तत् त्वं पूषन् अपावृणु
केन्द्रीय विद्यालय संगठन

केन्द्रीय विद्यालय संगठन, पटना संभाग

KENDRIYA VIDYALAYA SANGATHAN, PATNA REGION

ARTIFICIAL INTELLIGENCE (417)

CLASS - X

STUDENT SUPPORT MATERIAL
CBSE CURRICULUM

PATRON

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ARTIFICIAL INTELLIGENCE (SUBJECT CODE 417)
CLASS – X (SESSION 2023-2024)
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- ○ Data Sciences- Impact Filter (Impact of rise in temperature on different species) https://artsexperiments.withgoogle.com/impactfilter/ ○ 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.

UNIT 1 – Communication Skills – II

INTRODUCTION –

Communication is something we all do on a daily basis without paying much attention. It started hundreds of years ago and has evolved into writing, listening, speaking and reading as the four key components.

Communication has three important parts -

1. **Sender / Transmitter -** The sender transmits the message through one medium or another.

2. **Receiver / Listening -** The receiver listens or understands the message

3. **Feedback -** The receiver shows whether the message has been understood or not by replying it back to the sender in the form of feedback.

Types of communication - Communication is the ability to share your views or thoughts with other people. Communication can be any form of signal or message. It could be in any format. When a baby cries, it sends a message to the parents that it needs attention. This is also a form of communication.

Verbal Communication - When a person expresses ideas, views or thoughts by speaking or orally, it is known as verbal communication.

Advantages of Verbal Communication -

1. It saves time in communication as it is a direct communication between sender and receiver.

2. Quick feedback can be taken once the communication is completed.

3. It provides clarity in communication as any further explanation if required can be given by the speaker.

4. It is flexible and effective for all as the sender can make the communication clear and expressive by speaking the appropriate words clearly.

5. It is a powerful means of persuasion and control as appropriate words can leave better impact on the receiver. The speaker can influence the other person by using communication in proper tone and words.

Disadvantages of Verbal Communication -

1. It can lead to emotional problems as sometimes the speaker might use harsh words which can create problems with the other person who is listening.

2. It has no legal validity and hence will lead to problems in situation where verification is required through written or recorded information.

3. It lacks any means of permanent storage of record.

4. Difficulty in communicating with distant people as the sender and receiver must be in close proximity while conversing.

5. It is difficult for certain people to understand speech due to various speech tones used in verbal communication specially due to different languages spoken and its pronunciation.

6. This form of communication is not suitable for lengthy message as the receiver might not remember the words spoken if the conversation is lengthy.

Types of Verbal Communication - There are four types of verbal communication-

1. **Intrapersonal Communication -** This form of communication is immensely private and constricted to ourselves.

2. **Interpersonal Communication -** This form of communication takes place between two particulars and is thus a one-to-one conversation.

3. **Small Group Communication.**

4. **Public Communication.**

Non-Verbal Communication - In non-verbal communication the person interacts through gesture, body language, making communication effective where person can understand expression better than words.

Advantages of Non-Verbal Communications -

1. It conveys the meaning very fast as the receiver can easily interpret the cues without any barrier of language, tone etc.

2. It acts as a complementary to verbal communication.

3. It has easy presentation through gestures or body language.

4. Non-verbal message may substitute for the verbal message specially if it is blocked by noise, interruption, long distance etc.

Disadvantages of Non-Verbal Communication -

1. There are chances of misinterpretation of gestures. If the gesture is not clear, it can be misinterpreted by the receiver.

2. It is a continuous type of communication.

3. Non-verbal communication might not be appropriate where there are regional and cultural differences.

4. It is not suitable for lengthy messages.

Visual Communication - In visual communication the person interacts through visual ads, posters, logos, hoardings etc. making communication impressive as pictures communicate faster than words.

Advantages of Visual Communication -

1. It is effective for illiterate receiver.

2. It helps in oral communication.

3. It gives easy explanation. Pictures convey the meaning more quickly and clearly.

4. It provides simple presentation. Complex information, data and figures can be easily presented very simply on graphs, pictures and diagrams.

5. Visual techniques help to prevent the wastage of time.

6. It helps in quick decision. So management prefers visual techniques to communicate with others.

7. Visual communication is very much popular because people do not like much speech and long explanation rather than a chart or a diagram.

Disadvantages of Visual Communication -

1. The visual methods of communication are costlier than those of other methods. That's why only large companies or organizations can use this technique.

2. Sometimes visual presentation of information becomes complex. The receiver cannot understand the meaning of the presentation.

3. Visual presentation is not sufficient to communicate effectively and clearly but also it can be successfully used with oral communication.

4. Sometimes it is less influential and cannot be used everywhere.

Body Language – Body language is an important aspect of non-verbal communication where physical behavior is used to convey a message or information.

Body Language includes:

- Facial Expressions
- Posture
- Hand Gestures
- Touch
- Use of space
- Eye movement

It is also known as **'Kinesics' / 'Kinaesthetics'**.

Do's and Don'ts of Body Language –

| S. No.	Do's	Don'ts
1	Sit straight and make eye contacts.	Don't be over confident.
2	Always keep a smile on your face.	Don't look away while conversing.
3	Offer a gentle handshake showing confidence.	Do not drop your shoulders.
4	Keep your arms by your side.	Don't lean forward or backward while sitting.
5	Place your feet firmly on the ground while walking.	Do not touch your face often.
6	Keep your head up.	Do not lean on wall or any other object.
7	Keep your shoulder relaxed down.	Do not get close to your listener.
8	Listen to the speaker attentively.	-
9	Nod while listening to the speaker.	-

Formal and Non-Formal Communication –

A formal letter or email has a specific body, structure, tone and no personal information. You may use it with your teachers in school or in government organizations.

Non-formal communication is when you talk to your friends and family.

Writing a letter or an email –

	Formal	**Informal**
Salutation	Dear Mr. / Mrs. / Ms. Dear Madam / Sir	Hello / Hi + First name Dear + First name Hi there
Opening Line	Thank you for your letter / email dated …. I am writing with reference to …..	How are things with you? What's up? Guess what? I am writing to tell you about …
Closing Line	I look forward to hearing from you at the earliest.	Hope to hear from you soon!
Sign-off	Yours sincerely	Best wishes Love / Hug / XOXO

The Communication Cycle –
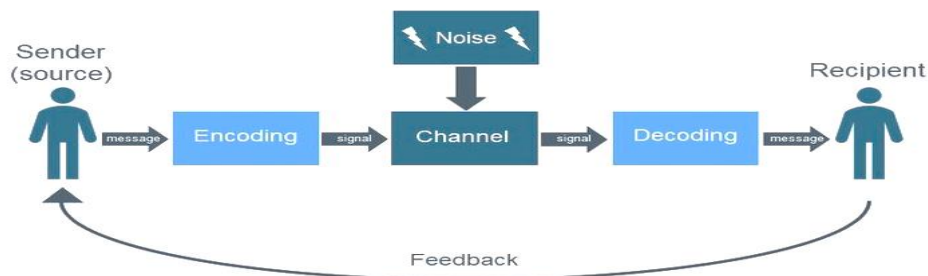
The Shannon and Weaver Model of communication is a theory of communication published in 1948. It consists of six key concepts:

Sender: The person who starts the communication process by choosing a message through a channel / medium to send.

Encoder: The sender is also the encoder who transform a thought or idea into words or body language to communicate to the receiver.

Channel: The medium through which information from one sender and encoder goes through to the decoder and the receiver. It could be oral, written or visual.

Noise: There could be potential interruption to a message on the way from the sender to the receiver. This is known as noise.

Decoder: The content of the message being understood by the person at the other end of the communication.

Receiver: The person who gets the sender's message.

Another concept (**'Feedback'**) was later added to this theory.

Feedback – When the receiver responds to the sender to give feedback or whether the message sent by the sender was understood in its entirety and intent.

According to Pearson and Nelson, "Feedback is the receiver's verbal and non-verbal response to the source's message." The process or technique of feedback should include the following steps:

1. Listening and understanding the message properly.

2. Asking questions if the message is not understood properly and ask for clarification.
3. Understanding the message in its original form.
4. Conveying the response to the sender of the message.

Importance of feedback – Feedback is the basis of proper understanding between sender and receiver. The necessities of feedback are given below:
1. Feedback helps to achieve goals of the communication.
2. Feedback acts as a basis of problem solving and decision making of the organization.
3. Feedback is a good basis of collecting information for planning on what next to be done specially statistical report.
4. Feedback is basis for measuring the effectiveness of communication.
5. Feedback ensures better understanding between sender and receiver.

Feedback can be in the form of –
1. A smile of a nod which is a way of showing feedback in an interactive communication.
2. A question or a clarification is a way of showing feedback in a personal interactive communication.
3. A thank you note or written acknowledge is a way of showing feedback in a written communication.
4. Clapping or hooting by audience is a way of showing feedback in a public speech.

Characteristics of feedback –

The effective feedback is possible only if the communication was perfect and to the point. An effective feedback has the following characteristics:
1. **Specific:** Feedback should have a clear focus on the main message and it should not be vague in meaning.
2. **Timely:** Feedback should be given promptly in case of verbal communication. Any delay in feedback makes the feedback useless.
3. **Meaningful:** Positive feedback helps in giving meaningful suggestions and later on positive decisions can be taken based on the suggestions.
4. **Clear and truthful:** Feedback should be true and clear. It should not be a result of a biased behavior.

Types of feedback –

Descriptive feedback: Specific information in the form of written comments or verbal communication that helps the listener understand what they need to do in order to improve is described as descriptive feedback. Further, depending on the tone and tenor, we may classify feedback as:
a) **Positive feedback:** Appreciation or encouraging words. But this can be even more powerful when the one giving the feedback highlights specific points.
b) **Constructive:** Highlights how a person could do better next time. The choice of words is important and the feedback must be delivered with sensitivity.
c) **Negative feedback:** This type of feedback points out a perceived a negative behavior, without proposing a resolution.

Barriers to Effective Communication – Effective communication is that communication in which the receiver understands what the sender wants to convey in the same form. But, many a time we feel that our friends or parents or even teachers are not able to understand our thoughts.

Let us try to understand the various barriers to effective communication:
1. **Differences in language is the first major barrier.** It would be difficult to communicate for two people if one cannot understand the other person's language.
2. **Physical barriers to non-verbal communication:** In an unusual situation like a pandemic, we are not able to see the non-verbal cues and gestures of others in person.
3. **Psychological barriers:** Many a time when we are disturbed, it is difficult to think clearly and communicate properly. We may say something but mean something else.
4. **Emotional barriers:** Sometime it is difficult to express opinions on certain topics such as politics, religion, culture or gender.
5. **Jargon or slangs or short forms can sometimes be confusing as well.** Some cultures have default slangs for certain expressions.

6. **Lack of attention and distractions can affect the listener.**
7. **Physical disadvantages such as hearing or speech problems** can also sometimes make communication difficult.
8. **Cultural differences in different countries and demographics can vary**. The way people greet or even interpret words is very different in different cultures.

Principles of effective communication – There are 7 Cs of effective communication which are applicable to both written as well oral communication. These are as follows:

1. **Completeness:** No critical information should be missing and no question should remain unanswered.
2. **Conciseness:** It saves time and it ensures that the focus is on the key message.
3. **Consideration:** Empathize and express interest to communicate as per the receiver's preference. Use positive words and avoid any negative references.
4. **Clarity:** Understanding the message easily by the receiver and clarity of thought and intent.
5. **Concreteness:** Message is supported by facts and figures and the message is clear and precise.
6. **Courtesy:** One needs to take into consideration both viewpoints as well as feelings of the receiver of the message. The message is without any bias and prejudice.
7. **Correctness:** There is no semantic error in the message. The facts and figures used in the message are correct. Language and tone are correct.

How to overcome barriers in effective communication –

1. Clarify the ideas before communication.
2. Communicate according to the need of the receiver.
3. Language, tone and content of message should be carefully chosen.
4. Convey things of helps and value to listeners.
5. Ensure proper feedback.
6. Overcoming barriers related to cultural and language.

Writing skills – Writing skill is an important part of communication. It is a part of verbal communication and include e-mails, letters, notes, articles, SMS / chat, blogs etc. In all these forms of written communication, we use sentences to express ourselves.

Sentence: A sentence is a sequence of words which conveys a complete thought.

Parts of a sentence – A complete sentence consists of two parts: a subject and a predicate. The subject is what the sentence is about, while the predicate tells us something about the subject.

Types of sentences – There are four basic types of sentences, depending on the purpose of the speaker or writer.

1. **Imperative sentence** which gives a command. Eg. Look at the red rose.
2. **Declarative sentence** which states a fact, opinion or idea. Eg. The rose is red.
3. **Interrogative sentence** which asks a question. Eg. Is the rose red?
4. **Exclamatory sentence** which expresses a strong emotion. Eg. I love the red rose!

Capitalization – Capitalize means that the first letter of the word is written in capital form. So, we use capitalization normally to mark the beginning of a sentence and also to identify all types of proper nouns, names and titles. We follow the M.I.N.T.S rule of capitalization:

Alphabet	M	I	N	T	S
What it shows:	**Months and Days**	**word 'I' (by itself)**	**Names (of people and places)**	**Titles (of movies, songs and books)**	**Starting letter of sentences**
Rule	Capitalize the first letter in the names of months and days	Capitalize the letter 'I' when it is used as a word (Pronoun).	Capitalize the first letter in the names of people, places, days and months.	Capitalize the first letter in the titles used before people's names.	Capitalize the first letter in every sentence.
Example	My birthday is on Monday, October 21st.	He said that I should accompany him to the mall.	Suresh is planning to visit London next year.	Dr. Malik and Mr. Pandey were invited to the party.	The little girl lost her book.

Punctuation - Certain set of marks, such as full stop, comma, question mark, exclamation mark and apostrophe are used in communication to separate parts of a sentence for better clarity of message. Some common punctuation marks and their rules are shown below:

Punctuation name	Sign	Use	Example
Full stop	**.**	• Used at the end of a sentence. • Used with short form of long words.	• Omar is a professor. His students call him Prof. Omar.
Comma	**,**	• Used to indicate a pause in the sentence. • Used to separate two or more items in a row.	• After getting down from the bus, I walked towards my school. • The grocery store had fresh kiwis, strawberries and mangoes.
Question mark	**?**	• Used at the end of a question.	• Where is your book?
Exclamation mark	**!**	• Used at the end of a word or a sentence to indicate a strong feeling.	• What a beautiful dress! • Hooray! We won the match.
Apostrophe	**'**	• Used followed by an 's' to show possession or belonging. • Used with shortened form of words in informal speech.	• That is Shobha's cat. • Are these Rahim's color pencils? • Let's go for the movies today. • She isn't coming to school today.

Parts of Speech - The part of speech indicates how a particular word functions in meaning as well as grammatically within the sentence.

Parts of speech	What they do	Example sentence	Example words
Noun	Words (naming words) that refer to a person, place, thing or idea.	Kavita bought a book. 'Kavita' and 'book' are nouns.	Tiger, Truth, India, Raj, January
Pronoun	Words used in place of a noun.	Kavita bought a book. She has a great book collection. 'She' is used in place of the noun Kavita.	You, They, Us, She, He
Adjectives	Words that describe other words.	Kavita bought a best-selling book. best-selling is an adjective that describes the noun book.	Large, Red, Naughty, Weak, One-foot
Verbs	Words that show action.	Kavita buys a new book every month. Buys is the verb that tells about Kavita's actions.	Run, Eat, Think, Sit
Adverbs	Words that add meaning to verbs by answering How? How often? When? and Where?	Kavita quickly read her book. 'Quickly' tells us how Kavita did the action.	Easily, Always, Before, Fast, Carefully

Supporting Parts of Speech –

Supporting Parts of Speech	Use	Example
Articles (a, an, the)	Generally used before nouns. An — used before words with a vowel sound A — used before nouns with a consonant sound The — Refers to specific or particular words	Wow! The boy was taken by surprise because he saw a bird flying over his head.
Conjunctions (and, but, because)	Joins two nouns, phrases or sentences	Wow! The boy was taken by surprise because he saw a bird flying over his head.

Prepositions (on, over, in, under)	Connects one word with another to usually answer the questions 'where', 'when' and 'how'.	Wow! The boy was taken by surprise because he saw a bird flying over his head.
Interjections (Wow!, Help!)	Expresses strong emotions, such as happiness, surprise, anger or pain.	Wow! The boy was taken by surprise because he saw a bird flying over his head.

SENTENCE CONSTRUCTION – A sentence is a group of words which starts with a capital letter and ends with a full stop (.), question mark (?) or exclamation mark (!).

Simple sentence: A simple sentence consists of one independent clause (An independent clause contains a subject and a verb and expresses a complete thought.)

Examples –   1. I like coffee.
                      2. John likes playing cricket.
                      3. The earth goes round the sun.

Compound sentence: A compound sentence is two (or more) independent clauses joined by a conjunction or semi-colon.

Examples –   1. Meeta went to work but John went to the party.
                      2. I like coffee and John likes playing cricket.
                      3. Our car broke down; we came last.

There are seven coordinating conjunctions: and, but, or, nor, for, yet, so.

Complex sentence: A complex sentence is an independent clause joined by one or more dependent clauses A dependent clause either lacks a subject or a verb or has both a subject and a verb that do not express a complete thought.

Examples –   1. The woman who taught literature was fired for stealing school goods.
                      2. When I come home, I will eat dinner.
                      3. If you sell the most cakes, you will win the prize.

Parts of a Sentence – Almost all English sentences have a subject and a verb while some also have an object.

Subject: Person or thing that performs an action.
Verb: Describes the action.
Object: Person or thing that receives the action.

Examples -

Sentence	Subject	Verb	Object
He swam in the lake.	He	Swam	the lake
She rode the bicycle.	She	Rode	the bicycle
He threw the ball.	He	Threw	the ball
The dog chased the cat.	Dog	Chased	the cat

Types of Objects - In a sentence, there can be two types of objects — **Direct and Indirect.**

Sentence	Verb	Verb+What?	Verb+by whom / to whom?	Direct Object	Indirect Object
Ravi repaired his car.	repaired	Car		Car	
The children played football.	played	Football		football	
The parents sent him a postcard.	sent	Postcard	Him	postcard	him
He bought his daughter a computer.	bought	Computer	his daughter	computer	his daughter

Types of Sentences –
Active and Passive Sentences –
What is the difference between the two sentences?
1. Radha is reading a book.
2. A book is being read by Radha.

        The action (verb) in both sentences is reading a book. But the 'subject' of both sentences is different. In the first sentence, the subject (Radha) does the action. In the second sentence, the subject (a book) receives the action.

        Sentences where the subject does an action are known to be in the **Active** voice, whereas sentences in which the subject receives an action are known to be in the **Passive** voice.

                         Active Voice   **Passive Voice**

1.	Ali changed the flat tire.	The flat tire was changed by Ali.
2.	I will clean the house every Saturday.	The house will be cleaned by me every Saturday.
3.	Ravi painted the entire house.	The entire house was painted by Ravi.

Paragraph - Sentences come together to form a paragraph. A paragraph is held together by a **'topic sentence'**. A topic sentence tells readers what the particular paragraph is about. All sentences which come after it help in extending the idea or topic and provide more facts and information. They are known as **'supporting ideas'**. Then we keep **adding details** to the paragraph and finally **a concluding sentence** is added.

The Art of Storytelling – Storytelling is a key skill that we should master. Each story has a beginning, a middle and an end.

Objective Type Questions (1 mark):
Fill in the Blanks with Suitable Prepositions.
1. He lives ……… 48, MG Road.
(a) In   (b) At   (c) On   (d) For
Answer: (b) At
2. We started …………. Eight …………… the morning.
(a) At, in   (b) In, at   (c) In, on   (d) At, on
Answer: (a) At, in
3. Stricken with grief, she hanged herself ………….. a piece of cloth.
(a) With   (b) By   (c) To   (d) Of
Answer: (a) With
4. This portrait was painted …………… an artist who lived in the eighteenth century.
(a) By   (b) With   (c) In   (d) For
Answer: (a) By
5. We must start …………… dawn if we want to reach in time.
(a) In   (b) On   (c) At   (d) With
Answer: (c) At
6. The next flight is due ……… 6 pm.
(a) In   (b) On   (c) At   (d) Before
Answer: (c) At
7. He ran twelve miles …….. two hours.
(a) In   (b) At   (c) On   (d) For
Answer: (a) In
8. He ran ……… the room, panting for breath.
(a) At   (b) Into   (c) After   (d) On
Answer: (b) Into
9. He does not leave his house ……. 9 pm.
(a) In   (b) On   (c) Before   (d) By
Answer: (c) Before
10. The train departs ………. 3 am.
(a) In   (b) At   (c) On   (d) Within
Answer: (b) At

Subjective Type Questions: (2 marks)
1. Write any three advantages of verbal communication.
Answer: The advantages of verbal communications are:
(a) It saves time in communication as it is a direct communication between sender and receiver. You don't have to depend on any other communication medium (like telephone or the internet) for proper communication.
(b) Quick feedback can be taken once the communication is completed. The sender can see and observe the feedback of the receiver instantly without asking.

(c) It provides clarity in communication as any further explanation if required can be given by the speaker. The clarity of words or ideas can be taken from the speaker at the time of conversation.

2. What do you mean by body language?

Answer: Body language is your unspoken communication that is used to show your true thoughts and emotions. It includes your gestures, facial expressions and posture. Positive body language is and of itself creates a sense of confidence even if you are not feeling confident.

3.How can we give the feedback?

Answer: Feedback can be given in the form of:
   (a) A smile or a nod which is a way of showing feedback in an interactive communication.
   (b) A question or a clarification is a way of showing feedback in a personal interactive communication.
   (c) A thank you note or a written acknowledgement is a way of showing feedback in a written communication.
   (d) Clapping or hooting by audience is a way of showing feedback in a public speech.

4.How can you describe manners?

Answer: The way someone acts or behaves is a part of manners. Mannerisms are shown usually through actions, so they are often described by phrases with verbs.

Some of the verbs related to mannerisms are:

To show nervous temperament some people might tap their fingers, bite their finger nails or chew pencil tips, etc.

Some people roll their eyes to show that they are being sarcastic.

Let us see how to describe mannerisms.

a. Teena chew pencil tips while watching horror show.

b. Neha commented while rolling her eyes.

5.   What do you mean by weakness? Write a few words to describe weakness.

Answer: Weakness is a persons' characteristic or property of lacking physical or mental strength and also shows inutility to act. Words related to weakness

Obstructer, Fearful, Aggressive, Greedy, Moody, Shy, Indiscipline, Dull, Wasteful etc.

Tips for scoring good marks in Class X CBSE Board Exam

   1. Set Clear Goals and Prioritize.

   2. Write Down Notes or Use Flash Cards.

   3. Make proper short notes for quick revision.

   4. Practice Writing Your Answers.

   5. Self-Testing Through Sample Papers & Mock Tests.

UNIT 2 - SELF MANAGEMENT SKILLS - II

INTRODUCTION -

Self-management skills are those abilities that allow a person to feel more productive while doing daily routine tasks regardless of the working environment.

The skills that are needed for self-management -

1. **Self-awareness:** You should be self-aware of your positive and negative traits. Look at your personality insight and work proficiencies.
2. **Responsibility:** Taking responsibility of what we do is very important. Taking responsibility is a way to move towards self-development.
3. **Time Management:** Prioritize the things you have to do. Remove waste and redundancy from work. Make a time table and follow it diligently.
4. **Adaptability:** Stay current with best practices and read up on new information always. Prepare yourself for new changes, so that you can transition seamlessly.

Stress - Stress is one of the important reasons for low productivity in all stages of life. Stress drains one's energy and impedes day-to-day work and peace of mind.

Stress can be positive, if taken in the right sense, and may result in effective outcomes. However, the most common is negative stress that makes a person worrisome, less productive and may also lead to various psychosomatic disorders. **Good stress is also known as eustress.**

Bad stress is acute stress. Bad stress if continues for a long duration turns into chronic stress.

Stress Management - Stress management refers to focusing on maintaining a healthy body and mind to handle stressful situations.

Stress refers to a physical, mental or emotional strain or tension.

Sources of Stress -

i. **Mental:** It is easy to get stressed due to examinations and assignments. There are expectations from parents and teachers besides peer pressure. This can lead to feelings of anxiety and stress.
ii. **Physical:** Youngsters can become conscious of their looks while coping with hormonal changes. Social media, fashion magazines and peer pressure to look good only add to their stress.
iii. **Social:** Managing relationships and friendships can be difficult in today's time of social media and societal expectations. One feels the need to be the best at everything which can create a false sense of pressure for overachievement.
iv. **Financial:** With a number of social media sites, youngsters often feel the need to shop more and look good. They also want to be financially independent. This creates financial pressure on them.

Importance of Stress Management - As can be seen, we are surrounded by various sources of stress. It is important to be able to cope with stress to lead a healthy and happier life to ward off illnesses later in life. Stress management can lead to the following benefits:

1. Improves mood and general well-being.
2. Boosts immune system.
3. Helps in increasing lifespan.
4. Checks distractions in life.
5. Prevents psychological and other behavioral disorders

Stress Management Techniques - Stress is a mental state wherein an individual may feel overwhelmed with a situation. It affects different people differently. Some of the symptoms of stress may be common while others may vary from person to person.

Some physical signs which may point to stress are:

1. Breathlessness
2. Dry mouth or choking feeling

3. Indigestion
4. Fatigue
5. Nausea
6. Sweaty palms
7. Cold hands and feet

At the mental level, the symptoms may include:
1. Irritation
2. Mood swings
3. Boredom
4. Loneliness
5. Anxiety

Self-awareness about symptoms of stress can help in managing it better. It is important to speak to well-wishers like family and friends, if required. Apart from sharing and thinking positively, engaging in the following activities can also help manage stress:

a) **Physical exercise:** Physical exercise in the form of walking, running or going to the gym can be helpful in relieving stress as it helps stabilize mood, improves self-esteem and induces sleep after a long day at work.
b) **Yoga:** Yoga includes a series of asanas, postures and breathing exercises to gain control of your body and mind. There are various types of yoga which help calm both the body and the mind.
c) **Meditation:** It is a practice where an individual uses a set of techniques and focuses on a particular object or thought to achieve a calm state of mind, thus reducing stress.
d) **Recreational activities:** Engaging in activities like watching movies, playing games, singing, dancing or arts can help one get to a calmer state of mind and be cheerful.
e) **Going on vacations with family and friends:** Vacations with your loved ones provide an opportunity to appreciate different flavors of life and take a break from the mundane daily routine. It is very useful in de-stressing and rejuvenating oneself.
f) **Taking nature walks:** Taking nature walks in the woods or in the countryside relaxes the brain and can help one become calmer. There are many apps, such as Calm, which can help one relax by listening to soulful natural soundscapes.

