1x5=5
(i)	Fill in the blanks: "Human intelligence encompasses various components such as reasoning, problem-solving, and _____."	1
(ii)	Artificial Intelligence (AI) always operates ethically and without bias. -True or False?	1
(iii)	With Great Power Comes Great Responsibility"? List 2 suggestions for responsible use of AI.	1
(iv)	Which of the following statements about AI bias are incorrect? a) AI bias can result from biased training data. b) AI systems are inherently unbiased. c) Addressing AI bias requires diverse and inclusive data. d) Regular monitoring and auditing can help mitigate AI bias.	1
(v)	How can AI be used in real life? a) Autonomous driving vehicles b) Personalized medicine c) Predicting future stock prices d) All of the above	1
(vi)	What are some ethical concerns involved in AI development? a)AI bias b)Data privacy c)Unemployment due to automation d)Transparency in decision-making	1
Q3	**Answer any 5 out of the given 6 questions**	**1 x 5 = 5**
(i)	What is the first step in the AI project cycle? (a) Model training	1

	(b) Data collection and preprocessing (c) Model deployment (d) Evaluation and testing	
(ii)	Which technique is commonly used in data science to handle missing data in a dataset? (a) Ignoring the missing values (b) Filling missing values with the mean or median (c) Dropping rows with missing values (d) Creating synthetic data to replace missing values	1
(iii)	What is the primary application of object detection in computer vision? (a) Classifying images into categories (b) Segmenting images into regions (c) Identifying and locating objects within an image (d) Generating captions for images	1
(iv)	Which task in natural language processing involves predicting the next word in a sequence of words? (a) Named Entity Recognition (NER) (b) Sentiment Analysis (c) Part-of-Speech Tagging (POS) (d) Language Modeling	1
(v)	What is the purpose of model evaluation in machine learning? (a) To train the model on new data (b) To select the best model based on performance metrics (c) To preprocess the data before training (d) To collect data for future analysis	1
(vi)	The total number of Sustainable Development Goals (SDGs) were launched at the United Nations Sustainable Development Summit in New York in the year 2015, forming the 2030 Agenda for Sustainable Developmentare: (a) 17 (b) 15 (c) 13 (d) 1	1
Q 4.	**Answer any 5 out of the given 6 questions**	1X5=5
(i)	Which of the following includes major tasks of NLP? a) Automatic Summarization b) Discourse Analysis c) Machine Translation d) All of the mentioned	1
(ii)	Which NLP task involves determining the sentiment or emotional tone expressed in a piece of text such as positive, negative, or neutral? a) Named entity recognition b). Sentiment analysis c) Part of speech tagging d). Machine translation	1
(III)	Rock, Papers, and Scissors game is based on the following domain. a) Data for AI b). Natural Language Processing c). Computer Vision	1

		d). Image Processing	
(iv)		The _____makes the data understandable for humans as we can discover trends and patterns out of it. a) Random Data b) Graphical Representation C) Unstructured Data d)None of the above	1
(v)		)In unsupervised learning model, if we need to reduce their dimension, which algorithm do we have to use? a) Supervised algorithm b) Dimensionality reduction algorithm c). Clustering algorithm d)None of the above	1
(vi)		Chatbots often use a specific type of NLP model to maintain the context of a conversation. What is the name of this model? a)) Recurrent Neural Network (RNN) b) Convolutional Neural Network (CNN) c) Transformer Model d) Decision Tree Classifier	1
Q5		**Answer any 5 out of the given 6**	1x5=5
(i)		What is the primary purpose of a confusion matrix in model evaluation? a) To compare different machine learning algorithms b.) To visualize the model's decision boundary c) To measure model's prediction accuracy d) To evaluate the performance of classification model	1
(ii)		Each evaluation metric represents the ratio of true negatives to all actual negative instances and is commonly used in binary classification. a)Accuracy b). Precision c). Recall d). Specify	1
(iii)		In model evaluation, what is the term for the process of splitting the data set into two parts? One for training and one for testing. a). Data sampling. b). Data cleaning. c). Data splitting. d). Data transformation.	1
(iv)		If evaluation model will simply remember the whole training set, and will therefore always predict the correct label for any point in the training set. This is known as : a). Overfitting b). Overriding c). Over remembering d) None of the above	1
(v)		The percentage of true positive cases versus all the cases where the prediction is true is called A. Overfitting B. Accuracy	1

	C. Precision D. Data Acquisition	
(vi)	Rhea wants to know what is the primary purpose of validation data set in machine learning. It is: A. To train the model. B. To evaluate the model on unseen data. C. To test the model's performance on the training data. D. To visualize data relationships.	1

SECTION B: SUBJECTIVE TYPE QUESTIONS

Answer any 3 out of the given 5 questions on Employability Skills
Answer each question in 20 – 30 words.   **2 x 3 = 6**

