

SUPPORT VECTOR MACHINE

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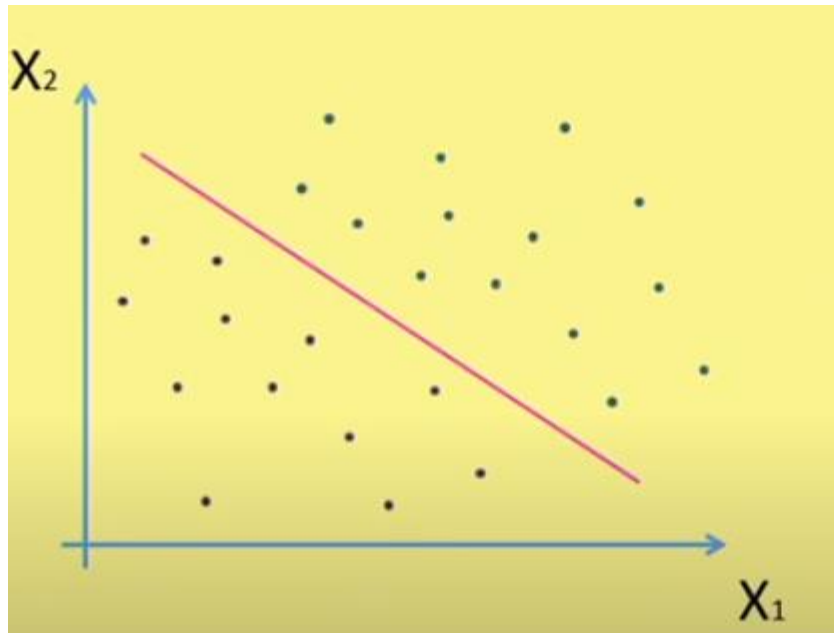
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Support Vector Machine (SVM)

