SVM

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Support Vector Machine – Introduction

A Support Vector Machine (SVM) is a discriminative classifier formally defined by a separating hyperplane.

In other words, given labeled training data (supervised learning), the algorithm outputs an optimal hyperplane which categorizes new examples.

In two dimensional space this hyperplane is a line dividing a plane in two parts where in each class lay in either side.

SVM – Concepts

SVM – Support Vector Machine

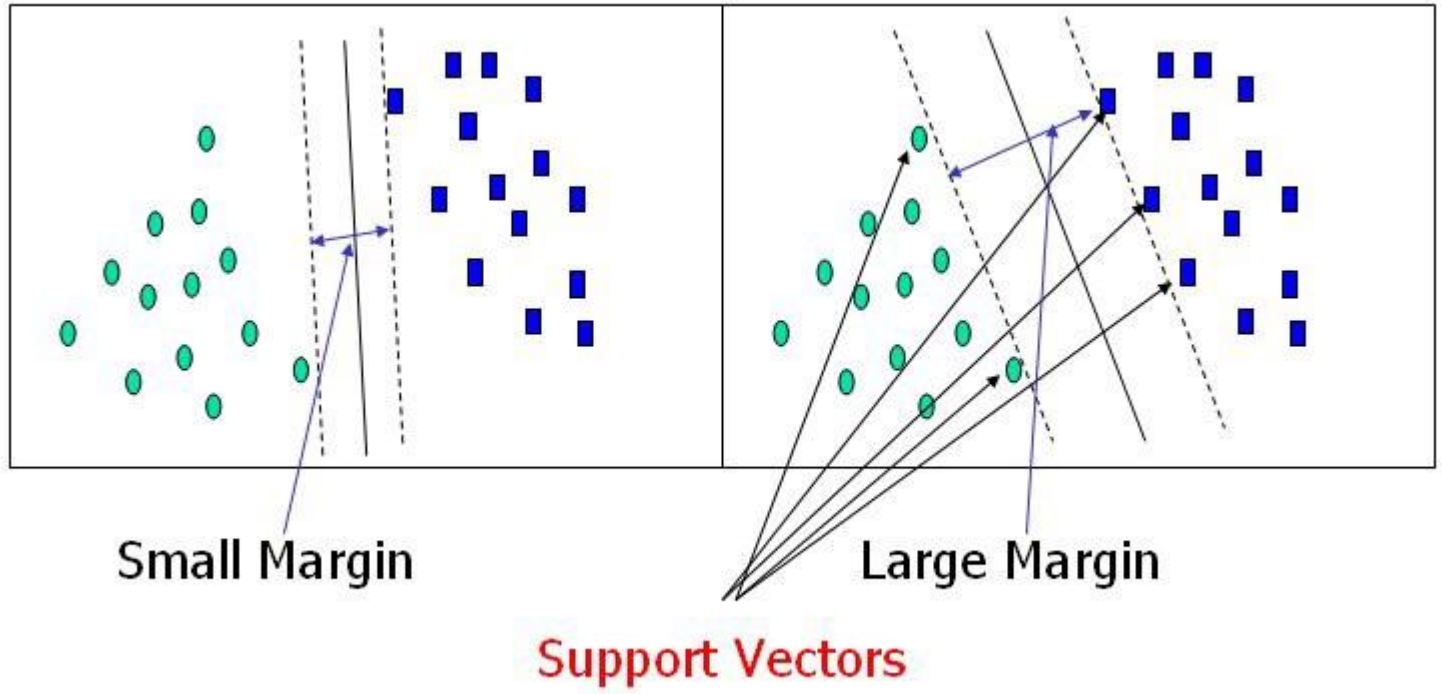
Hyperplane – Decision Boundary

Margins = (D-) + (D+)

Support Vectors

Classification – Linear & Non-linear

Kernel Functions



SVM – Hyperplane

Hyperplane separates the data into classes.

In this diagram, the hyperplane divides data in two classes – red and blue.

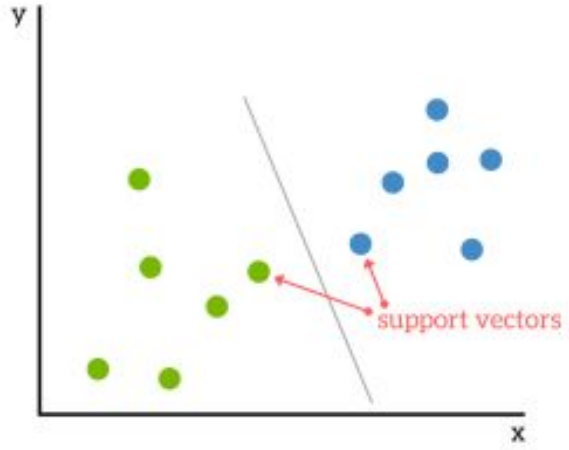
Support Vectors

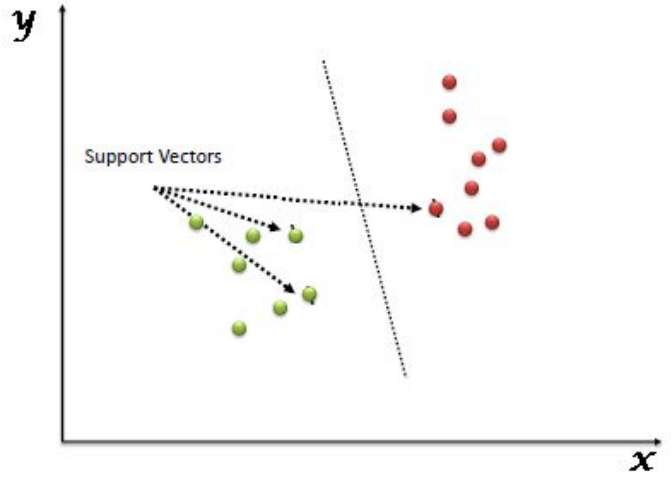
Support vectors are data points that are closer to the hyperplane and influence the position and orientation of the hyperplane.

