Department of Computer Engineering

Government Polytechnic for Girls, Surat

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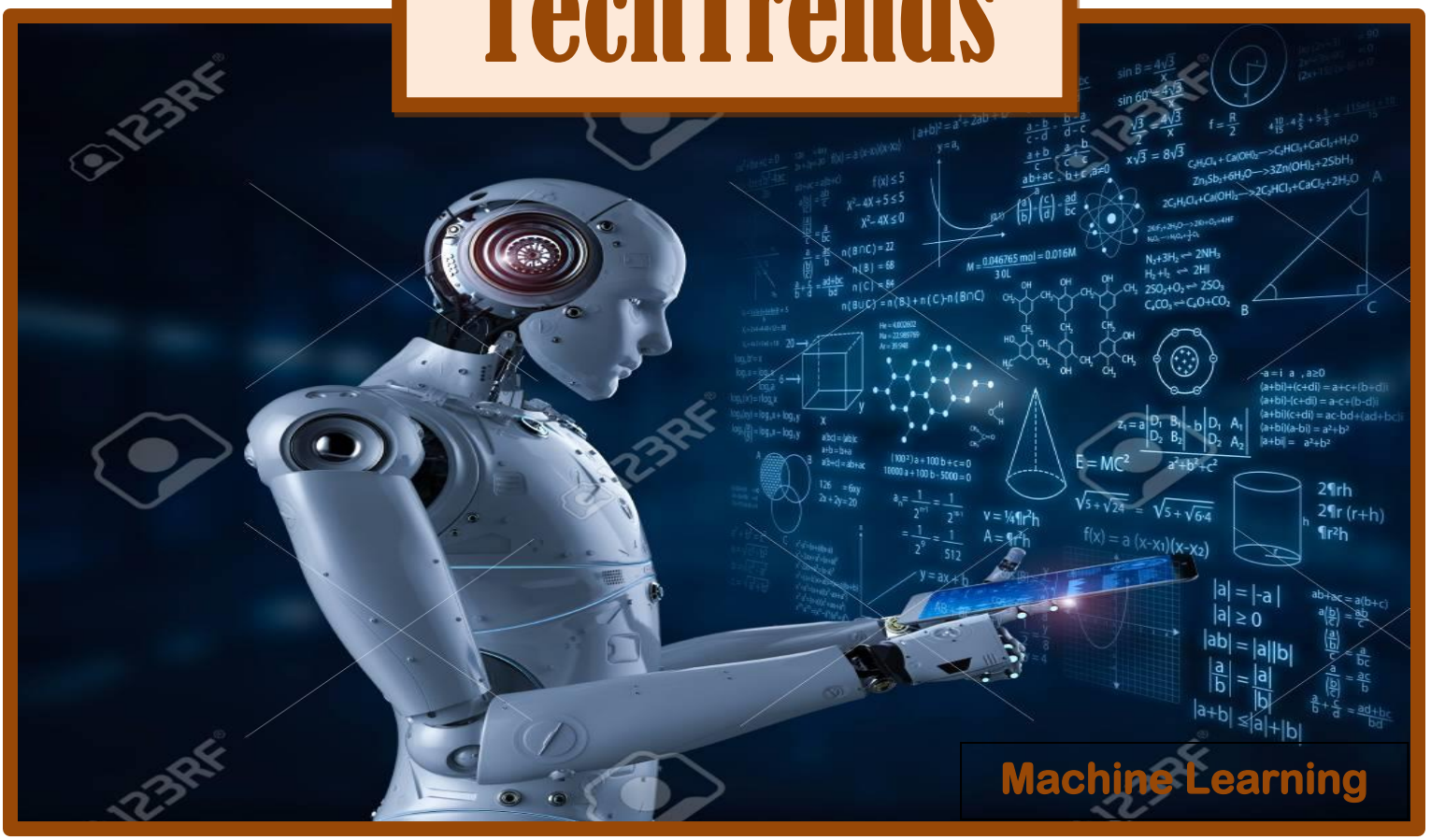
TechTrends

E-Newsletter



Vision:

To empower girls of diploma computer engineering to excel in IT Industries and serve the society.

Mission:

- To strive for academic excellence and professional competence among students and staff.
- To encourage innovative ideas among students to enhance their entrepreneurship skills.
- To provide high tech educational resources and supportive infrastructure.

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Machine Learning

Introduction:

Learning is a natural human behavior which has been made an essential aspect of the machines as well. While artificial intelligence (AI) is the broad science of mimicking human abilities, machine learning is a specific subset of AI that trains a machine how to learn. Machine learning is the study of computer algorithms that allow computer programs to automatically improve through experience. It is seen as a subset of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention. These applications learn, grow, change, and develop by themselves.

In other words, with Machine Learning, computers find insightful information without being told where to look. Instead, they do this by leveraging algorithms that learn from data in an iterative process.

Example: When you upload a photo on Facebook, it can recognize a person in that photo and suggest you, mutual friends. ML is used for these predictions. It uses data like your friend-list, photos available etc. and it makes predictions based on that.

Mr. B. R. Mahyavanshi
Lecturer,
Department of
Computer Engineering

Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to do so. It is a method of data analysis that automates analytical model building.

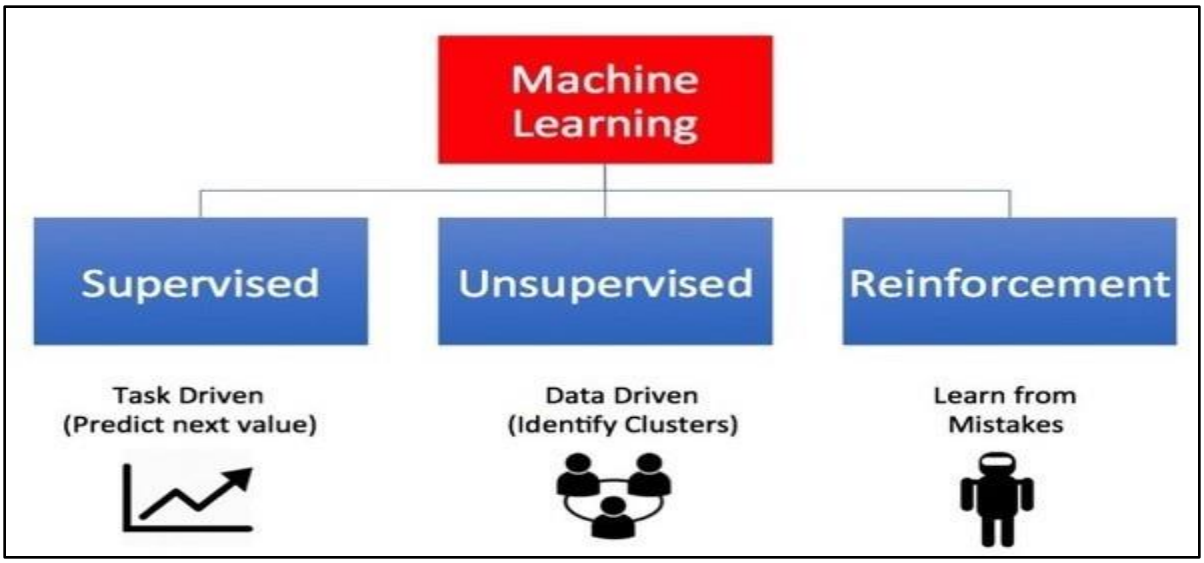
How Does Machine Learning Work?

Machine Learning is, undoubtedly, one of the most exciting subsets of Artificial Intelligence. It completes the task of learning from data with specific inputs to the machine.

The Machine Learning process starts with inputting training data into the selected algorithm. Training data which being known or unknown data to develop the final Machine Learning algorithm. The type of training data input does impact the algorithm, and that concept will be covered further momentarily.

To test whether this algorithm works correctly, new input data is fed into the Machine Learning algorithm. The prediction and results are then checked. If the prediction is not as expected, the algorithm is re-trained multiple numbers of times until the desired output is found. This enables the Machine Learning algorithm to continually learn on its own and produce the most optimal answer that will gradually increase in accuracy over time.

Types of Machine Learning:



Supervised learning:

In supervised learning, we are given a data set and **already know what our correct output** should look like, having the idea that there is a relationship between the input and output.

