TYPES OF MACHINE LEARNING
LECTURE 9

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PART I: TYPES OF MACHINE LEARNING ALGORITHMS BASED ON INPUT

PART II: TYPES OF MACHINE LEARNING ALGORITHMS BASED ON OUTPUT

Part I

BASED ON INPUT

INTRODUCTION

▶ **Machine learning** involves showing a large volume of data to a machine to learn and make predictions, find patterns, or classify data.

▶ Based on the methods of input and way of learning, machine learning can be classified into mainly four types:
- Supervised learning
- Unsupervised learning
- Semi-supervised learning
- Reinforcement learning
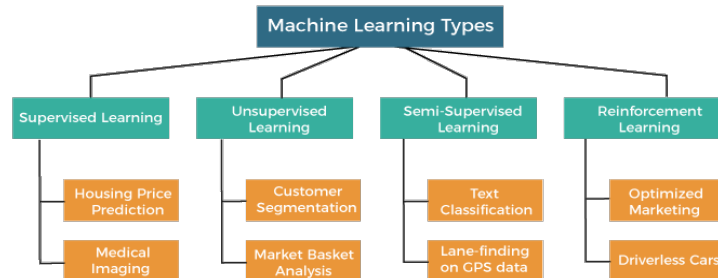
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[1]Source: java-point (n.d.)

TYPES OF MACHINE LEARNING(INPUT BASED)

► In supervised learning, the machine is trained based on well-labelled data. Then the machine is provided with new data so that it can use the training data to analyse and produce an outcome from labelled data.

► The data set is a pair, consisting of a feature vector and a label $\{x_i, y_i\}_{i=1}^{N}$, where, x_i is a feature vector and y_i is the label. The feature vector can be multidimensional, i.e., $x_i \in \mathbb{R}^d$, where d is any positive integer.

► Some examples of supervised learning:
  - Linear Regression
  - Logistic Regression
  - Support Vector Machine (SVM)
  - Nearest Neighbor
  - Decision Trees
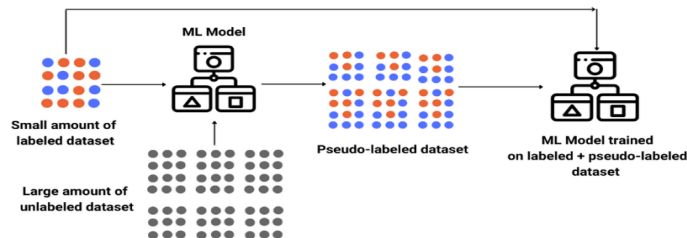
TYPES OF MACHINE LEARNING(INPUT BASED)

▶ It uses machine learning algorithms to analyze and cluster unlabeled datasets. These algorithms discover hidden patterns or data groupings without human intervention.

▶ Here the model is trained with unlabeled data, i.e., the dataset is only $\{x_i\}_{i=1}^N$ with no labels attached to it.

▶ Some of the examples:
  • Clustering
  • Anomaly Detection
  • Dimension reduction

TYPES OF MACHINE LEARNING(INPUT BASED)

▶ The basic disadvantage of supervised learning is that it requires hand-labelling data scientists, and it also requires a high cost for the process. And unsupervised learning also has a limited spectrum for its applications. To overcome these drawbacks of supervised learning and unsupervised learning algorithms, the concept of **Semi-supervised learning** is introduced.

▶ In semi-supervised learning the model is trained on both labelled $\{x_i, y_i\}_{i=1}^{N}$ and unlabelled datasets $\{x_j\}_{j=1}^{M}$.

▶ The method could not work if the labelled data section isn't representative of the complete distribution.

▶ Some examples:
  • Speech Recognition
  • Text Document Classification

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► **Reinforcement learning** is different from semi-supervised learning, as it works with rewards and feedback. Reinforcement learning aims to maximize the rewards by their hit and trial actions, whereas, in semi-supervised learning, we train the model with a less labelled dataset.

► Few examples:
  - Automated Robots
  - Natural Language Processing (NLP)
  - Gaming

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[3]Source: Techvidvan (n.d.)

Part II

BASED ON OUTPUT

INTRODUCTION

- ▶ The machine learning algorithms may be classified based on their outputs.
- ▶ The divisions are as follows:
  - Regression- The output is a real or continuous number.
  - Classification- The output is based on categories.
 - Ranking- The output comes with some priority order(e.g., ascending or descending order).

- **Regression** analysis uses one or more independent variables to describe the relationship between dependent (target) and independent (predictor) variables.
- For continuous/real or numerical variables like salary, age, product price, etc., regression makes predictions.

► On the basis of training data, the **Classification algorithm** is a Supervised Learning technique that is used to categorise new observations.

► In classification, the algorithm makes use of the dataset or observations that are provided to learn how to categorise fresh observations into various classes or groups. For instance, good or bad, yes or no, 0 or 1, spam or not spam, etc. Targets, labels, or categories can all be used to describe classes.
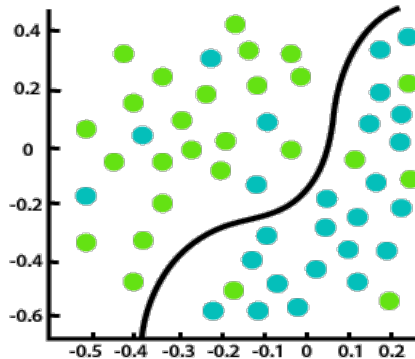
Classification   Regression

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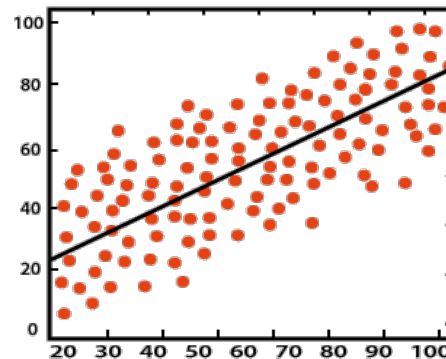
[4]Source: Javapoint (n.d.)

TYPES OF MACHINE LEARNING(OUTPUT BASED)

- ▶ **Ranking** uses labelled datasets to train its models and future data to categorise and predict outcomes. A ranking model's objective is to arrange data in the most advantageous and pertinent way possible.

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