Support Vector Machines

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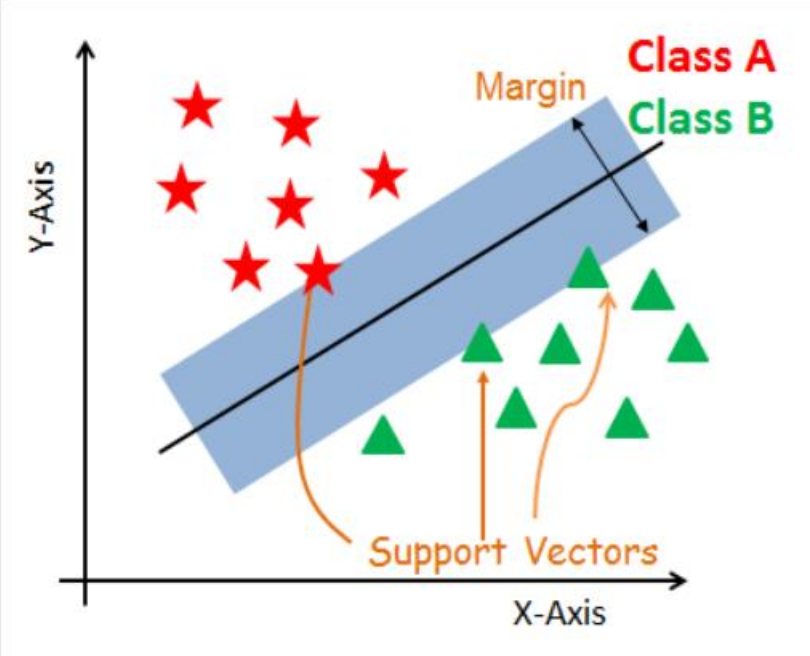
- Support Vector Machines (SVM) are typically used for classifying things.
- SVM can also handle other tasks, like predicting values (regression).
- It's good at dealing with both numbers and categories.
- SVM uses a line (hyperplane) in space to separate different groups.
- The line is adjusted to minimize mistakes.
- The main idea is to find the best line (maximum margin) to split the groups.

Goal of SVM:

The SVM algorithm's aim is to draw a special line (like a superhero line) that can split a space into different groups. This way, when new data comes along, we can quickly figure out which group it belongs to. This special line is called a "superplane."



Support Vectors

Support vectors are the data points closest to the separation line (hyperplane). They play a crucial role in defining the line and calculating the margins.

Hyperplane

The hyperplane is like a decision line that separates objects into different categories or classes.

Margin

Margin is the gap between the closest class points and the separation line. It's measured as the perpendicular distance from the line to the support vectors or nearest points.