Linear classifier

It maximize the margin

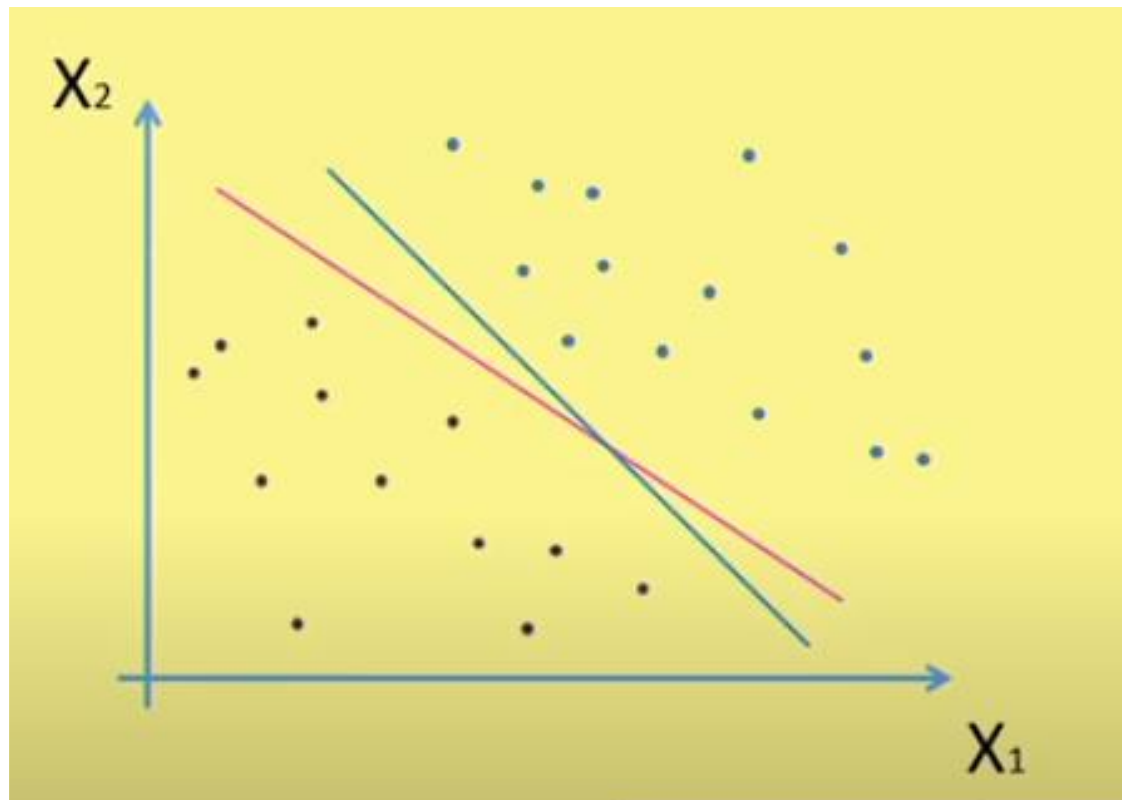
Support vector machine

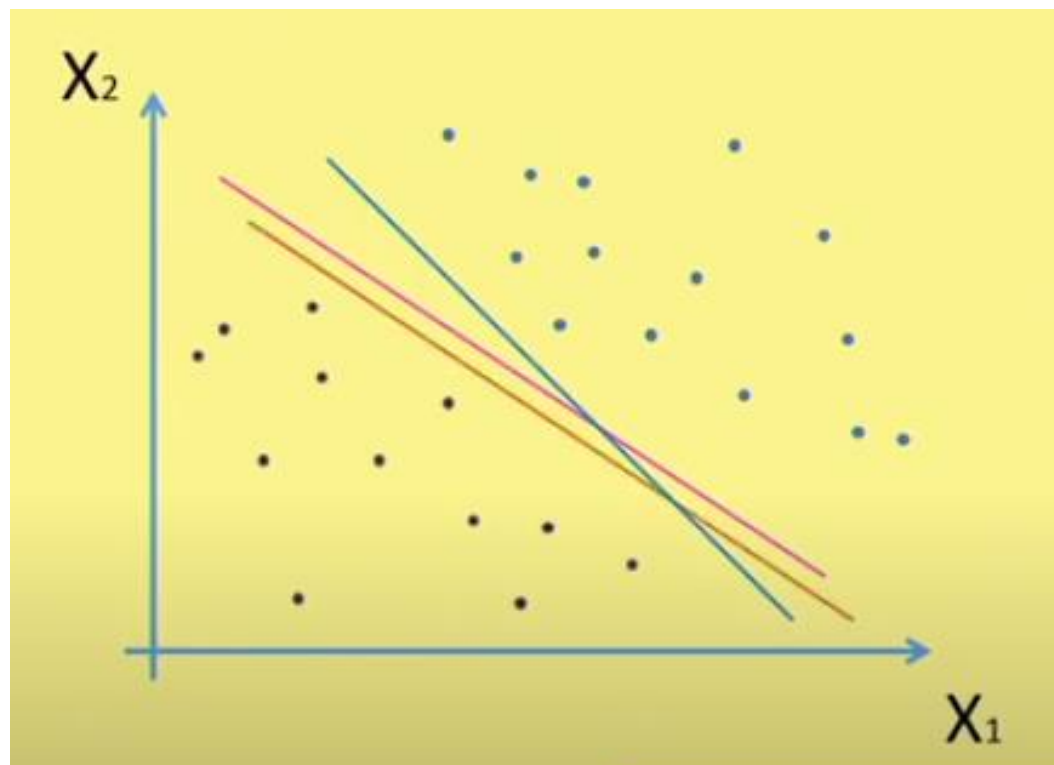


$$a'X + b = 0$$

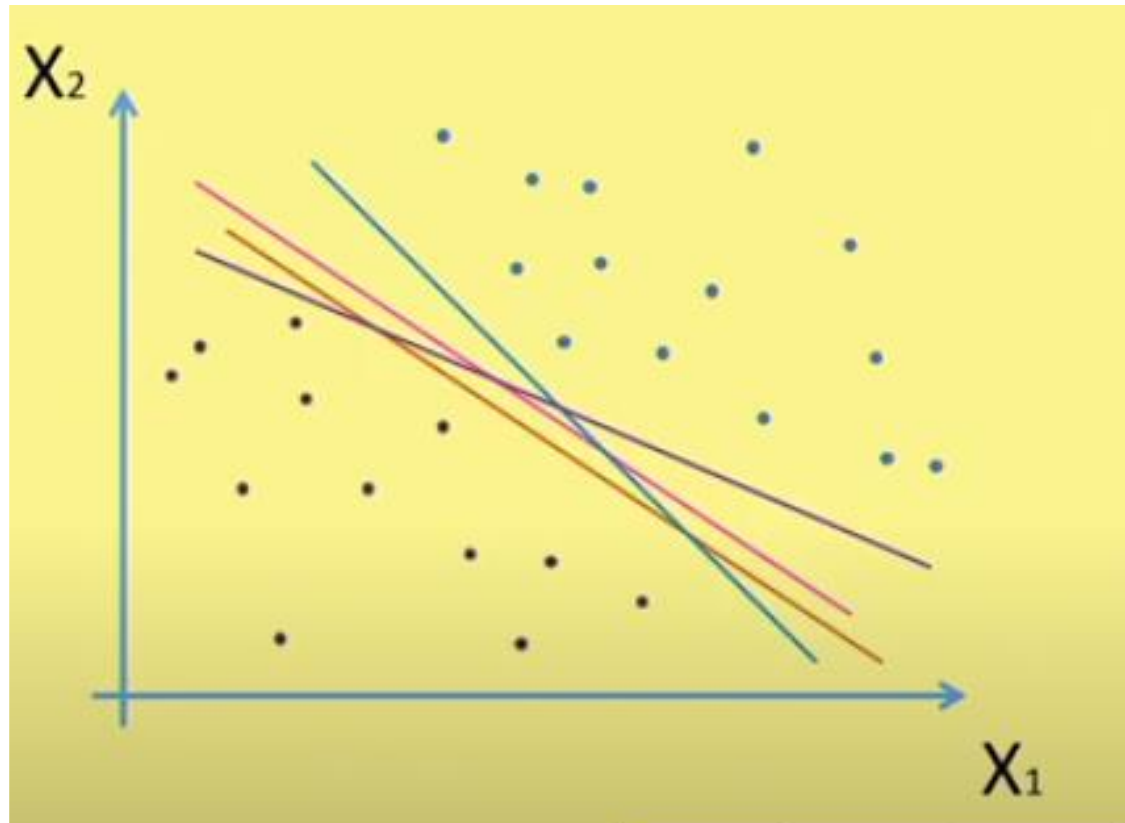
$$\text{For } X \in \omega_1: a'X + b > 0$$

$$\text{For } X \in \omega_2: a'X + b < 0$$





- We have infinite number of such linear equation that satisfies the condition

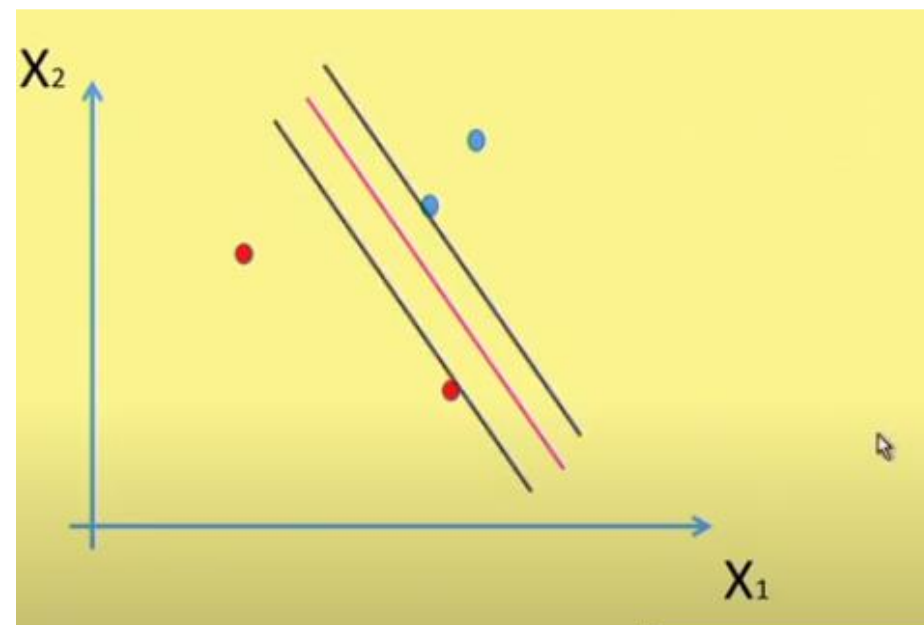
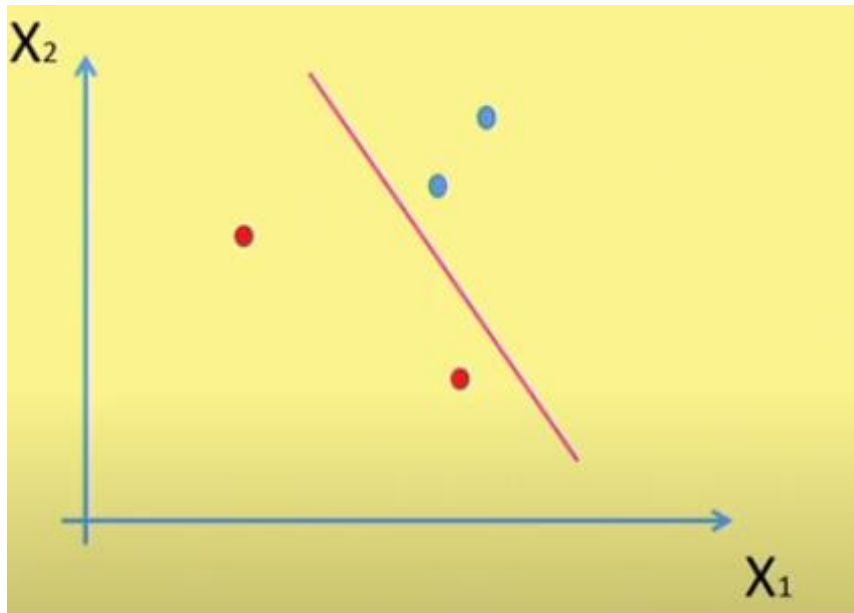


SVM - Intuition

- Among all possible decision boundary which one is best suitable to have
- That's where SVM come into picture
- Lets illustrate this

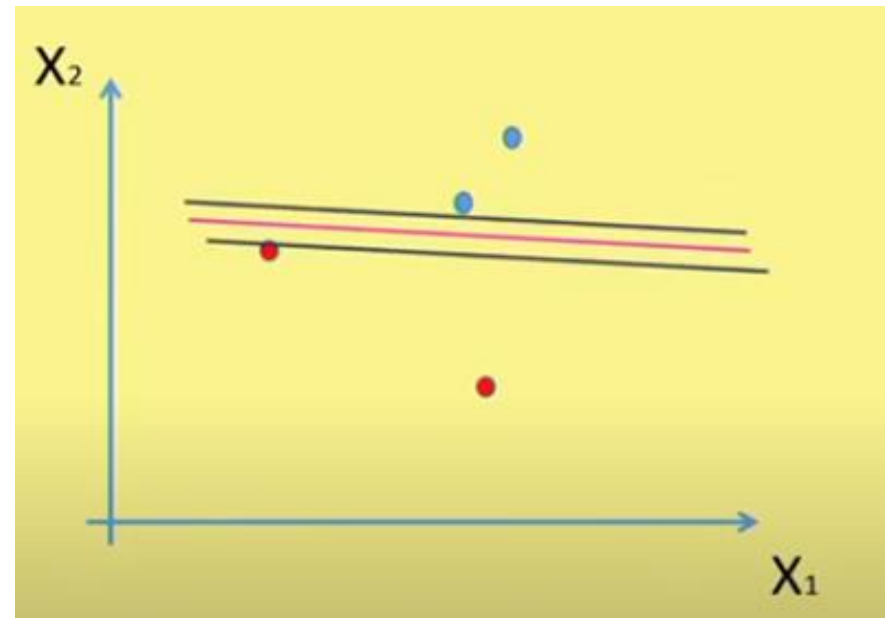
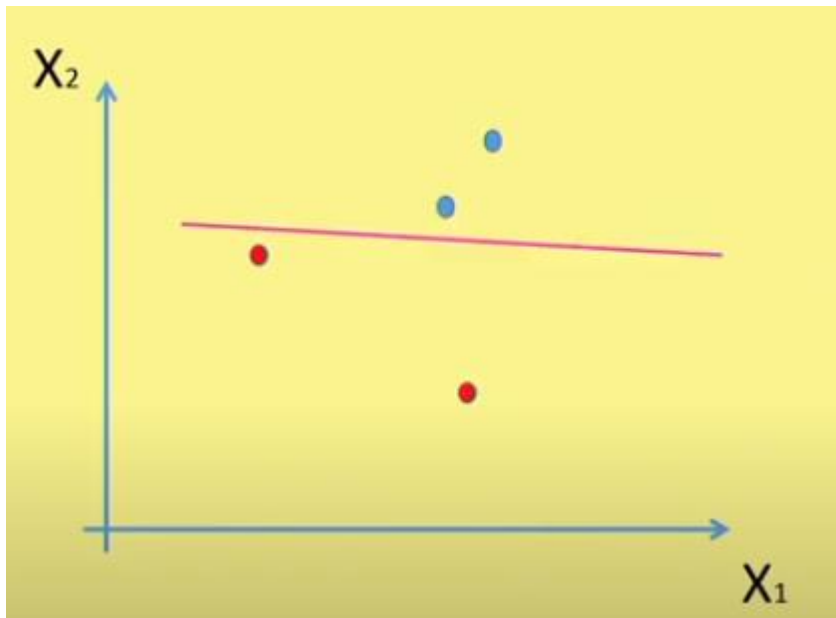
SVM

