**MACHINE LEARNING**

**Supervised Learning:**

**Supervised Learning is a type of machine learning where the algorithm is trained of the basis of labeled dataset, where each of the data point has some input and output value. The algorithm uses the input and output dataset to make predictions for new dataset.**

**Types of Supervised learning algorithm:**

**Classification:**

**Classification main goal is to assign input data predefined classes or categories.**

**Types: Support Vector machine, Logical regression and Decision trees etc**

**Example:**

**Credit card fraud detection**

**Credit Card Fraud Detection is a crucial application of machine learning in the financial sector. The goal is to build models that can automatically identify and flag transactions that are likely to be fraudulent, helping financial institutions and credit card companies prevent or minimize losses due to fraudulent activities. involves building a model to identify potentially fraudulent transactions based on various patterns and anomalies in credit card transactions.**

**Unsupervised Learning:**

**Unsupervised learning is a type if machine learning where algorithm is trained on the basis of unlabeled dataset, where each of the data point only have input values. The data learns to identify the pattern via making clusters or groups without any guidance to make a new prediction for a new dataset**

**Example:**

**Land Price detection:**

**Supposedly we have a size of a land and locality of it, we will provide the input on the basis of land and locality and the machine learning algorithm will group each of them separately. We will use this data to predict the prices of the land accordingly**

**Types of Unsupervised Learning:**

**Pca, K- Mean clustering, Hierarchal clustering, DB scan clustering**

**Reinforcement learning:**

**Reinforcement learning is a feedback based Machine learning approach here an agent learns to which actions to perform by looking at the environment and the results of actions. For each correct action the agents get rewards and for each incorrect action the agents get negative feedback or Penalty.**

**Elements of Reinforcement Learning**

**Reinforcement learning elements are as follows:**

1. **Policy**
2. **Reward function**
3. **Value function**
4. **Model of the environment**

**Example:**

**Consider a self-driving car that needs to navigate city traffic. Roads, traffic patterns, pedestrian behavior, and countless other factors can make the environment highly dynamic and complex. AI teams train the vehicle in a simulated environment in the initial stages. The vehicle takes actions based on its current state and receives rewards or penalties.**

**Over time, by driving millions of miles in different virtual scenarios, the vehicle learns which actions are best for each state without explicitly modeling the entire traffic dynamics. When introduced in the real world, the vehicle uses the learned policy but continues to refine it with new data.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **CLASSIFICATION** | **CLUSTERING** | **Regression** |
| **Type** | **used for supervised learning** | **used for unsupervised learning** | **used for unsupervised learning** |
| **Basic** | **process of classifying the input instances based on their corresponding class labels** | **grouping the instances based on their similarity without the help of class labels** | **When values need to be converted to a continuous output, the Mapping Function is what you need** |
| **Need** | **it has labels so there is need of training and testing dataset for verifying the model created** | **there is no need of training and testing dataset** | **There is need if training on the basis of action** |
| **Complexity** | **more complex as compared to clustering** | **less complex as compared to classification** | **Most complex among all** |
| **Example Algorithms** | **Logistic regression, Naive Bayes classifier, Support vector machines, etc.** | **k-means clustering algorithm, Fuzzy c-means clustering algorithm, Gaussian (EM) clustering algorithm, etc.** | **Linear Regression, Polynomial Regression, Ridge Regression, Lasso Regression, Support Vector Regression (** |