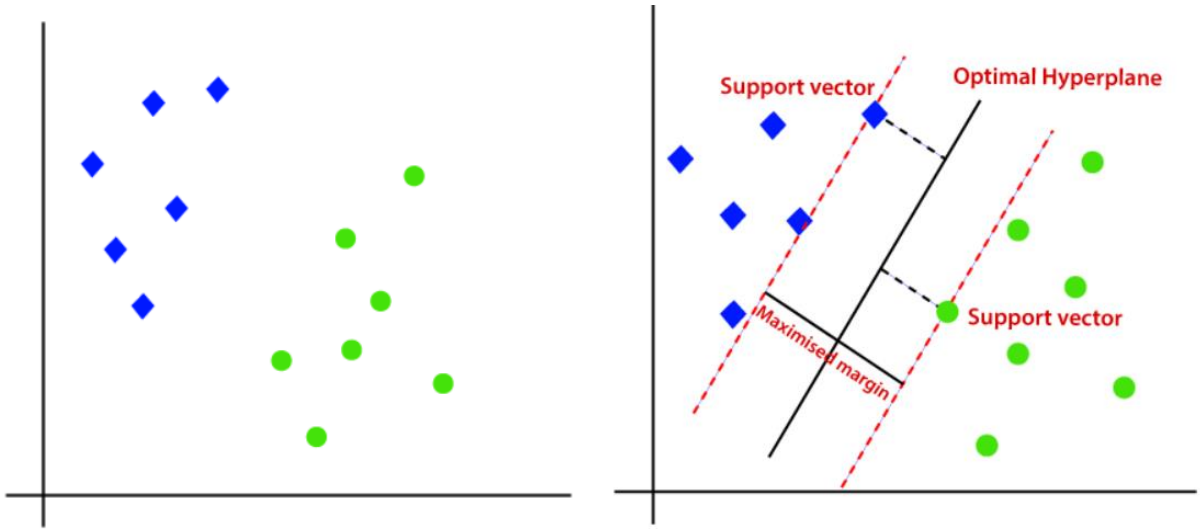
Types of SVM

SVM comes in two types:

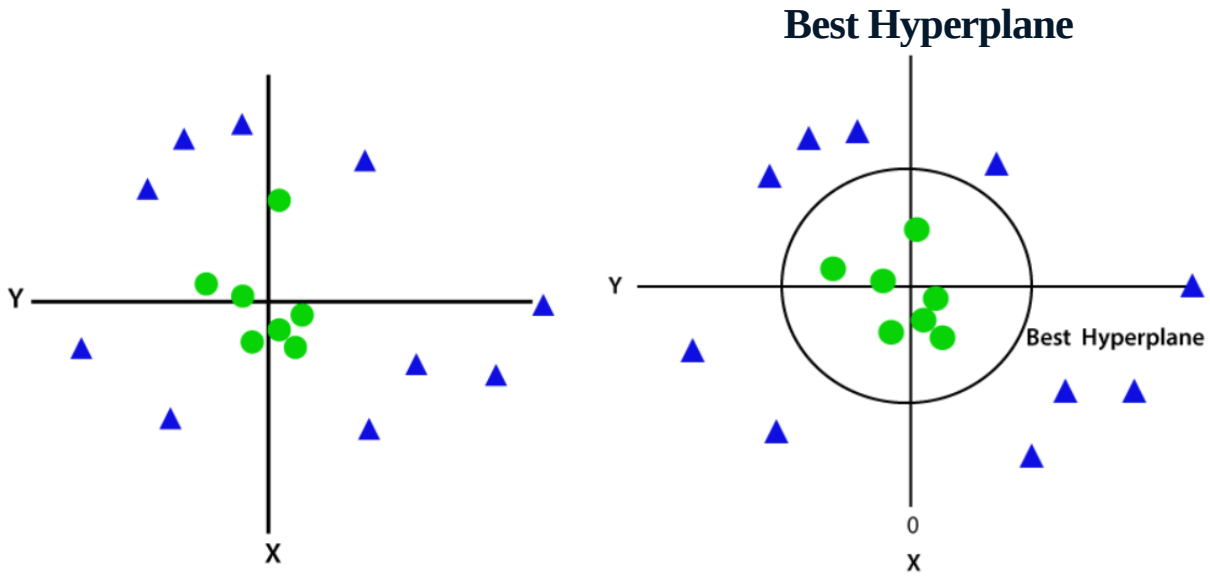
1. Linear SVM:

Use this when you can draw a straight line to separate your data into two groups. It's for simple cases.

Optimal Hyperplane



2. Non-linear SVM: If a straight line can't split your data, go for this one. It handles more complicated, curvy data divisions.



Advantages:

- ❖ Good Accuracy: SVMs are good at making accurate predictions.
- ❖ Faster Predictions: They work quickly when predicting.
- ❖ Memory Efficiency: They use less computer memory since they only use a part of the training data.
- ❖ Clear Separation: SVMs work best when there's a clear gap between categories.
- ❖ High-Dimensional Data: They handle data with lots of features (dimensions) well.

Disadvantages:

- ❖ Not for Large Datasets: SVMs aren't great for big datasets because they take a long time to train.
- ❖ Slower Training: They take more time to train than Naïve Bayes.
- ❖ Poor with Overlapping Data: If categories overlap, SVMs struggle.
- ❖ Kernel Sensitivity: They can be sensitive to the type of mathematical function (kernel) used.