Students are one of the most common victims of stress. Factors such as financial expenses, over commitment, family expectations, deadlines and workload-all create stress in students. A little stress related to studies is very useful as it motivates students but too much stress can make your daily life difficult.

A long term stress can give rise to many serious problems such as depression and anxiety. Managing stress in its early stages can help maximize opportunities for students.

INDEPENDENT WORKING - An "independent" worker usually means someone who does not need to be led by anyone in every step of the way or someone who can handle troubleshooting on their own. The people who work independently know that they have to take initiative and act accordingly. For them, it means:
- Becoming self-aware, self-monitoring and self-correcting.
- Knowing what you need to do
- Taking the initiative rather than waiting to be told what to do,
- Doing what is asked to the best of your ability, without the need for external prodding, and
- working until the job is completed.
- Learning to work at a pace that you can sustain.
- Taking ownership of your mistakes without looking for excuses
- Refusing to let self-doubt or negative emotions take you off from your work.

The key factors behind working independently are:

1 Self-awareness

2 Self-motivation

3 Self-regulation

Emotional Intelligence – Emotional intelligence is the ability to identify and manage one's own emotions, as well as the emotions of others. It is generally said to include at least three skills:

• **Emotional awareness:** the ability to identify and name one's own emotions.

• **Harnessing emotions:** the ability to harness and apply emotions to tasks like thinking and problem solving.

• **Managing emotions:** the ability to regulate one's own emotions when necessary and help others to do the same.

Being emotionally intelligent enhances your chances of success and a balanced life.

Some steps to manage emotional intelligence are as given below:

• **Understand your emotions:** Observe your behavior and note the things you need to work on. You can then work on the things you need to improve.

• **Rationalize:** Do not take decisions abruptly; be rational in your thinking.

• **Practice:** Do meditation and yoga to keep yourself calm.

Knowing Yourself - Understanding who you are, what you like or dislike, what are your beliefs, what are your opinions, what is your background, what you do well and what you do not do well is important because only then you can actually measure your strengths and weaknesses.

Strength and Weakness Analysis - Understanding who you are means looking outside your usual characteristics, such as your name, qualification and interpersonal relationships. In other words, being self-aware actually means knowing your inner strengths, hidden talents, skills and even weaknesses. Let us look at how we define strengths and weaknesses.

Examples of strengths -

• I am good at creative writing.

• I am confident of speaking in front of an audience.

• I play guitar very well.

Examples of weaknesses -

• I find it difficult to solve mathematics problems.

• I would like to speak English fluently.

• I do not like to lose in any game or sports.

Techniques for Identifying your Strengths and Weaknesses -

Finding Strengths (or abilities) -

1. Think of anything that you are always successful at.
2. Think about what others like in you
3. Take out time and think about what you do well.
4. Find what makes you happy and you do with perfection.
5. Find what you enjoy doing and does it well.

Finding Weaknesses -

1. Find those areas where you struggle and the things you find difficult to do.
2. Listen to the feedback given by others for you.
3. Be open to feedback and accept your weaknesses without feeling ashamed.
4. Motivate yourself and note the area of improvement.

You can ask the following questions to find your strength and weakness:

a) How am I different from others?

b) What do I do better than others?
c) What do other people admire in me?
d) What makes me stand out?
e) Why do I worry and struggle?
f) Where, how and why do others perform better than me?
g) What advice for improvement do I often receive from others?

Difference between Interests and Abilities (Strengths) -

S. No.	Interests	Abilities
1.	Things that you like to do in your free time that make you happy.	An acquired or natural capacity.
2.	Things you are curious about or would do even if no one asked you to do it.	Enable you to perform a particular job or task with considerable proficiency.
3.	Things you want to learn or would like to do in the future.	

When your interests do not match your abilities, you can either improve your abilities or follow some other path. For example, you may like music, but you may not be good at singing. In that case, do not try to become a singer!

SELF-MOTIVATION - Self-motivation is the force inside you that drives you to do things. Self-motivation is what forces Is to achieve our goals, feel happy and improve our quality of life. It is our ability to do the things That need to be done without someone or something influencing us. Different people are motivated by different things and at different times in their lives.

Self-motivation is our internal drive to achieve, produce, develop, and keep moving forward. When you think you are ready to quit something, or you just do not know how to start, your self- motivation is what pushes you to go on.

Types of Motivation -
1. **Internal / Intrinsic motivation -** the force that leads you to achieve a goal because of personal satisfaction or desire. **Examples are:**
   a) Putting up your own business.
   b) Participating in a competition.
   c) Achieving a trophy or medal by working hard for it.

We do things because they make us happy, healthy and feel good. For example, when you perform on your annual day function and you learn something new, such as dancing, singing, etc. you feel good.
2. **External Extrinsic motivation -** the driving force that drives you in achieving your goal. Such as
   a) Money
   b) Prize.
   c) Sometimes a simple smile and encouragement.

We do things because they give us respect, recognition and appreciation. For example, Meera participated in a 100 m race and won a prize. This motivated her.

Qualities of Self-motivated People -

❖ **Mr E Shreedharan**, Former Managing Director, Delhi Metro Rail Corporation Ltd, popularly known as the "Metro Man", was a self-motivated and energetic person. With his dedication and respect for others, he motivated his team to work hard and achieve results.

❖ **Mahashay Dharmapal Gulati**, the founder of Mahashian Di Hatti (MDH) Private Limited started with a small shop in Karol Bagh but with his focus, dedication and clear ideas, MDH (Spice Company) became one of the most popular brands in India besides having a good reputation all over the world.

Building Self-motivation - There are four steps for building self-motivation, which are as given below.

1. **Find your strength:** We should know our positive points.
2. **Set and focus on your goal:** We need to set our goal and focus it with concentration.
3. **Develop a plan to achieve goal:** We need to make a road map to our goal.
4. **Stay loyal to your goals:** We need to be dedicated towards our goal for achieving it.

SELF-REGULATION - GOAL SETTING - Self-regulation is concerned with how you control and manage yourself and your emotions, inner resources, and abilities. It also includes your ability to manage your impulses. Self-control is NOT masking or hiding your emotions but recognizing and controlling them appropriately.

GOALS AND SETTING SMART GOALS –

Goals: Goals are those dreams that you want to achieve in life but these dreams have a deadline to get them, e.g., saving pocket money to buy a favorite mobile phone by a particular date.

Goal setting: Goals are set with an aim of fulfilling. It is all about finding and listing your goals and then planning on how to achieve them. Goals allow you to separate out what is important and should be done for fulfilling our aim. It helps you to concentrate on the end result instead of less important work. This will make you successful in your career and personal life.

How to Set Goals -

We can use SMART model for setting our goals. SMART stands for:

S	**M**	**A**	**R**	**T**
Specific	**Measureable**	**Attainable**	**Realistic**	**Time-bound**
Do: Set real numbers with real deadlines. Don't Say "I want more Visitors.	Do: Make sure your goal is Trackable. Don't Hide behind buzzwords like, "brand engagement", or "social influence".	Do: Work towards a goal that is challenging but possible. Don't Try to take over the world in one night.	Do: Be honest with yourself-you know what you and your team are capable of. Don't Forget any hurdles you may have to overcome.	Do: Give yourself a deadline. Don't Keep pushing towards a goal you might hit, "someday"

Specific: A specific and clear goal must be there. Here is a list of six questions which you need to answer:

1. Who is involved in the goal?
2. What do I want to do?
3. Where do I start?
4. When do I start and finish?
5. Which means do I use?
6. Why am I doing this?

"I want to learn playing guitar". This sentence shows that your **goal is not specific**.

"I want to learn playing a guitar from a guitar teacher as I have to take part in an inter-school competition next year." This sentence shows that your **goal is specific.**

Measurable: A measurable goal is when we can find the exact measurement of our goal we want. Here is a list of two questions which you need to answer:

1 "How much?" or "How many?"

2. "How do I know that I have achieved results?"

"I want to be rich." This sentence shows that your **goal is not measurable**.

"I want to be rich and have five times more money than what I have today in my hand now."
This sentence shows that your **goal is measurable**.

Achievable / Attainable: We can break down big goals into smaller parts so that the goal is achievable.

"I want to become a teacher in a reputed school." This sentence shows whether your goal is achievable or not, you are not clear.

We can break down the goal into smaller goals like:

1. "First complete higher secondary"
2. "Then Complete Graduation"
3. "Complete B.Ed."
4. "Apply for jobs in the teaching field"

Realistic: A realistic goal is when we know we can make it real. We would be doing something that we want to achieve and can work towards it.

Example of unrealistic goal: "I will prepare for exam in three hours."

Example of realistic goal: "I will spend three hours every day for preparing my term exam."

Time bound: A **SMART** goal should have a timeline or deadline. It must have a time duration by when the goal needs to be achieved. This motivates us to take actions to completely fulfil the goals.

Not a time bound goal: "I want to lose my weight by 20 kg."

Time bound goal: "I want to lose my weight 20 kg in the next six months."

SELF-REGULATION-TIME MANAGEMENT - Producing expected results in a timely manner determines the success of our effort. Time management is an extremely important self-management skill that makes an employee to be more productive.

Self-regulation allows us to manage our emotions, behavior and body movement when faced with tough situations. Self-regulation is not only controlling yourselves but also managing time so that you can do smart work.

"Time management" is the process of organizing and planning how to divide your time between specific activities. Good time management enables you to work smarter rather than work harder so that you get more work done in less time. Failing to manage your time damages your effectiveness and causes stress.

In Self-regulation, time management is the thinking skill that helps you to:

1. complete tasks on time.
2. make a daily timetable.
3. make a good guess at how long it will take you to do something.
4. submit homework and assignments on time.
5. not waste time during the day

Tips for Practicing the Four Steps for Effective Time Management -

a. Avoid delay or postponing any planned activity
b. Organize your room and school desk
c. Develop a 'NO DISTURBANCE ZONE', where you can sit and complete important t
d. Use waiting time productively
e. Prepare a 'To-do' list
f. Prioritize
g. Replace useless activities with productive activities

Objective Type Questions (1 Mark):

1. Which of these is not a way of enhancing ability to work independently?

(a) Self-awareness   (b) Self-motivation   (c) Self-regulation   (d) Self-governance

Answer: (d) Self-governance

2. Which of these are ways to reduce stress?

(a) Physical exercise   (b) Meditation

(c) Going on vacations with family and friends   (d) All of the Above

Answer: (d) All of the Above

3. Which of these are not a physical signs of stress?

a) Breathlessness   (b) Nausea   (c) Fatigue   (d) Fever

Answer: (d) Fever

4. Stress cannot be _____ but _____.

(a) Cured, practiced   (b) Eradicated, managed   (c) Learnt, forgotten   (d) Avoided, welcomed

Answer: (b) Eradicated, managed

5. Which of these is not a benefit of stress management?

(a) Improves mood   (b) Promotes longevity

(c) Increases efficiency and effectiveness Increase in weight   (d) Increase in weight

Answer: (d) Increase in weight

6. Radhika has prepared a timetable to achieve her goal. This skill is known as

    (a) Self-Awareness   (b) Responsibility   (c) Time-Management   (d) Adaptability

Answer: (c) Time-Management

7. The force that is within you drives you to do things.

    (a) Self-Awareness   (b) Self-Regulation   (c) Self-Motivation   (d) None of the above

Answer: (c) Self-Motivation

8. A set of dreams with a deadline to get them...............

    (a) Goals   (b) Goal Setting   (c) Vision   (d) None of the above

Answer: (a) Goals

9. We can use _____ method to set goals.

    (a) SMART   (b) CLASS   (c) FIRST   (d) None of the above

Answer: (a) SMART

10. Strength and weakness analysis starts with

    (a) knowing others   (b) understanding feelings of others

    (c) identifying others fault and weaknesses   (d) knowing yourself

Answer: (d) knowing yourself

Subjective Type Question (2 Marks):

1. What is stress?

Answer: Richard Lazarus explained 'Stress as a condition or feeling experienced "when a person perceives that demands exceed the personal and social resources; the individual is able to mobilize." This means that we experience stress if we believe that we don't have the time, resources, or knowledge to handle a situation. In other words, we experience stress when we feel our situation is "out of control" or "it cannot be handled".

2. What are some common signs and symptoms of stress?

Answer: Some common signs and symptoms of stress include:

- Frequent headaches:
- Cold or sweaty hands and feet.
- Frequent heartburn, stomach pain, or nausea.

- Panic attacks.
- Excessive sleeping, or insomnia.
- Persistent difficulty concentrating.
- Obsessive or compulsive behaviors.
- Social withdrawal or isolation.
- Constant fatigue.
- Irritability and angry episodes
- Significant weight gains or loss.
- Consistent feelings of being overwhelmed or overloaded.

3. What is Good and Bad Stress?
Answer: Stress can be good or bad. The so-called "good stress" is also known as "eustress" by the psychologists. It is the type of stress we feel when we feel excited. Our pulse quickens, our hormones change, but there is no threat or fear. We feel this type of stress when we ride a roller coaster, go for a promotion, or when we go to receive an award. It keeps us feeling alive and excited about life.

Bad stress is acute stress. Acute stress increases stress response (stress response is the collection of physiological changes that occur when you face a threat). This is what we normally think of as "stress." Bad stress in itself affects us mentally and physically till if we find ways to relax. Once the factors creating stress have been dealt with, we return to our pre-stress state and feel healthy and happy.

4. What do you mean by Independent Working? What are the key factors required for working Independently?
Answer: An "Independent" worker usually means someone who does not need to be led by anyone in every step of the way or someone who can handle troubleshooting on their own.
The Key factors behind working independently are:
1. Self-awareness
2. Self-motivation
3. Self-Regulation.

5. What are the factors that cause common stress to students?
Answer: The factors that create common stress in students are:
1. **Social factor:** Social stress puts serious peer pressure on students. The causes of stress can be dealing with new relationships, balancing academic life with social life, living with or without family members, adjusting to the new environment, etc.
2. **Academic factor:** Strict schedules, deadlines, low grades, challenging classes, examination, responsibilities, and poor time management-all lead to academic stress.
3. **Other Factors:** The other factors include issues that are not related to academic or social life. These can include daily commute, part-time job, financial burdens, etc.

Tips for scoring good marks in Class X CBSE Board Exam:

1. Set Clear Goals and Prioritize.
2. Write Down Notes or Use Flash Cards. ...
3. Make proper short notes for quick revision.
4. Practice Writing Your Answers.
5. Self-Testing Through Sample Papers & Mock Tests.

Syllabus for the Session 2023-24:

UNIT 3: INFORMATION AND COMMUNICATION TECHNOLOGY SKILLS – II

LEARNING OUTCOMES	THEORY	PRACTICAL
1. Distinguish between different operating systems	1. Classes of operating systems 2. Menu, icons and task bar on the desktop 3. File concept, file operations, file organization, directory structures, and file-system structures 4. Creating and managing files and folders	1. Identification of task bar, icons, menu, etc. 2. Demonstration and practicing of creating, renaming and deleting files and folders, saving files in folders and sub-folders, restoring files and folders from recycle bin

2. Apply basic skills for care and maintenance of computer	1. Importance and need of care and maintenance of computer
	  - Cleaning computer components
	  - Preparing maintenance schedule
	  - Protecting computer against viruses
	  - Scanning and cleaning viruses and removing SPAM files, temporary files and folders
		1. Demonstration of the procedures to be followed for cleaning, care and maintenance of hardware and software

Topics & sub-topics

Topics	Sub-topics
Session 1 Basic Computer Operations	● Computer Hardware and Software ● Starting a Computer ● Shutting Down a Computer ● Using the Keyboard ● Function Keys ● Using a Mouse
Session 2: Performing basic file operations	● Basic file operations ● Files and Folders
Session 3: Computer Care and Maintenance	● Importance of Care and Maintenance of Computers ● Basic Tips for Taking Care of Devices
Session 4: Computer Security and Privacy	● Reasons for security break ● Threats to computers ● Protecting your data

Key points from the chapter

- ICT stands for Information and Communication Technology. ICT refers to all the methods, tools, concepts related to storing, recording and sending digital information.
- Information can be recorded or stored in many ways, handwritten on paper, written using a typewriter and so on. When information is stored and recorded on electronic devices, it takes on a 'digital' form.
- A computer system consists of two main parts— the hardware and the software. The physical parts that we can see and touch are called hardware. It is the machinery of a computer. These are the keyboard,

monitor, CPU, etc. There is another important part i.e., the software. Though we cannot see it, it makes the hardware work the way we want.

- To start a computer, press the Power button on the CPU. This will start the operating system.
- A computer automatically runs a basic program called BIOS (Basic Input/Output System) as soon as it is switched on or the power button is pushed on.
- There are different categories of keys in a keyboard, each having some specific purpose.
- All information stored in a computer is kept in files. Different types of files store different types of information. Each file is given a file name and has a file name extension that identifies the file type.
- A folder is a location where a group of files can be stored.
- Electronic gadgets, like computers and smartphones, function more effectively when they are taken care of. We must take care of our equipment just like we take care of our bodies by bathing, cleaning our teeth, and eating every day. A computer is a sensitive device with several electronic moving parts. It needs to be shielded from harm and dust. It won't operate effectively if we are careless.
- Computer security and privacy deals with the measures used to prevent loss of data.
- Threats are the ways in which personal information can be leaked from a computer without our knowing.
- To protect our data from theft and viruses we can take the following measures: Use strong passwords, use antivirus, use firewall.

Multiple Choice Questions (MCQs)

QNo	Questions
1	ICT Stands for (a) Indian communication Technology (b) Information and Communication technology (c) Inform and communicate technology (d) Inform and communication technology
2	Arrange the steps in the correct order. (i) Press the power button on CPU (ii) BIOS Load the Operating System (iii) Computer run basic program (iv) Load the Operating system (a) (i)-(ii)-(iii)-(iv) (b)(ii)-(iii)-(i)-(iv) (c) (i)-(iii)-(ii)-(iv) (d) (iv)-(iii)-(ii)-(i)
3	Which of the following is not an example of an Operating System ? (a) Sun (b) Window XP (c) Window CE (d) Window 9
4	Which of the following is an example of Antivirus Software? (a) MaCfee (b) Disk Clean-up (c) Notepad (d) Ms access

5	Which of the following is a symptom of a computer affected with a virus ?
	   (a) Computer Can't open a permanently deleted file (b) computer runs very fast
	   (c) Computer runs very slow (d) Computer go in sleep mode after 5 min inactive

6	Ms word helps us to read and edit file for (a) Audio (b) text (c) video (d) Exe
7	Which one of the following shortcut keys is used to cut a file ? (a) Ctrl+b (b) Ctrl+x (c) Ctrl+v (d) Ctrl+p
8	Which of the following is the input device ? (a) Plotter (b) mouse (c) speaker (d) camera
9	Which of the following is mobile Operating system (a) Symbian (b) window 7 (c) window 11 (d) ms word

10	Similar types of file can be placed into groups called (a) File (b) folder (c) icon (d) drive
11	Can computer virus infect hardware of system ? (a) Yes, temporarily (b) no (c) Can't say (d) Yes, Permanently
12	Which of the following is a strong password? (a) abc@123 (b) abc123 (c) 123456 (d) abcedef
13	To recover a file from the Recycle Bin, right-click the file, and then click _____ . (a) Recover (b) Restore (c) Move (d) Undelete
14	What is the term used when you press and hold the left mouse key and move the mouse around? (a) Highlighting (b) Dragging (c) Selecting (d) Moving
15	What is the shortcut key to delete a file or folder in windows? (a) Del (b) Ctrl + D (c) Alt + D (d) Ctrl + Del

Answers to MCQs

1. b	2. b	3. d	4. a	5. c	6. b	7. c	8. b
9. a	10. b	11. b	12. a	13. b	14. b	15. a	

Very Short Answer Questions (2 Marks)

QNo	Questions
1	What is BIOS ?
2	Define Real time operating system ?
3	Define Computer Icons ?
4	Define Recycle Bin ?
5	Name any three mobile operating systems ?
6	Why should the keyboard be covered when not in use?
7	What are files and folders in a computer system?
8	How to increase Computer performance?
9	What do you mean by Operating System?
10	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.

Answer to Very Short Answer Questions (2 Marks)

QNo	Answers
1	BIOS (basic input output system) is a program used to start a computer system when the computer is powered on .
2	A real-time operating system (RTOS) is an OS that guarantees real-time applications a certain capability within a specified deadline.
3	An icon is **a small graphical representation of a program, feature, or file**.
4	Storage area where deleted files are stored.
5	Three mobile operating system are 1. Symbian 2. Android 3. ios
6	Dirt and dust can cause damage to the keyboard. Key of the keyboard may not function properly if dirt enters the keys.
7	a. File – File is a collection of information different types of files store different types of information. Every file has a file name and extension that identifies the type of file. b. Folder – Folder is a collection of files or a group of files.
8	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.
9	Operating System : It is a software that acts as an interface between the user and the computer.
10	a. Hardware b. Software c. Operating System d. Keyboard e. Mouse

Short Answer Questions (3 Marks)

QNo	Questions
1	Write Steps to create a new folder ?
2	Write any four components of window 7 desktop ?
3	Why should regular disk defragmentation be done?
4	How can you prevent your computer from virus attack?
5	What is a firewall?
6	What is a temporary file? Write two names of temporary files?
7	Write common sign of a virus attack ?
8	What is the purpose of the mouse?
9	Differentiate between Worms and Trojan Horse.
10	What is a Security Break?

QNo	Answers
1	Double -click computer icon Select the drive in which you want to create folder Click new folder from toolbar Type name and press enter
2	Four component of window 7 desktop are 1. Taskbar 2. Wallpaper 3. Icons 4. Start button
3	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 disk space to be used at an optimal level.
4	To prevent our computer from viruses, use Antivirus software which will detect and remove viruses from your computer.
5	Computer firewall is a network security system that monitors and controls incoming and outgoing network traffic based on user defined security rules.
6	Temporary file is created when you are running a computer program. Some names of temporary files are abc.temp,wan.temp
7	Some common signs of virus attack are. 1. Computer runs very slow 2. There is a change in file size. 3. Computer restarted on its own.
8	The purpose of the mouse is – a. Roll Over or Hover – Whenever we bring the mouse over the files, it shows the details of the file. b. Click or Double Click – Mouse allows you to select, open or delete files and folders from the computer system. c. Drag and Drop – Click on the file and drag and drop your file where you want.
9	Worms: These are viruses that replicate and spread to all files once they attack a computer. Trojan: A Trojan Horse seems to be a useful program but once it reaches a computer it starts destroying data.
10	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.

Long Answer Questions (4 Marks)

QNo	Questions

1	Write four points to care for and maintain the computer ?
2	Differentiate between Hardware and Software ?
3	Write a few tips to protect your data from online theft and viruses?
4	How is a computer file system similar to our physical file system in a school?
5	What are the different types of keys in Keyboard?

QNo	Answers
1	Some of the maintenance activity ares Keep the computer components like keyboard ,mouse clean Replace hardware which is not working properly Keep food items away from computer Cables and chords not mesh up
2	<table><tr><td>Hardware The physical components that we can see and touch. Monitor, Keyboard are examples of Hardware. It is manufactured. Hardware typically wears out over time.</td><td>Software It is a set of programs/instructions that perform a specific task MS Paint, MS Word are examples of Software. It is developed and engineered. The software does not wear out with time.</td></tr></table>
3	Few tips to protect our data from online theft and viruses are: a. Use passwords to login to your computer: b. Install Anti-virus and Firewall: c. Use Data Encryption d. Give details of your credit card or bank account only on secure sites
4	In any school, each teacher has a separate cabinet where they keep the files of different students or classes on separate shelves. Similarly, information on a computer is stored in electronic files, which can be put into separate folders. It is easier to manage the electronic files as they can be simply copied, moved, renamed or even deleted.
5	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.

- ❖ A one-mark and a two-mark questions are likely to be asked from this Unit. Students should prepare accordingly.
- ❖ Try to answer pointwise to the best extent possible.
- ❖ Employability Skills NCERT book must be read thoroughly by the students.

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Syllabus for the Session 2023-24:

UNIT 4: ENTREPRENEURIAL SKILLS- II

LEARNING OUTCOMES	THEORY	PRACTICAL
1. List the characteristics of successful entrepreneur	1. Entrepreneurship and society 2. Qualities and functions of an entrepreneur 3. Role and importance of an entrepreneur 4. Myth about entrepreneurship	1. Writing a note on entrepreneurship as career option 2. Collecting success stories of first generation and local entrepreneurs 3. Listing the entrepreneurial qualities – analysis of strength and weaknesses 4. Group discussion of self-qualities that students feel are needed to become successful entrepreneur
	5. Entrepreneurship as a career option	5. Collect information and related data for a business 6. Make a plan in team for setting up a business

Topics & sub-topics

Topics	Sub-topics
Session 1: Entrepreneurship and Society	
Session 2: Qualities and Functions of an Entrepreneur	● Qualities of an Entrepreneur ● Functions of an Entrepreneur
Session 3: Myths about Entrepreneurship	● Discussion on different misconceptions
Session 4: Entrepreneurship as a Career Option	

Key points from the chapter

- Today, the topic of entrepreneurship is widely discussed, particularly in India. Entrepreneurship is a form of self-employment in which an individual operates a business to meet customer needs while also looking for methods to improve the operation in order to increase earnings.
- Markets are where entrepreneurs operate their firms. Both buyers and sellers of goods and services can be found in the market. Everyone benefits when people buy and sell from one another because everyone involved makes money. This is how businesspeople contribute to the development of their communities and society.
- Qualities of an entrepreneur are: Confident, Patient and Creative
- There are certain misconceptions about entrepreneurs: (a) The misconception is that every business idea needs to be unique or special. (b) The misconception we have is that a person needs a lot of money to start a business. (c) A misconception we have is that only a person having a big business is an entrepreneur. (d) A misconception we have is that entrepreneurs are born, not made.

