

Assignment - Introduction to Machine Learning

Q.1: Where do you place and use machine learning, Explain with the help of an example?

Answer: Machine learning is a branch of artificial intelligence that enables computers to learn from data and perform tasks without being explicitly programmed. Machine learning is used in various domains and applications, such as social media, e-commerce, healthcare, self-driving cars, and more. Here are some examples of how machine learning is used in different scenarios:

1. Recommendation systems

Recommendation engines are one of the most popular applications of machine learning, as product recommendations are featured on most e-commerce websites. Using machine learning models, websites track your behaviour to recognize patterns in your browsing history, previous purchases, and shopping cart activity. This data collection is used for pattern recognition to predict user preferences. Companies like Spotify and Netflix use similar machine learning algorithms to recommend music or TV shows based on your previous listening and viewing history. Over time and with training, these algorithms aim to understand your preferences to accurately predict which artists or films you may enjoy.

2. Social media connections

Another example of a similar training algorithm is the “people you may know” feature on social media platforms like LinkedIn, Instagram, Facebook, and X (formerly known as Twitter.) Based on your contacts, comments, likes, or existing connections, the algorithm suggests familiar faces from your real-life network that you might want to connect with or follow.

3. Image recognition

Image recognition is another machine learning technique that appears in our day-to-day life. With the use of ML, programs can identify an object or person in an image based on the intensity of the pixels. This type of facial recognition is used for password protection methods like Face ID and in law enforcement. By filtering through a database of people to identify commonalities and matching them to faces, police officers and investigators can narrow down a list of crime suspects.

4. Natural language processing (NLP)

Just like ML can recognize images, language models can also support and manipulate speech signals into commands and text. Software applications coded with AI can convert recorded and live speech into text files.

Voice-based technologies can be used in medical applications, such as helping doctors extract important medical terminology from a conversation with a patient. While this tool isn't advanced

enough to make trustworthy clinical decisions, other speech recognition services provide patients with reminders to “take their medication” as if they have a home health aide by their side.

5. Virtual personal assistants

Virtual personal assistants are devices you might have in your own homes, such as Amazon’s Alexa, Google Home, or the Apple iPhone’s Siri. These devices use a combination of speech recognition technology and machine learning to capture data on what you're requesting and how often the device is accurate in its delivery. They detect when you start speaking, what you’re saying, and deliver on the command. For example, when you say, “Siri, what is the weather like today?”, Siri searches the web for weather forecasts in your location and provides detailed information.

6. Stock market predictions

Predictive analytics and algorithmic trading are common machine learning applications in industries such as finance, real estate, and product development. Machine learning classifies data into groups and then defines them with rules set by data analysts. After classification, analysts can calculate the probability of an action. These machine learning methods help predict how the stock market will perform based on year-to-year analysis. Using predictive analytics machine learning models, analysts can predict the stock price for 2025 and beyond.

7. Credit card fraud detection

Predictive analytics can help determine whether a credit card transaction is fraudulent or legitimate. Fraud examiners use AI and machine learning to monitor variables involved in past fraud events. They use these training examples to measure the likelihood that a specific event was fraudulent activity.

8. Traffic predictions

When you use Google Maps to map your commute to work or a new restaurant in town, it provides an estimated time of arrival. Google uses machine learning to build models of how long trips will take based on historical traffic data (gleaned from satellites). It then takes that data based on your current trip and traffic levels to predict the best route according to these factors.

9. Self-driving car technology

A frequently used type of machine learning is reinforcement learning, which is used to power self-driving car technology. Self-driving vehicle company Waymo uses machine learning sensors to collect data of the car's surrounding environment in real time. This data helps guide the car's response in different situations, whether it is a human crossing the street, a red light, or another car on the highway.

Q.2: Write the steps involved in machine learning?