Using these support vectors, we maximize the margin of the classifier.

Deleting the support vectors will change the position of the hyperplane.

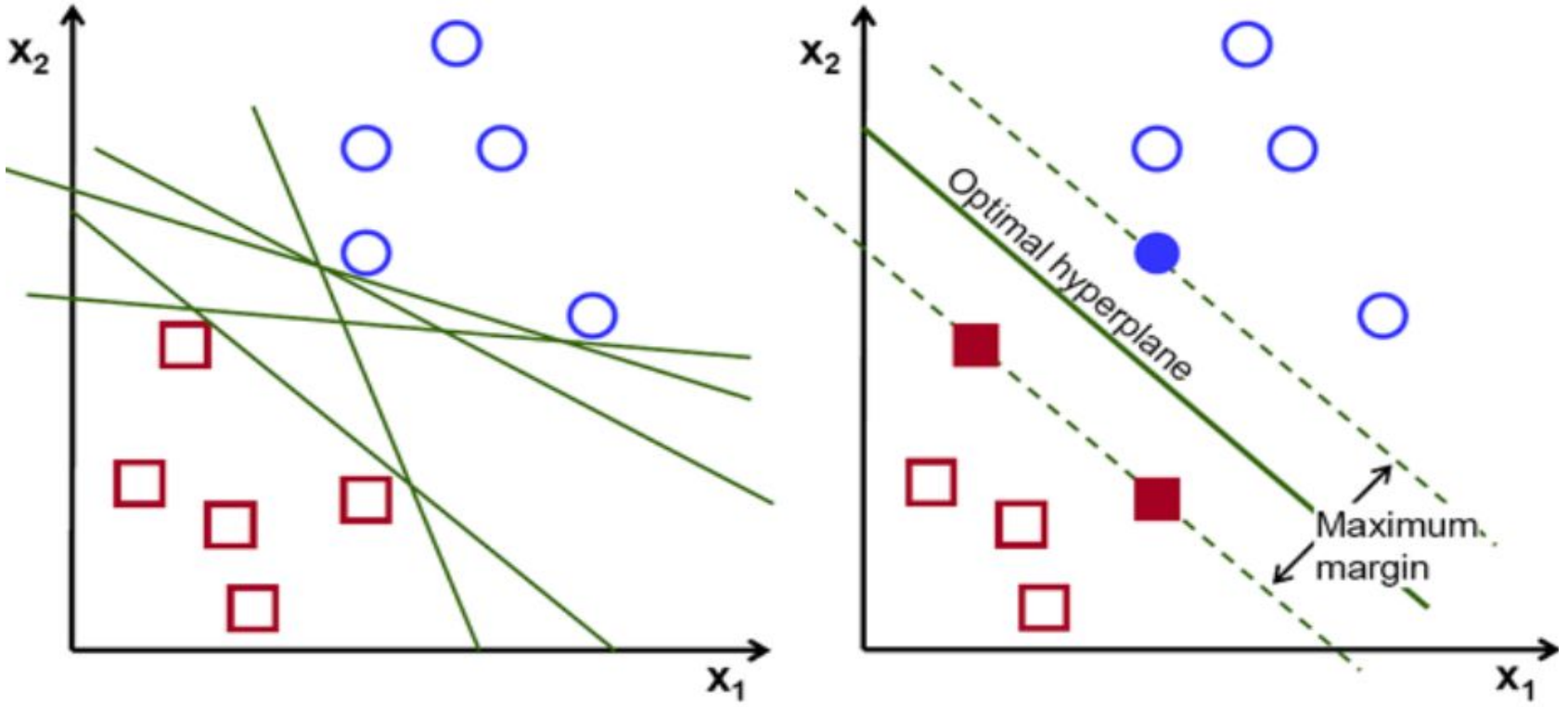
These are the points that help us build our SVM.





How to chose the hyperplane?

The maximum is the width of the Margin, the better is the hyperplane. MMH should get selected. (Maximum Margin Hyperplane)



Kernel Functions

SVM algorithms use a set of mathematical functions that are defined as the kernel. The function of kernel is to take data as input and transform it into the required form. Different SVM algorithms use different types of kernel functions. These functions can be different types. For example linear, nonlinear, polynomial, radial basis function (RBF), and sigmoid.

Kernel-based classification. When working with non-linear problems, it's useful to transform the original vectors by projecting them into a (often higher-dimensional) space where they can be linearly separated.

SVM – Applications

- Face detection
- Text and hypertext categorization
- Classification of images
- Bioinformatics
- Protein fold and remote homology detection
- Handwriting recognition
- Generalized predictive control(GPC)

SVM – Summary

SVM is a model-free method that provides efficient solutions to classification problems without any assumption regarding the distribution and interdependency of the data.

The major components to build SVM are as follows

- Support Vectors
- Hyperplane
- Kernel Function

Application of SVM:

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