

Support Vector Machine

Definition - A Support Vector Machine (SVM) is a supervised learning model used for classification tasks. **In the context of linear classification, an SVM aims to find the best linear decision boundary that separates data points of different classes with the largest possible margin.**

How It Works

1 - **Linear Decision Boundary**: In a linear SVM, the decision boundary is a straight line (in 2D), a plane (in 3D), or a hyperplane (in higher dimensions) that divides the data points into two classes.

2 - **Maximizing the Margin**: The margin is the distance between the hyperplane and the nearest data points (support vectors) from each class. The goal of an SVM is to maximize this margin.

3 - **Support Vectors**: The data points that are closest to the hyperplane and lie on the edges of the margin are called support vectors. These are the critical elements used to determine the optimal hyperplane.

4 - **Optimization Problem**: To find the optimal hyperplane, SVM solves an optimization problem. The objective is to maximize the margin.

5 - **Classification**: Once the optimal hyperplane is found, it can be used to classify a new data point.