Answer: Machine learning is the process of making systems that learn and improve by themselves, by being specifically programmed. The steps involved in machine learning are:

- **Collecting Data:** This is the first step where you gather data from reliable sources that are relevant to your problem. Data is the input to your machine learning model, so it should be accurate, consistent, and representative of the various subcategories or classes present in your problem domain.
- **Preparing the Data:** This is the step where you clean, transform, and explore the data. You may have to deal with missing or repeated values, outliers, or errors in the data. You may also have to perform feature engineering, which is the process of creating new features or modifying existing ones to make them more suitable for your machine learning model.
- **Choosing a Model:** This is the step where you select a machine learning algorithm that suits your problem and data. There are many types of machine learning models, such as supervised, unsupervised, or reinforcement learning. You may have to consider factors such as the complexity, interpretability, scalability, and performance of the model.
- **Training the Model:** This is the step where you feed the data to the machine learning model and let it learn from the data. You may have to split the data into training and validation sets, and use techniques such as cross-validation, regularization, or hyperparameter tuning to avoid overfitting or underfitting the model.
- **Evaluating the Model:** This is the step where you test the machine learning model on unseen data and measure its accuracy, precision, recall, or other metrics. You may have to compare the model with other models or baselines, and analyze the results to identify the strengths and weaknesses of the model.
- **Using the Model and Presenting Results:** This is the final step where you deploy the machine learning model in a real-world scenario and use it to make predictions or decisions. You may also have to communicate the results and insights of the model to stakeholders or customers, using visualizations, reports, or dashboards.

These are the general steps involved in machine learning, but they may vary depending on the specific problem and data.

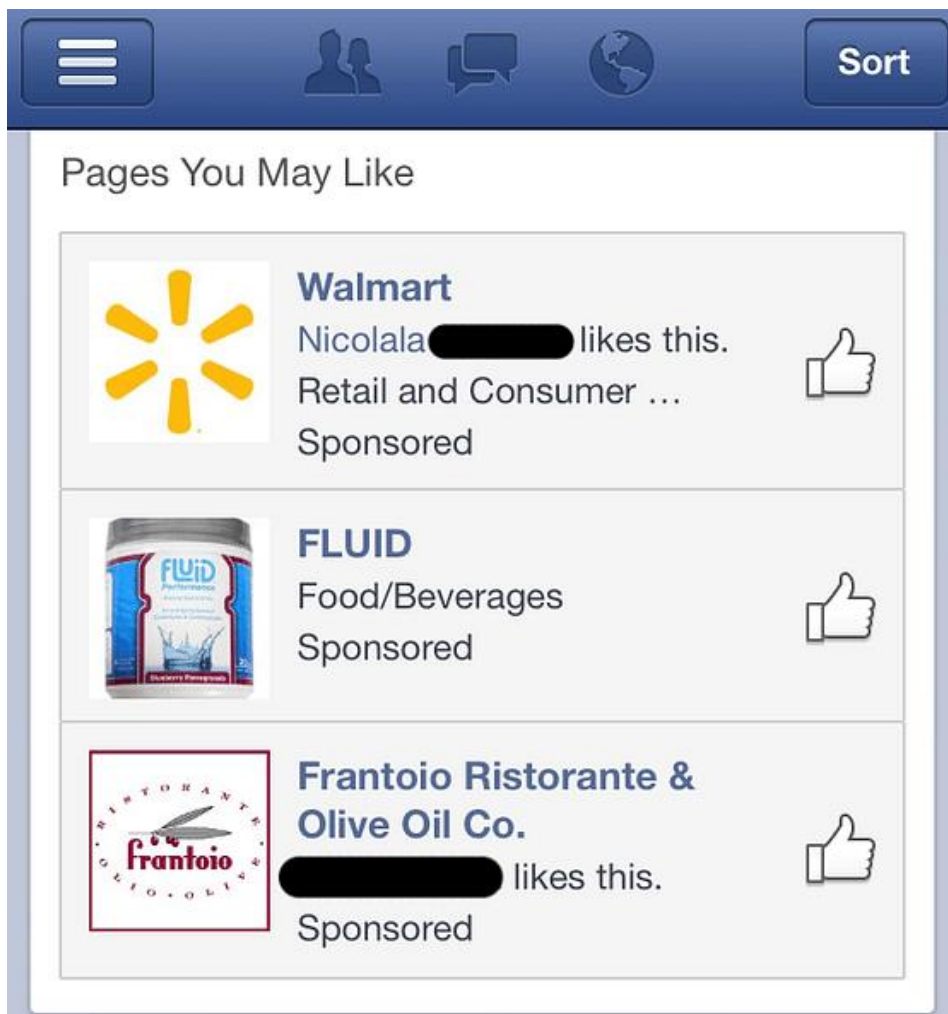
Q.3: Give application for machine learning?

