National University of Modern Languages

Artificial Intelligence - Lab

Lab # 10

BSSE - 5 - Morning

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TASK:

Define the following terms

- **Supervised machine learning**
- **Unsupervised machine learning**
- **Classification problem**
- **Regression problem**

Answers:

1. **Supervised Machine Learning:**
    - Supervised learning is the type of machine learning in which machines are trained using well-labeled training data, and on basis of that data, machines predict the output. The labeled data means some input data is already tagged with the correct output.
    - In supervised learning, the training data provided to the machines work as the supervisor that teaches the machines to predict the output correctly. It applies the same concept as a student learns under the supervision of the teacher.
    - Supervised learning is a process of providing input data as well as correct output data to the machine learning model. A supervised learning algorithm aims to find a mapping function **to map the input variable(x) with the output variable(y**).
    - In the real world, supervised learning can be used for **Risk Assessment, Image classification, Fraud Detection, spam filtering, etc.**

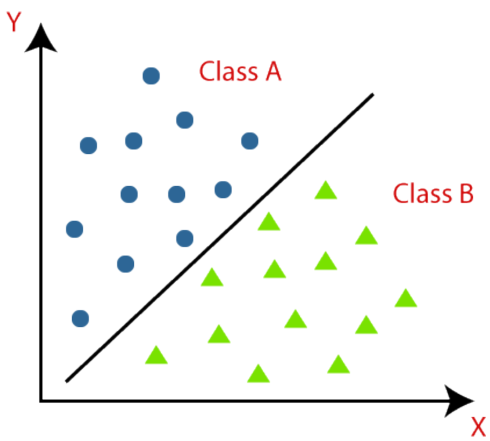
2. **Unsupervised Machine Learning:**
    - Unsupervised learning is a machine learning technique in which models are not supervised using a training dataset. Instead, the models themselves find the hidden patterns and insights from the given data. It can be compared to learning which takes placein the human brain while learning new things.
    - It can be defined as *Unsupervised learning is a type of machine learning in which models are trained using an unlabeled dataset and are allowed to act on that data without any supervision*
    - Unsupervised learning cannot be directly applied to a regression or classification problem because, unlike supervised learning, we have the input data but no corresponding output data.
    - The goal of unsupervised learning is to find the underlying structure of the dataset, group that data according to similarities, and represent that dataset in a compressed format.

3. **Classification Problem:**
    - The Classification algorithm is a Supervised Learning technique that is used to identify the category of new observations based on training data.
    - In Classification, a program learns from the given dataset or observations and then classifies new observations into several classes or groups. Such as, **Yes or No, 0 or 1, Spam or Not Spam, cat or dog,** etc. Classes can be called targets/labels or categories
    - Unlike regression, the output variable of Classification is a category, not a value, such as "Green or Blue", "fruit or animal", etc. Since the Classification algorithm is a Supervised learning technique, hence it takes labeled input data, which means itcontains input with the corresponding output.
    - The main goal of the Classification algorithm is to identify the category of a given dataset, and these algorithms are mainly used to predict the output for the categorical data.

In classification algorithm, a discrete output function(y) is mapped to input variable(x).

y=f(x), where y = categorical output

The best example of an ML classification algorithm is **Email Spam Detector**.



Classification algorithms can be better understood using the below diagram. In the below diagram, there are two classes, class A and Class B. These classes have features that are similar to each other and dissimilar to other classes.

4. **Regression Problems:**

Regression analysis consists of a set of machine learning methods that allow us to predicta continuous outcome variable (y) based on the value of one or multiple predictor variables (x). Briefly, the goal of a regression model is to build a mathematical equation that defines y as a function of the x variables

Types of Regression

- **Simple Linear Regression**
- **Polynomial Regression**
- **Support Vector Regression**
- **Decision Tree Regression**
- **Random Forest Regression**