# Supervised Machine Learning: Regression and Classification

## What is machine learning?

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| Supervised Machine Learning: | Regression and Classification, | you will learn about the two main types of machine learning algorithms: | supervised learning and unsupervised learning. |
| supervised learning | which is widely used in real-world applications | and has seen rapid advancements. | |
| A deep understanding of | regression and classification techniques | and how to apply them effectively. | |

## Question - Can you explain the difference between supervised learning and unsupervised learning?

ANSWER - Supervised learning and unsupervised learning are two main types of machine learning algorithms.

SUPERVISED LEARNING:

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| 1) In supervised learning, the algorithm learns | from labeled data | where the input data is | paired with corresponding output labels. |
| 2) The goal of supervised learning | is to train the algorithm to predict or classify new, | unseen data based on the patterns and | relationships it has learned from the labeled data. |
| 3) Supervised learning algorithms require | a training dataset | with known input-output pairs to learn from. | |
| 4) Examples of supervised learning tasks | include image classification, spam detection, and sentiment analysis. | | |

| Unsupervised Learning: | | |
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| 1) In unsupervised learning, the algorithm | learns from unlabeled data | , where there are no predefined output labels. |
| 2) The goal of unsupervised learning | is to discover patterns, structures, or relationships in the data | without any prior knowledge or guidance. |
| 3) Unsupervised learning algorithms aim | to find hidden patterns, group similar data points, | or reduce the dimensionality of the data. |
| 4) Unsupervised learning is often used for | tasks such as clustering, anomaly detection, and dimensionality reduction. | |

| In summary, | | |
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| supervised learning relies | on labeled data | to make predictions or classifications, |
| while unsupervised learning explores | the underlying structure of unlabeled | data to discover patterns or relationships. |

## Question - Can you explain the major differences between supervised learning and unsupervised learning?

**ANSWER - Here are the major differences between supervised learning and unsupervised learning:**

### (1) LABELED VS. UNLABELED DATA:

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| **SUPERVISED LEARNING:** | | | | |
| (a) In supervised learning | the algorithm learns from labeled data, | where each data point is paired with a corresponding output label. | The algorithm uses this labeled data | to learn the relationship between the input features and the output labels |
| **UNSUPERVISED LEARNING:** | | | | |
| (b) In unsupervised learning | the algorithm learns from unlabeled data, | where there are no predefined output labels. | The algorithm explores | the patterns, structures, or relationships within the data without any guidance. |

### (2) Task Types:

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| (a) Supervised Learning is used for tasks | such as classification and regression. | In classification the algorithm predicts the class or category of a given input, | while in regression, the algorithm predicts a continuous value. |
| (b) Unsupervised Learning is used for tasks | such as clustering, dimensionality reduction, and anomaly detection. | Clustering algorithms group similar data points together, dimensionality reduction techniques | reduce the number of input features, and anomaly detection algorithms identify unusual or abnormal data points. |

| (3) TRAINING DATA: | | | |
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| (a) Supervised Learning algorithms require | a training dataset with known input-output pairs. | This labeled data is used to train the algorithm | to make accurate predictions or classifications on new, unseen data. |
| (b) Unsupervised Learning algorithms do not require | labeled data. | They explore the inherent structure of the unlabeled data | to find patterns or relationships. |

| (4) EVALUATION: | | | |
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| (a) Supervised Learning: the performance of the algorithm | is evaluated using metrics | such as accuracy, precision, recall, or mean squared error, depending on the task. | |
| (b) Unsupervised Learning: Evaluating the performance of unsupervised learning algorithms | is more subjective and challenging since there are no predefined output labels. | Evaluation is often based on the quality of the discovered | patterns or the usefulness of the clustering or dimensionality reduction results. |

| IN SUMMARY | |
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| supervised learning | relies on labeled data and is used for tasks like classification and regression, |
| while unsupervised learning | explores unlabeled data to discover patterns and relationships and is used for tasks like clustering and dimensionality reduction. |

# Machine learning algorithms

rapid advancements

used most in real-world applications

- Supervised learning ← course 1, 2

- Unsupervised learning ←
- Recommender systems
- Reinforcement learning

course 3

Practical advice for applying learning algorithms