QNo	Questions
1	Which statement is wrong for successful entrepreneurs? (a) They do not believe in themselves and their abilities. (b) They are creative and think differently about business ideas. (c) They take responsibility for their actions. (d) They are confident.
2	An _____ is a person who is self – employed, is willing to take a calculated risk and brings in a new idea to start a business. (a) Software Engineer (b) Entrepreneur (c) Civil Engineer (d) Mechanical Engineer
3	What do entrepreneurs do when she/he runs their business? (a) Fulfill Customer Needs (b) Use Local Materials (c) Create Jobs (d) All of the above
4	There may be losses at times but even then an entrepreneur should stay_____ and continue to work hard towards their goal. (a) Negatively (b) Positively (c) Both (a) and (b) (d) None of the above
5	Experimenting with many ideas is a quality related to _____. (a) Perseverance (b) Confidence (c) Creativity (d) Trial and error
6.	Susheela decides to sell her company tyres in Sri Lanka. It does not sell and she has a loss. She apologizes to the people who work for her. She says she will plan better next time. She............................... (a) Takes responsibility for your mistakes (b) Thinks before making a decision (c) Does not give up (d) Is creative
7.	Rehnuma has two people who work for her. Every day, she spends one hour with them to learn about what they've done that day. (a) Creates a new product (b) Divides income (c) Manages the business (d) None of the above
8.	_____ are people who work for a person or an organization and get paid for that. (a) Self Employed (b) Wage employed (c) Both of the above (d) None of the above
9.	The money used to start a business is called_____

	(a) Capital (b) Business Money (c) Start Up (d) None of the above
10.	Which of the following are misconceptions about Entrepreneur. (a) Entrepreneur are born, not made (b) A person having a big business is an entrepreneur. (c) A person needs a lot of money to start a business. (d) All of the above
11.	Which of the following is a disadvantage of entrepreneurship as a career? (a) Uncertainty (b) Independence (c) Ambition fulfillment (d) None of the above
12.	The decision-making function of an entrepreneur includes: (a) Hard Work (b) Risk bearing (c) Utilisation of financial resources (d) All of the above
13.	'An entrepreneur has to get the work done through other.' Which characteristic of the entrepreneur does this statement depict? (a) Motivator (b) Organiser (c) Innovator (d) All of the above
14.	Ravi's customer comes to his store and starts shouting at him. He does not get angry. He listens to what his customer is saying. He is........................... (a) Hardworking (b) Confident (c) Patient (d) Trying new ideas
15.	When many entrepreneurs sell mobile phones in a market, the prices of phones increase.(True/False) (a) False (b) True
16.	Which of these is not a business activity ? (a) Service (b) Manufacturing (c) Creativity (d) Merchandising
17.	Amul (White revolution in India) is an example of which of these business enterprises (a) Sole proprietorship (b) Partnership (c) Cooperative society (d) Joint stock company
18.	Hybrid is a type of business/company which (a) Provides products with no physical form

	(b) Is a buy and sell business (c) Is a mixed type of business (d) None of these

19	Which one of these is not a step to start a business?
	    (a) Business idea
	    (b) Getting money and material
	    (c) Understanding customer needs
	    (d) Trade services

20	Mary buys bulbs for her business from Noida. She learns that bulbs are cheaper in Faridabad. So, she decides to start buying bulbs from there. select the correct business activity.
	    (a) Makes decisions
	    (b) Divides income
	    (c) Takes risk
	    (d) Makes new product

Answers to MCQs

1. (a)	2. (b)	3. (d)	4. (a)	5. (c)	6. (a)	7. (c)	8. (b)
9. (a)	10. (d)	11. (a)	12. (c)	13. (a)	14. (c)	15. (a)	16. (c)
17 (c)	18 (c)	19 (d)	20 (a)				

Very Short Answer Questions (2 Marks)

QNo	Questions
1	Give some advantages of entrepreneurship as a career.
2	What is wage employment?
3	What are the different ideas entrepreneurs add?
4	What is self employment?
5	Write against the option, if the business idea is of self-employment or wage employment. **(a)** Cooking in a restaurant **(b)** Owning a clothing business **(c)** Having a dosa selling stall
6	Name the term used for a false belief or opinion about something.

Answer to Very Short Answer Questions (2 Marks)

QNo	Answers
1	Advantages of entrepreneurship are Independence, ambition fulfillment, excitement, freedom,

	wealth creation and status.
2	Wage management is based on work grades and performance parameters. Wage management's goal is to take reward and give high performance standards in the business. The wage management does not take too much risk but entrepreneurs have to take risks.
3	New ideas with which an entrepreneur adds varieties of product, new services, cost reduction ideas, or new marketing techniques.
4	Self Employment – An entrepreneur is a self-employed individual who runs a business to meet a need by experimenting with new ideas. **i. Enter** – When an entrepreneur first starts business, they are simply getting their feet wet in the business world. **ii. Survive** – There are a lot of entrepreneurs around nowadays. In a competitive market, the entrepreneur must remain competitive. **iii. Grow** – An entrepreneur considers growing his or her business once it has reached a certain level of stability.
5	(a) Wage Employment (b) Self Employment (c) Self Employment
6	Myth or Misconception term used for a false belief or opinion about something.

Short Answer Questions (3 Marks)

QNo	Questions
1	Do you think an entrepreneur is innovative by nature? Discuss.
2	What is the difference between a misconception and reality? Give an example. Ans. The difference between misconception and reality are:
3	What are the misconceptions of Entrepreneurship?
4	Write the positive impact of Entrepreneurship on society.
5	How entrepreneurship contributes to a country's economy?
6	Entrepreneurs act as "Agents of change". Explain the statement.
7.	What adverse impact is created by entrepreneurship on society?

Answer to Short Answer Questions (3 Marks)

QNo	Answers
1	An innovative entrepreneur is a person who discovers totally new things. An innovative owner is a person who creates innovative products and services. An innovative entrepreneur is a person who innovates the business processes in his business. An innovative person is a person who is not afraid to take a risk.
2	**Misconception:** A myth, or a misconception, is a false belief or opinion about something. For example, if we think tall people run faster than short people, we have a misconception. It is not

	true. The truth is that short people can also run fast. **Reality**: Reality means the things which actually exist. It may happen that it appears or nor. You may have unnoticed it but in actuality it exists. In other words, reality is all the things which have real existence irrespective of appearance or not.
3	Misconceptions of Entrepreneurship are – ● It is a common misconception that every company idea must be unique or exceptional. ● A person needs a lot of money to start a business. ● Entrepreneurs are born, not made. ● A person having a big business is an entrepreneur.
4	Entrepreneurship has some positive impacts on society. These are: • Accentuates Economic Growth • Fosters Creativity • Stimulates Innovation and Efficiency • Creates Jobs and Employment Opportunities • Solves the problems of the society • Encourages welfare of the society
5	Entrepreneurship contributes to the country's economy are: (i) Entrepreneurship creates wealth (ii) Contribute to the growth of the overall economy by stimulating the growth of related business. (iii) Regional Development. (iv) GDP and Per capita income. (v) Exports
6	Entrepreneurs act as 'Agents of Change' as they identify opportunities, solve problems, offer effective solutions, establish enterprises, set up industries, and bring positive change for the economy.
7.	Adverse impacts created by entrepreneurship on society are (a) Environmental degradation, (b) Trade imbalance, (c) Labour exploitation etc.

Long Answer Questions (4 Marks)

QNo	Questions
1	List the ways in which an entrepreneur affects a society. Ans. The ways in which an entrepreneur affects a society are:
2	What do entrepreneurs do when they run their business?
3	Discuss the importance of entrepreneurship ?
4	Write the **Pros** and **Cons** of being an entrepreneur.

QNo	Answers
1	**Fulfill Customer Needs:** Entrepreneurs find out what people want. Then, they use their creativity to come up with a business idea that will meet that demand. **Use Local Materials:** Entrepreneurs use the material and people available around them, to make products at low cost. **Help Society:** They make profits through activities that benefit society. Some entrepreneurs work towards saving the environment, some give money to build schools and hospitals. This way, the people and area around them becomes better. **Create Jobs:** With the growth of a business, entrepreneurs look for more people to help them. They buy more material, and from more people.The also hire more people to work for them. **Sharing of Wealth:** As entrepreneurs grow their business, the people working for them and in related businesses also grow. **Lower Price of Products:** As more entrepreneurs sell the same product, the price of the product goes down. For example, when more mobile phones were getting sold in India, the cost of the phone became lesser.
2	a. **Fulfill Customer Needs** – A product or service that people want is referred to as demand. Entrepreneurs discover what people desire. Then students use their imaginations to come up with a business plan to address that demand. b. **Use Local Materials** – Entrepreneurs produce low-cost items by using the materials and people available to them. c. **Help Society** – Entrepreneurs have a good interaction with the general public. They gain money by doing things that help society. Some business people donate money to create schools and clinics, while others work to save the environment. d. **Create Jobs** – They buy more material, and from more people. They also hire more people to work for them. In this way, more people have jobs. e. **Sharing of Wealth** – Wealth means having enough money to live a comfortable life. As entrepreneurs grow their business. f. **Lower Price of Products** – The price of a product decreases when more entrepreneurs sell the same thing. In India, for example, as more mobile phones were sold, the cost of the phone decreased.
3	Ans. If we go through the business history of India, we come across many names who have emerged as successful entrepreneurs, like Tatas, Birlas, Dalmia, Modi, Ambani etc. These business houses started as small scale enterprises and have made their name in the list of industrialists of world fame. The success of small enterprises and their growth to leading industrial houses can be attributed to entrepreneurs themselves. Thus, it is important to understand the success story of such entrepreneurs. There are definitely some common personal characteristics in entrepreneurs. The entrepreneur is in essence an institution which comprises of all people required to perform various functions. The task of such people is to innovate, adjust or combine various factors of production, and expand on account of change in demand and market conditions. They must acknowledge the opportunities and must also be in a position to make

	opportunities out of a given situation. (i) It give Freedom: An entrepreneur is himself a boss or owner and he can take all the decisions independently. (ii) It can be Exciting: Entrepreneurship can be very exciting with many entrepreneurs considering their ventures highly enjoyable. Every day will be filled with new opportunities to challenge your determination, skills and abilities. (iii) It Allows to Set your own Earnings: The principal focus of entrepreneurship is wealth creation and improved livelihood by means of making available goods and services. Entrepreneurial ventures generate new wealth. New and improved products, services or technology from entrepreneurs, enable new markets to be developed and new wealth to be created. (iv) If offers Flexibility: As an entrepreneur you can schedule your work hours around other commitments, including quality time you would spend with your family. (v) Status: Success in entrepreneurship brings a considerable fame and prestige within the society. (vi) It offers Ambition-fulfillment: Through entrepreneurship one can fulfill his ambitions into original products or services.
4	PROS: ➢ Freedom: There's no denying that one of the best parts of being an entrepreneur is the complete freedom you have to do your own thing. No more bosses to report to, or managers peering over your shoulder – now you've gone from the bottom all the way to the top. You are the boss. ➢ Flexibility: Many people are excited to work for themselves because it means they can work when they want and where they want. Your commute could be as simple as walking to the couch or taking a stroll to the local coffee shop. ➢ Control: Many budding entrepreneurs value control. Getting your own venture off the ground requires heavy lifting but at the end of the day, it's your dream and you are in control of making it happen. Having influence over the direction of the company is one of the most exciting parts of being an entrepreneur. ➢ Profits: Instead of making others richer, now your profits can slide right into your own pocket. This means each business success becomes your success, and as your business grows, so does your potential income. This can be incredibly motivating for many new entrepreneurs on the path to success. CONS: ➢ Responsibility: Not only is the future of your business in your hands but so is your next paycheck. Moving away from a salaried job to an unstable income is hard. There is great sacrifice that comes from starting your own business, and while the pay-off may be worth it, carrying the weight of responsibility can be difficult at first. ➢ Risk: As the business owner, you will take on much of the risk associated with starting a new venture. This means, instead of your employer taking the fall, you're often risking your savings, time and effort to get your business off the ground. ➢ Workload: It takes serious hustle to get a new business up and running, and for the most part, you'll be doing all the grunt work – especially in the early stages. All the heavy lifting can be hard for one person to manage. While it can be an exciting time, full of possibility, it can also be exhausting. ➢ Limitations: The idea of running your own business can be very different to the reality. From late nights to lonely weekends, being an entrepreneur is not without its challenges. You can also find it quite limiting in the early stages, without the funding of a big name or well established business behind you.

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Syllabus for the Session 2023-24:

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.

Suggested Textbook:

❖ **Employability Skills for class X by NCERT**

Topics & sub-topics

Topics	Sub-topics
Session 1 Sustainable Development	● Sustainable development ● Importance of sustainable development ● Dimensions of sustainable development ● Problems related to sustainable development ● Sustainable development goals ● Measures taken for implementing SDGs in India
Session 2: Our role in sustainable development	● Our role towards sustainable development ● Sustainable cities and communities ● Measures for overcoming challenges in sustainable development

Key points from the chapter

- All facets of our lives are influenced by the environment around us, and all of our daily actions have an impact on the environment as well.
- Environmental contamination has risen over time as a result of economic progress. For instance, the advent of high input agriculture has allowed us to produce more food through the use of fertilizers, pesticides, and hybrid crops. But it has caused the destruction of the soil and the environment. We must arrange the use of resources in a sustainable way so that both we and our children and grandchildren can benefit from the healthy environment.
- Sustainable development ensures the balance between economic progress, environmental protection, and social well-being while meeting the requirements of the present without sacrificing the capacity of

future generations.

- Three major problems related to sustainable development are: Food, water and fuel
- The Sustainable Development Goals (SDGs) are a global call to action to eradicate poverty, safeguard the environment, and guarantee that everyone lives in peace and prosperity. The 2030 Agenda for Sustainable Development, which consists of the Sustainable Development Goals (SDGs), was introduced during the United Nations Sustainable Development Summit in New York in September 2015.
- The 17 SDGs were created with the intention of addressing significant issues that affect businesses, governments, and society.
- Natural resource use has increased as a result of population growth and development. We require more food, energy, and water as the population increases. The nutrients in the soil are depleted as we grow more crops, thus making the soil worthless. Similar to this, if we keep using fossil fuels like coal, oil, and natural gas, we will soon run out of these resources.
- We all have to play a very significant role in preserving our resources.

Multiple Choice Questions (MCQs)

QNo	Questions
1	How many sustainable development goals are given by the United Nations? (a) 18 (b) 17 (c) 15 (d) 20
2	Choose the option which defines sustainable development. (a) Taking care of future generations (b) Taking care of only ourselves (c) Taking care of ourselves and the future generations (d) Well-being of all
3	Which organization has made the Sustainable Development Goals. (a) United Nations (b) League of Nations (c) UNICEF (d) World Health Organisation
4	What leads to soil erosion? (a) Growing trees (b) Cutting of trees (c) Lighting bulb (d) Playing on ground
5	Our environment can be protected by which of the following: (a) Solar Power Plants (b) Waste Water Treatment Plants (c) Electric vehicles (d) All of the above
6	Sustainable development does not include which of the following (a) Green grassy patches and trees to be grown between building made up of concrete (b) Use of environment friendly technologies (c) Excessive use of resources (d) None of the above
7	In which year SDGs were launched at the United Nations? (a) 2015 (b) 2013 (c) 2016 (d) 2017
8	Which of the following is used in organic farming? (a) Chemical spray (b) Pesticides (c) Fertilizers (d) None of the above
9	Which of the following is not good for the environment? (a) Plastic cups (b)Kulhads (c) Edible cutlery (d) None of the above
10	___ is the affordable and clean energy.

	(a) Solar Energy (b)Energy from fossil fuels (c) Both of them (d) None of them
11	Which of the following is not a sustainable development goal according to the United Nations? (a) Reduced inequalities (b) Population (c) Gender equality (d) Clean water and sanitation
12	Which increases consumption of natural resources? (a) Development of all sectors (b) Increasing Population (c) None of them (d) Both a and b
13	What are the problems related to sustainable development? (a) Large population (b) Poverty (c) Lack of awareness (d) All of them
14	"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
15	_____is caused when natural or a man-made disturbance disrupts the natural balance of an ecosystem. a) Pollution b) Damage c) Natural disaster d) Ecological Imbalance

Answers to MCQs

1. b	2. c	3. a	4. b	5. d	6. c	7. a	8. d
9. a	10. a	11. b	12. d	13. d	14. c	15. d	

Very Short Answer Questions (2 Marks)

QNo	Questions
1	What is the meaning of sustainable development?
2	Why do you think the United Nations has made the 17 Sustainable Development Goals?
3	What are the core skills required by a person who wants to contribute towards the environment?
4	What do you understand from organic farming?
5	Name some of the eco-friendly fuel alternatives.
6	How can marine life be protected?
7	Define Social sustainability.
8	Define Economic sustainability.
9	Enlist any 2 SDGs which are formulated to address the problems related to water?
10	Name any 4 man-made disruptions that cause ecological imbalance

QNo	Answers
1	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.
2	The Sustainable Development Goals (SDGs) aim to transform our world. They are a call to action to end poverty and inequality, protect the planet, and ensure that all people enjoy health, justice and prosperity.
3	The core skills required by a person who wants to contribute towards the environment include environmental awareness and willingness to learn about sustainable development.
4	Organic farming is where farmers do not use chemical pesticides and fertilizers to increase their production. They use organic and natural fertilizers, such as cow dung to help in growing crops.
5	Solar energy and biogas
6	Marine life can be majorly protected by avoiding throwing of plastic in the ocean.
7	Social sustainability is the ability of a social system, such as a country, family or organization to function at a defined level of social well-being and harmony.
8	Economic sustainability is the ability of an economy to support a defined level of economic production over a long term period.
9	Clean water and sanitation Life below water Responsible consumption, and production
10	(Any 4 out of the following) Deforestation, Degradation of Land and Soil Erosion, Overexploitation of Resources, Industrial and Atmospheric Pollution, Faulty Mining Practices, E waste generation

Short Answer Questions (3 Marks)

QNo	Questions
1	Mention any three major problems related to sustainable development.
2	What are the three major advantages gained by using 'Kulhads'?
3	Mention some of the Sustainable Development Initiatives used in the recent past.
4	Name some of the ways in which we can contribute to quality education.
5	Mention some of the ways to ensure decent work and economic growth
6	Mention some of the ways to reduce inequality in society.
7	Describe some of the ways to create sustainable cities.

QNo	Answers
1	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 fertilisers. (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.
2	The three major advantages gained by using 'Kulhads' are a. reduced cutting of trees for making paper cups. b. job creation for potters, which contributes to the economy. c. reduced plastic waste.
3	When plastics were banned by the municipal corporation of Mangalore, an innovator and entrepreneur Mr Avasth Hedge found an eco-friendly alternative. He made a 100 per cent bio-degradable bag which can dissolve in hot water and decompose in natural environment. This is now being used in many countries and is going to help the environment. Another innovative idea was to stop the use of plastics spoons, forks, etc. Narayana Peesapaty made edible cutlery made out of a grain — these spoons can be eaten and even if they are not eaten they will easily decompose in the soil enriching it.
4	We can contribute to quality education in following ways a. use the facilities present in our areas. b. take our friends to school. c. help friends study. d. stop friends from dropping out of school.
5	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 add value in our community.
6	To reduce inequalities we can a. be helpful to one another. b. be friendly with everyone. c. include everyone while working or playing. d. help others by including everyone whether they are small or big, girl or boy, belong to any class or caste.
7	Some of the ways to create sustainable cities are: a. Save energy by switching off lights and fans when not in use. b. Use natural light as much as possible. c. Use energy efficient lights (LED bulbs) and appliances.

QNo	Questions
1	How can we become responsible about our own environment?
2	What are the things included in Sustainable Development?
3	Describe and discuss some of the ways to behave responsibly towards the society.
4	List the 17 SDGs included in agenda 2030 for Sustainable development.
5	What are the measures taken for implementing SDGs in India?

Answer to Long Answer Questions (4 Marks)

QNo	Answers
1	we can become responsible about our own environment by adopting following methods: a. reusing paper, glass, plastic, water, etc. b. taking cloth bags to market carrying fruits and vegetables. c. donate things we do not use such as clothes, books, furniture, food, etc. d. Buy and eat seasonal fruits and vegetables from local growers. e. Repair leaking taps and pipes to avoid wasting water. f. Sort and treat garbage before disposing
2	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 environmental friendly and based on efficient use of resources.
3	We can become responsible about our own environment by a. reusing paper, glass, plastic, water, etc. b. taking cloth bags to market carrying fruits and vegetables. c. donate things we do not use such as clothes, books, furniture, food, etc. d. Buy and eat seasonal fruits and vegetables from local growers. e. Repair leaking taps and pipes to avoid wasting water. f. Sort and treat garbage before disposing.
4	The 17 SDGs included in agenda 2030 for Sustainable development are A. No poverty B. Zero hunger (No hunger) C. Good health and well-being D. Quality education E. Gender equality F. Clean water and sanitation G. Affordable and clean energy H. Decent work and economic growth I. Industry, Innovation and Infrastructure J. Reduced inequality

	K. Sustainable cities and communities L. Responsible consumption and production M. Climate action N. Life below water O. Life on land P. Peace, justice and strong institutions Q. Partnership for the goals
5	Many programs were introduced by the Government of India like Swach Bharat, Make in India, Digital India and Skill India for promoting the SDGs. Some other measures taken by India are as follows: a. The NITI Aayog is supported by the UN national team in India in its initiatives to address the interconnections of the goals to make sure that no one is left behind and to push for enough funding to realise the SDGs. In order to address important development concerns at the state level, the UN is now assisting five states in localising the SDGs. b. The creation of national indicators for the SDGs is being carried out by the Ministry of Statistics and Programme Implementation (MoSPI). c. State governments have been tasked with giving careful consideration to SDG visioning, planning, budgeting, and system development.

Scoring Tips for the Chapter

- ❖ Try to answer pointwise to the best extent possible.
- ❖ 1 MCQ and 1 Two-mark question are likely to be asked from this unit.
- ❖ Employability Skills NCERT book must be read thoroughly by the students.

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INTRODUCTION TO AI: FOUNDATIONAL CONCEPTS

SUB-UNIT	LEARNING OUTCOMES
Foundational concepts of AI	Understand the concept of human intelligence and its various components such as reasoning, problem-solving, and creativity
Basics of AI: Let's Get Started	➤ Understand the concept of Artificial Intelligence (AI) and its domains (Introduction to AI and related terminologies. ● Introducing AI, ML & DL. ● Introduction to AI Domains (Data Sciences, CV & NLP)) ➤ Explore the use of AI in real Life. ➤ Learn about the ethical concerns involved in AI development, such as AI bias, data privacy and how they can be addressed.

BLUE-PRINT FOR SAMPLE QUESTION PAPER FOR CLASS X (SESSION 2023-2024)

UNIT NO.	NAME OF THE UNIT	OBJECTIVE TYPE QUESTIONS	SHORT ANSWER TYPE QUESTIONS	DESCRIPTIVE/ LONG ANS. TYPE QUESTIONS	TOTAL
		1 MARK EACH	2 MARKS EACH	4 MARKS EACH	
1	Introduction to AI	5	1	1	7
	Total Marks	**5**	**2**	**4**	**11**

WHAT IS INTELLIGENCE?

Humans have been developing machines to make their lives easier by accomplishing tasks which are either too tedious or are time consuming. Life without machines today is unimaginable so humans have been putting efforts into making them even more smart. These drastic technological advancements lead us to the concept of Artificial Intelligence.

WHAT IS ARTIFICIAL INTELLIGENCE ?

If we break up this term up, we get the words "Artificial" and "Intelligence".

> "Artificial" is something which is man-made, which does not occur naturally
>
> "Intelligence" refers to one's capacity to put one's knowledge into practise.

According to researchers, intelligence is the 'ability to perceive or infer information, and to retain it as knowledge to be applied towards adaptive behaviours within an environment or context.'

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.
Kineasthetic Intelligence	● Ability that is related to how a person uses his limbs in a skilled manilr.
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.

AI imitates human intelligence in machines by programming them to do the same things people do. When a machine possesses the ability to mimic human traits, it is said to have artificial intelligence.

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

MACHINE LEARNING (ML)

Machine learning is a branch of artificial intelligence (AI). It explains one of the most important ideas in AI, which has to do with learning through experience and not through being taught. Algorithms for machine learning are based on ways that people learn from their experiences. This means that they are programmed to learn from what they do and get better at what they do.

DEEP LEARNING (DL)

Deep Learning is a subfield of machine learning that focuses on algorithms called "Artificial Neural Networks" (ANN) that are based on how the brain is built and how it works. Deep Learning is a type of machine learning that can handle a wider range of data sources, needs less pre-processing of data, and often gives more accurate results than traditional machine learning methods.

COMPARE ARTIFICIAL INTELLIGENCE, MACHINE LEARNING & DEEP LEARNING

ARTIFICIAL INTELLIGENCE(AI)	MACHINE LEARNING(ML)	DEEP LEARNING(DL)
AI is the broader concept that encompasses both ML and DL.	ML is a subset of AI that focuses on developing algorithms that can learn from data.	DL is a subset of ML that focuses on developing artificial neural networks that can learn and improve on their own.
depend the efficiency provided by ML and DL	Less efficient than DL	More powerful than ML
AI can perform a wide range of tasks, from recognizing images and speech to making decisions and translations.	ML algorithms are primarily used for tasks such as image and speech recognition, predictive analytics, and data mining.	DL is primarily used for applications that require large amounts of data such as language processing, and self-driving cars.
AI requires large amounts of data	ML requires comparatively fewer data	require significantly larger amounts of data than ML

INTRODUCTION TO AI DOMAINS

With respect to the type of data fed in the AI model, AI models can be broadly categorised into three domains:

DATA SCIENCES

Data Science is a multi-disciplinary science with an objective to perform data analysis to generate knowledge that can be used for decision making. This knowledge can be in the form of similar patterns or predictive planning models, forecasting models etc. Example of Data Science:- Price Comparison 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. Examples of Computer Vision:- Self-Driving cars/ Automatic Cars and Face Lock in Smartphones

NATURAL LANGUAGE PROCESSING

Natural language refers to language that is spoken and written by people, and natural language processing (NLP) attempts to extract information from the spoken and written word using algorithms. The ultimate objective of NLP is to read, decipher, understand, and make sense of the human languages. Examples of Natural Language Processing:- Email filters and Smart assistants

APPLICATIONS OF ARTIFICIAL INTELLIGENCE AROUND US

1. Voice assistant:- Alexa, Google Assistant, Cortana, Siri are some very common examples of the voice assistants which are a major part of our digital devices.
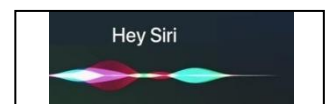
2. Navigate to Places: To help us navigate to places, apps like UBER and Google Maps are useful. Thus, one no longer needs to stop repeatedly to ask for directions.

3. Improved Gaming Experience: A lot of games nowadays are backed up with AI which helps in enhancing the graphics, come up with new difficulty levels, encourage gamers

4. Platforms that provide recommendations: Netflix, Amazon, Spotify, YouTube etc. show us recommendations on the basis of what we like As AI been taking care of our habits, likes, and dislikes.

