**Q. Write down 10 differences between machine learning classification and machine learning clustering.**

1. **Objective:**

* **Classification**: Aims to predict the class or category of a given input based on labeled training data.
* **Clustering:** Focuses on grouping similar data points together based on inherent patterns, without predefined labels.

1. **Supervised vs. Unsupervised:**

* **Classification:** Supervised learning where the algorithm learns from labeled data.
* **Clustering:** Unsupervised learning as it works with unlabeled data, discovering patterns without predefined categories.

1. **Output:**

* **Classification:** Produces a discrete output, assigning input to predefined classes.
* **Clustering:** Yields clusters or groups of data points based on similarity.

1. **Training Data:**

* **Classification:** Requires labeled training data with known outcomes for model training.
* **Clustering:** Works with unlabeled data, discovering patterns without explicit guidance.

1. **Use Cases:**

* **Classification:** Commonly used for tasks like spam detection, image recognition, and sentiment analysis.
* **Clustering:** Applied in customer segmentation, anomaly detection, and organizing large datasets.

1. **Evaluation:**

* **Classification:** Evaluated using metrics such as accuracy, precision, recall, and F1-score.
* **Clustering:** Evaluation is often more subjective, assessing the quality of clusters based on internal cohesion and external separation.

1. **Algorithm Types:**

* **Classification:** Algorithms include decision trees, support vector machines, and neural networks.
* **Clustering**: Involves algorithms like k-means, hierarchical clustering, and DBSCAN.

1. **Goal for Unseen Data:**

* **Classification:** Predicts the predefined class for new, unseen data.
* **Clustering:** Groups new data based on similarity but does not assign predefined labels.

1. **Interpretability:**

* **Classification:** Models are often more interpretable, as the relationship between features and classes is explicitly learned.
* **Clustering:** Interpretability can be challenging, as clusters are formed based on similarity without predefined explanations.

1. **Handling Outliers:**

* **Classification:** Outliers may be treated as noise and can affect model performance.
* **Clustering:** Outliers can influence the formation of clusters but may also indicate interesting patterns or anomalies.