Q 6.	How can AI-powered chatbots be utilized to enhance customer service in a retail business? Provide specific examples of how such technology can improve communication with customers and resolve common queries.	2
Q 7.	As a student managing multiple assignments and deadlines. How could you use AI tools or apps to organize your tasks, set priorities, and ensure timely completion of each assignment? Provide 2 AI-based strategies for effective self-management.	2
Q 8.	How can AI-based recommendation systems enhance the user experience on e-commerce platforms? Provide an example of how these systems work.	2
Q 9.	Discuss the role of AI in improving agricultural practices to reduce water usage and increase crop yield.	2
Q 10.	Mention precautions to take to do secure online payments	2

Answer any 4 out of the given 6 questions in 20 – 30 words each (2 x 4 = 8 marks)

Q 11.	Compare and contrast the approaches of symbolic AI and machine learning in solving AI tasks, highlighting their strengths and limitations.	2
Q 12.	Evaluate the role of continuous testing and validation throughout the AI project cycle in ensuring the reliability and accuracy of AI models.	2
Q 13.	Explain the impact of data quality on the outcomes of data science projects, considering factors such as data completeness, accuracy, and relevance	2
Q 14.	What are the ethical considerations related to the use of facial recognition technology in public spaces, discussing privacy concerns and potential biases.	2
Q 15.	What are NLP systems with machine learning-based approaches, highlighting their applicability in different NLP tasks.	2

Q 16.	Evaluate the effectiveness of different evaluation metrics, such as precision, recall, and F1 score, in assessing the performance of AI models across various tasks.	2

Answer any 3 out of the given 5 questions in 50– 80 words each 4 x 3 = 12

Q 17.	Aaadya is multi-talented and has excelled in academics, music, dancing, sports and painting. Describe different types of intelligences by naming and explaining any four types of intelligences?	4
Q 18.	After class 12 Rahul wanted to join for AI course. His parents didn't know much about its domains Explain them the domains of AI.	4
Q 19.	you're explaining neural networks to your classmate Varun in a class 10 AI lesson. How would you describe the basic structure and functioning of a neural network using a simple example? Also, mention one real-world application of neural networks that you find interesting and explain how neural networks are beneficial in that context.	4
Q 20.	Normalise the text on the segmented sentences given below: Document 1: Diya and Riya are best friends. Document 2: Diya likes to play guitar but Riya prefers to play violin	4
Q 21.	A social media company has developed an AI model to predict which users are likely to churn (cancel their account). During testing, the AI model came up with the following predictions. | Confusion Matrix		Reality	
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		yes	no
Predicted	yes	60	25
	no	5	10 | (i) Calculate precision, recall and F1 Score for churn prediction (ii) How many total tests were performed in the above scenario?	4

ANSWER KEY

Q1	(i) (b) To understand the speaker's message fully and accurately (ii) (d) Use diplomatic language and provide constructive feedback during the discussion (iii) (b) Prioritizing tasks based on urgency and importance (iv) (c) Use a Virtual Private Network (VPN) (v) (c) Being adaptable and willing to learn from failures (vi) (b) Implementing renewable energy sources in their production facilities	
Q2	(i) creativity (ii) False (iii)(a) Ensure transparency in AI decision-making processes (b) Regularly audit AI systems for bias and fairness (iv) b) AI systems are inherently unbiased. (v) d) All of the above (vi)(a) AI bias(b) Data privacy	
Q3	(ii) (b) Filling missing values with the mean or median (iii) (c) Identifying and locating objects within an image (iv) (d) Language Modeling (v) (b) To select the best model based on performance metrics (vi) (a) 17	
Q4	(i) d) All of the mentioned (ii) b) Sentiment analysis (III) d) Image Processing (iv) b) Graphical Representation (v) b) Dimensionality reduction algorithm	
Q5	(i) d) To evaluate the performance of classification model (ii) c) Recall (iii) c) Data splitting (iv) a) Overfitting (v) C. Precision (vi) B. To evaluate the model on unseen data.	
Q6	AI-powered chatbots can enhance customer service in retail by providing immediate assistance, answering frequently asked questions, and guiding customers through the purchasing process. For example, a chatbot can help customers track their orders, recommend products based on their preferences, and resolve billing inquiries in real-time.	
Q7	As a student, AI tools can help organize tasks and set priorities by using task management apps that utilize AI algorithms to schedule assignments based on deadlines and workload. Additionally, AI-powered virtual assistants can provide reminders and suggestions for effective time management.	
Q8	AI-based recommendation systems enhance user experience on e-commerce platforms by analyzing user preferences and behavior to provide personalized product recommendations. For instance, platforms like Amazon use collaborative filtering algorithms to suggest products based on past purchases, browsing history, and similar users' preferences.	
Q9	AI plays a crucial role in improving agricultural practices by analyzing data from sensors, drones, and satellites to optimize water usage, detect crop diseases	

	early, and forecast yield. AI algorithms can provide insights on when and where to irrigate, identify areas needing pest control, and suggest crop varieties suited to specific conditions.	
Q10	Precautions for secure online payments include using trusted payment gateways, ensuring the website has SSL encryption, avoiding public Wi-Fi for transactions, regularly monitoring bank statements, and enabling two-factor authentication where possible. Additionally, using virtual cards or digital wallets can add an extra layer of security.	
Q11	Symbolic AI relies on predefined rules and representations to solve AI tasks, while machine learning learns patterns from data. Symbolic AI is transparent and interpretable but may struggle with complex or ambiguous tasks. Machine learning, on the other hand, can handle large datasets and adapt to new information but may lack transparency and require substantial computational resources for training.	
Q12	Continuous testing and validation throughout the AI project cycle ensure the reliability and accuracy of AI models by detecting and correcting errors early. It helps in refining models, improving performance, and ensuring that they meet the desired objectives and specifications.	
Q13	Data quality significantly impacts the outcomes of data science projects. Factors such as data completeness, accuracy, and relevance influence the reliability and effectiveness of analyses and models. Poor data quality can lead to biased results, erroneous insights, and ineffective decision-making.	
Q14	Facial recognition technology in public spaces raises ethical concerns regarding privacy invasion and potential biases. There are concerns about surveillance, consent, and the misuse of facial data. Biases in facial recognition algorithms can lead to discriminatory outcomes, particularly against certain demographics.	
Q15	NLP systems with machine learning-based approaches utilize algorithms to learn patterns from textual data, enabling tasks such as sentiment analysis, named entity recognition, and machine translation. These systems excel in handling large and diverse datasets, offering scalability and adaptability across various NLP tasks.	
Q16	Types of Intelligences: Linguistic Intelligence: Aaadya's ability to excel in academics and possibly writing or public speaking showcases linguistic intelligence, which involves proficiency in language and communication. Musical Intelligence: Aaadya's talent in music indicates musical intelligence, which involves sensitivity to rhythm, melody, and sound. Bodily-Kinesthetic Intelligence: Aaadya's prowess in dancing and sports suggests bodily-kinesthetic intelligence, which relates to physical coordination, agility, and control. Visual-Spatial Intelligence: Aaadya's skill in painting reflects visual-spatial intelligence, which involves the ability to perceive the world accurately and manipulate objects mentally	
Q17	Types of Intelligences: Linguistic Intelligence: Aaadya's ability to excel in academics and possibly writing or public speaking showcases linguistic intelligence, which involves proficiency in language and communication. Musical Intelligence: Aaadya's talent in music indicates musical intelligence, which involves sensitivity to rhythm, melody, and sound. Bodily-Kinesthetic Intelligence: Aaadya's prowess in dancing and sports suggests bodily-kinesthetic intelligence, which relates to physical coordination, agility, and control.	

	Visual-Spatial Intelligence: Aaadya's skill in painting reflects visual-spatial intelligence, which involves the ability to perceive the world accurately and manipulate objects mentally. Domains of AI:	
Q17	Machine Learning: It involves algorithms that enable computers to learn from data and make predictions or decisions. Natural Language Processing (NLP): It focuses on enabling computers to understand, interpret, and generate human language. Computer Vision: This domain enables computers to interpret and analyze visual information from the real world, such as images or videos. Robotics: It involves the design and creation of robots capable of performing tasks autonomously or with human assistance.	
Q18	Neural networks can be explained as a computational model inspired by the human brain's structure and functioning. They consist of interconnected nodes or neurons organized in layers. Each neuron receives input, processes it, and sends output to other neurons. By adjusting the connections between neurons, neural networks can learn and perform tasks such as classification or prediction. For example, in image recognition, a neural network analyzes pixel values to identify objects in images.	
Q19	Hint -Stopwords in the given sentence which should not be removed are: @, . (fullstop) ,_(underscore) , 123(numbers) These tokens are generally considered as stopwords, but in the above sentence, these tokens are part of email id. removing these tokens may lead to invalid website address and email ID. So these words should not be removed from the above sentence. (1 mark for identifying any two stop words from the above, and 1 mark for the valid justification.	
Q20	Precision = True Positives / (True Positives + False Positives) = 60 / (60 + 5) = 0.923 Recall = True Positives / (True Positives + False Negatives) = 60 / (60 + 25) = 0.706 F1 Score = 2 * (Precision * Recall) / (Precision + Recall) = 2 * (0.923 * 0.706) / (0.923 + 0.706) ≈ 0.801 (ii) Total tests performed = Sum of all entries in the confusion matrix = 60 + 25 + 5 + 10 = 100.	

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