5. Monitor Health: AI is also being used to monitor our health. A lot of chatbots and other health apps are available, which continuously monitor the physical and mental health of its users.

WHAT IS NOT AI:

A fully automatic washing machine, An Air Conditioner working remotely, Automated Projects using Sensors are not AI as it requires human intervention.

AI ETHICS

Ethics is a set of moral principles which help us discern between right and wrong. AI ethics is a set of guidelines that advise on the design and outcomes of artificial intelligence.

MORAL ISSUES: SELF-DRIVING CARS:-

The morality of the developer gets transferred into the machine as what according to him/her is right would have a higher priority and hence would be the selection made by the machine. Every person has a different perspective and hence he/she takes decisions according to their moralities. It's unrealistic to

think that a driverless car would never get into a car accident, but who is responsible and liable under those circumstances.

DATA PRIVACY

We need to understand that the data which is collected by various applications is ethical as the smartphone users agree to it ,But at the same time if one does not want to share his/her data with anyone, he/she can opt for alternative applications which are of similar usage and keep your data private.

AI BIAS

Another aspect to AI Ethics is bias. Everyone has a bias of their own no matter how much one tries to be unbiased. We in some way or the other have our own biases even towards smaller things. Any bias can transfer from the developer to the machine while the algorithm is being developed.

AI ACCESS

Since Artificial Intelligence is still a budding technology, not everyone has the opportunity to access it. The people who can afford AI enabled devices make the most of it while others who cannot are left behind.

AI CREATES UNEMPLOYMENT

AI is making people's lives easier. In no time AI will manage to be able to do all the laborious tasks which we humans have been doing since long. This may start an era of mass unemployment where people having little or no skills may be left without jobs and others who keep up with their skills according to what is required, will flourish.

OBJECTIVE TYPE QUESTIONS:- 1 MARKS

1. _____ help us to make our work easier and more comfortable.
2. _____ means man-made, which does not occur naturally.
3. The ability to perceive or infer information and to retain it as knowledge to be applied towards adaptive behaviours within an environment or context is known as _____.
4. The basis of decision making depends upon the availability of _____and how we experience and understand it.
5. A machine can also become intelligent if it is trained with _____ which helps them achieve their tasks.
6. The ability to regulate, measure, and understand numerical symbols, abstraction and logic is known as _____
     a. Linguistic Intelligence   b. Spatial Visual Intelligence
     c. Kinaesthetic Intelligence   d. Mathematical Logical Reasoning
7. _____ refers to language processing skills both in terms of understanding or implementation in writing or verbally.
8. Which of the following can be defined as the ability to perceive the visual world and the relationship of one object to another?
     a. Linguistic Intelligence   b. Spatial Visual Intelligence
     c. Kinaesthetic Intelligence   d. Mathematical Logical Reasoning
9. A machine is artificially intelligent when it can accomplish tasks by itself.
10. Is a smart washing machine an example of Artificially Intelligent devices?
11. Platforms like Netflix, Amazon, Spotify, YouTube etc. show us recommendations on the basis of what we like.

12. A person's ability to recognize and create sounds, rhythms, and sound patterns is known as Musical Intelligence. (True/False)

13. If a person is well aware of self weakness and strengths or own feelings is known as _____ intelligence.

14. An additional category of intelligence relating to religious and spiritual awareness is known as Existential Intelligence. (True/False)

15. The ability to communicate with others by understanding other people's feelings influence the person is known as _____ intelligence.
    a. Naturalist Intelligence   b. Interpersonal intelligence
    c. Intrapersonal Intelligence   d. Musical Intelligence

16. The basis of decision-making depends upon
    a. The available information and experience   b. Prejudices and Suggestions
    c. Own beliefs and Knowledge   d. Internet facts

17. Which of the following is not a domain of AI?
    a. Data Science   b. Computer Vision
    c. Natural Language Processing   d. Neural Network

18. The information extracted through data science can be used to make a decision about it. (True/False)

19. _____ 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.

20. Which of the following is an example of data science?
    a. Social media websites   b. Price Comparison websites
    c. Online Shopping websites   d. Blog web sites

21. Which of the following forms of AI is the most advanced?
    a. Machine Learning   b. Deep Learning
    c. Neural Network   d. None of the above

22. The _____ is the domain of AI that depicts the capability of a machine to get and analyse visual information and afterwards predict some decisions about it.

23. Which of the following translates digital visual data into descriptions and then turned into a computer-readable language to aid the decision-making?
    a. Computer Vision   b. PixelLab
    c. Pixel It   d. Pixar

24. Which of the following is an example of a CV?
    a. Self-driving cars   b. Smart Interactions
    c. Face Locks   d. All of these

25. NLP stands for _____.

26. _____ is a branch of artificial intelligence that deals with the interaction between computers and humans using the natural language.

27. Which of the following is an example of NLP?
    a. Online translator   b. Email filters
    c. Smart Assistants   d. All of these

28. Which of the following component of NLP establish linkage with natural language inputs and analyse different aspects of language?
    a. NLU   b. NLG   c. NLTK   d. NLC

29. _____ produces meaningful phrases and sentences in the form of natural language.

30. The full form of NLU is _____
    a. Natural Language Understanding   b.Natural Language Utilization
    c. Natural Langauge Unity   d. Natural Language Union

31. The full form of NLG is _____
    a. Natural Language Group   b. Natural Langauge Gap
    c. Natural Language Generation   d. Natural Language gaming

32. The machine's ability to mimic human traits such as making decisions, predicting the future, learning and improving is known as _____.
    a. Machine Intelligence   b. Artificial Intelligence
    c. Machine Learning   d.Machine Automation

33. Which of the following is not a virtual assistant?

a. Alexa   b. Cortana   c. Siri   d. Chatbot

34. AI can be used in games to the encouragement of gamers. (True/False)
35. You are getting Amazon, Netflix, Spotify, and youtube recommendations based on which of the following?

    a. Company Rules   b. Government Policy

    c. User behaviour   d. None of these

36. Which of the following is the very first humanoid robot?

    a. Sophia   b. ASIMO   c. Pepper   d. Romeo

37. All smart devices are considered AI-enabled devices. (True/False)
38. Which of the following is not AI?

    a. Humanoid robots   b. Self Driving Cars

    c. An automated Air Conditioner   d. All of these

39. _____ is a subset of Artificial Intelligence which enables machines to improve at tasks with experience.
40. What are the demerits of Artificial Intelligence?

    a. Create Unemployment   b. Decrease the work quality

    c. Unstructured Data collection   d. All of the above

SHORT ANSWER TYPE QUESTIONS:- 2 MARKS EACH

1. What do you understand by Interpersonal Intelligence?
2. What is AI Domain?
3. What is the purpose of Data Science in AI?
4. What is Machine Learning?
5. What is Computer Vision? Give an example of it.
6. What is Natural Language Processing? Give an example of it.
7. What do you understand by Data Privacy?
8. What is AI Ethics?
9. What is a AI Bias?
10. Is data which is collected by various applications ethical in nature? Justify your answer.
11. What are the concerns related to the use of AI to control defence equipment?
12. How does a machine become Artificially Intelligent?
13. Mention four examples of machines that are not AI but confused with AI.
14. How does learning and adapting help an AI machine in improvising itself?
15. What is Deep Learning, and how is it used in real-world?
16. What are the moral issues related to self-driving cars?
17. AI increased the gap between two classes of people. Which are these two classes of people?
18. Why AI models are biased in one or another way? Explain it.
19. Is it ethical that children to use technology to help to finish their study-related work?
20. What is the major AI ethical concern related to AI adoption?

DESCRIPTIVE/ LONG ANSWER TYPE QUESTIONS:- 4 MARKS EACH

1. What do you understand by AI bias? Discuss in detail with some examples.
2. What do you understand by Data Privacy? Discuss in detail with some examples.
3. What do you understand by AI, ML & DL? How are they different from each other?
4. Should AI replace laborious jobs? Is there an alternative for major unemployment?
5. What is Intelligence? Explain in brief any three types of intelligence that are mainly perceived by human beings?
6. How can AI be integrated with non-AI technologies? Explain with the help of an example.
7. How AI helps in giving you personalized experience online?
8. Give some example of NLP applications (Natural Language Processing).
9. What are the different areas where AI has a great impact?
10. Write four popular AI apps and tools.

Answer of objective question

1. Machines	21. Deep Learning
2. Artificial	22. Computer Vision/CV
3. Intelligence	23. Computer Vision
4. data / past experience/knowledge	24. All of these
5. (data)	25. Natural Language Processing
6. Mathematical Logical Reasoning	26. Natural Language Processing/NLP
7. Linguistic Intelligence	27. All of these
8. Spatial Visual Intelligence	28. NLU
9. TRUE	29. NLG
10. False	30. Natural Language Understanding
11. True	31. Natural Language Generation
12. True	32. Artificial Intelligence
13. Intrapersonal)	33. Chatbot
14. True	34. True
15. Interpersonal intelligence	35. User behavior
16. The available information and experience	36. Sophia
17. Neural Network	37. False
18. True	38. An automated Air Conditioner
19. Data Science	39. Machine Learning
20. Price Comparison websites	40. Create Unemployment

UNIT 2 : AI PROJECT CYCLE

SUB-UNIT	LEARNING OUTCOMES
Introduction	Understand the stages involved in the AI project cycle, such as problem scoping, data collection, data exploration, modelling, evaluation.
Problem Scoping	Learn about the importance of project planning in AI development and how to define project goals and objectives.
Data Acquisition	Develop an understanding of the importance of data collection in AI and how to choose the right data sources.
Data Exploration	Know various data exploration techniques and its importance
Modelling	Know about the different machine learning algorithms used to train AI models
Evaluation	Know the importance of evaluation and various metrics available for evaluation

BLUE-PRINT FOR SAMPLE QUESTION PAPER FOR CLASS X (SESSION 2023-2024)

UNIT NO.	NAME OF THE UNIT	OBJECTIVE TYPE QUESTIONS	SHORT ANSWER TYPE QUESTIONS	DESCRIPTIVE/ LONG ANS. TYPE QUESTIONS	TOTAL QUESTIONS
		1 MARK EACH	2 MARKS EACH	4 MARKS EACH	
2	AI Project Cycle	3	1	2	6
Total Marks		3	2	8	13

WHAT IS AN AI PROJECT CYCLE?

The AI Project Cycle is a step-by-step process that one must follow in order to derive value from an AI project and to solve the problem. The AI Project Cycle offers us a suitable framework which can lead us towards the goal. Project cycle is the process of planning, organizing, coordinating, and finally developing a project effectively throughout its phases, from planning through execution then completion and review to achieve pre-defined objectives. The major role of AI Project Cycle is to distribute the development of AI project in various stages so that the development becomes easier, clearly understandable and the steps / stages should become more specific to efficiently get the best possible output. It mainly has 5 ordered stages which distribute the entire development in specific and clear steps: These are Problem Scoping, Data Acquisition, Data Exploration, Modelling and Evaluation.

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. Many times, we become so used to a problem that it becomes a part of our life. Identifying such a problem and having a vision to solve it, is what Problem Scoping is about. Sustainable Development Goals:- 17 SDGs

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

Scoping a problem is not that easy as we need to have a deeper understanding around it so that the picture becomes clearer while we are working to solve it. Hence, we use the 4Ws Problem Canvas to help us out.

The 4Ws problem canvas is the basic template while scoping a problem and using this canvas, the picture becomes clearer while we are working to solve it.

a) Who: The "Who" block helps you in analyzing the people getting affected directly or indirectly due to it? Under this, you find out who the 'stakeholders' to this problem are and what you know about them. Stakeholders are the people who face this problem and would be benefitted with the solution.

b) What: Under the "What" block, you need to look into what you have on hand. At this stage, you need to determine the nature of the problem. What is the problem and how do you know that it is a problem?

c) Where: In this block, you need to focus on the context/situation/location of the problem. It will help you look into the situation in which the problem arises, the context of it, and the locations where it is prominent.

d) Why: in the "Why" canvas, think about the benefits which the stakeholders would get from the solution and how would it benefit them as well as the society.

DATA ACQUISITION

Data can be a piece of information or facts and statistics collected together for reference or analysis. Whenever we want an AI project to be able to predict an output, we need to train it first using data. The data with which the machine can be trained is known as Training Data while the output prediction data set is known as the Testing Data.

For any AI project to be efficient, the training data should be authentic and relevant to the problem statement scoped.

Data Features: Data features refer to the type of data you want to collect.

There can be various ways in which you can collect data. Some of them are:
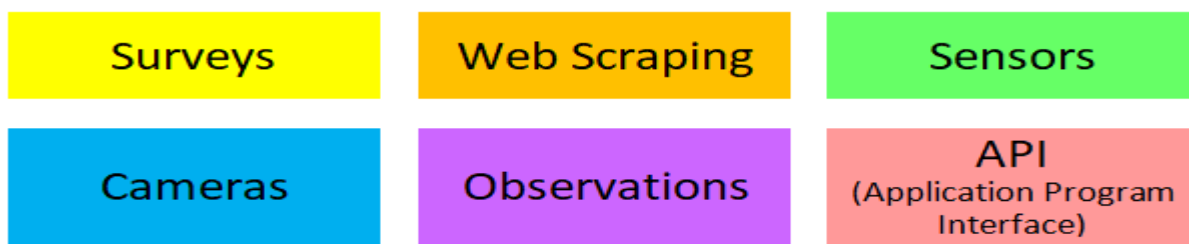
One of the most reliable and authentic sources of information, are the open-sourced websites hosted by the government.

DATA EXPLORATION

Data is a complex entity – it is full of numbers and if anyone wants to make some sense out of it, they have to work some patterns out of it. 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 analyse that:

- The data is according to the specifications decided.
- The data is free from errors.
- The data is meeting our needs.

To analyse the data, we need to visualise it in some user-friendly format so that we can:

- quickly get a sense of the trends, relationships and patterns contained within the data.
- define strategy for which model to use at a later stage.
- Communicate the same to others effectively.
  To visualise data, we can use various types of visual representations.

Data Exploration or Visualization Tools

1. Google Charts

Google chart tools are powerful, simple to use, and free. Try out our rich gallery of interactive charts and data tools.

2. Tableau

Tableau is often regarded as the grandmaster of data visualization software and for good reason. Tableau has a very large customer base across many industries due to its simplicity of use and ability to produce interactive visualizations.

3. FusionCharts

This is a very widely-used, JavaScript-based charting and visualization package that has established itself as one of the leaders in the paid-for market. It can produce 90 different chart types and integrates with a large number of platforms and frameworks giving a great deal of flexibility.

4. Highcharts

A simple options structure allows for deep customization, and styling can be done via JavaScript or CSS. Highcharts is also extendable and pluggable for experts seeking advanced animations and functionality.

MODELLING

The 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 analysing 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.

RULE BASED APPROACH

AI modelling, where the rules are defined by the developer is rule based approach. The machine follows the rules or instructions mentioned by the developer and perform its task accordingly. We feed data in to the machine along with the rules which tell the machine all the possibilities. This is known as a rule-based approach because we fed the data along with rules to the machine and the machine after getting trained on them is now able to predict answers for the same.

A drawback/feature for this approach is that the learning is static. The machine once trained, does not take into consideration any changes made in the original training dataset. Once trained, the model cannot improvise itself on the basis of feedbacks.

LEARNING BASED APPROACH

AI modelling, where the machine learns by itself is Learning based approach. 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. The machine learning approach introduces the dynamicity in the model. The learning-based approach can further be divided into three parts:

Supervised Learning

In a supervised learning model, the dataset which is fed to the machine is labelled. A label is some information which can be used as a tag for data. There are two types of Supervised Learning models:

Classification: Where the data is classified according to the labels. This model works on discrete dataset which means the data need not be continuous.

Regression: Such models work on continuous data.
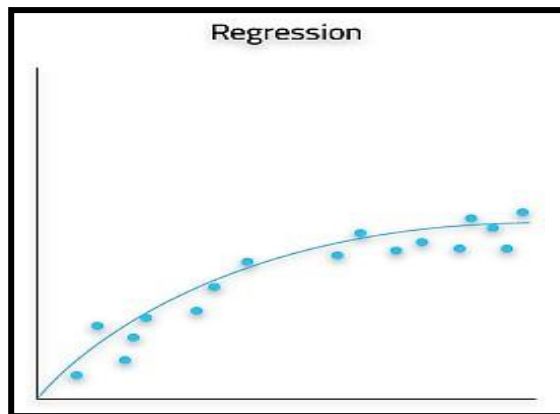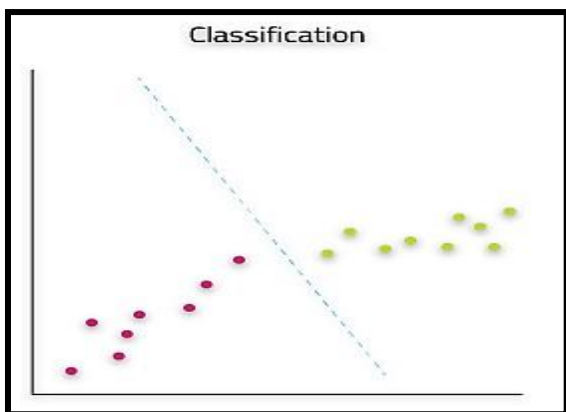
UNSUPERVISED LEARNING

An unsupervised learning model works on unlabelled 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. Unsupervised learning models can be further divided into two categories:

Clustering: Refers to the unsupervised learning algorithm which can cluster the unknown data according to the patterns or trends identified out of it.

Dimensionality Reduction: We humans are able to visualise upto 3-Dimensions only but according to a lot of theories and algorithms, there are various entities which exist beyond 3-Dimensions. Hence, to make sense out of it, we need to reduce their dimensions. Here, dimensionality reduction algorithm is used.

EVALUATION

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

NEURAL NETWORKS

Neural networks are loosely modelled after how neurons in the human brain behave. The key advantage of neural networks is that they are able to extract data features automatically without needing the input of the programmer.

The larger Neural Networks tend to perform better with larger amounts of data whereas the traditional
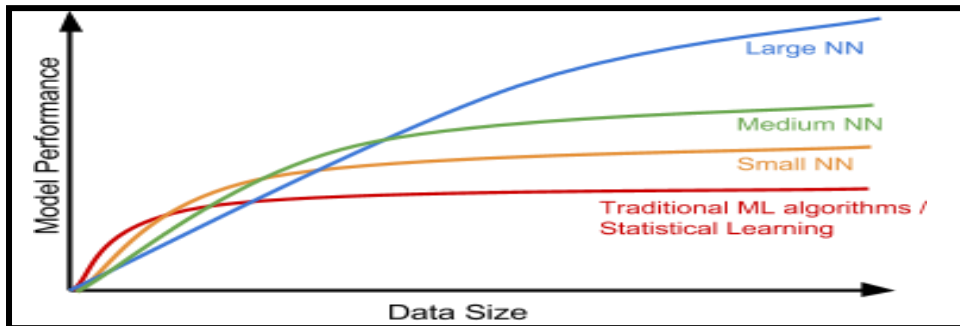
machine learning algorithms stop improving after a certain saturation point.

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. The first layer of a Neural Network is known as the input layer that acquires data and feed it to the Neural
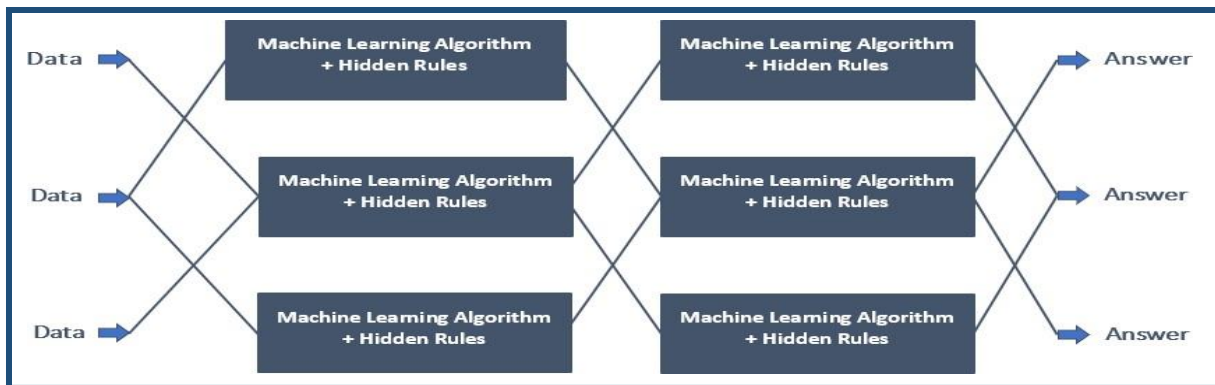
Network. Hidden layers are the layers in which the whole processing occurs. Each node of these hidden layers has its own machine learning algorithm which it executes on the data received from the input layer. The processed output is then fed to the subsequent hidden layer of the network. The last hidden layer passes the final processed data to the output layer which then gives it to the user as the final output.

Some of the features of a Neural Network are listed below:

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.

OBJECTIVE TYPE QUESTIONS: - 1 MARKS

1. The _____ 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.

a. Unsupervised learning   b. Supervised learning

c. Reinforcement Learning   d. All of the above

2 . Which categories belong to Unsupervised learning.

a. Clustering   b. Regression   c. Both a) and b)   d. None of the above

3. Where the data is classified according to the labels is known as _____.

a. Classification   b. Regression   c. Both a) and b)   d. None of the above

4. The AI Project Cycle mainly has _____.

a. 2 Stages   b. 3 Stages   c. 4 Stages   d. 5 Stages

5. _____ by collecting data from various reliable and authentic sources.

a. Data Acquisition   b. Database

c. Data Mining   d. None of the above

6. _____ refer to the type of data you want to collect.

a. Data features   b. Exploring Data

c. Data Acquisition   d. All of the above

7. What are the different types of supervised learning?

a. Classification   b. clustering   c. Both a) and b)   d. None of the above

8. One of the most reliable and authentic sources of information where we can download the authentic data for our project are _____.

a. Private websites   b. Government websites

c. Personal websites   d. None of the above

9. AI modelling where the rules are defined by the developer is known as _____.

a. Rule Based Approach   b. Learning based Approach

c. Both a) and b)   d. None of the above

10 . A Neural Network is divided into multiple layers and each layer is further divided into several blocks called _____.

a. Nodes   b. Connector   c. Terminal   d. All of the above

11. _____ helps to test data so that one can calculate the efficiency and performance of the model.

a. Accuracy   b. Evaluation   c. Precision   d. None of the above

12. In a _____ model, the dataset which is fed to the machine is labelled.

a. Supervised Learning   b. Unsupervised Learning

c. Reinforcement Learning   d. All of the above

13. The first layer of a Neural Network is known as the _____.

a. Output Layer   b. Input Layer   c. Hidden Layer   d. All of the above

14. _____ models work on continuous data.

a. Classification   b. Regression   c. Both a) and b)   d. None of the above

15. The _____ Problem canvas helps in identifying the key elements related to the problem.

a. 4Ws   b. 6Ws   c. 2Ws   d. 3Ws

16. _____ helps in analysing the people getting affected directly or indirectly due to it.

a. Who   b. What   c. Where   d. Why

17. An _____ model works on an unlabeled dataset.

a. Unsupervised learning   b. Supervised learning

c. Reinforcement Learning   d. All of the above

18. _____ are loosely modelled after how neurons in the human brain behave.

a. Neural networks   b. Neural science

c. Neural Analysis   d. None of the above

19. The Sustainable Development Goals aim is to achieve by the end of year_____.

a. 2025   b. 2030   c. 2035   d. 2040

20. _____ helps to determine the nature of the problem.

a. Who   b. What   c. Where   d. Why

21. Templates help us to summarize all the key points into one single Template so that in future, whenever there is a need to look back at the basis of the problem, we can take a look at the _____ and understand the key elements of it.

a. Problem Solving Template   b. Problem Statement Template

c. Problem Arising Template   d. None of the above

22. Whenever we want an AI project to be able to predict an output, we need to _____ it first using data.

a. Analyze   b. Train   c. Explore   d. All of the above

23. The first layer of a Neural Network is known as the _____.

a. Output Layer   b. Input Layer   c. Hidden Layer   d. All of the above

24. In Neural Network, The _____ are the layers in which the whole processing occurs.

a. Output Layer   b. Input Layer   c. Hidden Layer   d. All of the above

25. The last hidden layer passes the final processed data to the _____ which then gives it to the ser as the final output.

a. Output Layer   b. Input Layer   c. Hidden Layer   d. All of the above

26. You would feed the data into the machine. This is the data with which the machine can be trained. Now, once it is ready, it will predict his next data efficiently. This previous data is known as _____.

a. Testing Data   b. Training Data   c. Exploring Data   d. All of the above

27. What do you mean by Web Scraping?

a. Utilizing automated bots to browse the internet and collect data

b. Gathering information from the dark web

c. Using an app or website to collect data

d. None of the above

28. In Neural Network, The _____ are the layers in which the whole processing occurs.

a. Output Layer   b. Input Layer   c. Hidden Layer   d. All of the above

29. You would feed the data into the machine. This is the data with which the machine can be trained. Now, once it is ready, it will predict his next data efficiently. This next data is known as _____.

a. Testing Data   b. Training Data

c. Exploring Data   d. All of the above

30. It gives us a suitable framework that can help us get closer to the objective of our AI project.

a. 4Ws Canvas   b. AI Project Cycle   c. Project Model   d. AI Models

31. Data exploration is possible with the use of _____.

a. Problem Scoping   b. Data Visualization

c. Data Features   d. Web Scraping

32. _____ refer to the type of data you want to collect.

a. Data features   b. Exploring Data

c. Data Acquisition   d. All of the above

33. One of the most reliable and authentic sources of information where we can download the authentic data for our project are _____.

a. Private websites   b. Government websites

c. Personal websites   d. None of the above

34. AI modelling where the rules are defined by the developer is known as _____.

a. Rule Based Approach   b. Learning based Approach

c. Both a) and b)   d. None of the above

35. A Neural Network is divided into multiple layers and each layer is further divided into several blocks called _____.

a. Nodes   b. Connector   c. Terminal   d. All of the above

36. The first layer of a Neural Network is known as the _____.

a. Output Layer   b. Input Layer   c. Hidden Layer   d. All of the above

37. Data exploration is possible with the use of _____.

a. Problem Scoping   b. Data Visualization   c. Data Features   d. Web Scraping

38. The last hidden layer passes the final processed data to the _____ which then gives it to the ser as the final output.

a. Output Layer b. Input Layer   c. Hidden Layer   d. All of the above

39. It gives us a suitable framework that can help us get closer to the objective of our AI project.

a. 4Ws Canvas   b. AI Project Cycle   c. Project Model   d. AI Models

40. Select the five phases of the AI project cycle in the proper order.
a. Data Acquisition -> Problem Scoping -> Data Exploration -> Modelling -> Evaluation
b. Evaluation -> Problem Scoping -> Data Exploration -> Data Acquisition -> Modelling
c. Problem Scoping -> Data Acquisition -> Data Exploration -> Modelling -> Evaluation
d. Problem Scoping -> Data Exploration -> Data Acquisition -> Evaluation -> Modelling

SHORT ANSWER TYPE QUESTIONS:- 2 MARKS EACH

1. Draw the graphical representation of Classification AI model. Explain in brief.
2. What are the two different approaches for AI modelling? Define them.
3. What do you mean by Data Features?
4. Mention the precautions to be taken while acquiring data for developing an AI Project.
5. Draw the graphical representation of Clustering AI model. Explain in brief.
6. Draw the graphical representation of Regression AI model. Explain in brief.
7. What is a problem statement template and what is its significance?
8. Explain any two SDGs in detail.
9. Explain Data Exploration stage.
10. What are the different types of sources of data from where we can collect reliable and authentic datasets? Explain in brief.
11. What are the features of an Artificial Neural Network?
12. What is problem scoping?
13. Write the names for missing stages in the given AI project cycle:
14. What are the goals of sustainable development?
15. What is 4Ws Problem Canvas?
16. How many type of Unsupervised Learning model in AI?
17. What is data exploration?
18. What is data modelling?
19. What are the different types of Learning based approach?
20. Who many type of Supervised Learning models in AI?
21. What are the types of AI Modelling?
22. What is data Acquisition?
23. What is the difference between Training Data & Testing Data?
24. What is Rule Based Approach?
25. What is Learning Based Approach?

DESCRIPTIVE/ LONG ANSWER TYPE QUESTIONS:- 4 MARKS EACH

1. What is neural network? How neural network works.
2. Explain the relation between data size and model performance of an Artificial Neural network.
3. Explain the AI Project Cycle in detail.
4. Draw the 4Ws problem canvas and explain each one of them briefly.
5. Differentiate between rule-based and learning-based AI modelling approaches.
6. What is an Artificial Neural Network? Explain the layers in an artificial neural network.
7. What is the need of an AI Project Cycle? Explain.
8. Explain the following:
a. Supervised Learning b. Unsupervised Learning
9. What is data exploration? What are the tools used for data exploration.
10. Differentiate between classification and clustering algorithms with the help of suitable examples.
11. What are the different types of Learning based approach?
12. Five sustainable Development Goals are mentioned below. Write 2 problems under each goal that you think should be addressed for achieving the goal.
a. Quality Education
b. Reduced Inequalities

c. Life on Land

d. No Poverty

e. Clean Water and Sanitation

13. "A neural network is divided into multiple layers and each layer is further divided into several blocks." What do you understand by neural network? Explain the different layers of a neural network.

14. In the Modelling stage, we used learning algorithms through which we can, train our model. Explain the different types of learning algorithms along with their types.

15. 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.

ANSWER OF OBJECTIVE QUESTION

1. a. Unsupervised learning	21. b. Problem Statement Template
2 . a. Clustering	22. b. Train
3. a. Classification	23. b. Input Layer
4. d. 5 Stages	24. c. Hidden Layer
5. a. Data Acquisition	25. a. Output Layer
6. a. Data features	26. b. Training Data
7. a. Classification	27. a. Utilizing automated bots to browse the internet and collect data
8. b. Government websites	
9. a. Rule Based Approach	28. c. Hidden Layer
10 . a. Nodes	29. b. Training Data
11. b. Evaluation	30. b. AI Project Cycle
12. a. Supervised Learning	31. b. Data Visualization
13. b. Input Layer	32. a. Data features
14. b. Regression	33. b. Government websites
15. a. 4Ws	34. a. Rule Based Approach
16. a. Who	35. a. Nodes
17. a. Unsupervised learning	36. b. Input Layer
18. a. Neural networks	37. b. Data Visualization
19. b. 2030	38. a. Output Layer
20. b. What	39. b. AI Project Cycle
	40. c. Problem Scoping -> Data Acquisition -> Data Exploration -> Modelling -> Evaluation

Advanced Python and Data Science

Advanced Python

Jupyter Notebook

For interactively creating and presenting projects linked to AI, the Jupyter Notebook is a really powerful tool. The open source web application Jupyter Notebook allows users to create and share documents with live code, equations, visualisations, and text.

Through Anaconda, Jupyter Notebook may be installed and used most easily. The most popular Python distribution for data science, Anaconda, comes pre-installed with all the most used tools and libraries.

Introduction to Python

Guido Van Rossum, of Centrum Wiskunde & Informatica, is the inventor of the Python programming language. The language, which took its name from the 1970s BBC comedy series "Monty Python's Flying Circus," was made available to the general public in 1991. It can be used to programme in both an object-oriented and procedural manner. Because it offers so many features, Python is very popular.

Features of Python:

1. **Easy to learn, read and maintain**

Python has few keywords, simple structure and a clearly defined syntax. Python allows anyone to learn the language quickly. 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 a variety of problems.

3. **Interactive Mode**

Python has support for an interactive mode which allows 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, and has the same interface on all platforms.

5. *Extendable*

We can add low-level modules to the Python interpreter. These modules enable programmers to add to or customize their tools to be more efficient.

6. *Databases and Scalable*

Python provides interfaces to all major open source and commercial databases along with a better structure and support for much larger programs than shell scripting.

Python Basics

Keywords & Identifiers:

Some terms in Python have predefined meanings that the computer automatically assigns to them. These phrases are referred to as keywords. In order to avoid misunderstanding and unclear results, keywords should only be used in the default manner and cannot be changed at any point in time. The following list includes a few of the keywords:

False, class, finally, is, return, None, continue, for lambda, try, True, def, from, nonlocal, while, and, del, global, not, with, as, elif, if, or, yield, assert, else, import, pass, break, except, in, raise etc.

Recap

In this section, we will go through a quick refreshing session around Python concepts and Jupyternotebook. Along with this we will talk about newer concepts like packages, virtual environments, etc.
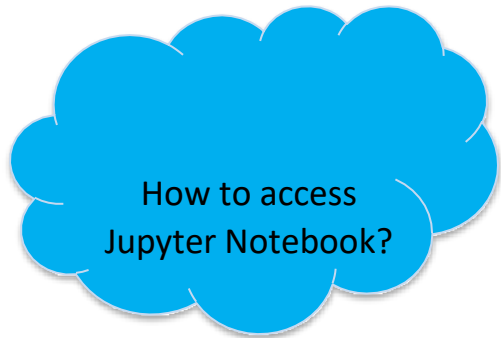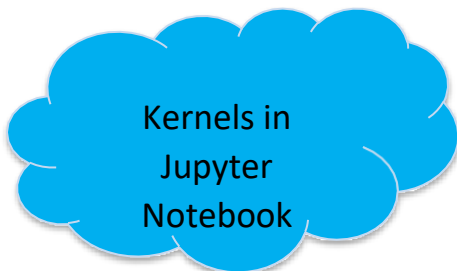
Recap 1: Jupyter Notebook
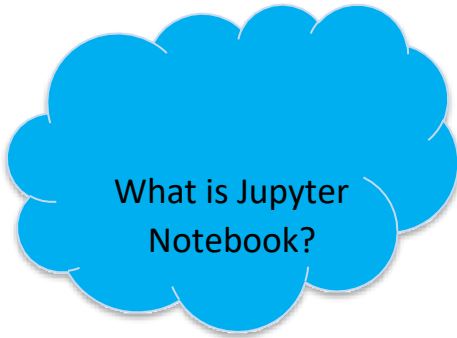
What is Jupyter Notebook?

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 Notebook, which was first published as a prototype in 2010. Although it is possible to use many different programming languages within Jupyter Notebooks, Python remains the most commonly used language for it. In other words, we can say that the Jupyter Notebook is an open source web application that can be used to create and share documents that contain live code, equations, visualizations, and text.

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.

How to access Jupyter Notebook?

Kernels in Jupyter Notebook

To work with Jupyter Notebook, it is necessary to have a kernel on which it operates. 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.

Introduction to Virtual Environments

What?

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.

Why?

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.

How?

Creating virtual environments is an easy task with Anaconda distribution. Steps to create one are:

1. Open Anaconda Prompt.
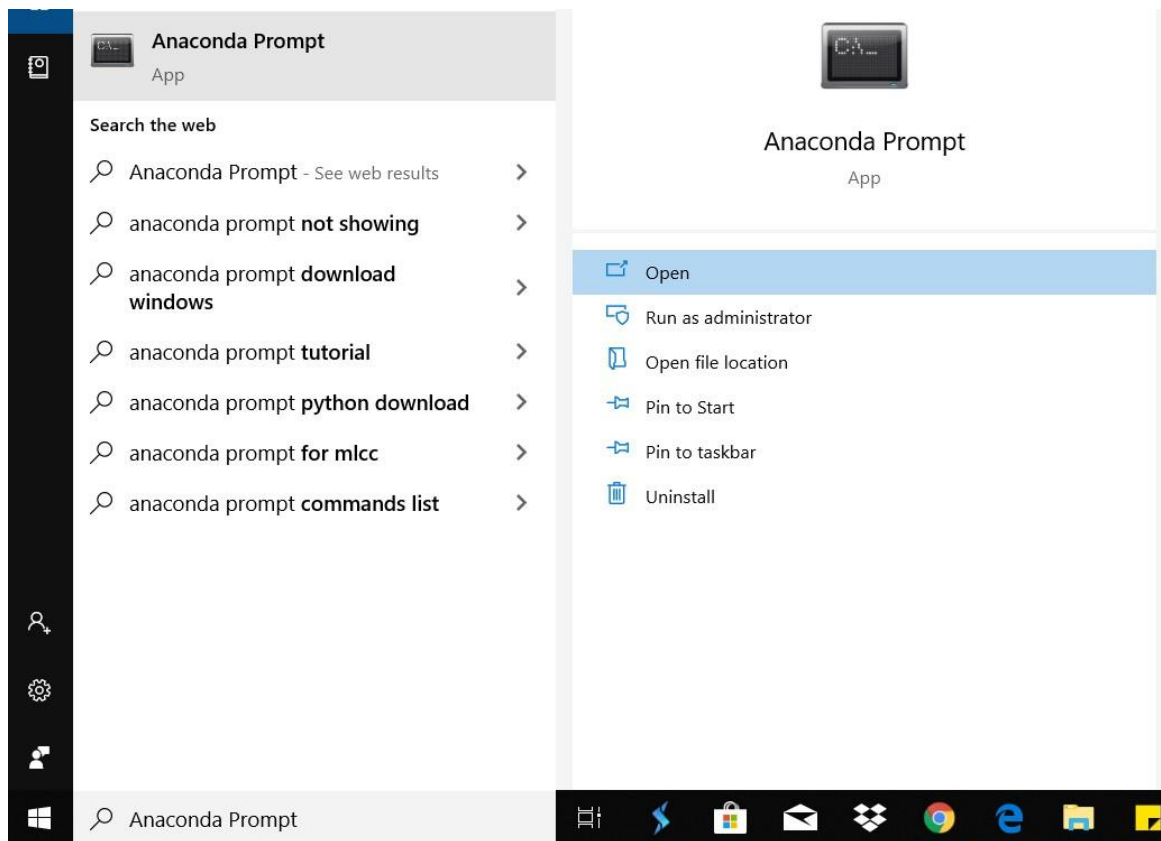
2. As we open the Anaconda prompt, we can see that in the beginning of the prompt message, the term **(base)** is written. This is the default environment in which the anaconda works. Now, we cancreate our own virtual environment and use it so that the base does not get affected by anything that is done in the virtual environment.
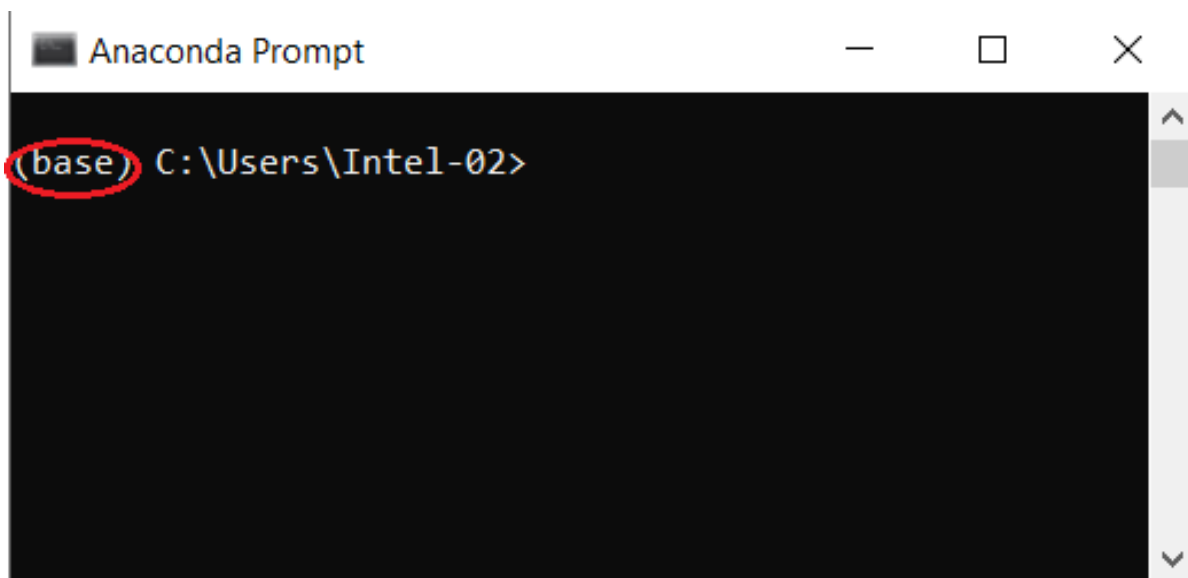
3. Let us now create a virtual environment named **env**. To create the environment, write

conda create -n env python=3.7

This code will create an environment named **env** and will install Python 3.7 and other basic packagesinto it.

4. After some processing, the prompt will ask if we wish to proceed with installations 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. The processing screen will look like this:Once all the packages are downloaded and installed, we will get a message like this:

6. This shows that our environment called **env** has been successfully created. Once an environmenthas been successfully created, we can access it by writing the following:
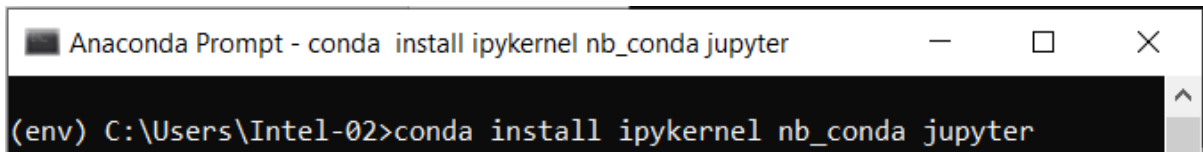
conda activate env

This would activate the virtual environment and we can see the term written in brackets has changedform **(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 install ipykernel nb_conda jupyter

```
Anaconda Prompt - conda  install ipykernel nb_conda jupyter        —    □    ×

(env) C:\Users\Intel-02>conda install ipykernel nb_conda jupyter
```

It will again ask if we wish to proceed with the installations, type **Y** to begin the installations. Once the installations are complete, we can start working with Jupyter notebooks in this environment.

Recap 2: Introduction to Python

In class 9, we were introduced to Python as the programming language which will be used for working around AI. Let us recall the basics of Python.

What?

Python is a programming language which was created by Guido Van Rossum in Centrum Wiskunde & Informatica. The language was publicly released in 1991 and it got its name from a BBC comedy series from 1970s – 'Monty Python's Flying Circus'. 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?

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:

Easy to learn, read and maintain

Python has few keywords, simple structure and a clearly defined syntax. Python allows anyone to learn the language quickly. A program written in Python is fairly easy-to-maintain.

A Broad Standard library

Python has a huge bunch of libraries with plenty of built-in functions to solve a variety of problems.

Interactive Mode

Python has support for an interactive mode which allows interactive testing and debugging of snippets of code.

Portability and Compatibility

Python can run on a wide variety of operating systems and hardware platforms, and has the same interface on all platforms.

Extendable

We can add low-level modules to the Python interpreter. These modules enable programmers to add to or customize their tools to be more efficient.

Python provides interfaces to all major open source and commercial databases along with a better structure and support for much larger programs than shell scripting.

Applications of Python

There exist a wide variety of applications when it comes to Python. Some of the applications are:

Recap 3: Python Basics

In class 9, as Python was introduced, we also discussed about some basic Python syntaxes which can help us in writing codes in Python language. Let us brush up all the concepts once and see how we canuse them in coding.

1. Printing Statements

We can use Python to display outputs for any code we write. To print any statement, we use **print()** function in Python.

2. Python Statements and Comments

Instructions written in the source code to execute are known as statements. These are the lines of code which we write for the computer to work upon. For example, if we wish to print the addition oftwo numbers, say 5 and 10, we would simply write:

print(5+10)

This is a Python statement as the computer would go through it and do the needful (which in thiscase would be to calculate 5+10 and print it on the output screen)

On the other hand, there exist some statements which do not get executed by the computer. These lines of code are skipped by the machine. They are known as comments. Comments are the statements which are incorporated in the code to give a better understanding of code statements to the user. To write a comment in Python, one can use # and then write anything after it. For example:

This is a comment and will not be read by the machine.

print(5+10) # This is a statement and the machine will print thesummation.

Here, we can see that the first line is a comment as it starts with #. In the second line, we have an executable statement followed by a comment which is written to explain the code. In this way, we canadd comments into our code so that anyone can understand the gist of it.

3. Keywords & Identifiers

In Python, there exist some words which are pre-defined and carry a specific meaning for the machine by default. These words are known as keywords. Keywords cannot be changed at any point in time and should not be used any other way except the default one, otherwise they create confusion and might result in ambiguous outputs. Some of the Keywords are mentioned below:

Keywords in Python

False	class	finally	is	return
None	continue	for	lambda	try
True	def	from	nonlocal	while
and	del	global	not	with
as	elif	if	or	yield
assert	else	import	pass	
break	except	in	raise	

Note that keywords are case-sensitive.

An identifier is any word which is variable. Identifiers can be declared by the user as per their convenience of use and can vary according to the way the user wants. These words are not defined and can be used in any way. **Keywords cannot be used as identifiers**. Some examples of keywords can be: **count, interest, x, ai_learning, Test**, etc. Identifiers are also case-sensitive hence an identifier named as **Test** would be different from an identifier named **test**.

4. **Variables & Datatypes**

A variable is a named location used to store data in the memory. It is helpful to think of variables as acontainer that holds data which can be changed later throughout programming. Just like in Mathematics, in Python too we can use variables to store values in it. The difference here is, that in Python, the variables not only store numerical values, but can also contain different types of data.

For example:

X = 10 # X variable contains numerical data

Letters = 'XYZ' # Letters variable contains alphabetic datanumber = 13.95 #

number variable contains a decimal value word = 'k' # word variable contains a

character

All of these variables contain different types of data in them. The type of data is defined by the term datatype in Python. There can be various types of data which are used in Python programming. Hence, the machine identifies the type of variable according to the value which is stored inside it. Various datatypes in Python can be:

Python Data types
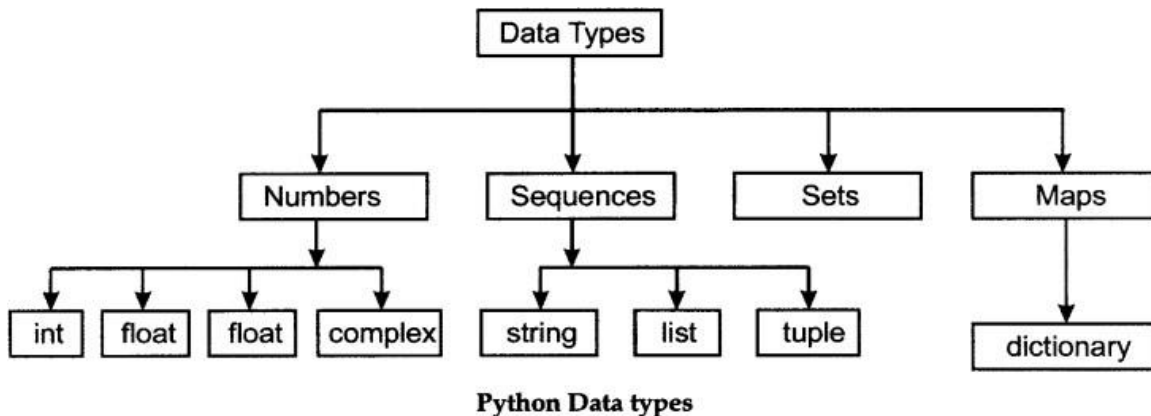
5. Python inputs

In Python, not only can we display the output to the user, but we can also collect data from the user and can pass it on to the Python script for further processing. To collect the data from the user at the time of execution, **input()** function is used. While using the input function, the datatype of the expected input is required to be mentioned so that the machine does not interpret the received data in an incorrect manilr as the data taken as input from the user is considered to be a string (sequence of characters) by default.

For example:

Str = input(<String>) # Python expects the input to be of stringdatatype

Number = int(input(<string>)) # Input string gets converted to aninteger value before assignment

Value = float(input(<String>)) # Input string gets converted to adecimal value before assignment

6. 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. Value and variables when used with operators are known as operands.

a. Arithmetic Operators

Operator	Meaning	Expression	Result
+	Addition	10 + 20	30
-	Subtraction	30 - 10	20
*	Multiplication	30 * 100	300
/	Division	30 / 10	20.0
//	Integer Division	25 // 10	2
%	Remainder	25 % 10	5
**	Raised to power	3 ** 2	9

b. Conditional Operators

Operator	Meaning	Expression	Result
>	Greater Than	20 > 10	True
		15 > 25	False
<	Less Than	20 < 45	True
		20 < 10	False
==	Equal To	5 == 5	True
		5 == 6	False
!=	Not Equal to	67 != 45	True
		35 != 35	False
>=	Greater than or Equal to	45 >= 45	True
		23 >= 34	False
<=	Less than or equal to	13 <= 24	True
		13 <= 12	False

c. Logical Operators

Operator	Meaning	Expression	Result
and	And operator	True and True	True
		True and False	False
or	Or operator	True or False	True
		False or False	False
not	Not Operator	not False	True
		not True	False

d. Assignment Operators

Operator	Expression	Equivalent to
=	X=5	X = 5
+=	X +=5	X = X + 5
-=	X -= 5	X = X - 5
*=	X *= 5	X = X * 5
/=	X /= 5	X = X / 5

7. Conditional Statements

While coding in Python, a lot of times 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. Some of them are:
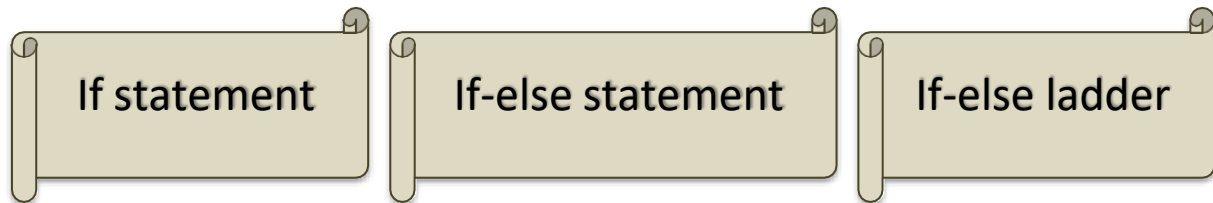
According to the number of conditions and their dependency on each other, the relevant type of conditional statement is used.

8. Looping

A lot of times, it happens that a task needs to be executed multiple number of times. For example, we need to print hello 10 times on the output screen. One way of doing this is writing 10 print statements. But this is time and space consuming. The other way, which is more efficient, is to use loop statements. The loop statements help in iterating statements or a group of statements as many times as it is asked for. In this case, we will simply write a loop which would start counting from 1 to 10. At every count, it will print hello once on the screen and as soon as it reaches 10, the loop will stop executing. All this can be done by just one loop statement.

Various types of looping mechanisms are available in Python. Some of them are:

These were some of the basic concepts for writing a code in Python. We can explore these concepts further by going through the experiential Jupyter notebook for this chapter. In that notebook, we will get to explore Python basic concepts and we can also work around them to develop better understanding around it.

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 by writing 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.

import numpy as np

Meaning: Import numpy and refer to it as np wherever it is used.

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
- A package created to work around numerical arrays in python.
- Handy when it comes to working with large numerical databases and calculations around it.

OpenCV
- An image processing package which can explicitly work around images and can be used for image manipulation and processing like cropping, resizing, editing, etc.

Matplotlib
- A package which helps in plotting the analytical (numerical) data in graphical form.
- It helps the user in visualizing the data thereby helping them in understanding it better.

NLTK
- NLTK stands for Natural Language Tool Kit and it helps in tasks related to textual data.
- It is one of the most commonly used package for Natural Language Processing.

Pandas
- A package which helps in handling 2-dimensional data tables in python.
- It is useful when we need to work with data from excel sheets and other databases.

To develop a better understanding around these packages, let us go through the Jupyter Notebook of package exploration and see how these packages can be used in Python.

Python Basic

PROGRAM NO-1:

AIM- Write a Python program to print the following string in a specific format.

SOURCE CODE-

```
Twinkle, twinkle, little star,
        How I wonder what you are!
                Up above the world so high,
                Like a diamond in the sky.
Twinkle, twinkle, little star,
        How I wonder what you are!
```

```python
print("Twinkle, twinkle, little star, \n\tHow I wonder what you are!
\n\t\tUp above the world so high, \n\t\tLike a diamond in the sky.
\nTwinkle, twinkle,little star, \n\tHow I wonder what you are!")
```

OUTPUT-

```
Twinkle, twinkle, little star,
        How I wonder what you are!
                Up above the world so high,
                Like a diamond in the sky.
Twinkle, twinkle, little star,
        How I wonder what you are!
```

RESULT- The source code is executed successfully and the output was verified.

PROGRAM NO-2

AIM- Write a Python program to print 5 lines about yourself using print() function.

SOURCE CODE

OUTPUT-

```
#Project - 1 Write 5 lines about your self
a = input("Write your name:")
b = int(input("Write your class:"))
c = int(input("Write your roll no.:"))
d= input("Write your father's name:")
e = input("Write your hobbies:")
print("Hello World")
print("1. My name is ",a)
print("2. I'm studying in class ",b)
print("4. My roll no. is ",c)
print("5. My Father's name is ",d)
print("6. My hobbies are ",e)
```

RESULT- The source code is executed successfully and the output was verified.