Two types of Supervised Learning :-

Regression—Estimate continuous values (Real valued output)

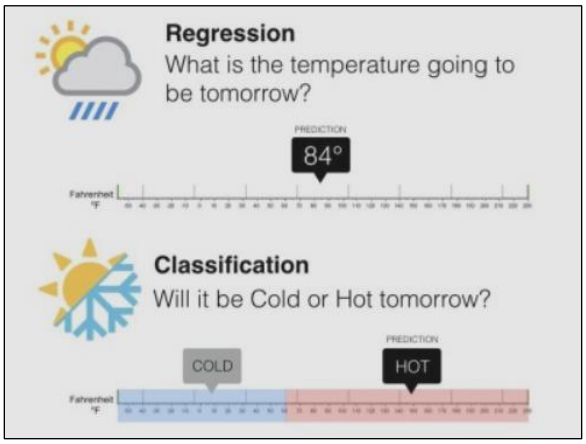
Classification—Identify a unique class (Discrete values, Boolean or Categories)

Regression:

- Regression models a target prediction value based on independent variables. It is mostly used for finding out the relationship between variables and forecasting. Regression can be used to estimate/ predict continuous values (Real valued output).
- For example **:** Given a picture of a person, we have to predict the age on the basis of the given picture .

Classification:

- Classification means to group the output into a class. If the data set is discrete or categorical then it is a classification problem.
- For example **:** Given data about the sizes of houses in the real estate market, making our output about whether the house "sells for more or less than the asking price" i.e. Classifying houses into two discrete categories.



Unsupervised learning:

It allows us to approach problems with little or no idea about what our results look like. We can derive structure from data where we don't necessarily know the effect of the variables.

We can derive this structure by clustering the data based on relationships among the variables in the data.

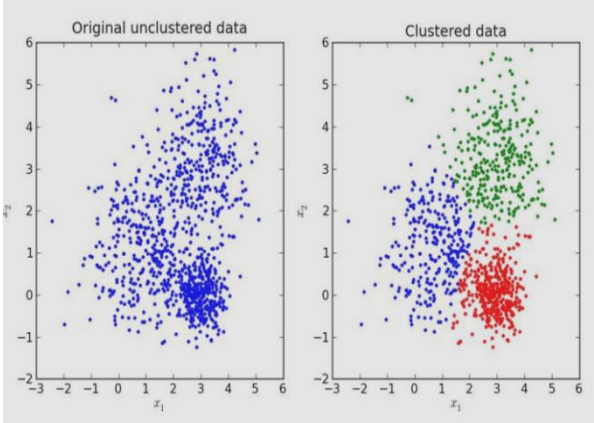
- **Clustering**. Splitting the data set into groups based on similarity.
- **Anomaly detection.** Identifying unusual data points in a data set.

- **Association mining.** Identifying sets of items in a data set that frequently occur together.
- **Dimensionality Reduction.** Reducing the number of variables in a data set.

Clustering

It is the task of grouping a set of objects in such a way that objects in the same group (called a cluster) are more similar (in some sense) to each other than to those in other groups (clusters).

For example : Take a collection of 1,000,000 different genes, and find a way to automatically group these genes into groups that are somehow similar or related by different variables, such as lifespan, location, roles, and so on.



Reinforcement learning:

Reinforcement Learning is about taking suitable actions to maximize reward in a particular situation. It is employed by various software and machines to find the best possible behavior or path to take in a specific situation.

Reinforcement learning differs from the supervised learning in a way that in supervised learning the training data has the answer key with it, so the model is trained with the correct answer itself whereas in reinforcement learning, there is no answer and the reinforcement agent decides what to do in order to perform the given task. In the absence of training data set, it is bound to learn from its experience.

Reinforcement learning is often used in areas like:

- **Robotics**. Robots can learn to perform tasks in the physical world using this technique.
- **Video game play**. Reinforcement learning has been used to teach bots to play a number of video games.
- **Resource management**. Given finite resources and a defined goal, reinforcement learning can help enterprises plan how to allocate resources.

Semi-supervised learning:

Semi-supervised learning falls between unsupervised learning (without any labeled training data) and supervised learning (with completely labeled training data). Some of the training examples are missing training labels, yet many machine-learning researchers have found that unlabeled data, when used in conjunction with a small amount of labeled data, can produce a considerable improvement in learning accuracy.

Differences between data mining, machine learning and deep learning:

Data Mining

Mining can be considered a superset of many different methods to extract insights from data. It might involve traditional statistical methods and machine learning. Data mining applies methods from many different areas to identify previously unknown patterns from data. Data mining also includes the study and practice of data storage and data manipulation.

Machine Learning

The main difference with machine learning is that just like statistical models, the goal is to understand the structure of the data – fit theoretical distributions to the data that are well understood. So, with statistical models there is a theory behind the model that is mathematically proven, but this requires that data meets certain strong assumptions too. Machine learning has developed based on the ability to use computers to probe the data for structure, even if we do not have a theory of what that structure looks like.