Answer:

Machine learning is the latest buzzword sweeping across the global business landscape. It has captured the popular imagination, conjuring up visions of futuristic self-learning AI and robots. In different industries, machine learning has paved the way for technological accomplishments and tools that would have been impossible a few years ago. From prediction engines to online TV live streaming, it powers the breakthrough innovations that support our modern lifestyles. Some of the applications are as follows:

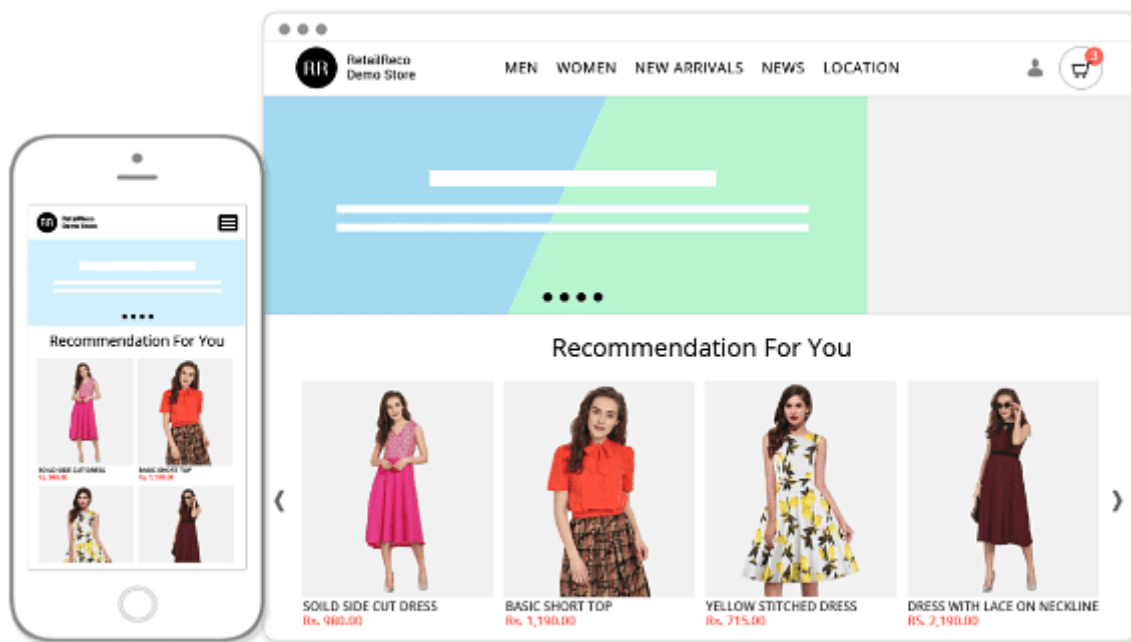
1. Social Media Features

Social media platforms use machine learning algorithms and approaches to create some attractive and excellent features. For instance, Facebook notices and records your activities, chats, likes, and comments, and the time you spend on specific kinds of posts. Machine learning learns from your own experience and makes friends and page suggestions for your profile.



2. Product Recommendations

Product recommendation is one of the most popular and known applications of machine learning. Product recommendation is one of the stark features of almost every e-commerce website today, which is an advanced application of machine learning techniques. Using machine learning and AI, websites track your behavior based on your previous purchases, searching patterns, and cart history, and then make product recommendations.



