Machine Learning

LAB

Lab #10

Support Vector Machine

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1. Support Vector Machine:

- A Support Vector Machine (SVM) is a versatile machine learning algorithm commonly used for linear and nonlinear classification, regression, and outlier detection tasks.
- Due to its flexibility, SVMs are well-suited for a range of applications, including text and image classification, spam detection, handwriting recognition, gene expression analysis, face detection, and anomaly detection.

1.1. Goal of SVM:

- The goal of SVM is to find the hyperplane (decision boundary) that best separates data points into different classes.
- SVM aims to maximize the margin between the data points of different classes, meaning it tries to find the hyperplane that has the largest possible distance from the nearest points of each class.
- These nearest points are called **support vectors**.

1.2. Key Concepts and Points:

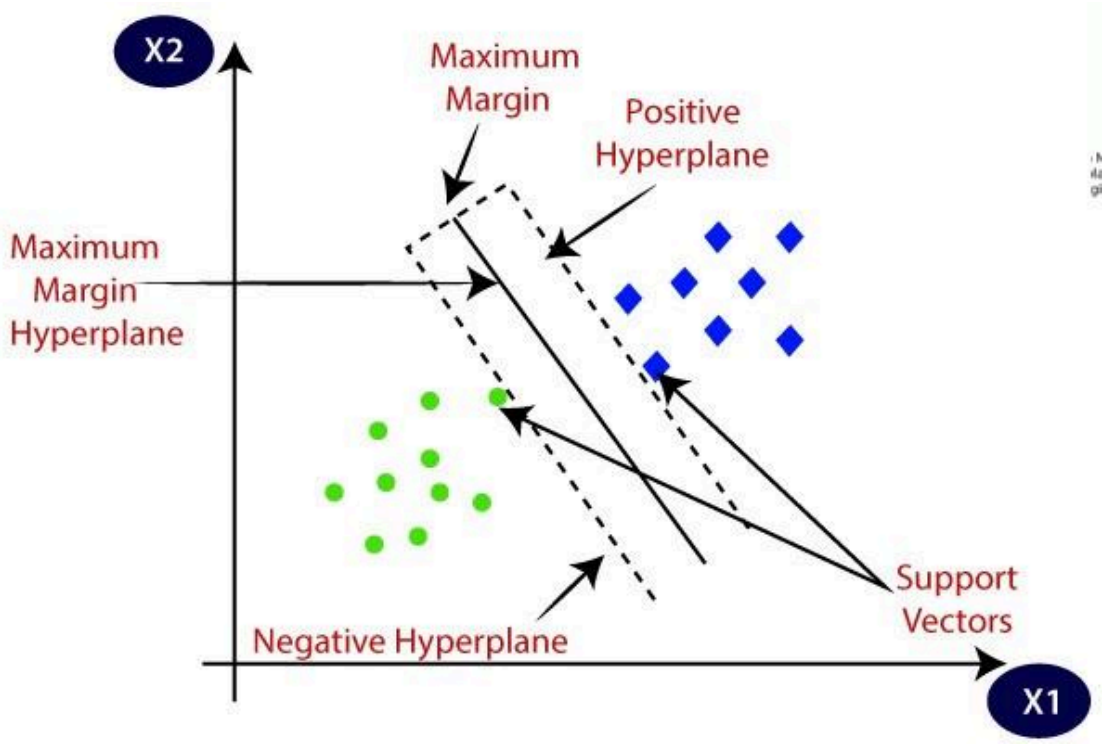
- The key concept behind SVM is that it transforms data into higher dimensions if needed, where a hyperplane can be used to separate the classes. For data that is not linearly separable, SVM uses the **kernel trick** to project the data into higher-dimensional space where a linear separation is possible.

Key-Points:

- **Linear SVM:** Works when the data is linearly separable.
- **Non-Linear SVM:** Uses kernels to deal with non-linearly separable data.
- **Kernel trick:** Helps to project data into higher-dimensional space.

1.3. Steps Involved in SVM:

- **Find a Hyperplane**: A hyperplane that divides the classes with maximum margin.
- **Maximize the Margin**: The margin is the distance between the hyperplane and the nearest point from either class.
- **Support Vectors**: These are the data points that are closest to the hyperplane and influence its position.



1.4. Detailed Explanation: