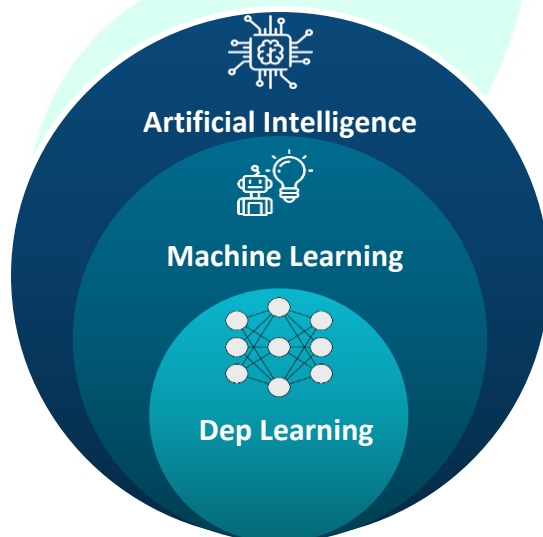# Day 31

DIY Solution

Q1. Explain Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning.

Answer: Deep Learning is a subset of Machine Learning, and both are the subsets of Artificial intelligence.

1. **Artificial Intelligence (AI):** Artificial Intelligence is about training machines/ computers to mimic human thinking and reasoning abilities. Like a human brain, AI systems develop the ability to make decisions and perform actions that have the best chance of achieving a specific goal. Artificial Intelligence is based on performing three basic cognitive skills just like a human brain – **learning, reasoning,** and **self-correction**.

2. **Machine Learning (ML):** Machine Learning is a subset of AI. It provides the statistical methods and algorithms to machines/computers to learn automatically from their previous experiences and data and allows the program to change its behavior accordingly. **Decision trees, Random Forests, Support Vector Machines, and K Means clustering** are a few algorithms extensively used for demand forecasting sales of products, predicting customer behavior, and gauging customer sentiments from their social media behavior. Machine learning algorithms work well when the input data is reasonably good enough.

3. **Deep Learning**: It can be thought of as the evolution of Machine Learning which is inspired by the functioning of the human brain. Deep learning models are built on top of Artificial Neural Networks, which mimic The working of a human nervous system. When the size of data increases, we need to look at more efficient algorithms and techniques where Deep Learning finds its hotspot. The human brain has neurons which are the basic functional units of our brain. The neurons transmit information to other nerve cells, muscles, and glands and receive input from other neurons, enabling the brain to make decisions.

Q2. Explain Supervised Learning.

Answer: Supervised learning [Target is present] is the model that learns using labeled data. The model is trained on an existing data set before making decisions with the test data.

There can be two scenarios while dealing with the supervised learning problems they are:

1. If the target variable is continuous, we can use Linear Regression, polynomial Regression, and quadratic Regression.
2. If the target variable is categorical, we can use Logistic Regression, Naive Bayes, KNN, SVM, Decision Tree, Gradient Boosting, ADA boosting, Bagging, Random Forest, etc.

Q3. Explain Unsupervised Learning.

Answer: Unsupervised learning [Target is absent] is the model trained on unlabeled data without proper guidance. It automatically infers patterns and relationships in the data by creating clusters. The model learns through observations and deduced structures in the data.

Types of Algorithms that fall under the Unsupervised learning category:

1. Principal component analysis
2. Factor analysis
3. Singular Value Decomposition, etc.

Q4. Explain Reinforcement Learning.

Answer: Reinforcement Learning is the model that learns through a trial-and-error method. In reinforcement learning, developers devise a program for rewarding desired behaviors and punishing negative behaviors. This method assigns positive values to the desired actions to encourage the agent and negative values to undesired behaviors by which the model seeks long-term and maximum overall reward to achieve an optimal solution.
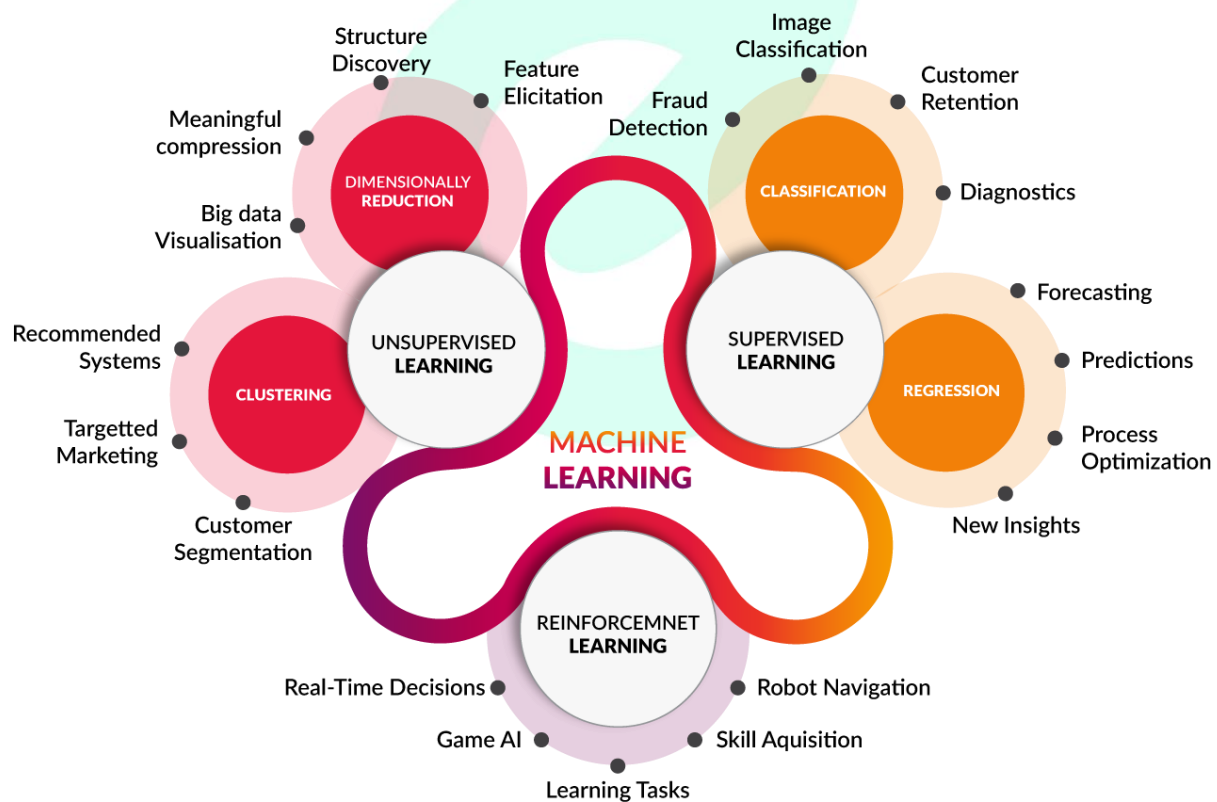
Current use cases include, but are not limited to, the following:

1. Gaming
2. Resource Management
3. Personalized Recommendations
4. Robotics

State-action-reward-state-action (SARSA), Q-learning, and Deep Q-Networks are the most common algorithms that fall under this category.

Q5. How to find the best machine learning algorithm for your problem?

Answer:

There are three basic approaches you can use.

1. **By input:**

   ➢ If you have a set of labeled data or can prepare such a set, it is the domain of   supervised learning

   ➢ If you still need to define a structure, it's an unsupervised learning problem.

   ➢ If you need the model to interact with an environment, you will apply a reinforcement learning algorithm.

2. **By output:**

   ➢ If the model's output is a number, it's a regression problem

   ➢ If the model's output is a class and the number of expected classes is known, it's a classification problem

   ➢ If the model's output is a class, but the number of expected classes is unknown, it's a clustering problem

   ➢ If you need to improve performance, it's optimization

   ➢ If you want a system to predict output based on the previous outputs, it's a recommendation problem

   ➢ If you wish to obtain insights from data, apply pattern recognition models

   ➢ If you want to detect problems, use anomaly detection algorithms

3. **Understand your data**

The process of choosing the algorithm isn't limited to categorizing the problem. You also need to look at your data because it plays a vital role in selecting the suitable algorithm for the problem. Some algorithms usually function with smaller sample sets, while others require many samples. Specific algorithms

work with categorical data while others only work with numerical input.

Other things that might affect the choice of a model:

- ➢ Accuracy of the model
- ➢ Complexity of the model
- ➢ Scalability of the model
- ➢ Time it takes to build, train, and test the model
- ➢ If the model meets your business goals