Deep learning

Deep learning combines advances in computing power and special types of neural networks to learn complicated patterns in large amounts of data. Deep learning techniques are currently state of the art for identifying objects in images and words in sounds. Researchers are now looking to apply these successes in pattern recognition to more complex tasks such as automatic language translation, medical diagnoses and numerous other important social and business problems.

Applications of Machine learning:

Financial services

Banks and other businesses in the financial industry use machine learning technology for two key purposes: to identify important insights in data, and prevent fraud. The insights can identify investment opportunities, or help investors know when to trade.

Government

Government agencies such as public safety and utilities have a particular need for machine learning since they have multiple sources of data that can be mined for insights.

Health care

Machine learning can be used in wearable devices and sensors that can use data to assess a patient's health in real time. The technology can also help medical experts analyze data to identify trends or red flags that may lead to improved diagnoses and treatment.

Retail

Websites recommending items you might like based on previous purchases are using machine learning to analyze your buying history. Retailers rely on machine learning to capture data, analyze it and use it to personalize a shopping experience, implement a marketing campaign, price optimization, merchandise supply planning, and for customer insights.

Customer relationship management

CRM software can use machine learning models to analyze email and prompt sales team members to respond to the most important messages first. More advanced systems can even recommend potentially effective responses.

Oil and gas

Finding new energy sources, Analyzing minerals in the ground, Predicting refinery sensor failure, Streamlining oil distribution to make it more efficient and cost-effective.

Transportation

The data analysis and modelling aspects of machine learning are important tools to delivery companies, public transportation and other transportation organizations.

Self driving cars

Machine learning algorithms can even make it possible for a semi-autonomous car to recognize a partially visible object and alert the driver.

Virtual Assistants

Smart assistants typically combine supervised and unsupervised machine learning models to interpret natural speech and supply context.

Software Libraries available:

There are a wide variety of software frameworks for getting started with training and running machine-learning models, typically for the programming languages Python, R, C++, Java and MATLAB.

Famous examples include Google's Tensor Flow, the open-source library Keras, the Python library Scikit-learn, the deep-learning framework CAFFE and the machine-learning library Torch.

The future of machine learning:

While machine learning algorithms have been around for decades, they've attained new popularity as artificial intelligence (AI) has grown in prominence. Deep learning models, in particular, power today's most advanced AI applications.

Machine learning platforms are among enterprise technology's most competitive realms, with most major vendors, including Amazon, Google, Microsoft, IBM and others, racing to sign customers up for platform services that cover the spectrum of machine learning activities, including data collection, data preparation, data classification, model building, training and application deployment.

As machine learning continues to increase in importance to business operations and AI becomes ever more practical in enterprise settings, the machine learning platform wars will only intensify.

References:

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3. https://en.wikipedia.org/wiki/Machine_learning
4.https://searchenterpriseai.techtarget.com/definition/machine-learning-ML

QUIZ (12)

Reasoning Questions:

Q. 1 XY_ _ YXX _ _ XY _

A. XXXXX C. XXYXX

B. XXYXY D. YXXYY

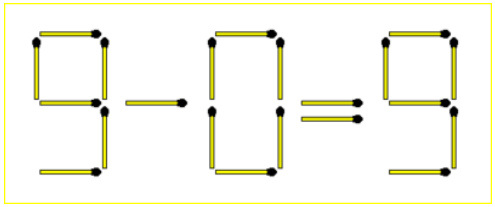
Q. 2 70 __ 35 35 00 70 __

A. 00 & 70 C. 35 & 00

B. 00 & 35 D. 35 & 70

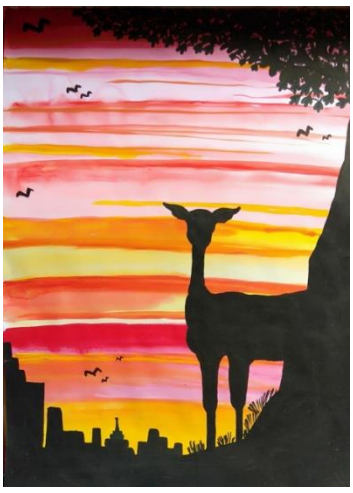
Answer of Last Quiz (11)

Q. 1 It can be done as shown below.



Q. 2 A map

Student Corner:



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