

SKILL EDUCATION

ARTIFICIAL INTELLIGENCE (SUBJECT CODE - 417)

MARKING SCHEME FOR CLASS X (PT SESSION 3 2024-2025)

Max. Time: 2 Hours

Max. Marks: 50

General Instructions:

1. Please read the instructions carefully.
2. This Question Paper consists of **21 questions** in two sections – Section A & Section B.
3. Section A has Objective type questions whereas Section B contains Subjective type questions.
4. All questions of a particular section must be attempted in the correct order.
5. **SECTION A - OBJECTIVE TYPE QUESTIONS (24 MARKS):**
 - i. This section has 30 questions.
 - ii. Student has to answer 24 questions.
 - iii. Do as per the instructions given.
 - iv. Marks allotted are mentioned against each question/part.
6. **SECTION B – SUBJECTIVE TYPE QUESTIONS (26 MARKS):**
 - i. This section contains 16 questions.
 - ii. A candidate has to do 10 questions.
 - iii. Do as per the instructions given.
 - iv. Marks allotted are mentioned against each question/part.

SECTION A: OBJECTIVE TYPE QUESTIONS

Q. No.	QUESTION	Source Material (NCERT/PSSCIVE/ CBSE Study Material)	Unit/ Chap. No.	Page no. of source material	Marks
Q.1	Answer any 4 out of the given 6 questions on Employability Skills (1 x 4 = 4 marks)				
i.	C. Maintaining eye contact	Employability Skills NCERT – Revision Notes / CBSE Textbook	Unit 1 Communication Skills	4	1
ii.	D. Understand your strengths and weaknesses	Employability Skills NCERT – Revision Notes / CBSE Textbook	Unit 2 Self- Management Skills	3	1
iii.	D. Microwave Oven.	Employability Skills NCERT – Revision Notes / CBSE Textbook	Unit 3 Information and communication Technology Skills	1	1
iv.	D. Tracking	Employability Skills NCERT – Revision Notes / CBSE Textbook	Unit 4 Entrepreneurial Skills	2	1

v.	B. Take calculated risks and manage them effectively	Employability Skills NCERT – Revision Notes / CBSE Textbook	Unit 4 Entrepreneurial Skills	2	1
vi.	C. Solar panel installation	Employability Skills NCERT – Revision Notes / CBSE Textbook	Unit 1 Green Skills	3	1
Q.2	Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)				
i.	B. Siri	Facilitator Handbook	Intro to AI	15	1
ii.	A. Google Assistant	Facilitator Handbook	Intro to AI	15	1
iii.	C. Context / Situation / Location	Facilitator Handbook	AI Project Cycle	31	1
iv.	A. Data Features	Facilitator Handbook	Data Science	35	1
v.	D. All of the above	Facilitator Handbook	Neural Network	41	1
vi.	B. Classification	Facilitator Handbook	AI Model	38	1
Q.3	Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)				
i.	D. .csv	Facilitator Handbook	Data Science	63	1
ii.	B. Wikipedia	Facilitator Handbook	Intro to AI	21	1
iii.	A. Image and Segment	Facilitator Handbook	Computer Vision	76	1
iv.	D. Multiple Objects	Facilitator Handbook	Computer Vision	78	1
v.	C. Text Classification	Facilitator Handbook	NLP	101	1
vi.	D. Cognitive Behavioral Therapy	Facilitator Handbook	NLP / Project Phase	101	1
Q.4	Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)				
i.	C. Prediction is the output which is given by the machine and the reality is the real scenario in which the prediction has been made.	Facilitator Handbook	Evaluation	119	1
ii.	B. Breaking text into words or phrases	Facilitator Handbook	NLP	109	1
iii.	C. Grammatical Structure	Facilitator Handbook	NLP	107	1
iv.	A. Sentiment Analysis	Facilitator Handbook	NLP	100	1
v.	D. Stemming	Facilitator Handbook	NLP	110	1
vi.	C. Both and (a) and (b)	Facilitator Handbook	NLP	104	1
Q.5	Answer any 5 out of the given 6 questions (1 x 5 = 5 marks)				
i.	B. Spatial visual Intelligence	Facilitator Handbook	Intro to AI	11	1

ii.	C. System Maps	Facilitator Handbook	AI Project Cycle	60	1
iii.	B. False Negative	Facilitator Handbook	Evaluation - Confusion Matrix	122	1
iv.	C. Pixel	Facilitator Handbook	Computer Vision	79	1
v.	D. Spam Filter	Facilitator Handbook	NLP	101	1
vi.	A. Natural Language Processing – NLP	Facilitator Handbook	NLP	99	1

SECTION B: SUBJECTIVE TYPE QUESTIONS

Q. No.	QUESTION	Source Material (NCERT/PSSCIVE / CBSE Study Material)	Unit/ Chap. No.	Page no. of source material	Marks
Answer any 3 out of the given 5 questions in 20 – 30 words each (2 x 3 = 6 marks)					
Q. 6	<p>The 7 Cs of Effective Communication — Clear, Concise, Concrete, Correct, Coherent, Complete, and Courteous — are a set of principles that help ensure communication is both effective and impactful.</p> <p>1. Clear <i>Definition: Your message should be easily understood by the recipient.</i> <i>Best Practice: Avoid ambiguity, jargon, or overly complex language. Be direct and straightforward.</i> <i>Why It Matters: Clear communication eliminates confusion and ensures that the message is easily interpreted by the audience. (or)</i></p> <p>2. Concise <i>Definition: Be brief and to the point. Remove unnecessary words or information.</i> <i>Best Practice: Focus on the main message, eliminating any redundant or irrelevant details.</i> <i>Why It Matters: Concise communication respects the listener's time and attention span, making it easier to digest and retain the key message.(or)</i></p> <p>3. Concrete <i>Definition: Be specific and provide</i></p>	CBSE – Text Book – Employability Skills	(Communication Skills – NCERT - Revision Notes)	20	2

<p><i>solid facts, details, and examples.</i> <i>Best Practice: Avoid vague statements and be as precise as possible.</i> <i>Why It Matters: Concrete communication gives the listener a clear understanding of what you mean, backed by evidence or examples.(or)</i></p> <p>4. Correct <i>Definition: Ensure your message is grammatically accurate and factually correct.</i> <i>Best Practice: Double-check for spelling, grammar, and factual errors. Ensure the message aligns with the context.</i> <i>Why It Matters: Correct communication maintains credibility and professionalism. Errors can lead to misunderstandings and reduce trust.(or)</i></p> <p>5. Coherent <i>Definition: Your message should be logically organized and easy to follow.</i> <i>Best Practice: Structure your communication in a way that flows logically, with a clear introduction, body, and conclusion.</i> <i>Why It Matters: Coherent communication helps the listener or reader follow your thought process, ensuring your message is understood and absorbed effectively.(or)</i></p> <p>6. Complete <i>Definition: Provide all necessary information and details the recipient needs to understand the message.</i> <i>Best Practice: Ensure your message answers the key questions like who, what, when, where, why, and how, as applicable.</i> <i>Why It Matters: Incomplete communication can leave the listener or reader with questions or confusion, leading to incomplete understanding or action.(or)</i></p> <p>7. Courteous <i>Definition: Communicate in a</i></p>				
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	<p><i>respectful and considerate manner. Best Practice: Be polite, empathetic, and professional. Avoid negative language or tone.</i></p> <p><i>Why It Matters: Courteous communication fosters positive relationships, reduces conflicts, and enhances collaboration. It shows respect for the other person's feelings and perspective.</i></p> <p><i>(note: a student can choose to any two as directed in the question paper, 1 mark each correct sentence)</i></p>				
Q. 7	<p>Time management is the process of planning and organizing tasks to maximize efficiency. One can manage time by prioritizing, setting goals, avoiding distractions, and allocating specific time for each task.</p>	CBSE – Text Book – Employability Skills	Session 5 – Self Regulation under Self-Management Skills	58	2
Q. 8	<p>A Trojan Horse virus hides itself as a legitimate program, tricking users into downloading or executing it. Once activated, it can steal data, damage files, or provide unauthorized access to systems.</p>	CBSE – Text Book – Employability Skills	ICT Skills (under Threats to computer)	82	2
Q. 9	<p>We also learnt that successful entrepreneurs have the following qualities.</p> <ul style="list-style-type: none"> • They are confident. They believe in themselves and their abilities. • They keep trying new ideas in their business. • They are patient. • They are creative and think differently about business ideas. • They take responsibility for their actions. • They take decisions after thinking about them. • They work hard. • They do not give up when they face a difficulty. 	CBSE – Text Book – Employability Skills	Entrepreneurial Skills	84	2
Q.10	<p>The United Nations' 17 Sustainable Development Goals (SDGs) aim to address global challenges such as poverty, inequality, climate change, and peace, promoting a fairer, more sustainable future for all.</p> <p><i>(definition around any of the highlighted keywords can be awarded full marks)</i></p>	CBSE – Text Book – Employability Skills	Green Skills	103	2

Answer any 4 out of the given 6 questions in 20 – 30 words. (2 x 4 = 8 marks)					
Q.11	Stop words are the words which occur very frequently in the corpus but do not add any value to it . Example: a, an, and, are, as, for, it, is, into, in, if, on, or, such, the, there, to (Standard definition with example – can be awarded full marks)	Facilitator Handbook	NLP	109	2
Q.12	Data Sciences majorly work around analyzing the data and when it comes to AI, the analysis helps in making the machine intelligent enough to perform tasks by itself. There exist various applications of Data Science in today's world. Some of them are: Fraud and Risk Detection: Data science was first applied in finance to reduce bad debts and losses. Banks used collected data, such as customer profiles and past expenditures, to assess risk and promote tailored products. Genetics & Genomics: Data science enables personalized treatment through genetics and genomics research, linking DNA to health, diseases, and drug responses. Integrating genomic data aids in understanding genetic issues and predicting genetic risks for better individual care. Internet Search: Search engines like Google, Yahoo, and Bing use data science algorithms to deliver fast, accurate results. Google processes over 20 petabytes of data daily, highlighting the importance of data science in its success. Targeted advertising uses data science algorithms to display personalized digital ads, from website banners to airport billboards. This leads to higher click-through rates (CTR) by targeting users based on past behavior. Website recommendations , like those on Amazon, use data science to suggest relevant products based on users' past searches, enhancing the user experience. Companies like Amazon, Netflix, and LinkedIn use this system to promote products effectively. The airline industry , facing losses due to high fuel prices and discounts, now uses data science for strategic improvements. It helps predict flight delays, choose airplane models, decide on direct or stopover routes, and enhance customer loyalty programs. (Students expected to list 4 applications and they can describe any 2 out of the list)	Facilitator Handbook	Data Science	55	2
Q.13	Once a model has been made and trained, it needs to go through proper testing so that one can calculate the efficiency and performance of the model . Hence, the model is tested with the help of Testing Data and the efficiency of the model is calculated on the basis of the parameters mentioned below:	Facilitator Handbook	Model Evaluation	39	2

	<ol style="list-style-type: none"> 1. Accuracy 2. Precision 3. Recall 4. F1 Score <p>(Definition / Description with listing the evaluation parameters can be awarded full marks)</p>				
Q.14	<p>Lemmatization: <i>Lemmatization is the process of reducing a word to its base or root form (called a lemma) based on its meaning and context. Unlike stemming, which simply removes prefixes or suffixes, lemmatization considers the word's part of speech and converts it to its correct dictionary form. For example:</i></p> <p><i>"running" becomes "run"</i></p> <p><i>"better" becomes "good"</i></p> <p><i>Lemmatization ensures that words with similar meanings are grouped together, improving the accuracy of natural language processing tasks.</i></p> <p>Stemming <i>is the process of reducing a word to its root or base form (known as the "stem") by removing prefixes or suffixes. Unlike lemmatization, stemming does not consider the word's meaning or context and often results in non-dictionary forms. The goal is to simplify words to their basic root for tasks like search or text analysis.</i></p> <p><i>For example:</i></p> <p><i>"running" becomes "run"</i></p> <p><i>"happiness" becomes "happi"</i></p> <p><i>"better" becomes "better" (since it doesn't have a common stem form)</i></p> <p><i>Stemming is faster but less accurate than lemmatization, as it doesn't guarantee valid word forms.</i></p> <p><i>(Standard definition with 1 example each can be awarded full marks)</i></p>	Facilitator Handbook	NLP	111	2
Q.15	<p>The number of pixels in an image is sometimes called the resolution¹. When the term is used to describe pixel count, one convention is to express resolution as the <u>width by the height</u>, for example a monitor resolution of 1280×1024. This means there are 1280 pixels from one side to the other, and 1024 from top to bottom².</p> <p>Here are some common examples of screen resolutions:</p> <p>HD (720p) – 1280 × 720 pixels</p> <p>Often used for smaller TVs and some mobile devices. It's the standard resolution for HD content.</p>	Facilitator Handbook	Computer Vision	80	2