PROGRAM NO-3

AIM- Write a program to make a simple calculator.

SOURCE CODE-

```
# Python program for simple calculator

# Function to add two numbers
def add(num1, num2):
        return num1 + num2
# Function to subtract two numbers
def subtract(num1, num2):
        return num1 - num2


# Function to multiply two numbers
def multiply(num1, num2):
        return num1 * num2
# Function to divide two numbers
# Take input from the user
select = int(input("Select operations form 1, 2, 3, 4 :"))

number_1 = int(input("Enter first number: "))
number_2 = int(input("Enter second number: "))

if select == 1:
        print(number_1, "+", number_2, "=",
                        add(number_1, number_2))
```

```
    elif select == 2:
            print (number_1, "-", number_2, "=",
                                        subtract (number_1, number_2))
    elif select == 3:
            print (number_1, "*", number_2, "=",
                                        multiply (number_1, number_2))
    elif select == 4:
            print (number_1, "/", number_2, "=",
                                        divide (number_1, number_2))

    else:
            print ("Invalid input")
```

OUTPUT-

RESULT- The source code is executed successfully and the output was verified

```
///
Please select operation -
1. Add
2. Subtract
3. Multiply
4. Divide

Select operations form 1, 2, 3, 4 :4
Enter first number: 21
Enter second number: 25
21 / 25 = 0.84
>>> |
```

Multiple-Choice Questions

1. Find the invalid variable among the following:

a. 1st_string

b. my_string_1

c. _

d. foo

Answer: (a) 1st_string

2. The order of precedence in the Python language is:

A) Exponential

B) Parentheses

C) Division

D) Multiplication

E) Subtraction

F) Addition

a. B,A,D,C,F,E

b. A,B,D,C,F,E

c. A,B,C,D,E,F

d. B,A,D,C,E,F

Answer: (a) B,A,D,C,F,E

3. Which one of these is incorrect?

a. float('nan')

b. float('inf')

c. float('12+34′)

d. float('56'+'78')

Answer: (c) float('12+34′)

4. The value of the Python expression given below would be:

4+2**5//10

a. 77

b. 0

c. 3

d. 7

Answer: (d) 7

5. The return value for trunc() would be:

a. bool

b. float

c. int

d. None

Answer: (c) int

6. What is the output of the Python code given below, if the date of the system is June 21st, 2017 (Wednesday)?

[] or {}

{} or []

a. [ ] [ ]

b.[ ] { }

c.{ } { }

d.{ }[ ]

Answer: (d){ } []

7. The output of this Python code would be:

s='{0}, {1}, and {2}'

s.format('hi', 'great', 'day')

a. 'hi, great, and day'

b. 'hi great and day'

c. 'hi, great, day'

d. Error

Answer: (a) 'hi, great, and day'

8. The output of this Python code would be:

a = ['mn', 'op']

for i in a:
    i.upper()
      print(a)

a. [None, None]
b. ['MN', 'OP']
c. ['mn', 'op']
d. None of the above

Answer: (c) ['mn', 'op']

9. The output of this Python code would be:

print("mno. PQR".capitalize())
a. Mno. Pqr
b. Mno. pqr
c. MNO. PQR
d. mno. pqr

Answer: (b) Mno. pqr

10. Which arithmetic operators can we NOT use with strings?

a. –
b. +
c. *

d. All of the above

Answer: (a) –

11. Which function do we use to shuffle a list(say list1)?
a. shuffle(list1)
b. list1.shuffle()
c. random.shuffleList(list1)
d. random.shuffle(list1)

Answer: (d) random.shuffle(list1)

12. In the following statements of Python, which ones will result into the output: 6?

A = [[1, 2, 3], [4, 5, 6], [7, 8, 9]]
a. A[3][2]
b. A[2][3]
c. A[1][2]
d. A[2][1]

Answer: (c) A[1][2]

13. Is this code valid in Python?

>>> m=6,7,8,9
>>> m
a. No, many values will unpack
b. Yes, (6,7,8,9) will be printed
c. Yes, 6 will be printed
d. Yes, [6,7,8,9] will be printed

Answer: (b) Yes, (6,7,8,9) will be printed

14. Which function removes a set's first and the last element from a list?
a. pop
b. remove
c. dispose
d. discard

Answer: (a) pop

15. The output of this Python code would be:
>>> x={1:"X",2:"Y",3:"Z"}
>>> del x
a. the del method does not exist for dictionary
b. the del would delete the values present in dictionary
c. the del would delete the entire dictionary

d. the del would delete all the keys in dictionary

Answer: (d) the del would delete all the keys in dictionary

16. The output of this Python code would be:

sum(1,2,3)

sum([2,4,6])

a. 6, 12

b. Error, Error

c. Error, 12

d. 6, Error

Answer: (c) Error, 12

17. The output of this Python code would be:

def find(x, **y):

      print(type(y))

      find('letters',X='1′,Y='2′)

a. Dictionary

b. An exception is thrown

c. String

d. Tuple

Answer: (a) Dictionary

18. Which one of these is NOT true about recursion?

a. We can replace a recursive function by a non-recursive function

b. The memory space taken by the recursive functions is more than that of non-recursive function

c. Running a recursive function is faster as compared to a non-recursive function

d. The process of recursion makes it easier for users to understand a program

Answer: (c) Running a recursive function is faster as compared to a non-recursive function

19. The output of this Python code would be:

a = ['mn', 'op']

print(len(list(map(list, a))))))

a. 4

b. 2

c. Not specified

d. Error

Answer: (d) Error

SHORT AND LONG QUESTION ANSWER:

1. What are some key features of Python?

Ans: Easy to code, free, open-source, interpreted, high-level and integrated, object-oriented, portable, dynamically typed, extensible, and offers GUI programming support.

2. What are keywords in Python?

Ans: Reserved and predefined words with special meanings used to define the coding syntax are called keywords in Python. Except for True and False, we always write these keywords in Python in lowercase. They can also not be used as variable, function, or identifier names.

3. What are the advantages of Python?

Ans: Python has English-like syntax, is concise, object-oriented, high-level, interpreted, free, and open source. Hence, Python is easy to learn, access, and write code in. Also, Python code is more readable, portable, and maintainable, and Python offers vast library support. No wonder then that Python improves the productivity of software developers and makes the process of software development smoother.

4. How many data types are there in Python?

Ans: Python has five standard data types:
String, Numbers, Tuple, List, Dictionary

5. What is the use of Jupyter Notebook?

Ans: The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations, and narrative text. Uses include data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning, and much more.

6. What do you need virtual environment?

Ans: A virtual environment is a tool that helps to keep dependencies required by different projects separate by creating isolated python virtual environments for them. This is one of the most important tools that most Python developers use.

7. Explain the python list.

Ans. A Python list is a sequence of comma separated items, enclosed in square brackets [ ]. The items in a Python list need not be of the same data type. In Python, a list is a sequence data type. It is an ordered collection of items.

8. What is standared data types of Python?

Ans: Python has five standard data types – Numbers, String, List , Tuple, Dictionary

9. Define the python tuple.

Ans: Python Tuple is a collection of objects separated by commas. In some ways, a tuple is similar to a Python list in terms of indexing, nested objects, and repetition but the main difference between both is Python tuple is immutable, unlike the Python list which is mutable.
T=(1, "Manoj Kumar")

10. **Explain the Decision making statements of python.**

Ans: Decision making statements can direct a program to execute on the based of instructions if a certain condition is True or another if it's False. Different decision making structures can be used such as if statements, else-if statements, and nested if else statements for decision making in python programming language.

Python's decision making functionality is in its keywords − **if..elif...else**. The if keyword requires a boolean expression, followed by colon symbol.

The colon (:) symbol starts an indented block. The statements with the same level of indentation are executed if the boolean expression in if statement is **True**. If the expression is not True (False), the interpreter bypasses the indented block and proceeds to execute statements at earlier indentation level.

Python − The if Statement
discount = 0
amount = 1200

# Check he amount value
if amount > 1000:
   discount = amount * 10 / 100

print("amount = ", amount - discount)

11. Define the Operators in Python.

Ans: In Python programming, Operators in general are used to perform operations on values and variables. These are standard symbols used for the purpose of logical and arithmetic operations. In this article, we will look into different types of **Python operators.**

- OPERATORS: These are the special symbols. Eg- $+$, $*$, $/$, etc.
- OPERAND: It is the value on which the operator is applied.

Types of Operators in Python

1. Arithmetic Operators
2. Comparison Operators
3. Logical Operators
4. Bitwise Operators
5. Assignment Operators
6. Identity Operators and Membership Operators

12. Differentiate between For loop and While Loop.

Ans: For Loop

A **for loop** is a control flow statement that executes code for a predefined number of iterations. The keyword used in this control flow statement is "**for**". When the number of iterations is already known, the *for* loop is used.

The *for* loop is divided into two parts −

Header − This part specifies the iteration of the loop. In the header part, the loop variable is also declared, which tells the body which iteration is being executed.

Body − The body part contains the statement executed per iteration.

- The initialization, condition checking, and iteration statements are written at the beginning of the loop.
- It is used only when the number of iterations is known beforehand.
- If the condition is not mentioned in the 'for' loop, then the loop iterates the infinite number of times.
- The initialization is done only once, and it is never repeated.
- The iteration statement is written at the beginning.
- Hence, it executes once all statements in the loop have been executed.

Syntax
```
for(initialization; condition; iteration){
  //body of the 'for' loop
}
```
Example:

```
# input list
inputList = [10, 20, 30, 40, 50]
print("Input list elements:")
# traversing through all elements of the list using for loop
for element in inputList:
  # printing each element of the list
  print(element)
```

While Loop

A loop that runs a single statement or a set of statements for a given *true* condition. This loop is represented by the keyword "**while**". When the number of iterations is unknown, a **while loop** is used. The statement is repeated until the Boolean value is *false*. Because the condition is tested at the beginning of a *while* loop, it is also known as the pre-test loop.

- The initialization and condition checking are done at the beginning of the loop.
- It is used only when the number of iterations isn't known.
- If the condition is not mentioned in the 'while' loop, it results in a compilation error.
- If the initialization is done when the condition is being checked, then initialization occurs every time the loop is iterated through.
- The iteration statement can be written within any point inside the loop.

Syntax
```
while ( condition) {
  statements;
  //body of the loop
}
```

Example
```
# Initializing a dummy variable with 1
i = 1
# Iterate until the given condition is true
while i < 10:
  # printing the current value of the above variable
  print(i)
  # incrementing the value of i value by 1
  i += 1
```
13. What is python Identifiers? **Rules for Naming Python Identifiers**

Ans: Identifier is a user-defined name given to a variable, function, class, module, etc. The identifier is a combination of character digits and an underscore. They are case-sensitive i.e., 'num' and 'Num' and 'NUM' are three different identifiers in python. It is a good programming practice to give meaningful names to identifiers to make the code understandable.

Rules for Naming Python Identifiers
- It cannot be a reserved python keyword.
- It should not contain white space.
- It can be a combination of A-Z, a-z, 0-9, or underscore.
- It should start with an alphabet character or an underscore (_).
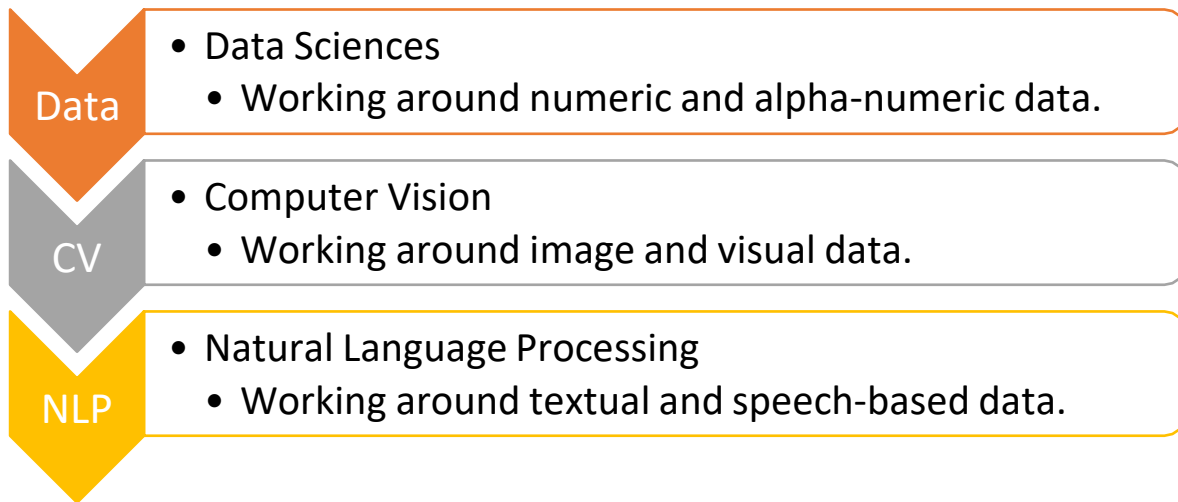- It should not contain any special character other than an underscore (_).

14. Write the program to find simple interest using Jupiter notebook.
```
P = int(input("Enter the principal amount :"))
T = int(input("Enter the time period :"))
R = int(input("Enter the rate of interest :"))
  si = (p * t * r)/100
  print('The Simple Interest is', si)
```

Data Sciences

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:

Data
- Data Sciences
  - Working around numeric and alpha-numeric data.

CV
- Computer Vision
  - Working around image and visual data.

NLP
- Natural Language Processing
  - Working around textual and speech-based data.

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 analyse 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:
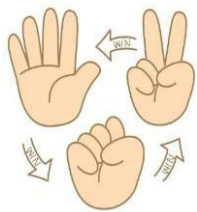
* Rock, Paper & Scissors:

Go to this link 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.

Did you manage to win?

_____

_____

What was the strategy that you applied to win this game against the AI machine?

_____
_____
_____
_____

Was it different playing Rock, Paper & Scissors with an AI machine as compared to a human?

_____
_____
_____
_____

What approach was the machine following while playing against you?

_____
_____
_____
_____

Applications of Data Sciences

Data Science is not a new field. Data Sciences majorly work around analysing 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 analyse 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 _____ ment personalization through research in genetics and genomics. The _____ _____ pact of the DNA on our health and find individual biologica _____ etics, diseases, and drug response. Data science techniques allow in _____ data with genomic data in disease research, which provides a deep _____ sues in reactions to particular drugs and diseases. As soon as we _____ ome data, we will achieve a deeper understanding of the humar _____ risk prediction will be a major step towards more individual care.
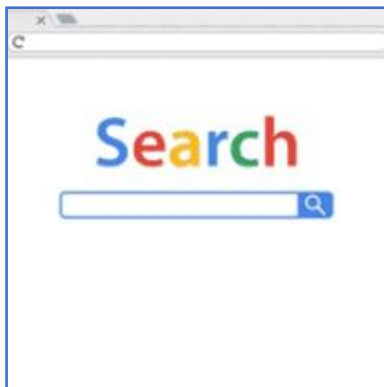
Internet Search*: When we talk about search engines, we think 'Google'. Right? But there are many other search engines like Yahoo, Bing, Ask, AOL, and so on. All these search engines (including Google) make use of data science algorithms to deliver the best result for our searched query in the fraction 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'thave 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.
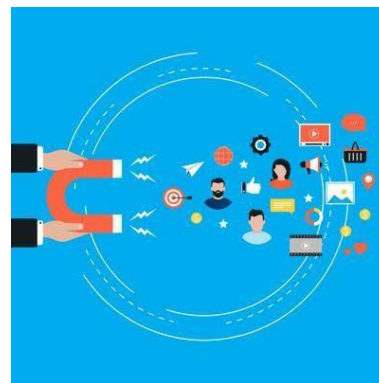
Website Recommendations:* Aren't we all used to the suggestions about similar products on Amazon? They not onlyhelp us find relevant products from billions of productsavailable with them but also add a lot to the user experience. A lot of companies have fervidly used this engine to promotetheir products in accordance with the user's interest andrelevance of information. Internet giants like Amazon, Twitter,Google Play, Netflix, LinkedIn, IMDB and many more use thissystem to improve the user experience. The recommendationsare 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:
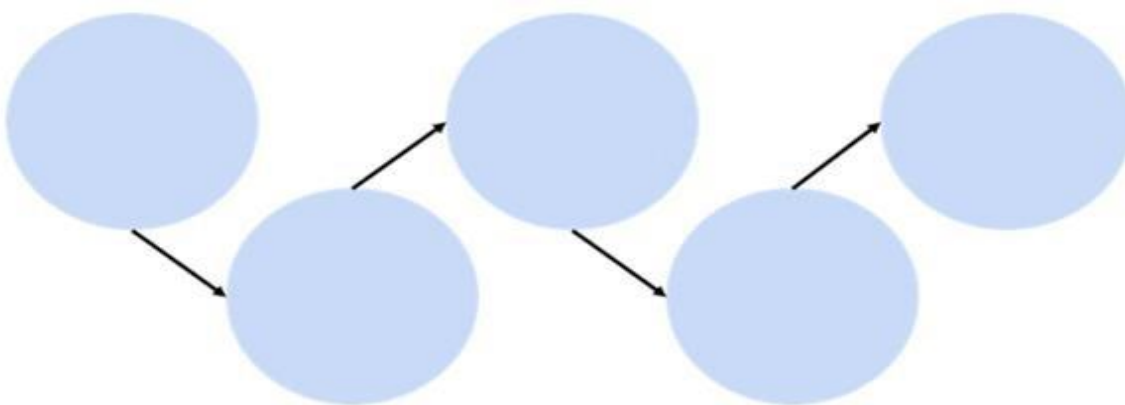
*The Scenario**

Humans are social animals. We tend to organise 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 ?	o Restaurants offering buffets o Restaurant Chefs
What do we know about them?	o Restaurants cook food in bulk every day for their buffets to meet their customer needs. o 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 ?	o 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. o 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.

What is the context/situation in which the stakeholders experience this problem?	o Restaurants which serve buffet food o At the end of the day, when no further food consumption is possible

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?	o 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?	o Less or no food would be left unconsumed. o Losses due to unconsumed food would reduce considerably.

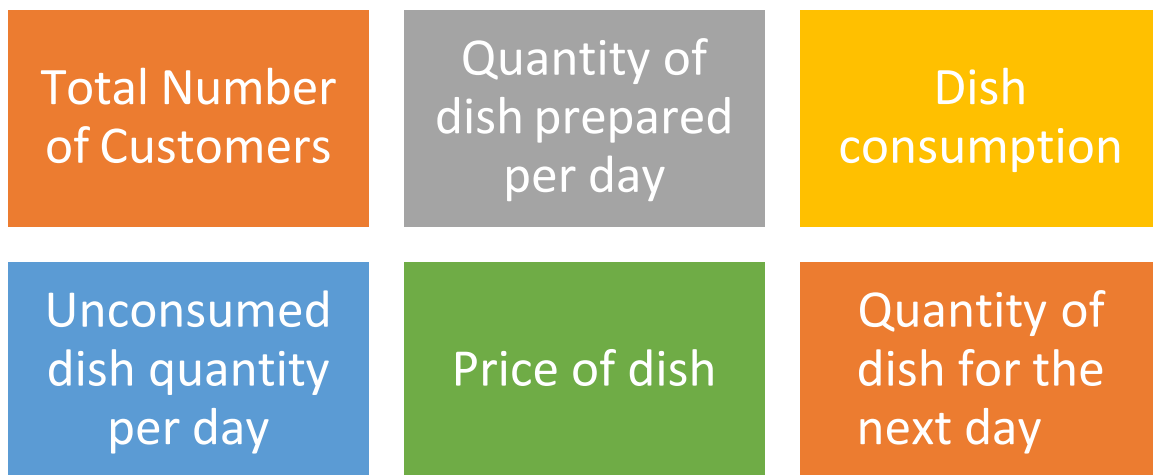Now that we have noted down all the factors around our problem, let us fill up the problem statement template.

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 statedas:

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

Data Acquisition

After finalising the goal of our project, let us now move towards looking at various data features which affect the problem in some way or the other. Since any AI-based project requires data for testing and training, 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:

Total Number of Customers	Quantity of dish prepared per day	Dish consumption
Unconsumed dish quantity per day	Price of dish	Quantity of dish for the next day

Now let us understand how these factors are related to our problem statement. For this, we can use the System Maps tool to figure out the relationship of elements with the project's goal. Here is the System map for our problem statement.
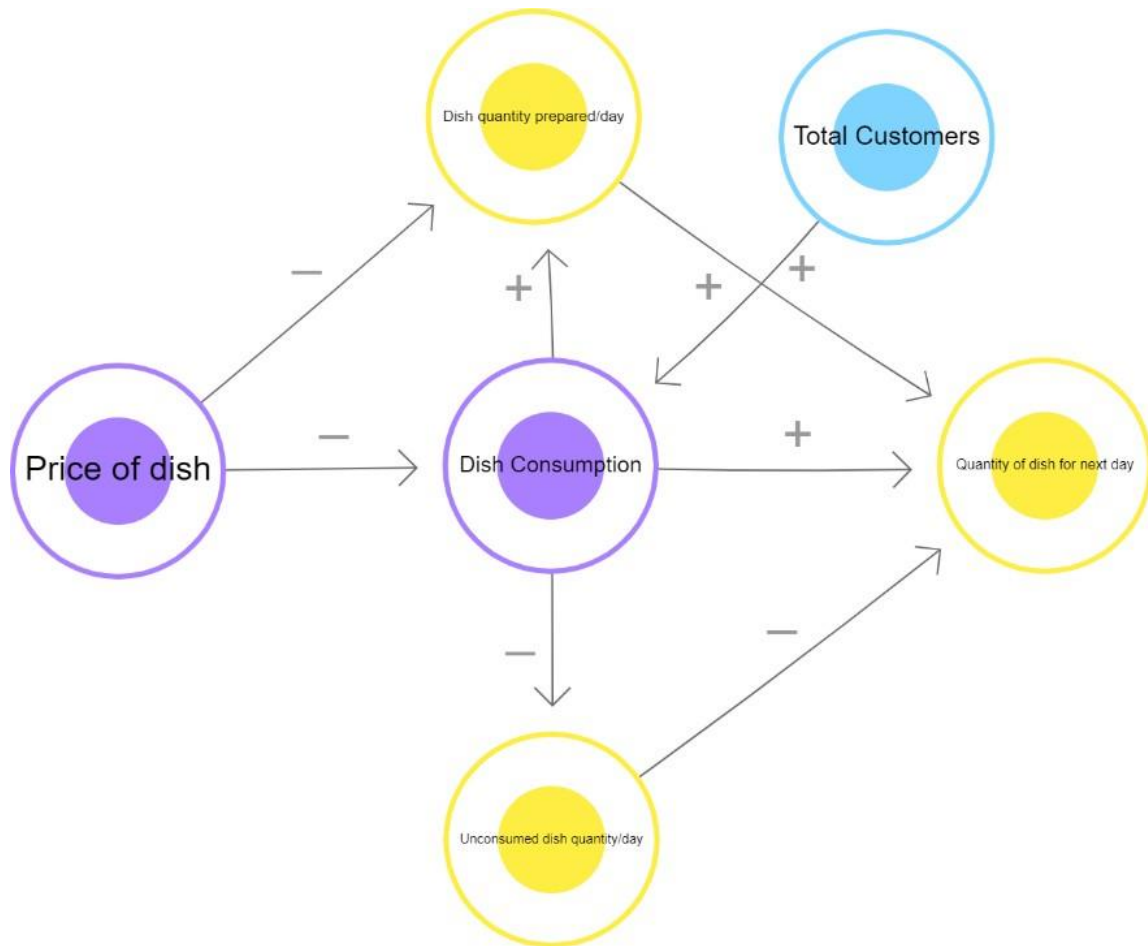
In this system map, you can see how the relationship of each element is defined with the goal of our project. Recall that the positive arrows determine a direct relationship of elements while the negative ones show an inverse relationship of elements.

After looking at the factors affecting our problem statement, now it's time to take a look at the data which is to be acquired for the goal. 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 personalised 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:

Name of dish	Quantity of that dish prepared per day	Quantity of unconsumed portion of the dish per day
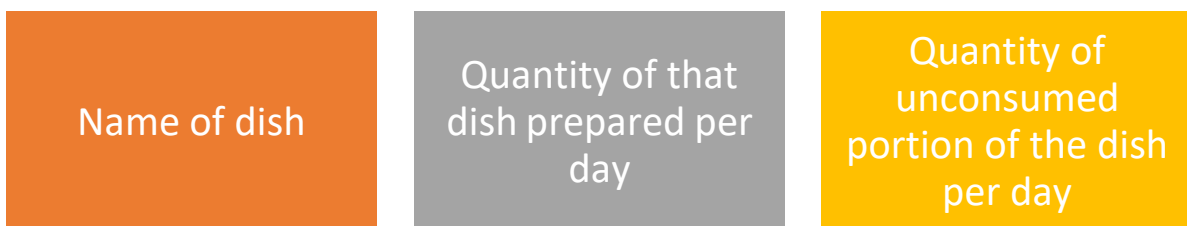
Thus, we extract the required information from the curated dataset and clean it up in such a way that

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 dataframe 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 manilr. 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 analysing 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 age details per day, cash denominations transaction details, visitor details, etc.

Movie Theatres ovie details, tickets sold offline, tickets sold online, refreshment purchases,

Now look around you and find out what are the different types of databases which are maintained in the places mentioned below. Try surveying people who are responsible for the designated places to get a better idea.

Your classroom   Your school   Your city

As you can see, all the type of data which has been mentioned above is 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 categorised in two ways: Offline and Online.

Offline Data Collection	Online Data Collection
Sensors	Open-sourced Government Portals
Surveys	Reliable Websites (Kaggle)
Interviews	World Organisations' open-sourced statistical websites
Observation s	

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.

A lot of other formats of databases also exist, you can explore them online!

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 datatype. They can be numbers, characters, booleans, etc. but only one datatype 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. Heterogenous collection of Data.
2. Can contain only one type of data, hence not flexible with datatypes.	2. Can contain multiple types of data, hence flexible with datatypes.
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=numpy.array([1,2,3,4,5,6,7,8,9,0])**	**A = [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.

