**1.Explain the term machine learning, and how does it work? Explain two machine learning applications in the business world. What are some of the ethical concerns that machine learning applications could raise?**

- Machine Learning is an AI technique that teaches computers to learn from experience. Machine learning algorithms use computational methods to “learn” information directly from data without relying on a predetermined equation as a model. The algorithms improve their performance as the number of samples available for learning increases.

**How does it work ?** - Machine learning uses two types of techniques: [supervised learning](https://www.mathworks.com/discovery/supervised-learning.html), which trains a model on known input and output data so that it can predict future outputs, and [unsupervised learning](https://www.mathworks.com/discovery/unsupervised-learning.html), which finds hidden patterns or intrinsic structures in input data.

**Examples of buissness world**

* Stock Price prediction – Predicting the stock prices of a particular stock with the help of its old performance history and trade values. This is basically a regression based problem.
* Recommendations systems - Here the algorithms process data points about an individual customer, such as the customer's past purchases, as well as other data sets such as a company's current inventory, demographic trends and other customers' buying histories to determine what products and services to recommend to each individual customer.

**Ethical Concerns would be :-**

- Lack of quality of data – Data inequality is the one the concerns where ML algorithms fail to give prediction as expected.

-Huge number of data or data like images and videos.

**2. Describe the process of human learning:**

**i. Under the supervision of experts**

- The human can gain all of the knowledge which his experts provides him.

**ii. With the assistance of experts in an indirect manner**

* - There would be a chance where the human will ignore or procrastinate the flow or the learning but depend on circumstances human would learn many things.

**iii. Self-education**

- Human can learn maximum things but there would be a chance of misunderstanding of the concepts through which there could be even a delay in understanding.

**3. Examine the various forms of machine learning.**

- Supervised Machine learning is a technique where the output variables or features are in the labelled format and here we need to find out the relationship between dependent features and independent features.

Example – Classifying between Gender ie male or female, Here the output is been in a labelled format.

UnSupervised machine learning is a technique where the output variables or features are not in labelled format and we need to calculate the result with the help of distance formula or creating groups.

Example :- creating a group of same colour marbles.

Reinforcement learning – **Reinforcement learning works on a feedback-based process, in which an AI agent (A software component) automatically explore its surrounding by hitting & trail, taking action, learning from experiences, and improving its performance.** Agent gets rewarded for each good action and get punished for each bad action; hence the goal of reinforcement learning agent is to maximize the rewards. In reinforcement learning, there is no labelled data like supervised learning, and agents learn from their experiences only.

Example :- **Robotics – where the robots get trained by themselves with trail or error method.**

Semi-Supervised Machine Learning - **Semi-Supervised learning is a type of Machine Learning algorithm that lies between Supervised and Unsupervised machine learning**. It represents the intermediate ground between Supervised (With Labelled training data) and Unsupervised learning (with no labelled training data) algorithms and uses the combination of labelled and unlabeled datasets during the training period.

Example :- Speech Analysis –labelling the audio data is next human work so this can be done by semi supervised learning.

**4. Can you explain what a well-posed learning problem is? Explain the main characteristics that must be present to identify a learning problem properly.**

- A well posed learning problem is that when it starts identifying the relationship between the dependent and independent values properly with less number of training. Ie the accuracy should be increased exponentially especially for the new data without any huddle in the process. The main characteristics that must be present is the reduction of error or loss. So, probably how good the data is the well the output is.

**5. Is machine learning capable of solving all problems? Give a detailed explanation of your answer.**

- **Yes**, it is capable of solving many problems but in some cases **No**. When it comes to train huge number of data which is basically present in billion or trillion records then machine learning techniques become complicated to handle. Data which include images or videos are also not handled by machine learning. So, not all of the process can be automated using machine learning. There are few drawbacks in it.

**6. Can you explain the various forms of supervised learning? Explain each one with an example application.**

- There are two forms of supervised learning

1.Regression - Regression is a machine learning algorithm technique which is used when the target variables or feature values are in continuous format. In this technique , the algorithm find outs the relationship between the independent and dependent variables and on the basis that the best fit line is calculated including less error the model is been built on which the prediction is been done. It is a supervised machine learning technique which has output values in continuous form.

2. Classification - Classification is a part of machine learning algorithm where the output is been classified between two classes. For example :- the number of people differentiating between genders male and female or classifying output with 0 or 1. The main distinction between classification and regression is in regression our prediction is continuous value such as price, income, age, etc and in classification classify the distinct values such as Real or False, Male or Female.

**7. What is the difference between supervised and unsupervised learning? With a sample application in each region, explain the differences.**

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Example – Classifying between Gender ie male or female, Here the output is been in a labelled format.

- UnSupervised machine learning is a technique where the output variables or features are not in labelled format and we need to calculate the result with the help of distance formula or creating groups.

Example :- creating a group of same colour marbles.

**8. Describe the machine learning process in depth.**

**Make brief notes on any two of the following:**

**i. MATLAB is one of the most widely used programming languages.**

**ii. Deep learning applications in healthcare**

Drug Discovery

**Medical Imaging and Diagnostics**

**Improved Health Records and Patient Monitoring**

Diagnosis with the help of images

**iii. Study of the market basket**

**iv. Linear regression (simple)**

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**9. Make a comparison between:-**

**1.Generalization and abstraction**

Both are the techniques involved in object oriented programming.

Abstraction is nothing the it is the process of removing details of objects. Where as generalization is the formulation of general concepts from specific instances by abstracting common properties. For example :- A is an abstraction of B if and only if , Every instance of concept B is also an instance of concept A where as A is a generalization of B if and only if Every instance of concept B is also an instance of concept A There are instances of concept A which are not instances of concept B

**2. Learning that is guided and unsupervised**

**3. Regression and classification**

- Both are Supervised machine learning algorithms

- In regression the target variable has continuous values in it where as classification contains classes in it.

- In Regression we find the relationship between Independent and dependent features and on the basis of the best fit line with less error the model is been fit. Where as in classification we classify the feature in to classes like gender as male or female, binary classification such as 0 or 1 etc.