	<p>Full HD (1080p) – 1920 × 1080 pixels A common resolution for many TVs, monitors, and streaming content. It provides a clear and sharp image.</p> <p>Quad HD (QHD) or 2K – 2560 × 1440 pixels Typically used in higher-end smartphones and computer monitors for better clarity and sharper images.</p> <p>Ultra HD (4K) – 3840 × 2160 pixels Widely used in large TVs, monitors, and video production. 4K offers four times the resolution of Full HD.</p> <p>8K – 7680 × 4320 pixels The next step after 4K, offering extremely high detail, primarily used for advanced TVs and professional displays.</p> <p>Ultra-Wide (21:9) – 2560 × 1080 pixels (often) Used in ultra-wide monitors for enhanced productivity or immersive gaming.</p> <p>Standard Definition (SD) – 640 × 480 pixels This older resolution is now less common but was once standard for DVDs and early television broadcasts. (Standard definition with 1 example can be awarded full marks)</p>				
Q.16	<p>Grayscale Images <i>Grayscale images are images which have a range of shades of gray without apparent colour.¹ The <u>darkest possible shade is black</u>, which is the total absence of colour or zero value of pixel. The <u>lightest possible shade is white</u>, which is the total presence of colour or 255 value of a pixel². Intermediate shades of gray are represented by equal brightness levels of the three primary colours³. A grayscale has each pixel of size 1 byte having a single plane of 2d array of pixels. The size of a grayscale image is defined as the Height x Width of that image⁴.</i></p> <p>RGB Images <i>All the images that we see around are coloured images. <u>These images are made up of three primary colours Red, Green and Blue¹</u>. All the colours that are present can be made by combining different intensities of red, green and blue². (each appropriate difference attract 1 marks, hence, expected to answer at least 2 differences each)</i></p>	Facilitator Handbook	Computer Vision	81	2
Answer any 3 out of the given 5 questions in 50– 80 words each (4 x 3 = 12 marks)					

<p>Q.17</p>	<p>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.</p> <p>4Ws Problem Canvas</p> <p>The 4Ws Problem canvas helps in identifying the key elements related to the problem.</p> <p>Who?¹</p> <p>The “Who” block helps in analyzing the people getting affected directly or indirectly due to it. Under this, we find out who the ‘Stakeholders’ to this problem are and what we know about them. Stakeholders are the people who face this problem and would be benefitted with the solution.</p> <p>What?²</p> <p>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? Under this block, you also gather evidence to prove that the problem you have selected actually exists.</p> <p>Where?³</p> <p>Now that you know who is associated with the problem and what the problem actually is; you need to focus on the context/situation/location of the problem. This block will help you look into the situation in which the problem arises, the context of it, and the locations where it is prominent.</p> <p>Why?⁴</p> <p>You have finally listed down all the major elements that affect the problem directly. Now it is convenient to understand who the people that would be benefitted by the solution are; what is to be solved; and where will the solution be deployed. These three canvases now become the base of why you want to solve this problem.</p>	<p>Facilitator Handbook</p>	<p>Unit 2 Topic (AI Project Cycle)</p>	<p>31</p>	<p>4</p>
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<div>Q. 18</div>	<div><p>To calculate the Accuracy, Precision, Recall, and F1 Score from the given confusion matrix, let's first break down the values from the matrix:</p><p>Confusion Matrix:</p><table><tr><th></th><th>Reality: Yes</th><th>Reality: No</th></tr><tr><th>Predicted: Yes</th><td>60</td><td>25</td></tr><tr><th>Predicted: No</th><td>5</td><td>10</td></tr></table><p>Where:</p><ul style="list-style-type: none">• True Positives (TP) = 60 (Predicted Yes and Reality Yes)• False Positives (FP) = 25 (Predicted Yes and Reality No)• False Negatives (FN) = 5 (Predicted No and Reality Yes)• True Negatives (TN) = 10 (Predicted No and Reality No)<p>1. Accuracy</p><p>Accuracy is the proportion of correct predictions (both True Positives and True Negatives) out of all predictions.</p>$\text{Accuracy} = \frac{TP + TN}{TP + FP + FN + TN}$$\text{Accuracy} = \frac{60 + 10}{60 + 25 + 5 + 10} = \frac{70}{100} = 0.70$<p>So, Accuracy = 0.70 or 70%.</p><p>2. Precision</p><p>Precision (also known as Positive Predictive Value) measures the accuracy of positive predictions. It is the proportion of True Positives out of all predicted positives (True Positives + False Positives).</p>$\text{Precision} = \frac{TP}{TP + FP}$$\text{Precision} = \frac{60}{60 + 25} = \frac{60}{85} \approx 0.7059$<p>So, Precision ≈ 0.706 or 70.6%.</p><p>3. Recall</p><p>Recall (also known as Sensitivity or True Positive Rate) measures how well the model identifies positive cases. It is the proportion of True Positives out of all actual positives (True Positives + False Negatives).</p>$\text{Recall} = \frac{TP}{TP + FN}$$\text{Recall} = \frac{60}{60 + 5} = \frac{60}{65} \approx 0.9231$<p>So, Recall ≈ 0.923 or 92.3%.</p><p>4. F1 Score</p><p>The F1 Score is the harmonic mean of Precision and Recall, providing a single measure that balances both.</p>$F1 \text{ Score} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}}$$F1 \text{ Score} = 2 \times \frac{0.706 \times 0.923}{0.706 + 0.923} \approx 2 \times \frac{0.651}{1.629} \approx 0.799$<p>So, F1 Score ≈ 0.799 or 79.9%.</p><p>Summary:</p><ul style="list-style-type: none">• Accuracy = 70%• Precision ≈ 70.6%• Recall ≈ 92.3%• F1 Score ≈ 79.9%</div>		Reality: Yes	Reality: No	Predicted: Yes	60	25	Predicted: No	5	10	<div>Facilitator Handbook</div>	<div>Unit 7 Topic (Evaluation – Under Confusion Matrix)</div>	<div>128</div>	<div>4</div>
	Reality: Yes	Reality: No												
Predicted: Yes	60	25												
Predicted: No	5	10												
<div>Q.19</div>	<div><p><i>A neural network is a computational model inspired by the way biological neural networks in the human brain work¹. It is composed of layers of interconnected "neurons" or nodes, which process input data and pass it through transformations to make predictions or decisions².</i></p><p><i>Here's a brief overview of how neural networks work:</i></p><p>Input Layer:</p><p><i>The input layer receives raw data (such as images, text, or numerical values) and passes it on to the next layer. Each input corresponds to a neuron that</i></p></div>	<div>Facilitator Handbook</div>	<div>Neural Network</div>	<div>41</div>	<div>4</div>									

<p><i>processes one feature of the data.</i></p> <p><i>Hidden Layers³:</i></p> <p><i>These layers consist of multiple neurons that process the data passed from the input layer.</i></p> <p><i>Each neuron performs a weighted sum of the inputs, applies an activation function, and sends the result to the next layer.</i></p> <p><i>The purpose of hidden layers is to capture patterns and relationships within the data.</i></p> <p><i>Activation Function:</i></p> <p><i>After each neuron processes the data, an activation function is applied to introduce non-linearity into the model.</i></p> <p><i>Common activation functions include:</i></p> <p><i>Sigmoid: Outputs a value between 0 and 1.</i></p> <p><i>ReLU (Rectified Linear Unit): Outputs the input directly if positive, or zero if negative.</i></p> <p>Output Layer:</p> <p><i>The output layer produces the final prediction or classification result.</i></p> <p><i>In a binary classification task, it might output a value between 0 and 1 (representing the probability of one class).</i></p> <p><i>In multi-class classification, the softmax function converts the outputs into probabilities for each class.</i></p> <p><i>Features of Neural Networks:</i></p> <p><i>Layered Structure:</i></p> <p>Neural networks consist of an input layer, one or more hidden layers, and an output layer. The depth (number of hidden layers) and width (number of neurons in each layer) determine the network's complexity⁴.</p> <p><i>Weights and Biases:</i></p> <p><i>Each connection between neurons has a weight that determines the strength of the connection. Additionally, each neuron has a bias that allows the model to shift the activation function's output.</i></p>				
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	<p>Activation Functions:</p> <p>Activation functions introduce non-linearity, enabling the network to learn complex patterns. Without them, the neural network would only be able to learn linear relationships.</p> <p>Learning:</p> <p>Neural networks "learn" by adjusting weights through backpropagation and optimization algorithms (like gradient descent) to minimize the loss function.</p> <p>Adaptability:</p> <p>Neural networks are highly adaptable and can learn from large datasets, making them ideal for tasks like image recognition, natural language processing, and more⁵.</p> <p>Parallel Processing:</p> <p>Neural networks are capable of processing multiple data inputs simultaneously, making them well-suited for large-scale and complex data tasks⁶.</p> <p>Generalization:</p> <p>Once trained, neural networks can generalize from their training data to make predictions or classify new, unseen data⁷.</p>				
Q.20	<p>The Bag of Words (BoW) algorithm is a simple text representation method in natural language processing. It converts text into a collection of words (or tokens), ignoring grammar and word order but retaining word frequency¹.</p> <p>Example²: For two sentences:</p> <p>"I love AI" "AI loves learning"</p> <p>The BoW representation would be:</p> <p>Vocabulary: ["I", "love", "AI", "loves", "learning"] Sentence 1: [1, 1, 1, 0, 0] Sentence 2: [0, 0, 1, 1, 1]</p>	Facilitator Handbook	Natural Language Processing	112	4

Q.21	<p>Supervised Learning</p> <p>In a supervised learning model, the dataset which is fed to the machine is labelled¹. In other words, we can say that the dataset is known to the person who is training the machine only then he/she is able to label the data². A label is some information which can be used as a tag for data³.</p> <p>There are two types of Supervised Learning models:</p> <p>Classification⁴: Where the data is classified according to the labels. For example, in the grading system, students are classified on the basis of the grades they obtain with respect to their marks in the examination. This model works on discrete dataset which means the data need not be continuous.</p> <p>Regression⁵: Such models work on continuous data. For example, if you wish to predict your next salary, then you would put in the data of your previous salary, any increments, etc., and would train the model. Here, the data which has been fed to the machine is continuous.</p> <p>Unsupervised Learning</p> <p>An unsupervised learning model works on un-labelled dataset¹. 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 it². The unsupervised learning models are used to identify relationships, patterns and trends out of the data which is fed into it³. It helps the user in understanding what the data is about and what are the major features identified by the machine in it.</p> <p>For example, you have a random data of 1000 dog images and you wish to understand some pattern out of it, you would feed this data into the unsupervised learning model and would train the machine on it. After training, the machine would come up with patterns which it was able to identify out of it⁴.</p> <p>Clustering: Refers to the unsupervised</p>	Facilitator Handbook	AI Models	37	4
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<p>learning algorithm which can cluster the unknown data according to the patterns or trends identified out of it⁵. 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.</p> <p>Dimensionality Reduction: We humans are able to visualize upto 3-Dimensions only but according to a lot of theories and algorithms, there are various entities which exist beyond 3-Dimensions⁵.</p> <p>For example, in Natural language Processing, the words are considered to be N-Dimensional entities. Which means that we cannot visualize them as they exist beyond our visualization ability. Hence, to make sense out of it, we need to reduce their dimensions. Here, dimensionality reduction algorithm is used⁶.</p>				
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