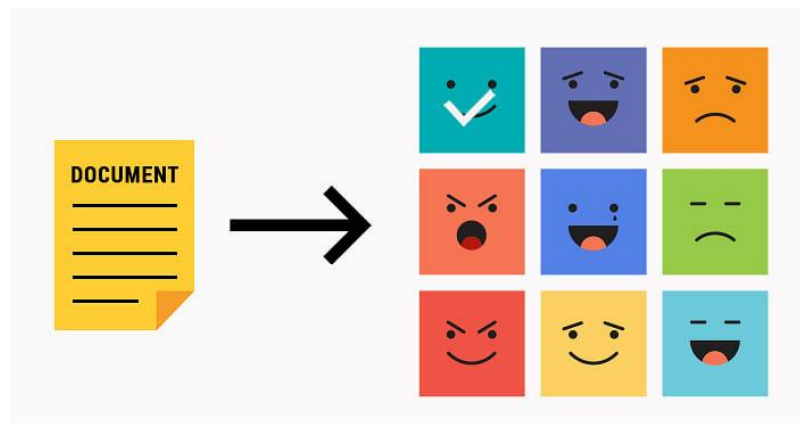
3. Image Recognition

Image recognition, which is an approach for cataloging and detecting a feature or an object in the digital image, is one of the most significant and notable machine learning and AI techniques. This technique is being adopted for further analysis, such as pattern recognition, face detection, and face recognition.



4. Sentiment Analysis

Sentiment analysis is one of the most necessary applications of machine learning. Sentiment analysis is a real-time machine learning application that determines the emotion or opinion of the speaker or the writer. For instance, if someone has written a review or email (or any form of a document), a sentiment analyzer will instantly find out the actual thought and tone of the text. This sentiment analysis application can be used to analyze a review based website, decision-making applications, etc.



5. Automating Employee Access Control

Organizations are actively implementing machine learning algorithms to determine the level of access employees would need in various areas, depending on their job profiles. This is one of the coolest applications of machine learning.

6. Marine Wildlife Preservation

Machine learning algorithms are used to develop behavior models for endangered cetaceans and other marine species, helping scientists regulate and monitor their populations.

7. Regulating Healthcare Efficiency and Medical Services

Significant healthcare sectors are actively looking at using machine learning algorithms to manage better. They predict the waiting times of patients in the emergency waiting rooms across various departments of hospitals. The models use vital factors that help define the algorithm, details of staff at various times of day, records of patients, and complete logs of department chats and the layout of emergency rooms. Machine learning algorithms also come to play when detecting a disease, therapy planning, and prediction of the disease situation. This is one of the most necessary machine learning applications.

8. Predict Potential Heart Failure

An algorithm designed to scan a doctor's free-form e-notes and identify patterns in a patient's cardiovascular history is making waves in medicine. Instead of a physician digging through multiple health records to arrive at a sound diagnosis, redundancy is now reduced with computers making an analysis based on available information.

9. Banking Domain

Banks are now using the latest advanced technology machine learning has to offer to help prevent fraud and protect accounts from hackers. The algorithms determine what factors to consider to create a filter to keep harm at bay. Various sites that are unauthentic will be automatically filtered out and restricted from initiating transactions.

10. Language Translation

One of the most common machine learning applications is language translation. Machine learning plays a significant role in the translation of one language to another. We are amazed at how websites can translate from one language to another effortlessly and give contextual meaning as well. The technology behind the translation tool is called 'machine translation.' It has enabled people to interact with others from all around the world; without it, life would not be as easy as it is now. It has provided confidence to travelers and business associates to safely venture into foreign lands with the conviction that language will no longer be a barrier.



Your model will need to be taught what you want it to learn. Feeding relevant back data will help the machine draw patterns and act accordingly. It is imperative to provide relevant data and feed files to help the machine learn what is expected. In this case, with machine learning, the results you strive for depend on the contents of the files that are being recorded.