CBSE BOARD EXAMINATION – 2025
ARTIFICIAL INTELLIGENCE
Solved Paper
Class– 10th

Maximum Marks: 50   *Time allowed: 2 hours*

GENERAL INSTRUCTIONS:

(i)   Please read the instructions carefully.

*(ii) This question paper consists of **21** questions in **two** Sections: **Section A** and **Section B**.*

*(iii) **Section A** has Objective type questions, whereas **Section B** contains Subjective type questions.*

(iv) Out of the given (5 + 16) = 21 questions, a candidate has to answer (5+10) = 15 questions in the allotted (maximum) time of 2 hours.

(v)   All questions of a particular section must be attempted in the correct order.

*(vi) **Section A:** Objective Type Questions (24 marks):*

   (a) This section has 5 questions.

   (b) There is no negative marking.

   (c) Do as per the instructions given.

   (d) Marks allotted are mentioned against each question/part.

*(vii) **Section B:** Subjective Type Questions (26 marks):*

   *(a) This section has **16** questions.*

   *(b) A candidate has to do **10** questions.*

   (c) Do as per the instructions given.

   (d) Marks allotted are mentioned against each question/part.

SECTION– A

(Objective Type Questions)

1. Answer any 4 out of the given 6 questions on Employability Skills.   **4×1=4**

(i) Which of the following does not help in stress management?

   (A) Healthy food   **(B)** Sound sleep

   (C) Yoga asanas   **(D)** Negative thoughts

(ii) Spam refers to _____ .

   (A) Unnecessary images

   (B) Temporary files

   (C) Junk mails.

   (D) Music files

(iii) Assertion (A): Sustainable agriculture is environment friendly.

   Reason (R) : It prevents use of chemical fertilizers to protect soil.

   (A) Both (A) and (R) are correct and (R) is the correct explanation of (A).'

   (B) Both (A) and (R) are correct but (R) is not the correct explanation of (A).

   (C) (A) is correct but (R) is not correct.

   (D) (A) is not correct but (R) is correct.

(iv) Which of the following is not a step to build self-motivation?

   (A) Focusing on your goal.

   (B) Planning to achieve your goal.

   (C) Being indisciplined..

   (D) Finding out your strength.

(v) Which of the following types of communication takes place when the number of people is small enough to communicate with each other effectively?

   (A) Interpersonal communication.

   (B) Public communication

   (C) Intrapersonal communication

   (D) Small group communication.

(vi) Reema has started her own restaurant. She keeps on trying new ideas to make different dishes for her customers. As entrepreneur, Reema is: an

   (A) Impatient   **(B)** Creative

   (C) Under-confident   **(D)** Lazy

2. Answer any 5 out of the given 6 questions: 5×1=5

(i) **Assertion (A):** When a machine is able to mimic human traits, it is said to be artificially intelligent.
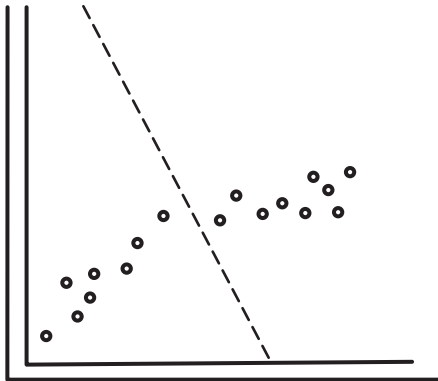
   Reason (R): A fully automatic washing machine is artificially intelligent.

   (A) Both (A) and (R) are correct and (R) is the correct explanation of (A).

   (B) Both (A) and (R) are correct and (R) is not the correct explanation of (A).

   (C) (A) is correct but (R) is not correct.

(D) (A) is not correct but (R) is correct.

(ii) Platforms such as Spotify, Facebook, Instagram, Amazon, Netflix etc. shows recommendation on the basis of what you like. Which is the tochnology behind this?

   (A) Human Intelligence

   (B) Platform Intelligence

   (C) Artificial Intelligence

   (D) Application Intelligence

(iii) Statement 1: In "When" block of 4Ws canvas we find the stakeholders.

   Statement 2: Stakeholders are the people who face a particular problem and would be benefitted with the solution.

   (A) Both Statement 1 and Statement 2 are correct.

   (B) Both Statement 1 and Statement 2 are incorrect.

   (C) Statement 1 is correct but Statement 2 is incorrect.

   (D) Statement 2 is correct but Statement 1 is incorrect.

(iv) Whenever we want an AI project to be able to predict an output, we need to

   (A) first test it using the data.

   (B) first train it using the data.

   (C) Both (A) and (B)

   (D) Neither (A) nor (B)

(v) What does the term "image processing" refer to in Computer Vision ?

   (A) Editing videos

   (B) Extracting meaningful information from images

   (C) Playing audio files

   (D) Compiling codes

(vi) A corpus contains 4 documents in which the words such as 'an, is, the' were appearing frequently. Identify the term that is used for such words.

   (A) Stop word   **(B)** Rare word

   (C) Missing word   **(D)** Removable word

3. **Answer any 5 out of the given 6 questions: 5×1=5**

(i) Identify the logo of an application of AI given below. It helps us to navigate to places.

(ii) Which of the following data science application is not associated with genetics and genomics?

   (A) To understand the impact of DNA on health.

   (B) To analyze reactions to drugs and disease.

   (C) To find individual biological connection.

   (D) To search the house address of a relative on the Internet.

(iii) In Computer Vision, which of the following tasks is used for single object?

   (A) Object Detection

   (B) Classification + Localization

   (C) Instance Segmentation

   (D) Non-Localization

(iv) It is a domain-specific language that is designed for managing data held in different kinds of DBMS (Database Management System). It is particularly useful in handling structured data. Which computer language is this?

   (A) SQL   **(B)** CSV

   (C) Spreadsheet   **(D)** TXT

(v) Which application of NLP helps to provide an overview of a news item or blog post? It also avoids redundancy from multiple sources and maximises the diversity of content obtained.

   (A) Virtual Assistants

   (B) Sentiment Analysis

   (C) Text Classification

   (D) Automatic Summarization

(vi) Which condition of evaluation does the following diagram indicate?

Prediction: No	Reality: Yes

   (A) False Positive

   (B) False Negative.

   (C) True Positive

   (D) True Negative

4. **Answer any 5 out of the given 6 questions: 5x1=5**

(i) Which of the following is the correct expansion of CSV?

   (A) Comma and Space Value

   (B) Comma Separated Values

   (C) Control Separated Values

   (D) Character Separated Values

(ii) Statement 1: Overfitting is not recommended for evaluation of a model.

   Statement 2: This is because the model will simply remember the whole training set, and will therefore always predict the correct label for any point in the training set.

   (A) Both Statement 1 and Statement 2 are correct..

   (B) Both Statement 1 and Statement 2 are incorrect.

   (C) Statement 1 is correct but Statement 2 is incorrect.

   (D) Statement 2 is correct but Statement 1 is incorrect.

(iii) It is one of the parameters for evaluating a model's performance and is defined as the percentage of true positive cases versus all the cases where the prediction is truo.

   Which of the following evaluation parameter is this?

   (A) Precision   **(B)** Recall

(C) F1 score   (D) Accuracy.

(iv) Which form of learning-based approach does the following diagram indicate?

(A) Clustering

(B) Classification.

(C) Regression

(D) Dimensionally Reduction

(v) Which of the following applications of NLP (Natural Language Processing) is associated with spam filtering in e-mails?

(A) Virtual Assistants

(B) Sentiment Analysis

(C) Text Classification

(D) Automatic Summarization

(vi) Raghav can turn on and off any appliance remotely using an internet enabled device. This is an example of _____ .

(A) Artificial Intelligence (AI)

(B) Internet of Things (IoT).

(C) Computer Vision (CV)

(D) Deep Learning (DL)

5. Answer any 5 out of the given 6 questions: 5×1=5

(i) Musical intelligence is a concept that

(A) assesses one's ability to regulate, measure and understand numerical symbols, abstraction and logic.

(B) measures the language processing skills both in terms of understanding or implementation in writing or verbally.

(C) evaluates the ability to process information on the environment around us.

(D) describes a person's ability to recognize and create sounds, rhythms and sound patterns.

(ii) With respect to evaluation, for which of the following does the prediction and reality match?

(A) True positive and False positive

(B) True positive and True negative

(C) False positive and False negative

(D) True positive and False negative

(iii) Statement 1 : Various search engines and e-commerce portals now have a new feature called image-based search using computer vision.

Statement 2: Image-based search helps in finding items, people and places by giving their sounds to the system.

(A) Both Statement 1 and Statement 2 are correct.

(B) Both Statement 1 and Statement 2 are incorrect.

(C) Statement 1 is correct but Statement 2 is incorrect.

(D) Statement 2 is correct but Statement 1 is incorrect.

(IV) In the context of NLP, which of the following words represents a stem resulting from stemming for "Studies"?

(A) Study   (B) Stud

(C) Studi   (D) Studied

(v) Which of the following scenarios might have a high False Negative (FN) cost?

(A) Viral Disease Outbreak.

(B) Spam

(C) Mining

(D) Image Search

(vi) Which type of chat-bot has a wide functionality, is flexible and powerful, and works on bigger databases directly?

SECTION–B

(Subjective Type Questions)

Answer any 3 out of the given 5 questions on Employability Skills. Answer each question in 20-30 words.   3×2=6

6. Explain the importance of following a healthy lifestyle in effectively dealing with stress. Write any one common factor that causes stress among the children nowadays.

7. If you are a team leader of a team of 20 people in an organization, mention any two methods that you will use for effective communication with your team members.

8. Write any two tasks that entrepreneurs do when they run their business.

9. Enlist any two measures that an individual should follow to take care of his/her digital devices.

10. Discuss the following problems related to sustainable development:

(i) Water   (ii) Fuel

Answer any 4 out of the given 6 questions in 20-30 words each.   4×2=8

11. Differentiate between Computer Vision (CV) and Natural Language Processing (NLP).

12. Define the following with respect to AI project cycle:

(i) Data Exploration

(ii) Data Features

13. One of the applications of Data Science is Airline Route Planning. List any two tasks that airline companies can do using Data Science.

14. Give any two key impacts of Computer Vision on medical imaging.

15. What is the primary difference between Human Language and Computer Language?

16. Suppose you are developing an AI model to detect fraudulent financial transaction risk. Describe False Positives and False Negatives in this context.

Answer any 3 out of the given 5 questions in 50-80 words each. 3 × 4 = 12

17. What do you understand by AI Bias and AI Access ? Give one example of each to support your answer.

18. What is the use of problem statement template with respect to 4Ws of problem scoping? Draw a problem statement template depicting all key elements.

19. Consider the following diagram. It explains how a system of organized machine learning algorithms perform certain tasks. Identify the concept and explain its working.
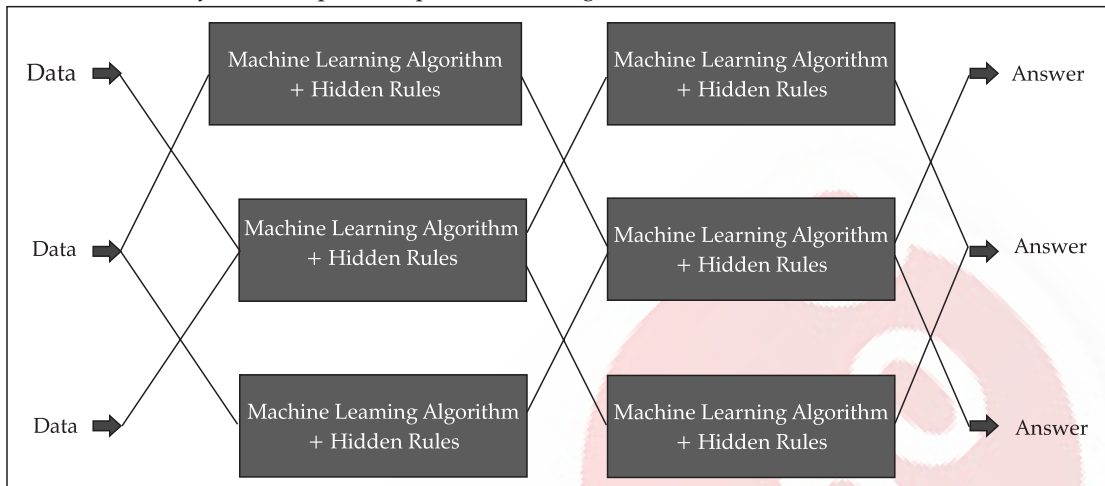
20. Consider the following documents:

Document 1: NLP is a domain of AI.

Document 2: NLP stands for Natural Language Processing.

Implement all the four steps of Bag of Words (BoW) model to create a document vector table.

21. An AI model has been developed to test specimens of blood/urine/cough etc. to diagnose ailments (diabetes/liver infection etc.). The model was tested on a data-set of about 630 tests and the resulting confusion matrix is as follows:

Confusion Matrix		Reality	
		Yes	No
Production	Yes	110	60
	No	50	410

(A) How many total cases are True Negative in the above scenario ?

(B) Calculate Precision, Recall and F1 Score.

■■

ANSWERS

SECTION– A

(20 × 1 = 20)

1. **(i)** Correct option is (D).

   Explanation: Negative thoughts are the effect of stress, whereas yoga, sound sleep and healthy food help in managing stress.

   (ii) Correct option is (C).

   Explanation: Spam mail is junk, unsolicited and unwanted email messages, often sent in bulk to a large number of recipients, frequently for commercial or malicious purposes.

   (iii) Correct option is (A).

   Explanation: Sustainable agriculture aims to produce food and fibre in a way that minimises environmental impact, promotes biodiversity and supports the long-term health of ecosystems and communities.

   (iv) Correct option is (C)

   Explanation: A Lack of discipline will deviate one from achieving his/her goal and hence an individual will lose motivation.

   (v) Correct option is (D).

   Explanation: Small group communication occurs when more than two people are involved, allowing each participant to interact and converse with the others.

   (vi) Correct option is (B).

   Explanation: Reema is trying to think differently to keep her business growing, which demonstrates creative.

2. **(i)** Correct option is (C).

   Explanation: A fully automatic washing machine is an example of automation, not AI because it follows pre-programmed instructions without the ability to learn, adapt or make decisions based on real-time conditions.

   (ii) Correct option is (C).

   Explanation: Recommendation systems are an example of AI because they are using machine learning algorithms to analyse user data and predict preferences, suggesting relevant items or content, a task that requires intelligent pattern recognition and learning.

   (iii) Correct option is (D).

   Explanation: 'Who' block of 4ws canvas tells us about the stakeholders. Also there is no "When" block in the 4Ws (Who, What , Where and Why).

   (iv) Correct option is (B).

   Explanation: AI models predict outputs by learning patterns from data, and then applying those learned relationships to new, unseen data to make predictions. This process involves training the model on historical data, refining its algorithms and then using the trained model to forecast future outcomes.

   (v) Correct option is (B).

   Explanation: Image processing involves transforming images into a digital format and applying various techniques to extract information, enhance quality and make decisions.

   (vi) Correct option is (A).

   Explanation: Stop words are words in a language that do not add significant meaning to a sentence. They can safely be ignored without sacrificing the meaning of the sentence. So grammatical words do not add any essence to the information which is to be transmitted through the statement hence they come under stop words.

3. **(i)** Google Maps

   (ii) Correct option is (D).

   Explanation: Genetics and genomics is the study of the impact of DNA on our health and finding individual biological connections between genetics, diseases, and drug response.

   (iii) Correct option is (B).

   Explanation: Single object classification is used when an image contains only one object of interest. So, Classification assigns one label to the entire image or object present in the image and at the same time, localisation identifies at what location that object is present in that image.

   (iv) Correct option is (A)

   Explanation: SQL is a programming language also known as Structured Query Language, used in programming and is designed for managing data held in different types of DBMS.

   (v) Correct option is (D).

   Explanation: Automatic summarization is a natural language processing (NLP) technique that uses algorithms to condense large amounts of text into shorter, more concise versions while preserving the key information while removing the redundant information.

   (vi) Correct option is (B).

   Explanation: A "false negative" means an AI model incorrectly predicts a negative outcome (e.g., no threat, no disease) when the actual outcome is positive (e.g., a threat exists, a disease is present).

4. **(i)** Correct option is (B).

   (ii) Correct option is (A).

   Explanation: Training data must not be used for evaluation purposes because a model might

memorise the training data, leading to overfitting.

(iii) Correct option is (A).

Explanation: It is defined as the percentage of true positive cases versus all cases where the prediction is true. It takes True Positives and False Positives.

(iv) Correct option is (B).

(v) Correct option is (C).

Explanation: Text classification makes it possible to assign predefined categories to a document and organise it to help you find the information you need or simplify some activities. For example, an application of text categorisation is spam filtering in email.

(vi) Correct option is (B).

Explanation: The Internet of Things, refers to a network of physical devices, vehicles, appliances, and other objects embedded with sensors, software and network connectivity, allowing them to collect and share data.

5. **(i)** Correct option is (D).

Explanation: Musical Intelligence is about a person's ability to recognise and create, sounds, rhythms and sound patterns.

(ii) Correct option is (B).

Explanation:

True Positive: Prediction= Yes, Reality= Yes

True Negative: Prediction= No, Reality= No

(iii) Correct option is (C).

Explanation: Image-based search allows users to find information or similar images by uploading or using an image as the search query, rather than relying on text keywords.

(iv) Correct option is (C).

Explanation: Stemming is the process in which the affixes of words are removed and the words are converted to their base form. In stemming, the stemmed words which are we get after removing the affixes, might not be meaningful.

(v) Correct option is (A).

Explanation: False negative situation will be when a person is carrying a virus/infection and has been tested as negative. In this situation, a person will spread the virus to others as well as himself if left untreated.

(vi) Learning-based chatbot/ Smart Chatbots

Explanation: Smart bots are flexible and powerful. These work on bigger databases and other resources directly and follow a learning-based approach.

Section -B

Subjective Type Questions

6. A healthy lifestyle is essential for managing stress. Stress levels are generally lower in people who maintain a healthy routine. Doing yoga, meditation and deep breathing exercises helps in proper blood circulation and relaxes the body. Even taking a walk or playing in the park will help you get a lot of fresh oxygen, which will help you become more active.

Having a healthy diet also helps you reduce stress. Eating a balanced diet, such as dal, roti, vegetables, and fruits, will give you the strength to do your daily work efficiently.

Common factor that causes stress in young children nowadays are: peer-pressure, bullying, and worrying about school grades.

7. Clear, Concise, Concrete, Correct, Coherent, Complete and Courteous are the various principles for effective communication.

- **Clear:** The message should be easily understandable and free from ambiguity.
- **Concise:** The message should be brief and to the point, avoiding unnecessary words.
- **Concrete:** The message should be specific and factual, using vivid language and avoiding vagueness.
- **Correct:** The message should be accurate and free from errors in grammar, facts and figures.
- **Coherent:** The message should be logically organized and consistent, with a clear flow of ideas.
- **Complete:** The message should provide all the necessary information for the audience to understand and act upon.
- **Courteous:** The message should be respectful and considerate of the audience's feelings and needs.

