



Margin And Support Vectors



MEMBER

Group 7

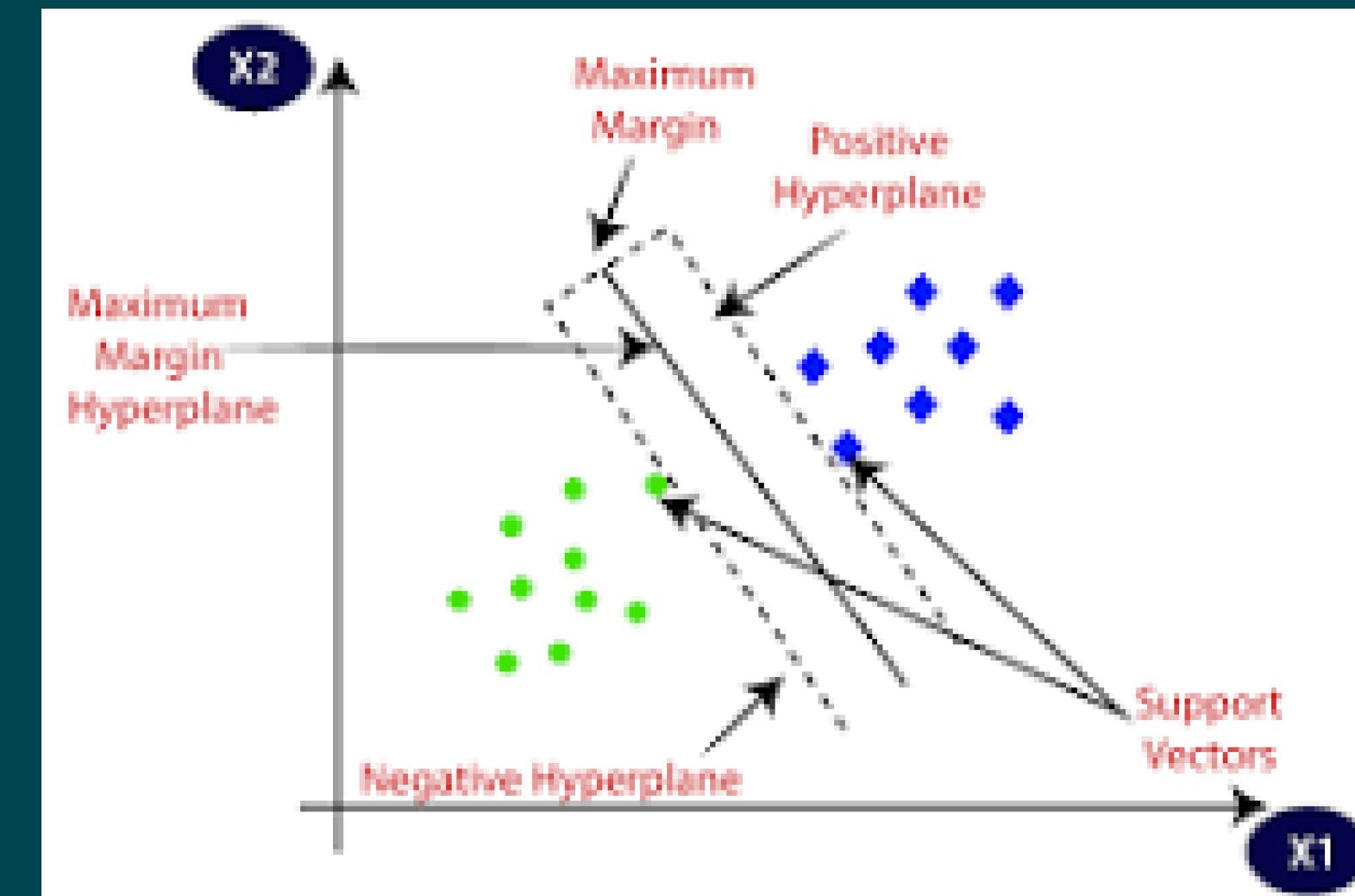
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Content

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1. Introduction
 2. Concept Of Margin
 3. Relationship Between Margin And Generalization Performance
 4. Significance of Support Vectors
 5. Impact of Support Vectors
 6. Summary

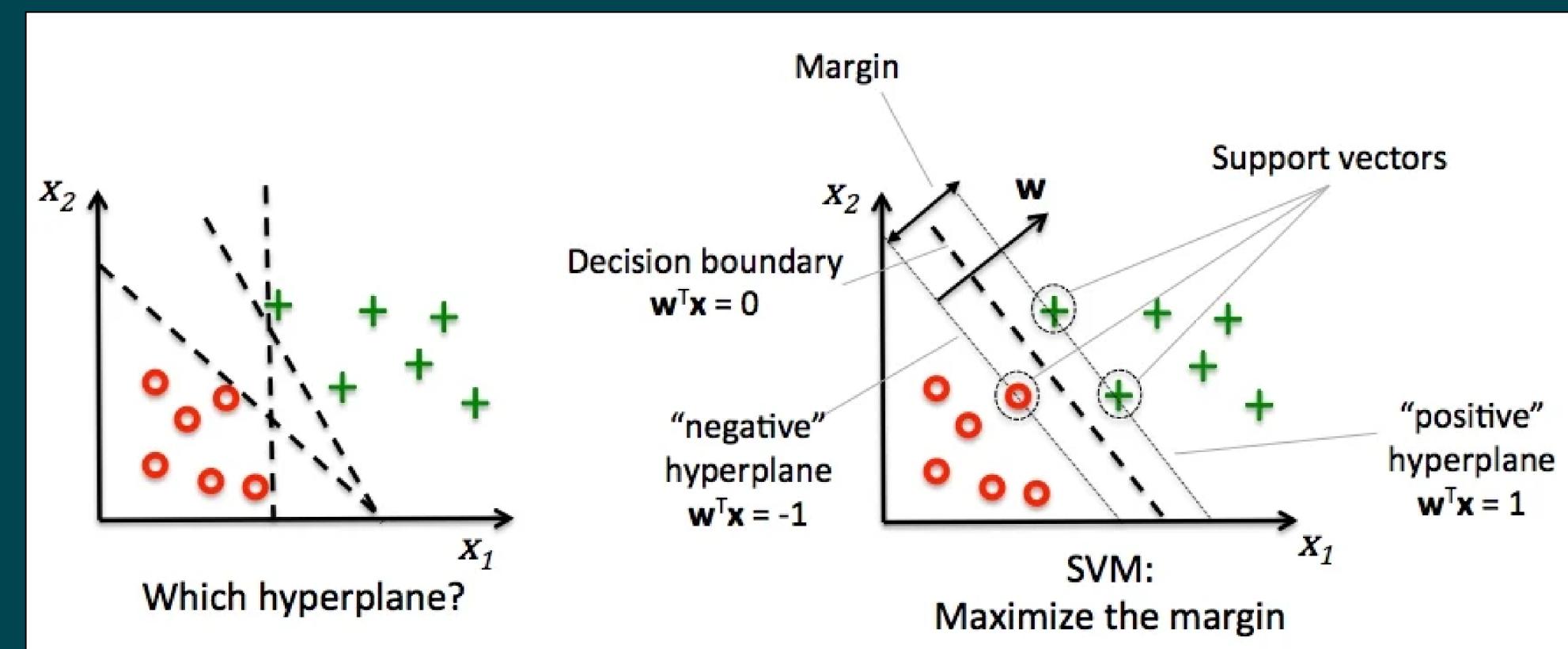
1. Introduction

It is the distance between the hyperplane and the observations closest to the hyperplane (support vectors). In SVM large margin is considered a good margin. There are two types of margins hard margin and soft margin.



2. Concept of Margin

In SVM, the margin is a key concept that defines the separation between different classes. The goal of SVM is to find the hyperplane that maximizes the margin, which is the distance between the hyperplane and the closest data points from each class. Intuitively, a larger margin indicates a better separation between the classes and is desirable for generalization performance.



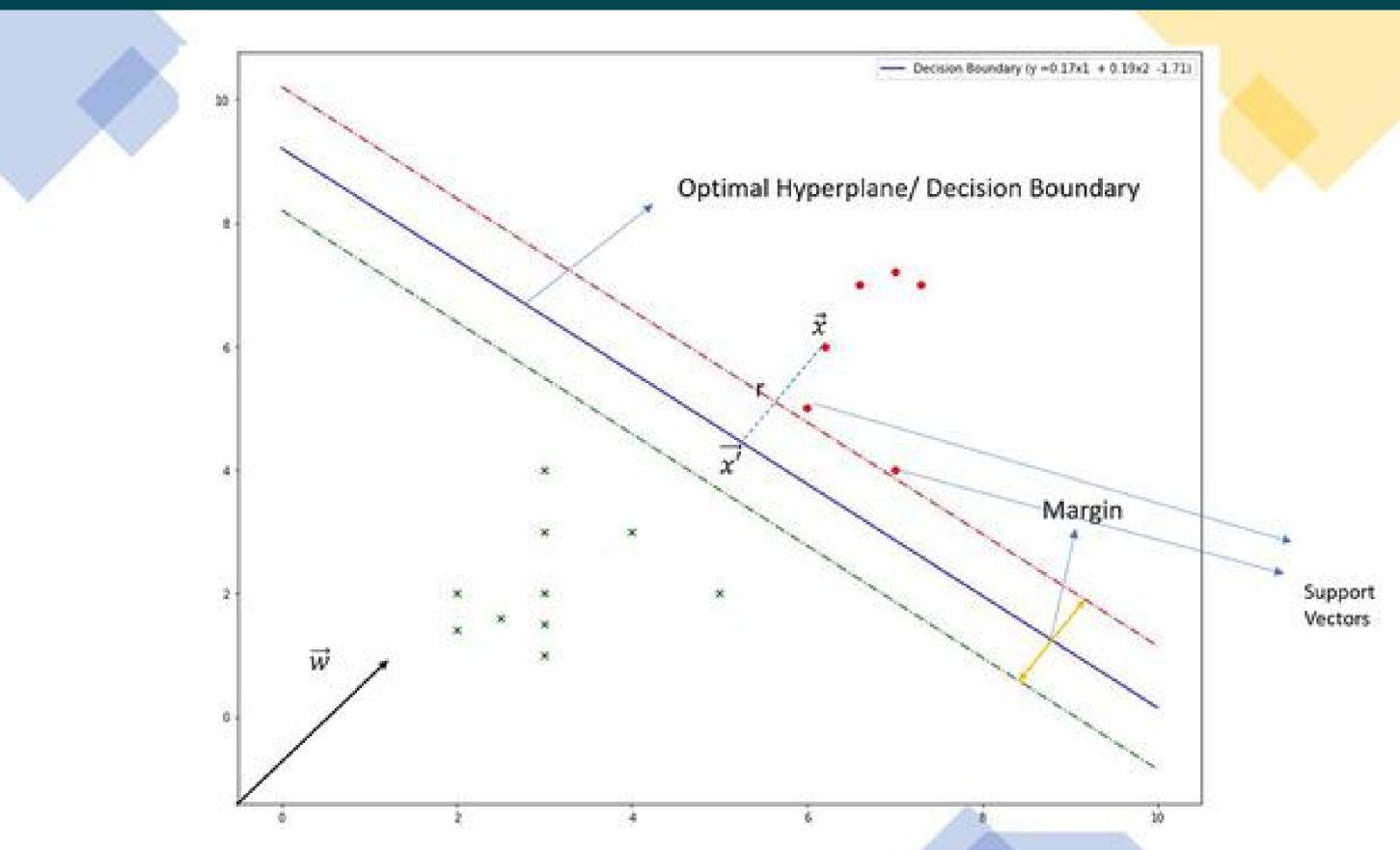
3. Relationship Between Margin And Generalization Performance

The margin plays a crucial role in the generalization performance of SVM. A wider margin suggests that the classifier is less sensitive to small perturbations or noise in the training data. It provides a certain level of robustness by allowing some errors or misclassifications within the margin region. On the other hand, a narrow margin may lead to overfitting, where the classifier becomes too specific to the training data and performs poorly on unseen data.

4. Significance of Support Vectors

Support vectors are the data points that are close to the decision boundary, they are the data points most difficult to classify, they hold the key for SVM to be optimal decision surface.

The significance of support vectors lies in their ability to capture the complexity and distribution of the data. Unlike other data points, removing or altering non-support vector instances does not significantly affect the decision boundary. However, if any support vectors are removed or modified, it can lead to a change in the decision boundary. This property makes support vectors crucial for the stability and robustness of SVM models.



5. Impact of Support Vectors

- **Effective in high-dimensional spaces:** perform well even in cases where the number of features is greater than the number of samples.
- **Powerful for non-linear relationships:** SVMs can handle non-linear relationships between the input variables and the target variable by using kernel functions.
- **Robust against overfitting:** find the maximum margin hyperplane that separates different classes.
- **Versatility in handling different data types:** handle both numerical and categorical data. SVMs can handle a wide range of data types, making them versatile for various machine learning tasks.
- **Wide range of applications:** applied in numerous domains, including but not limited to text and document classification, image and object recognition, bioinformatics, finance, sentiment analysis, and anomaly detection.

6. Summary

To summarize, the margin in SVM represents the separation between classes, while support vectors are the critical data points that define the decision boundary. The margin and support vectors play a significant role in determining the generalization performance, stability, and robustness of SVM models.

THANKYOU