1.Explain the term machine learning, and how does it work?

A:

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.

Explain two machine learning applications in the business world.

Examples:

* Real-time chatbot agent
* Decision support

What are some of the ethical concerns that machine learning applications could raise?

A:

* Accuracy. The accuracy of an ML model is the proportion of examples for which it generates a correct output [Leslie]. ...
* Bias
* Fairness. ...
* Safety & Security. ...
* Privacy. ...
* Transparency. ...
* Accountability. ...
* Human Control and Decision-making.

2. Describe the process of human learning:

i. Under the supervision of experts

A: Supervised learning uses a training set to teach models to yield the desired output. This training dataset includes inputs and correct outputs, which allow the model to learn over time. The algorithm measures its accuracy through the loss function, adjusting until the error has been sufficiently minimized.

ii. With the assistance of experts in an indirect manner

A: Indirect guidance is provided through learners actively observing, listening, and engaging with social practices and norms, which serve to furnish models and goals for performance and individuals' learning. The exercise of learner agency is a defining quality of guided learning.

iii. Self-education

Self-learning AI is artificial intelligence that can train itself using unlabeled data. On a high level, it works by analyzing a dataset and looking for patterns that it can draw conclusions from. It essentially learns to “fill in the blanks.”

3. Provide a few examples of various types of machine learning.

A:

Real-life examples of how machine learning is being used.

* Image recognition. Image recognition is a well-known and widespread example of machine learning in the real world
* Speech recognition
* Medical diagnosis
* Statistical arbitrage
* Predictive analytic
* Extraction

4. Examine the various forms of machine learning.

The three machine learning types are supervised, unsupervised, and reinforcement learning.

5. 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 – A computer program is said to learn from experience E in context to some task T and some performance measure P, if its performance on T, as was measured by P, upgrades with experience E.

Any problem can be segregated as well-posed learning problem if it has three traits –

* Task
* Performance Measure
* Experience

example

* Task – Classifying emails as spam or not
* Performance Measure – The fraction of emails accurately classified as spam or not spam
* Experience – Observing you label emails as spam or not spam

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

A:

# Limitation 1 — Ethics

# Limitation 2 — Deterministic Problems

# Limitation 3 — Data

7. What are the various methods and technologies for solving machine learning problems? Any two

of them should be defined in detail.

A:

Machine learning uses two techniques: supervised learning, which trains a model on known input and output data to predict future outputs, and unsupervised learning, which uses hidden patterns or internal structures in the input data.

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

application.

A:

### Regression: regression can help predict the price of a house based on its locality, size, etc. In logistic regression, the output has discrete values based on a set of independent variables.

### Classification: It involves grouping the data into classes.  If you are thinking of extending credit to a person, you can use classification to determine whether or not a person would be a loan defaulter. When the supervised learning algorithm labels input data into two distinct classes, it is called binary classification. Multiple classifications means categorizing data into more than two classes.

### Naive Bayesian Model:

As the model for supervised learning in ML helps construct the classifiers in a simple and straightforward way, it works great with very small data sets. This model draws on common data assumptions, such as each attribute is independent. Yet having such simplification, this algorithm can easily be implemented on complex problems.

* **Decision Trees**

A decision tree is a flowchart-like model that contains conditional control statements, comprising decisions and their probable consequences. The output relates to the labelling of unforeseen data.

### Random Forest Model

### The random forest model is an ensemble method. It operates by constructing a multitude of decision trees and outputs a classification of the individual trees. Suppose you want to predict which undergraduate students will perform well in GMAT – a test taken for admission into graduate management programs. A random forest model would accomplish the task, given the demographic and educational factors of a set of students who have previously taken the test.

### Neural Networks

### this algorithm is designed to cluster raw input, recognize patterns, or interpret sensory data. Despite their multiple advantages, neural networks require significant computational resources. It can get complicated to fit a neural network when there are thousands of observations. It is also called the ‘black-box’ algorithm as interpreting the logic behind their predictions can be challenging.

### Support Vector Machines

### the algorithm of supervised learning in ML, SVM is highly popular amongst the supervised learning models as it can be used for classification or regression. Implementation of the model works well with high-dimensional spaces, but it can also be used effectively with small data sets. SVM can also classify new observations efficiently when the algorithm is trained on a data set. SVM performs this by creating singular or multiple hyperplanes to separate the data set between the two classes.

9. What is the difference between supervised and unsupervised learning? With a sample application

in each region, explain the differences.

A:

The main difference between supervised and unsupervised learning: Labeled data. The main distinction between the two approaches is the use of labeled datasets. To put it simply, supervised learning uses labeled input and output data, while an unsupervised learning algorithm does not.

In supervised learning, the algorithm “learns” from the training dataset by iteratively making predictions on the data and adjusting for the correct answer. While supervised learning models tend to be more accurate than unsupervised learning models, they require upfront human intervention to label the data appropriately. For example, a supervised learning model can predict how long your commute will be based on the time of day, weather conditions and so on. But first, you’ll have to train it to know that rainy weather extends the driving time.

Unsupervised learning models, in contrast, work on their own to discover the inherent structure of unlabeled data. Note that they still require some human intervention for validating output variables. For example, an unsupervised learning model can identify that online shoppers often purchase groups of products at the same time. However, a data analyst would need to validate that it makes sense for a recommendation engine to group baby clothes with an order of diapers, applesauce and sippy cups.

10. Describe the machine learning process in depth.

Machine learning (ML) is a type of artificial intelligence (AI) that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so. Machine learning algorithms use historical data as input to predict new output values.

a. Make brief notes on any two of the following:

MATLAB is one of the most widely used programming languages.

ii. Deep learning applications in healthcare

By assessing patients' medical histories, symptoms, and tests, deep learning systems enable healthcare companies to provide individualized patient care. Natural language processing (NLP) extracts valuable information from free-text medical data for the most common medical procedures.

iii. Study of the market basket

iv. Linear regression (simple)

We could use the equation to predict weight if we knew an individual's height. In this example, if an individual was 70 inches tall, we would predict his weight to be: Weight = 80 + 2 x (70) = 220 lbs. In this simple linear regression, we are examining the impact of one independent variable on the outcome.

11. Make a comparison between:-

1. Generalization and abstraction

A

Abstraction aims at simplifying the description of an entity while generalization looks for common properties among these abstractions. Generalizations are clearly important and prevalent in many disciplines of study.

2. Learning that is guided and unsupervised

A:

supervised learning is when a model learns from a labeled dataset with guidance. And, unsupervised learning is where the machine is given training based on unlabeled data without any guidance.

3. Regression and classification

A

The most significant difference between regression vs classification is that while regression helps predict a continuous quantity, classification predicts discrete class labels.