8. Entrepreneurs perform the following tasks when they run their businesses:

- **Fulfil 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 materials and people available around them to make products a low cost.
- **Help Society:** Entrepreneurs have a positive relationship with 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 become better.
- **Create Jobs:** With the growth of a business, entrepreneurs look for more people to help them. They buy more materials and from more people. They also hire more people to work for them.

9. **(a) Daily Maintenance:**

- Clean up your e-mail inbox.
- Download e-mail attachments and save them in proper folders.

(b) Weekly Maintenance:

- Clean your keyboard.
- Clean your monitor.
- Dust the CPU and printer.
- Backup your data to an external drive.

(c) Monthly Maintenance

- Transfer photographs to the computer and delete them from the drive.
- Organise photos into folders or albums.
- Clean up the 'Download' folder.

- Uninstall unused programs and apps.
- Run disk-cleanup software.
- Run a full system virus scan.

10. (i) **Water:**

(a) **Scarcity:** Unpredictable water availability and droughts exacerbate scarcity, impacting health, productivity, and biodiversity.

(b) **Water pollution:** Cleaning rivers and oceans and making them free from industry waste to save life underwater.

(ii) **Fuel:**

(a) **Finite Resources:** Over use of natural resources leads to scarcity, potentially causing price increases, hardship, and conflict.

(b) **Environmental Impact:** The extraction, processing, and use of fuels can lead to environmental damage, including pollution and habitat destruction.

11. Computer Vision is a domain of AI that depicts the capability of a machine to get and analyse visual information and then predict decisions about it. The entire process involves image acquisition, screening, analysis, identification, and extracting information. This extensive processing helps computers understand visual content and act on it accordingly.

In computer vision, the Input to machines can be photographs, videos and pictures from thermal or infrared sensors, indicators and different sources.

Natural Language Processing (NLP) is a branch of artificial intelligence that deals with the interaction between computers and humans using the natural language that is spoken and written by people. Natural language processing (NLP) attempts to extract information from text and speech using algorithms. The ultimate objective of NLP is to read, decipher, understand, and make sense of human languages in a valuable manner.

12. (i) **Data Exploration:** In this stage of the project cycle, we try to interpret some useful information from 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 verifying the collected data and to analyse that the data is according to the specifications decided and data is free from errors. This stage is divided into two sub-stages.

- Data Cleaning.
- Data Visualisation.

(ii) Data Features refer to the type of data that you want to collect. Data features are the specific pieces of information or characteristics that describe each data point in a dataset, acting as variables or attributes used for analysis and model building. Data features are a crucial part of the AI project cycle, specifically during the data acquisition and data exploration stages. E.g., Salary amount, increment percentage, increment period, bonus etc.

13. • Predict flight delay.

- Decide which class of aeroplanes to buy.
- Whether to directly land at the destination or take a halt in between.

- Effectively drive customer loyalty programs.

14. • Computer Vision (CV) helps physicians develop images of the internal organs of a human for medical analyses.

• CV can act as an assistant and help them in the interpretation of the images.

15. • Computers can understand structured data, such as spreadsheets and tables in the database, but human languages, texts, and voices form an unstructured category of data, and it becomes difficult for the computer to understand it.

• Computer language has set defined rules where as human language is ambiguous, we need to know the content as well intent while dealing with human language, which is not in case of computer languages.

16. **False Positive:** A false positive occurs when the model incorrectly identifies a legitimate transaction as fraudulent. For example, a customer making a large purchase, which is unusual but valid, might be flagged as fraudulent. This can lead to unnecessary inconvenience for the customer, such as having their card temporarily blocked.

False Negative: A false negative happens when the model fails to identify a fraudulent transaction, allowing it to go through undetected. For instance, a sophisticated scam that mimics normal transaction patterns might be missed. This poses a direct financial risk to both the customer and the financial institution.

17. **AI Bias:** AI bias is an anomaly (irregularity or abnormality/discrimination) in the results produced through AI-based programs and algorithms because of prejudices (discriminatory) assumptions made during the algorithm development process or prejudices in the training data. For example: When we search for nurse images on Google, mostly female images are shown and when we search for the doctor, we get more male images than female ones.

AI Access: Artificial Intelligence is still a budding technology, and 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. Because of this, a gap has emerged between these two classes of people and it continues widened with the rapid advancement of technology.

Example: AI creating unemployment

AI is making people's lives easier. Most of the things nowadays are done in just a few clicks. In no time AI will manage to be able to do all the laborious tasks which we humans have been doing for since long. Maybe in the coming years, AI-enabled machines will replace all the people who work as labourers. 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.

18. The Problem Statement Template is a part of the Problem Scoping stage of AI project cycle where we summarise all the 4Ws Problem Canvas into one template. The Problem Statement Template helps us to summarise 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 Problem Statement Template and understand the key elements of it.

Our	[stakeholders] ⎯⎯⎯⎯⎯⎯ ⎯⎯⎯⎯⎯⎯ ⎯⎯⎯⎯⎯⎯	Who
has /have a problem that	[issue, problem, need] ⎯⎯⎯⎯⎯⎯ ⎯⎯⎯⎯⎯⎯ ⎯⎯⎯⎯⎯⎯	What
when / while	[context, situation] ⎯⎯⎯⎯⎯⎯ ⎯⎯⎯⎯⎯⎯ ⎯⎯⎯⎯⎯⎯	Where
An ideal solution would	[benefit of solution for them] ⎯⎯⎯⎯⎯⎯ ⎯⎯⎯⎯⎯⎯ ⎯⎯⎯⎯⎯⎯	Why

19. The concept shown in the image is Artificial Neural Networks. Neural networks are said to be modeled the way how neurons in the human brain behave. A similar system is mimicked by the AI machine to perform certain tasks. Neural networks can be explained as a computational model consisting of interconnected nodes or neurons organised in layers. Each neuron receives input, processes it, and sends output to other neurons. By adjusting the connections between neurons, neural networks can learn and perform tasks such as classification or prediction. For example, in image recognition, a neural network analyses pixel values to identify objects in images.

The features of a neural network are:
- They can extract data features automatically without needing the input of the programmer.
- A neural network is essentially a system of organising machine learning algorithms to perform certain tasks.
- It is a fast and efficient way to solve problems for which the dataset is very large, such as in images

20. **Step 1:**

Text Normalisation: Collecting data and pre-processing it.

Document 1: NLP is a domain of AI

Document 2: NLP stands for Natural Language Processing

After text normalization, text becomes:

Document 1: [nlp, is, a, domain, of, ai]

Document 2: [nlp, stand, for, natural, language, process]

Stop words like is, a, of, for have not been removed as our sample data is very small.

Step 2:

Create Dictionary: List down all the words which occur in both the documents. Even though some words are repeated in different documents, they are all written just once as while creating the dictionary, we create the list of unique words.

| nlp | is | a | domain | of | ai | stand |

| for | natural | language | processing |

Step 3: Create a document vector

In this step, the vocabulary is written in the top row. Now, for each word in the document, if it matches the vocabulary, we put a 1 under it. If the same word appears again, increment the previous value by 1. And if the word does not occur in that document, put a 0 under it.

NLP	is	a	domain	of	ai	stand	for	natural	language	processing
1	1	1	1	1	1	0	0	0	0	0

Step 4: Repeat for all the documents

Final document vector table for the given corpus with the first row as its vocabulary:

NLP	is	a	domain	of	ai	stand	for	natural	language	processing
1	1	1	1	1	1	0	0	0	0	0
1	0	0	0	0	0	1	1	1	1	1

21. **(A)** The total number of true negatives is 410

(B) Precision = True Positives / (True Positives + False Positives)

110 / (110 + 60) = 110 / 170 ≈ 0.647

Recall = True Positives / (True Positives + False Negatives)

110 / (110 + 50) = 110 / 160 ≈ 0.688

F1 Score = 2 × (Precision × Recall) / (Precision + Recall)

2 × (0.647 × 0.688) / (0.647 + 0.688) ≈ 0.667

■■