Pandas is well suited for many different kinds of data:

- Tabular data with heterogeneously-typed columns, as in an SQL table or Excel spreadsheet
- Ordered and unordered (not necessarily fixed-frequency) time series data.
- Arbitrary matrix data (homogeneously typed or heterogeneous) with row and column labels
- Any other form of observational / statistical data sets. The data actually need not be labeled at all to be placed into a Pandas data structure

The two primary data structures of Pandas, Series (1-dimensional) and DataFrame (2-dimensional), handle the vast majority of typical use cases in finance, statistics, social science, and many areas of engineering. Pandas is built on top of NumPy and is intended to integrate well within a scientific computing environment with many other 3rd party libraries.

Here are just a few of the things that pandas do well:

- Easy handling of missing data (represented as NaN) in floating point as well as non-floating point data
- Size mutability: columns can be inserted and deleted from DataFrame and higher dimensional objects
- Automatic and explicit data alignment: objects can be explicitly aligned to a set of labels, or the user can simply ignore the labels and let Series, DataFrame, etc. automatically align the data for you in computations
- Intelligent label-based slicing, fancy indexing, and subsetting of large data sets
- Intuitive merging and joining data sets
- Flexible reshaping and pivoting of data sets

*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:
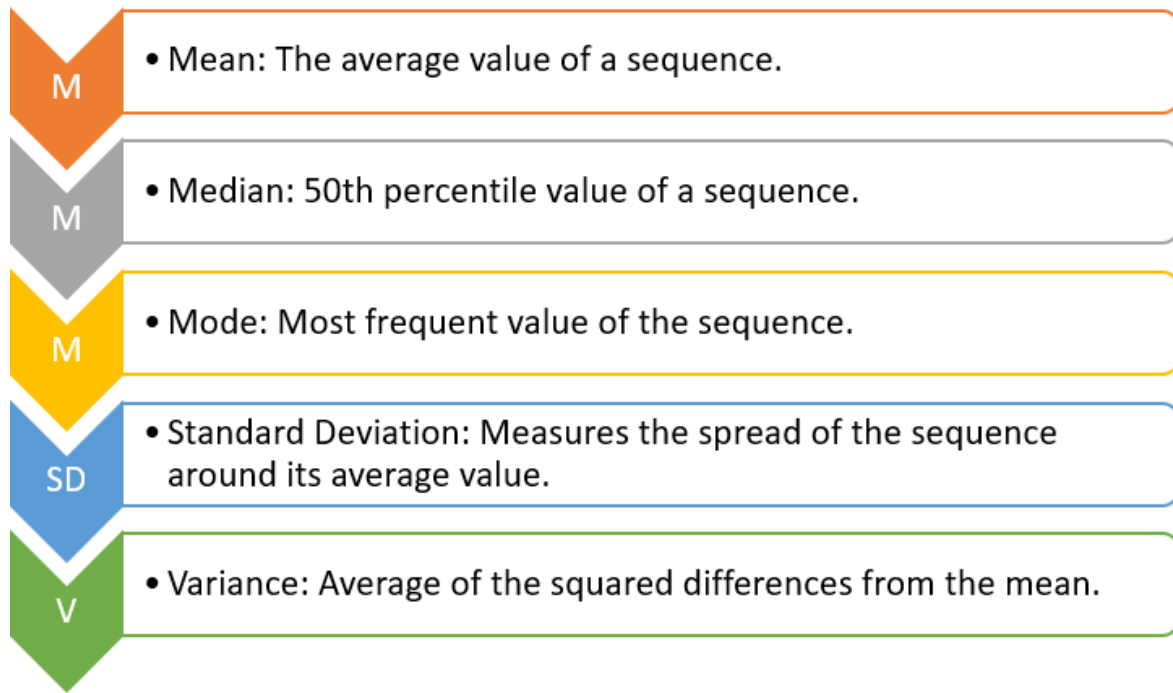

Not just plotting, but you can also modify your plots the way you wish. You can stylise them and make them more descriptive and communicable.

These packages help us in accessing the datasets we have and also in exploring them to develop a better understanding of them

Basic Statistics with Python

We have already understood that Data Sciences works around analysing data and performing tasks around it. For analysing the numeric & alpha-numeric data used for this domain, mathematics comes to our rescue. Basic statistical methods used in mathematics come quite hAmanin Python too for analysing and working around such datasets. Statistical tools widely used in Python are:

- **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.

Do you remember using these formulas in your class? Let us recall all of them here:

1. What is Mean? How is it calculated?

_____
_____
_____
_____

2. What is Median? How is it calculated?

_____
_____
_____
_____

3. What is Mode? How is it calculated?

_____
_____
_____
_____

4. What is Standard Deviation? How is it calculated?

_____

_____

_____

_____

5. What is Variance? How is it calculated?

_____

_____

_____

_____

Advantage of using Python packages is that we do not need to make our own formula or equation to find out the results. There exist a lot of pre-defined functions with packages like NumPy which reduces this trouble for us. All we need to do is write that function and pass on the data to it. It's that simple!

Let us take a look at various Python syntaxes that can help us with the statistical work in data analysis. Head to the Jupyter Notebook of Basic statistics with Python and start exploring! You may find the Jupyter notebook here:

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:

1. 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 not processible. That is why, these values (as and when encountered) are removed from the database.

2. 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.

3. 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.

Machines work efficiently on numbers, humans need visual aid to understand and comprehend the information passed. Hence, data visualization is used to interpret the data collected and identify patterns and trends out of it.

In Python, Matplotlib package helps in visualising the data and making some sense out of it. As we have

already discussed before, with the help of this package, we can plot various kinds of graphs. Let us discuss some of them here:

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 scatter plot can display information maximum upto 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.
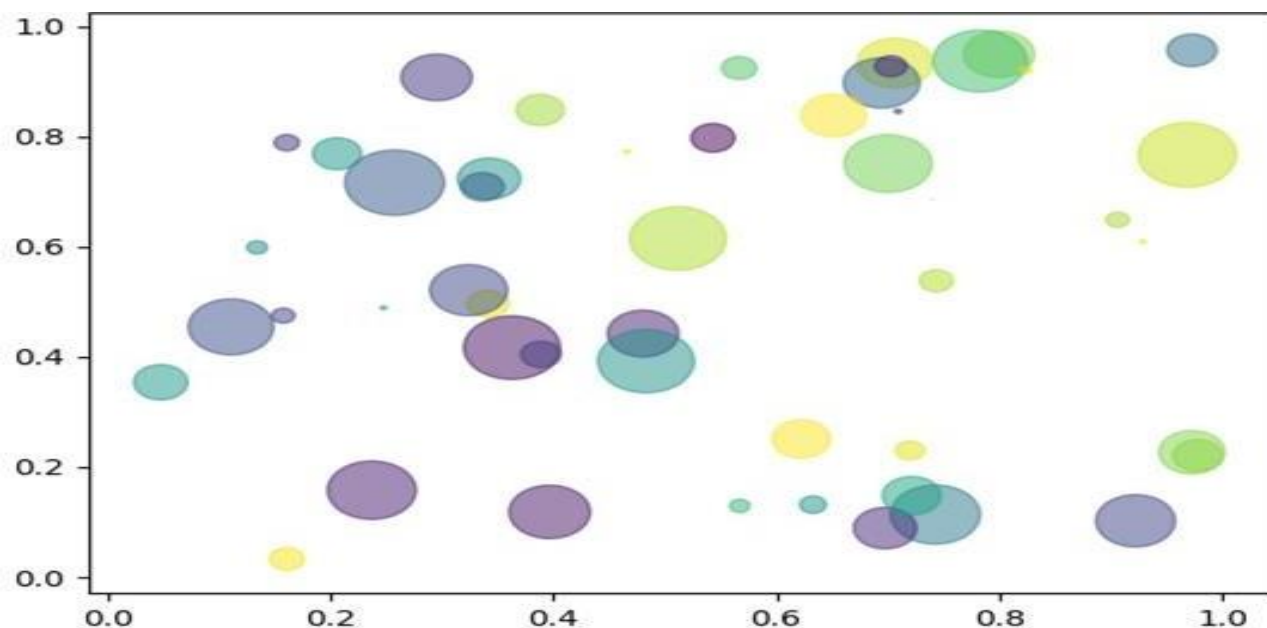
Bar Chart

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.
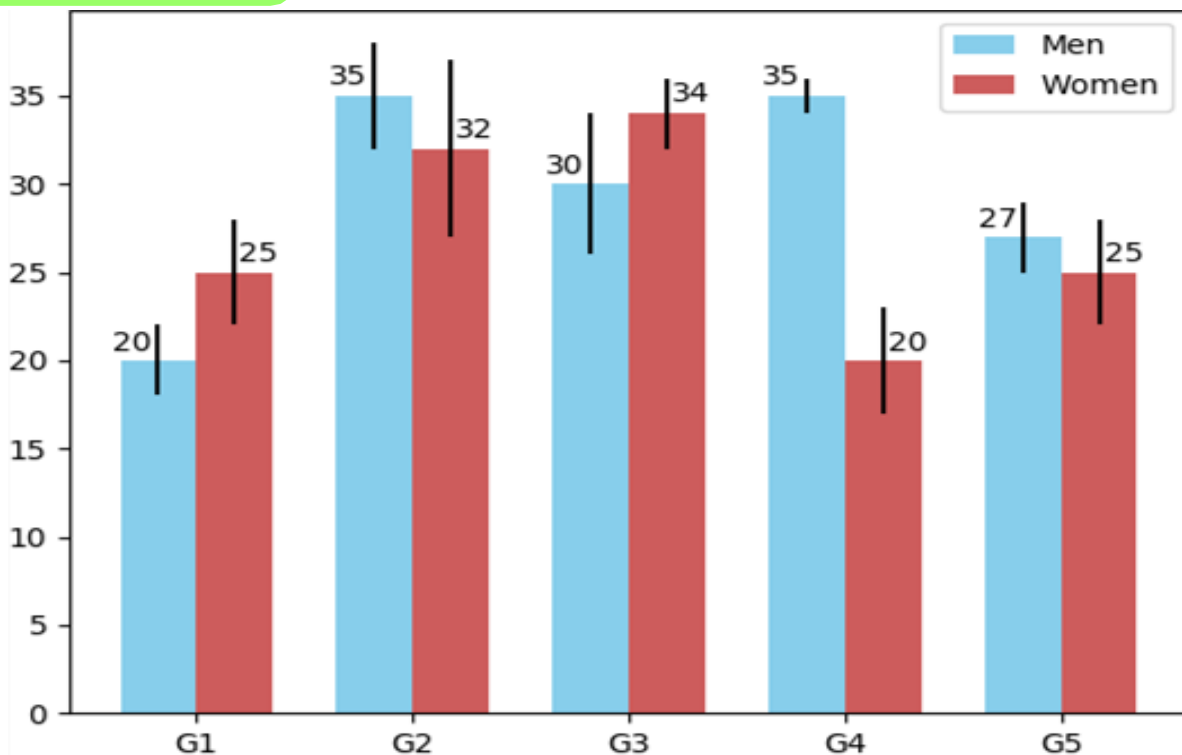
This is an example of a double bar chart. The 2 axes depict two different parameters while bars of different colours work with different entities (in this case it is women and men). Bar chart also works on discontinuous data and is made at uniform intervals.

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 the element.
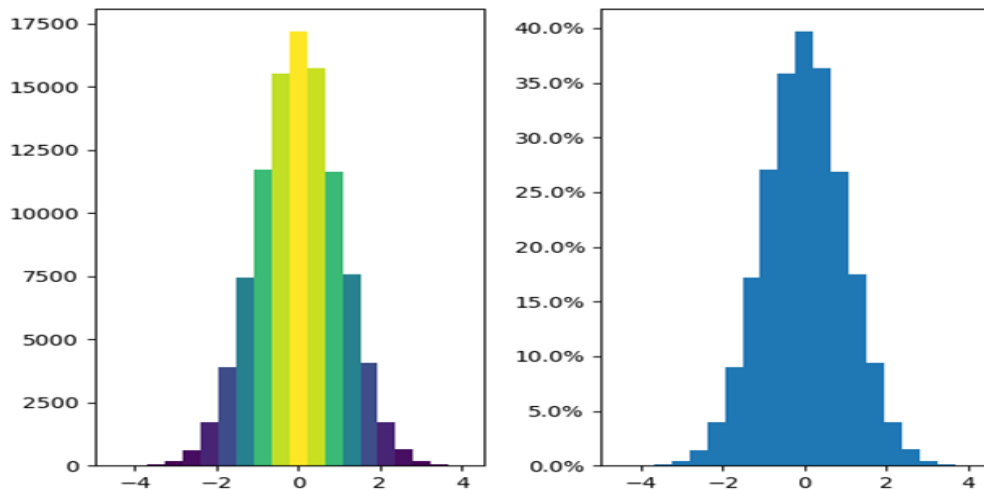
Box Plots

When the data is split according to its percentile throughout the range, box plots come in haman. Box plots also known as box and whiskers plot conveniently display the distribution of data throughout the range with the help of 4 quartiles.
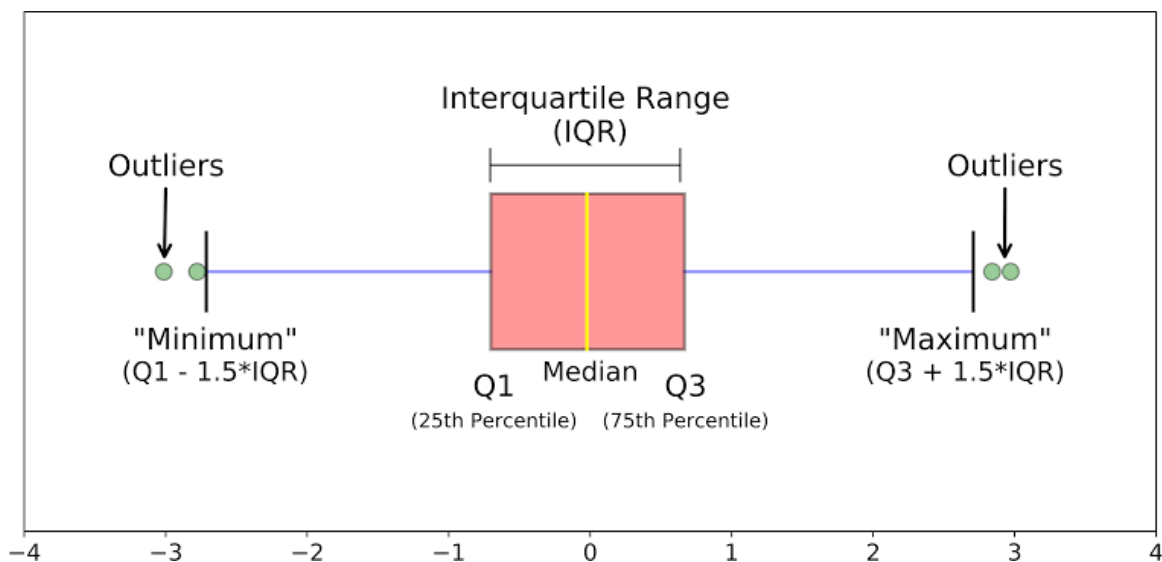
Here as we can see, the plot contains a box and two lines at its left and right are termed as whiskers. The plot has 5 different parts to it:

Quartile 1: From 0 percentile to 25th percentile – Here data lying between 0 and 25th percentile is plotted. Now, if the data is close to each other, lets say 0 to 25th percentile data has been covered in just 20-30 marks range, then the whisker would be smaller as the range is smaller. But if the range is large that is 0-30 marks range, then the whisker would also get elongated as the range is longer.

Quartile 2: From 25th Percentile to 50th percentile – 50th percentile is termed as the mean of the whole distribution and since the data falling in the range of 25th percentile to 75th percentile has minimum deviation from the mean, it is plotted inside the box.

Quartile 3: From 50th percentile to 75th percentile – This range is again plotted in the box as its deviation from the mean is less. Quartile 2 & 3 (from 25th percentile to 75th percentile) together constitute the Inter Quartile Range (IQR). Also, depending upon the range of distribution, just like whiskers, the length of box also varies if the data is less spread or more.

Quartile 4: From 75th percentile to 100th percentile – It is the whiskers plot for top 25 percentile data.

Outliers: The advantage of box plots is that they clearly show the outliers in a data distribution. Points which do not lie in the range are plotted outside the graph as dots or circles and are termed as outliers as they do not belong to the range of data. Since being out of range is not an error, that is why they are still plotted on the graph for visualisation.

Let us now move ahead and experience data visualisation using Jupyter notebook. Matplotlib library will help us in plotting all sorts of graphs while Numpy and Pandas will help us in analysing the data.

Data Sciences: Classification Model

In this section, we would be looking at one of the classification models used in Data Sciences. But before we look into the technicalities of the code, let us play a game.

Personality Prediction

Step 1: Here is a map. Take a good look at it. In this map you can see the arrows determine a quality. The qualities mentioned are:

1. Positive X-axis – People focussed: You focus more on people and try to deliver the best experience to them.
2. Negative X-axis – Task focussed: You focus more on the task which is to be accomplished and try to do your best to achieve that.
3. Positive Y-axis – Passive: You focus more on listening to people and understanding everything that they say without interruption.
4. Negative Y-axis – Active: You actively participate in the discussions and make sure that you make your point in-front of the crowd.

Think for a minute and understand which of these qualities you have in you. Now, take a chit and write your name on it. Place this chit at a point in this map which best describes you. It can be placed anywhere on the graph. Be honest about yourself and put it on the graph.

Step 2: Now that you have all put up your chits on the graph, it's time to take a quick quiz. Go to this link and finish the quiz on it individually.

On this link, you will find a personality prediction quiz. Take this quiz individually and try to answer all the questions honestly. Do not take anyone's help in it and do not discuss about it with anyone. Once

the quiz is finished, remember the animal which has been predicted for you. Write it somewhere and do not show it to anyone. Keep it as your little secret.

Once everyone has gone through the quiz, go back to the board remove your chit, and draw the symbol which corresponds to your animal in place of your chit. Here are the symbols:

Lion	Otter	Golden Retriever	Beaver
☐	☐	☐	☐

Place these symbols at the locations where you had put up your names. Ask 4 students not to do so and tell them to keep their animals a secret. Let their name chits be on the graph so that we can predict their animals with the help of this map.

Now, we will try to use the nearest neighbour algorithm here and try to predict what can be the possible animal(s) for these 4 unknowns. Now look that these 4 chits one by one. Which animal is occurring the most in their vicinity? Do you think that if the m lion symbol is occurring the most near their chit, then there is a good probability that their animal would also be a lion? Now let us try to guess the animal for all 4 of them according to their nearest neighbours respectively. After guessing the animals, ask these 4 students if the guess is right or not.

K-Nearest Neighbour: Explained

The k-nearest neighbours (KNN) algorithm is a simple, easy-to-implement supervised machine learning algorithm that can be used to solve both classification and regression problems. The KNN algorithm assumes that similar things exist in close proximity. In other words, similar things are near to each other as the saying goes "*Birds of a feather flock together"*. Some features of KNN are:

- The KNN prediction model relies on the surrounding points or neighbours to determine its class or group
- Utilises the properties of the majority of the nearest points to decide how to classify unknown points
- Based on the concept that similar data points should be close to each other

The personality prediction activity was a brief introduction to KNN. As you recall, in that activity, we tried to predict the animal for 4 students according to the animals which were the nearest to their points. This is how in a lay-man's language KNN works. Here, K is a variable which tells us about the number of neighbours which are taken into account during prediction. It can be any integer value starting from 1

1 - Nearest Neighbour   2 - Nearest Neighbour   3 - Nearest Neighbour
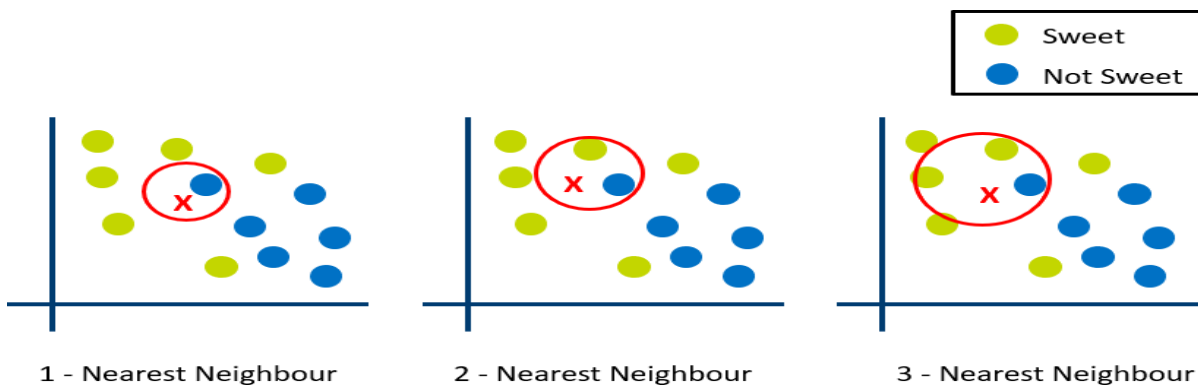
Here, X is the value which is to be predicted. The green dots depict sweet values and the blue ones denote not sweet. Let us try it out by ourselves first. Look at the map closely and decide whether X should be sweet or not sweet? Now, let us look at each graph one by one:

1 Here, we can see that K is taken as 1 which means that we are taking only 1 nearest neighbour into consideration. The nearest value to X is a blue one hence 1-nearest neighbour algorithm predicts that the fruit is not sweet.

2 In the 2nd graph, the value of K is 2. Taking 2 nearest nodes to X into consideration, we see that one is sweet while the other one is not sweet. This makes it difficult for the machine to make any predictions based on the nearest neighbour and hence the machine is not able to give any prediction.

3 In the 3rd graph, the value of K becomes 3. Here, 3 nearest nodes to X are chosen out of which 2 are green and 1 is blue. On the basis of this, the model is able to predict that the fruit is sweet.

On the basis of this example, let us understand KNN better:

KNN tries to predict an unknown value on the basis of the known values. The model simply calculates the distance between all the known points with the unknown point (by distance we mean to say the different between two values) and takes up K number of points whose distance is minimum. And according to it, the predictions are made.

Let us understand the significance of the number of neighbours:

1. As we decrease the value of K to 1, our predictions become less stable. Just think for a minute, imagine K=1 and we have X surrounded by several greens and one blue, but the blue is the single nearest neighbour. Reasonably, we would think X is most likely green, but because K=1, KNN incorrectly predicts that it is blue.

2. Inversely, as we increase the value of K, our predictions become more stable due to majority voting / averaging, and thus, more likely to make more accurate predictions (up to a certain point). Eventually, we begin to witness an increasing number of errors. It is at this point we know we have pushed the value of K too far.

3. In cases where we are taking a majority vote (e.g. picking the mode in a classification problem) among labels, we usually make K an odd number to have a tie breaker.

END

QUESTIONS AND ANSWER:

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

Explanation: William S. developed data science.

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

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:

11. **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.

12. 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.

13. 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

13. Draw the confusion matrix for the following data the number of true positive = 100 the number of true negative 47, the number of false positive = 62, the number of false negative = 290

14. How can data science help the government in fraud detection?

ANS: Data Scientists use methods and technologies that are combined in fraud analytics to assist spot possibly fraudulent transactions. The ability to process vast amounts of data at once is the main advantage of employing Data Science and Data Analytics for fraud detection by Data Analysts.

In US government, every year there is tax evasion so mow the government uses fraud-detection protocols in the digital age. The government has improved efficiency by making multidimensional taxpayer profiles from social media data, mixed metadata, emailing analysis, electronic payment patterns and more. Based on these profiles, the government forecasts individual tax returns. It became easy to catch those individuals who tried to evade the tax. Indian Government will soon the digital KYC for the verification of each Indian citizen for checking whether they are paying taxes as per their income or are conducting any fraud using black money.

15. What is Data science? Give an example of it.

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.

16. Where do we collect data from?

Data can be collected from various sources like –

- Surveys
- Sensors
- Observations
- Web scrapping (Internet)
- Interviews
- Documents and records.
- Oral histories

17. Why do we need to collect data?

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.

18. What is data mining? Explain with example.

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)
To be moved to chapter no. 3

19. What do you understand by Data Privacy?

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

20. Is data which is collected by various applications ethical in nature? Justify your

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

UNIT- 5   TOPIC- **Computer Vision**

SUB-TOPIC- **Introduction of Computer Vision**

Computer vision is a branch of artificial intelligence (AI) that enables computers and systems to extract useful information from digital photos, videos, and other visual inputs and to execute actions or make recommendations based on that information.

DETAILED EXPLAINATION : **Applications of Computer Vision**
In the 1970s, computer vision as a concept was first introduced. Everyone was excited by the new uses for computer vision. However, a considerable technological advance in recent years has elevated computer vision to the top of many companies' priority lists. Let's examine a few of them:

Facial Recognition
Computer vision is essential to the advancement of the home in the era of smart cities and smart homes. The most crucial application of computer vision is facial recognition in security. Either visitor identification or visitor log upkeep is possible.

Face Filters
Many of the functionality in today's apps, including Instagram and Snapchat, rely on computer vision. One of them is the usage of facial filters. The computer or algorithm may recognise a person's facial dynamics through the camera and apply the chosen facial filter.

Google's Search by Image
The majority of data that is searched for using Google's search engine is textual information, but it also has the intriguing option of returning search results via an image. This makes use of computer vision since it examines numerous attributes of the input image while also comparing them to those in the database of images to provide the search result.

Computer Vision in Retail
One of the industries with the quickest growth is retail, which is also utilising computer vision to improve the user experience. Retailers can analyse navigational routes, find walking patterns, and track customer movements through stores using computer vision techniques.

Self-Driving Cars
Computer Vision is the fundamental technology behind developing autonomous vehicles. Most leading car manufacturers in the world are reaping the benefits of investing in artificial intelligence for developing on-road versions of hands-free technology.

Medical Imaging
A reliable resource for doctors over the past few decades has been computer-supported medical imaging software. It doesn't just produce and analyse images; it also works as a doctor's helper to aid in interpretation.
The software is used to interpret and transform 2D scan photos into interactive 3D models that give medical professionals a thorough insight of a patient's health.

Google Translate App
To read signs written in a foreign language, all you have to do is point the camera on your phone at the text, and the Google Translate software will very immediately translate them into the language of your choice. This is a useful application that makes use of Computer Vision, utilising optical character recognition to view the image and augmented reality to overlay an accurate translation.

Computer Vision Tasks
The many Computer Vision applications are based on a variety of tasks that are carried out to extract specific information from the input image that may be utilised for prediction or serves as the foundation for additional analysis. A computer vision application performs the following tasks:

Classification

Image Classification problem is the task of assigning an input image one label from a fixed set of categories. This is one of the core problems in CV that, despite its simplicity, has a large variety of practical applications.

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. It is used only for single objects.

Object Detection

Finding occurrences of real-world items like faces, bicycles, and buildings in pictures or movies is a process known as object detection. To identify occurrences of a certain object category, object identification algorithms frequently employ extracted features and learning techniques. Applications like image retrieval and automatic car parking systems frequently employ it.

Instance Segmentation

The process of identifying instances of the items, categorising them, and then assigning each pixel a label based on that is known as instance segmentation. An image is sent into a segmentation algorithm, which produces a list of regions (or segments).

Basics of Images

We all see a lot of images around us and use them daily either through our mobile phones or computer system. But do we ask some basic questions to ourselves while we use them on such a regular basis.

Basics of Pixels

A picture element is referred to as a "pixel." In digital form, pixels make up each and every image. They are the tiniest piece of data that go into a picture. They are normally structured in a 2-dimensional grid and are either circular or square.

Resolution

The resolution of an image is occasionally referred to as the number of pixels. One approach is to define resolution as the width divided by the height when the phrase is used to describe the number of pixels, for example, a monitor resolution of 1280×1024. Accordingly, there are 1280 pixels from side to side and 1024 pixels from top to bottom.

Pixel value

Each of the pixels that make up an image that is stored on a computer has a pixel value that specifies its brightness and/or intended colour. The byte image, which stores this number as an 8-bit integer with a possible range of values from 0 to 255, is the most popular pixel format. Zero is typically used to represent no colour or black, and 255 is used to represent full colour or white.

Grayscale Images

Grayscale images are images which have a range of shades of gray without apparent colour. The darkest possible shade is black, which is the total absence of colour or zero value of pixel. The lightest possible shade is white, which is the total presence of colour or 255 value of a pixel . Intermediate shades of gray are represented by equal brightness levels of the three primary colours.

RGB Images

Every image we encounter is a coloured image. Three main colors—Red, Green, and Blue—make up these graphics. Red, green, and blue can be combined in various intensities to create all the colours that are visible.

Image Features

In computer vision and image processing, 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.

Introduction to OpenCV

OpenCV or Open Source Computer Vision Library is that tool which helps a computer extract these features from the images. It is used for all kinds of images and video processing and

analysis. It is capable of processing images and videos to identify objects, faces, or even handwriting.

What is a Kernel?

A Kernel is a matrix, which is slid across the image and multiplied with the input such that the output is enhanced in a certain desirable manner. Each kernel has a different value for different kind of effects that we want to apply to an image.

Convolution Neural Networks (CNN)

A Convolutional Neural Network (CNN) is a Deep Learning algorithm that can take in an image as input, assign importance (learnable weights and biases) to various elements and objects in the image, and be able to distinguish between them.

A convolutional neural network consists of the following layers:
1) Convolution Layer
2) Rectified linear Unit (ReLU)
3) Pooling Layer
4) Fully Connected Layer

Convolution Layer

The Convolution Operation's goal is to take the input image's high-level characteristics, such edges, and extract them. There is no requirement that CNN use just one Convolutional Layer. There are several kernels that are used to produce several features. The output of this layer is called the feature map. A feature map is also called the activation map. We can use these terms interchangeably.There's several uses we derive from the feature map: We reduce the image size so that it can be processed more efficiently. We only focus on the features of the image that can help us in processing the image further.

Rectified Linear Unit Function

The next layer in the Convolution Neural Network is the Rectified Linear Unit function or the ReLU layer. After we get the feature map, it is then passed onto the ReLU layer. This layer simply gets rid of all the negative numbers in the feature map and lets the positive number stay as it is.

Pooling Layer

Similar to the Convolutional Layer, the Pooling layer is responsible for reducing the spatial size of the Convolved Feature while still retaining the important features.
There are two types of pooling which can be performed on an image.
1) Max Pooling : Max Pooling returns the maximum value from the portion of the image covered by the Kernel.
2) Average Pooling: Max Pooling returns the maximum value from the portion of the image covered by the Kernel.

Fully Connected Layer

The final layer in the CNN is the Fully Connected Layer (FCP). The objective of a fully connected layer is to take the results of the convolution/pooling process and use them to classify the image into a label.

MCQ'S (Computer Vision)

1. Computer vision is concerned with modeling and replicating human vision using computer software and hardware.
A. TRUE B. FALSE C. Can be true or false D. Can not say   Ans : A
Explanation: True, Computer vision is concerned with modeling and replicating human vision using computer software and hardware.

2. Computer vision is a discipline that studies how to reconstruct, interrupt and understand a 3d scene from its _____. A. 1d images B. 2d images C. 3d images D. 4d images   Ans : B
Explanation: Computer vision is a discipline that studies how to reconstruct, interrupt and understand a 3d scene from its 2d images.

3. Computer vision is divided into _____ basic categories A. 1 B. 2 C. 3 D. 4 Ans : C

Explanation: Computer vision is divided into three basic categories : Low-level vision, Intermediate-level vision and High-level vision.

4. Which vision includes object recognition and 3D scene Interpretation?

A. Low-level vision B. Intermediate-level vision C. High-level vision D. All of the above Ans B Explanation: Intermediate-level vision: includes object recognition and 3D scene Interpretation

5. The input and output of image processing are?
A. signal and image B. signal only C. image only D. depends on input   Ans : C
Explanation: Image processing studies image to image transformation. The input and output of image processing are both images.

6. Which of the following studies various techniques to classify patterns?
A. Image Processing B. Photogrammetry C. Image Recognition D. Pattern Recognition Ans : D
Explanation: Pattern Recognition: it studies various techniques to classify patterns

VERY SHORT ANSWER QUESTIONS (2 MARKS)

1.   What is Resolution ?
Ans : The resolution of an image is occasionally referred to as the number of pixels.The resolution of an image is occasionally referred to as the number of pixels.

2.   What is RGB ?
Ans : Every image we encounter is a coloured image. Three main colors—Red, Green, and Blue—make up these graphics.

SHORT ANSWER QUESTIONS (3 MARKS)

1.   What is Object Detection ?
Ans : Finding occurrences of real-world items like faces, bicycles, and buildings in pictures or movies is a process known as object detection. To identify occurrences of a certain object category, object identification algorithms frequently employ extracted features and learning techniques.

2.   What is instance segmentation ?
Ans : The process of identifying instances of the items, categorising them, and then assigning each pixel a label based on that is known as instance segmentation.

LONG ANSWER QUESTIONS (4 MARKS)

1.   Differentiate the terms Facial Recognition and Face Filters.
Ans : Computer vision is essential to the advancement of the home in the era of smart cities and smart homes. The most crucial application of computer vision is facial recognition in security. Either visitor identification or visitor log upkeep is possible.

Face Filters : Many of the functionality in today's apps, including Instagram and Snapchat, rely on computer vision. One of them is the usage of facial filters. The computer or algorithm may recognise a person's facial dynamics through the camera and apply the chosen facial filter.

UNIT-6   **TOPIC- Natural Language Processing**

NLP (Natural Language Processing), is dedicated to making it possible for computers to comprehend and process human languages. Artificial intelligence (AI) is a subfield of linguistics, computer science, information engineering, and artificial intelligence that studies how computers interact with human (natural) languages, particularly how to train computers to handle and analyze massive volumes of natural language data.

SUB-TOPIC : Applications of Natural Language Processing

Most people utilize NLP apps on a regular basis in their daily lives. Following are a few examples of real-world uses for natural language processing:
Automatic Summarization – Automatic summarization is useful for gathering data from social media and other online sources, as well as for summarizing the meaning of documents and other written materials.
Sentiment Analysis – To better comprehend what internet users are saying about a company's goods and services, businesses use natural language processing tools like sentiment analysis to understand the customer requirement.
Indicators of their reputation – Sentiment analysis goes beyond establishing simple polarity to analyse sentiment in context to help understand what is behind an expressed view. This is very important for understanding and influencing purchasing decisions.
Text classification – Text classification enables you to classify a document and organise it to make it easier to find the information you need or to carry out certain tasks. Spam screening in email is one example of how text categorization is used.

Virtual Assistants – These days, digital assistants like Google Assistant, Cortana, Siri, and Alexa play a significant role in our lives. Not only can we communicate with them, but they can also facilitate our life.

DETAILED EXPLAINATION

Chatbots
A chatbot is one of the most widely used NLP applications. Many chatbots on the market now employ the same strategy as we did in the instance above.

There are 2 types of chatbots : Scriptbot and Smart-bot.

Scriptbot	Smart-bot
Script bots are easy to make	Smart-bots are flexible and powerful
Script bots work around a script which is programmed in them	Smart bots work on bigger databases and other resources directly

Scriptbot	Smart-bot
Mostly they are free and are easy to integrate to a messaging platform	Smart bots learn with more data
No or little language processing skills	Coding is required to take this up on board
Limited functionality	Wide functionality

Human Language VS Computer Language

Humans need language to communicate, which we constantly process. Our brain continuously processes the sounds it hears around us and works to make sense of them. Our brain continuously processes and stores everything, even as the teacher is delivering the lesson in the classroom.

The Computer Language is understood by the computer, on the other hand. All input must be transformed to numbers before being sent to the machine. And if a single error is made while typing, the machine throws an error and skips over that area. Machines only use extremely simple and elementary forms of communication.

Data Processing

Data Processing is a method of manipulation of data. It means the conversion of raw data into meaningful and machine-readable content. It basically is a process of converting raw data into meaningful information.

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

The process of converting a text into a canonical (standard) form is known as text normalisation. For instance, the canonical form of the word "good" can be created from the words "gooood" and "gud." Another illustration is the reduction of terms that are nearly identical, such as "stopwords," "stop-words," and "stop words," to just "stopwords."

Sentence Segmentation

Under sentence segmentation, the whole corpus is divided into sentences. Each sentence is taken as a different data so now the whole corpus gets reduced to sentences.

Tokenisation

Sentences are first broken into segments, and then each segment is further divided into tokens. Any word, number, or special character that appears in a sentence is referred to as a token. Tokenization treats each word, integer, and special character as a separate entity and creates a token for each of them.

Removing Stopwords, 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?

Stopwords are words that are used frequently in a corpus but provide nothing useful. Humans utilise grammar to make their sentences clear and understandable for the other person. However, grammatical terms fall under the category of stopwords because they do not add any significance to the information that is to be communicated through the statement. Stopwords include a, an, and, or, for, it, is, etc.

Converting text to a common case

After eliminating the stopwords, we change the text's case throughout, preferably to lower case. This makes sure that the machine's case-sensitivity does not treat similar terms differently solely because of varied case usage.

Stemming

The remaining words are boiled down to their root words in this step. In other words, stemming is the process of stripping words of their affixes and returning them to their original forms.

Lemmatization

Stemming and lemmatization are alternate techniques to one another because they both function to remove affixes. However, lemmatization differs from both of them in that the word that results from the elimination of the affix (also known as the lemma) is meaningful.

Bag of Words

A bag-of-words is a textual illustration that shows where words appear in a document. There are two components: a collection of well-known words. a metric for the amount of well-known words. A Natural Language Processing model called Bag of Words aids in the extraction of textual information that can be used by machine learning techniques. We gather the instances of each term from the bag of words and create the corpus's vocabulary.

Here is the step-by-step approach to implement bag of words algorithm:

1. Text Normalisation: Collect data and pre-process it
2. Create Dictionary: Make a list of all the unique words occurring in the corpus. (Vocabulary)
3. Create document vectors: For each document in the corpus, find out how many times the word from the unique list of words has occurred.
4. Create document vectors for all the documents.

Term Frequency

The measurement of a term's frequency inside a document is called term frequency. The simplest calculation is to count the instances of each word. However, there are ways to change that value based on the length of the document or the frequency of the term that appears the most often.

Inverse Document Frequency

A term's frequency inside a corpus of documents is determined by its inverse document frequency. It is calculated by dividing the total number of documents in the corpus by the number of documents that contain the phrase.

Applications of TFIDF

TFIDF is commonly used in the Natural Language Processing domain. Some of its applications are:

Document Classification	Topic Modelling	Information Retrieval System	Stop word filtering
Helps in classifying the type and genre of a document.	It helps in predicting the topic for a corpus.	To extract the important information out of a corpus.	Helps in removing the unnecessary words out of a text body.

MCQ'S(NLP)

1. NLP stands for _____
a. Natural Language Processing
b. Nature Language Processing
c. None Language Processing
d. None of the above   a. Natural Language Processing

2. _____, is the sub-field of AI that is focused on enabling computers to understand and process human languages.
a. Natural Language Processing
b. Data Science
c. Computer Vision
d. None of the above   a. Natural Language Processing

3. _____ is the sub-field of AI that make the interactions between computers and human (natural) languages
a. Natural Language Processing
b. Data Science
c. Computer Vision
d. None of the above   a. Natural Language Processing

4. Which of the games below is related to natural language processing?
a. Voice Assistants
b. Chatbots
c. Mystery Animal
d. Grammar Checkers   c. Mystery Animal

5. Applications of Natural Language Processing
a. Automatic Summarization
b. Sentiment Analysis
c. Text Classification
d. All of the above   d. All of the above

VERY SHORT ANSWER QUESTIONS (2 MARKS)

1. **What do you mean by Natural Language Processing?**
   Answer – The area of artificial intelligence known as natural language processing, or NLP, is dedicated to making it possible for computers to comprehend and process human languages. The interaction between computers and human (natural) languages is the focus of artificial intelligence (AI), a subfield of linguistics, computer science, information engineering, and artificial intelligence. This includes learning how to programme computers to process and analyze large amounts of natural language data.
2. **What is Problem Scoping?**
   Answer – Understanding a problem and identifying numerous elements that have an impact on it help define the project's purpose or objective. Who, What, Where, and Why are the 4Ws of problem scoping. These Ws make it easier and more effective to identify and understand the problem.

3. **. What is Data Acquisition?**
   Answer – We need to gather conversational data from people in order to decipher their statements and comprehend their meaning in order to grasp their feelings. This collection of information is known as Data Acquisition. Such information can be gathered in a variety of ways –a. Surveys b. Observing the therapist's sessions c. Database available on the internet
4. **What is Data Exploration?**
   Answer – Once the textual information has been gathered using Data Acquisition, it must be cleaned up and processed before being delivered to the machine in a simpler form. As a result, the text is normalised using a number of processes, and the vocabulary is reduced to a minimum because the computer just needs the text's main ideas rather than its grammar.
5. **What is Data Modelling?**
   Answer – After the text has been normalised, an NLP-based AI model is then fed the data.

Keep in mind that in NLP, data pre-processing is only necessary after which the data is supplied to the computer. There are numerous AI models that can be used, depending on the kind of chatbot we're trying to create, to help us lay the groundwork for our project.

6. **What is Data Evaluation?**
Answer – The correctness of the trained model is determined based on how well the machine-generated answers match the user's input is known as Data Evaluation. The chatbot's proposed answers are contrasted with the correct answers to determine the model's efficacy.

SHORT ANSWER QUESTIONS (3 MARKS)

1. **What is Cognitive Behavioural Therapy (CBT)?**
Answer – One of the most effective ways to deal with stress is cognitive behavioural therapy (CBT), which is popular since it is simple to apply to people and produces positive outcomes. Understanding a person's behaviour and mentality in daily life is part of this therapy. Therapists assist clients in overcoming stress and leading happy lives with the aid of CBT.

2. **What do you mean by Multiple Meanings of a word in Deep Learning?**
Answer – Depending on the context, the term mouse can be used to refer to either a mammal or a computer device. Consequently, mouse is described as ambiguous. The Principle of Economical Versatility of Words states that common words have a tendency to acquire additional senses, which can create practical issues in subsequent jobs. Additionally, this meaning conflation has additional detrimental effects on correct semantic modelling, such as the pulling together in the semantic space of words that are semantically unrelated yet are comparable to distinct meanings of the same word.

3. **What is Data Processing?**
Answer – Making data more meaningful and informative is the effort of changing it from a given form to one that is considerably more useable and desired. This entire process can be automated using Machine Learning algorithms, mathematical modelling, and statistical expertise.

4. **What is Text Normalisation?**
Answer – The process of converting a text into a canonical (standard) form is known as text normalisation. For instance, the canonical form of the word "good" can be created from the words "gooood" and "gud." Another case is the reduction of terms that are nearly identical, such as "stopwords," "stop-words," and "stop words," to just "stopwords."

5. We must be aware that we will be working on a collection of written text in this portion before we start. As a result, we will be analysing text from a variety of papers. This collection of text from all the documents is referred to as a corpus. We would perform each stage of Text Normalization and test them on a corpus in addition to going through them all.

LONG ANSWER QUESTIONS (4 MARKS)-
1. What are the different applications of NLP which are used in real-life scenario?
Answer – Some of the applications which is used in the real-life scenario are –
a. Automatic Summarization – Automatic summarization is useful for gathering data from social media and other online sources, as well as for summarizing the meaning of documents and other written materials. When utilized to give a summary of a news story or blog post while eliminating redundancy from different sources and enhancing the diversity of content acquired, automatic summarizing is particularly pertinent.
b. Sentiment Analysis – In posts when emotion is not always directly expressed, or even in the same post, the aim of sentiment analysis is to detect sentiment. To better comprehend what internet users are saying about a company's goods and services, businesses employ natural language processing tools like sentiment analysis.

c. Text Classification – Text classification enables you to classify a document and organize it to make it easier to find the information you need or to carry out certain tasks. Spam screening in email is one example of how text categorization is used.

d. Virtual Assistants – These days, digital assistants like Google Assistant, Cortana, Siri, and Alexa play a significant role in our lives. Not only can we communicate with them, but they can also facilitate our life. They can assist us in making notes about our responsibilities, making calls for us, sending messages, and much more by having access to our data.

2. What is Chatbot? Write Types of Chatbot.

Answer – A chatbot is a piece of software or an agent with artificial intelligence that uses natural language processing to mimic a conversation with users or people. You can have the chat through a website, application, or messaging app. These chatbots, often known as digital assistants, can communicate with people verbally or via text.

The majority of organizations utilize AI chatbots, such the Vainubot and HDFC Eva chatbots, to give their clients virtual customer assistance around-the-clock.

<u>Some of the example of Chatbot –</u>a. Mitsuku Bot b. CleverBot c. Jabberwacky d. Haptik e. Rose f. Ochtbot

There are two types of Chatbot –

a. Script Bot – An Internet bot, sometimes known as a web robot, robot, or simply bot, is a software programme that does automated operations (scripts) over the Internet, typically with the aim of simulating extensive human online activity like communicating.

b. Smart Bot – An artificial intelligence (AI) system that can learn from its surroundings and past experiences and develop new skills based on that knowledge is referred to as a smart bot. Smart bot that are intelligent enough can operate alongside people and learn from their actions.

3. Difference between human language vs computer language?

Answer – Although there is a significant difference between the languages, human language and computer language can be translated into one other very flawlessly. Human languages can be used in voice, writing, and gesture, whereas machine-based languages can only be used in written communication. A computer's textual language can communicate with vocal or visual clues depending on the situation, as in AI chatbots with procedural animation and speech synthesis. But in the end, language is still written. The languages also have different meanings. Human languages are utilized in a variety of circumstances, including this blog post, whereas machine languages are almost solely used for requests, commands, and logic.

UNIT-7   **TOPIC- Evolution**

SUB-TOPIC Introduction(Evolution)

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. There can be different Evaluation techniques, depending of the type and purpose of the model.

DETAILED EXPLAINATION

The various terms which are very important to the evaluation process.

Model Evaluation Terminologies : There are various new terminologies which come into the picture when we work on evaluating our model. Let's explore them with an example of the Forest fire scenario.

Consider developing an AI-based prediction model and deploying it in a forest that is prone to forest fires. The model's current goal is to make predictions about whether or not a forest fire has started. We need to consider the two circumstances of prediction and reality. The reality is the actual situation in the forest at the time of the prediction, while the prediction is the machine's output.

Confusion matrix : The result of comparison between the prediction and reality can be recorded in what we call the confusion matrix. The confusion matrix allows us to understand the prediction results. Note that it is not an evaluation metric but a record which can help in evaluation.

Evaluation Methods : Accuracy, precision, and recall are the three primary measures used to assess the success of a classification algorithm.

Accuracy : Accuracy allows you to count the total number of accurate predictions made by a model. The accuracy calculation is as follows: How many of the model predictions were accurate will be determined by accuracy. True Positives and True Negatives are what accuracy considers.

Precision : Precision is defined as the percentage of true positive cases versus all the cases where the prediction is true. That is, it takes into account the True Positives and False Positives.

Recall :It can be described as the percentage of positively detected cases that are positive.

MCQ'S(Evolution)

1. _____ 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.
a. Evaluation b. Problem Scoping c. Data acquisition d. Data Exploration   a. Evaluation
2. If 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   a. Overfitting
3. The result of comparison between the prediction and reality can be recorded in what we call the
a. Overfitting b. Problem Scoping c. Confusion Matrix d. Data acquisition   c. Confusion Matrix

4. The _____ allows us to understand the prediction results.
a. Overfitting b. Problem Scoping c. Confusion Matrix d. Data acquisition   c. Confusion Matrix

5. _____ is defined as the percentage of correct predictions out of all the observations.
a. Overfitting b. Accuracy c. Confusion Matrix d. Data acquisition   b. Accuracy

[1] Define: Evaluation
Ans.: Evaluation is the 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] Name two parameters considered for the evaluation of a model.
Ans.: The two parameters considered for evaluation of a model are: 1. Prediction 2. Reality

[3] What is not recommended to evaluate the model?
Ans.: Its not recommended to use the data used to build the model to evaluate the model.

[4] Define overfitting.
Ans.: The model simply remember the whole training data set and will always predict the correct label for any point in the training set. This is known as overfitting.

[5] Enlist the data sets used in AI modeling.
Ans.: There are two types of datasets used in AI. 1. Training Data Set 2. Testing Data Set

[6] What do you mean by prediction?
Ans.: Prediction refers to the output produced by the AI model.

[7] What is reality?
Ans.: Reality refers to the real scenario, when the prediction has been made by a model.

[8] What are the cases considered for evaluation?
Ans.:1. True Positive 2. True Negative 3. False Positive 4. False Negative

SHORT ANSWER QUESTIONS (3 MARKS)

1. What is evaluation?
Answer – By feeding test datasets into AI models and comparing the outputs to real-world results, evaluation is the process of determining the dependability of any AI model is known as evaluation. Various evaluation methods may be used, depending on the kind and function of the model. Keep in mind that it is not advised to utilize the model's construction data for its evaluation.

2. What is overfitting?
Answer – Overfitting happens when a statistical model matches its training data exactly. When this occurs, the algorithm's goal is lost because it is unable to accurately execute against unseen data.

3. What is Confusion Matrix?
Answer – The result of comparison between the prediction and reality can be recorded in what we call the confusion matrix. The confusion matrix allows us to understand the prediction results. Note that it is not an evaluation metric but a record which can help in evaluation.

4. What is the purpose of Accuracy in AI and give the example of equation?
Answer – The percentage of accurate predictions among all the observations is what is meant by the term accuracy. A prediction is deemed accurate if it agrees with reality. There are two circumstances in this case where the Prediction and Reality match: True Positive and True Negative. The equation for accuracy is –

5. What is Precision and give the example of equation?
Answer – Precision is defined as the percentage of true positive cases versus all the cases where the prediction is true. That is, it takes into account the True Positives and False Positives.

6. What is Recall in AI and give the example of equation?
Answer – The percentage of pertinent documents that are successfully retrieved is known as recall. Recall, for instance, is the ratio of the number of accurate results to the number of results that should have been returned for a text search on a set of documents.

7. What is F1 Score ?
Answer – F1 score can be defined as the measure of balance between precision and recall. By calculating the harmonic mean of a classifier's precision and recall, the F1-score integrates both into a single metric. It mainly used to compare the effectiveness of two classifiers.

LONG ANSWER QUESTIONS (4 MARKS)

[1] State and explain some possible reasons why AI model is not efficient.

Ans.: The possible reasons for AI model is not being effcient are:

1. Lacking of training data : This refers to the situation when data is not satisfactory as per requirement or data is not used properly means something is missing from it, the model won't be efficient.

2. Unauthenticated Data/Wrong Data: For getting good results and predictions data must be authenticated and correct. Unauthenticated data may not help in getting the good results.

3. Inefficient Coding/Wrong Algorithm: For preparing a good model, coding or algorithm is necessary. The coding or algorithm should be written appropriately. If coding and algorithm is not accurate or appropriate the model will not generate the desired output.

4. Less Accuracy

[2] High accuracy is not usable. Justify this with an example.

Ans.: High accuracy refers to accuracy 99.9%. This means that a small mistake leads to high damage. High accuracy is very sensitive parameter for an AI model.

SCENARIO: An expensive robotic chicken crosses a very busy road a thousand times per day. An ML model evaluates traffic patterns and predicts when this chicken can safely cross the street with an accuracy of 99.99%. Explanation: A 99.99% accuracy value on a very busy road strongly suggests that the ML model is far better than chance. In some settings, however, the cost of making even a small number of mistakes is still too high. 99.99% accuracy means that the expensive chicken will need to be replaced, on average, every 10 days. (The chicken might also cause extensive damage to cars that it hits.)

[3] Shweta is learning NLP. She read about the F1 score but did not understand the need for the F1 score formulation. Support her by giving an answer.

Ans.: The F1 score is also known as the F score or F measure of AI model's test accuracy. It calculated from the precision and recall of the test. Here

1) The precision is the number of correctly recognized positive results divided by the number of all positive results, including the those not identified correctly.

2) The recall is the number of correctly identified positive results divided by the number of all samples that should have been identified as positive.

3) The F1 score is defined as the harmonic mean of the test's precision and recall. The formula of F1 score is as below:

F1 score = 2 x precision x recall / (precision + recall)

From this formula,

i) A good F1 score means that you have high true positives and high true negatives. It means that machine is correctly identifying real threats and not disturbs the users by false alarms.

ii) An F1 score is considered prefect when it's 1 while the model is a total failure when it's 0.

iii) F1 score is a better metric to evaluate the model on real-life classification problems and when imbalanced class distribution exists.

[4] Explain with an example: Perfect Syntax, no meaning Multiple meanings of a word.

Ans.1. Perfect Syntax, no meaning – The sentence which is grammatically correct but it does not make any sense. In human language, a perfect balance of syntax and semantics is important for better understanding. Human is communication is complex. For example, Chcikens feed extravagantly while the moon drinks tea. 2. Multiple meaning of a word – In Natural language it is important to understand that a word can have multiple meanings and the meanings fit into the sentence according to the context of it. For example:

1. His face turned red after he found out that he took the wrong bag.

2. The red car zoomed past his nose.

3. His face turns red after consuming the medicine

+++++++++++++++BEST OF LUCK++++++++++++++++++++