- Margin 1: Margin between the line is given



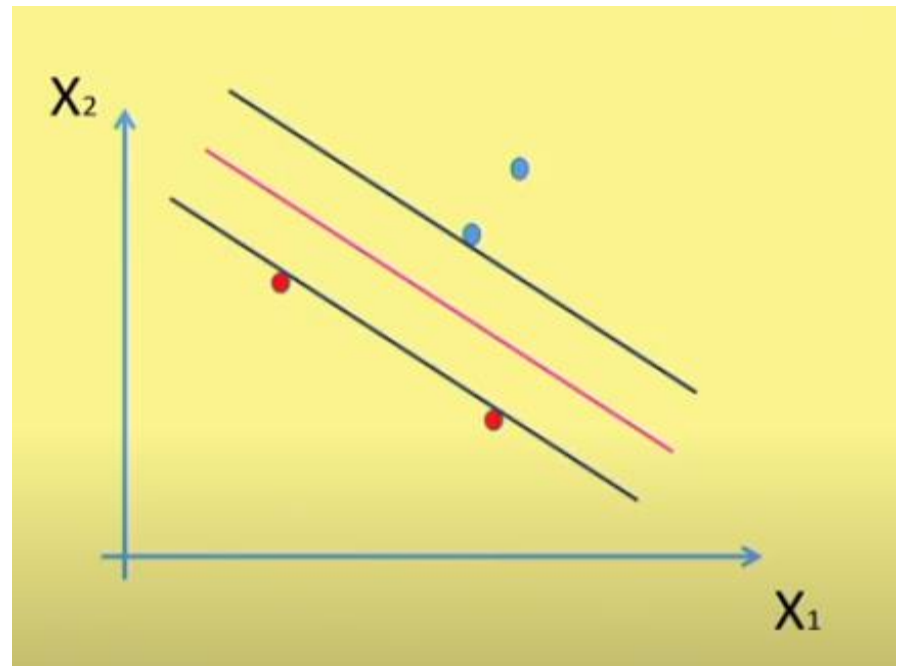
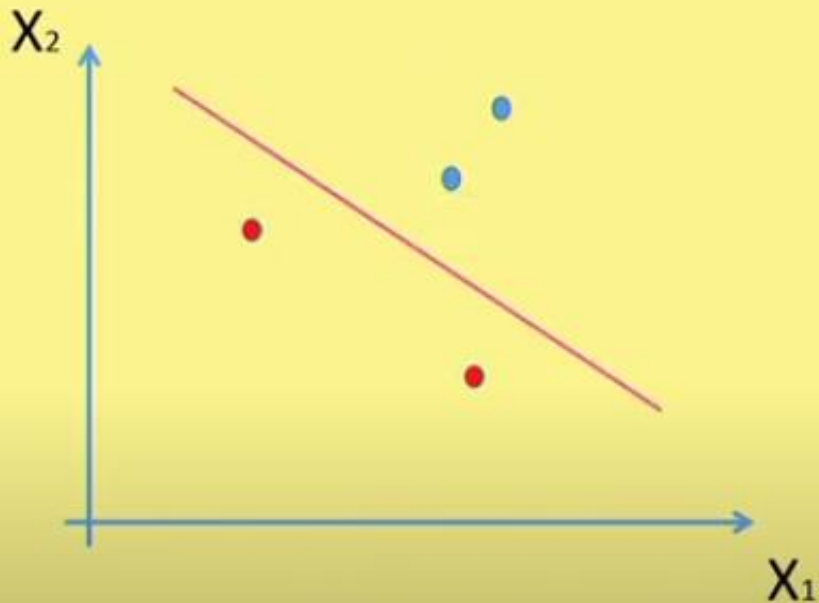
SVM

- Margin 2: Margin between the line is given



SVM

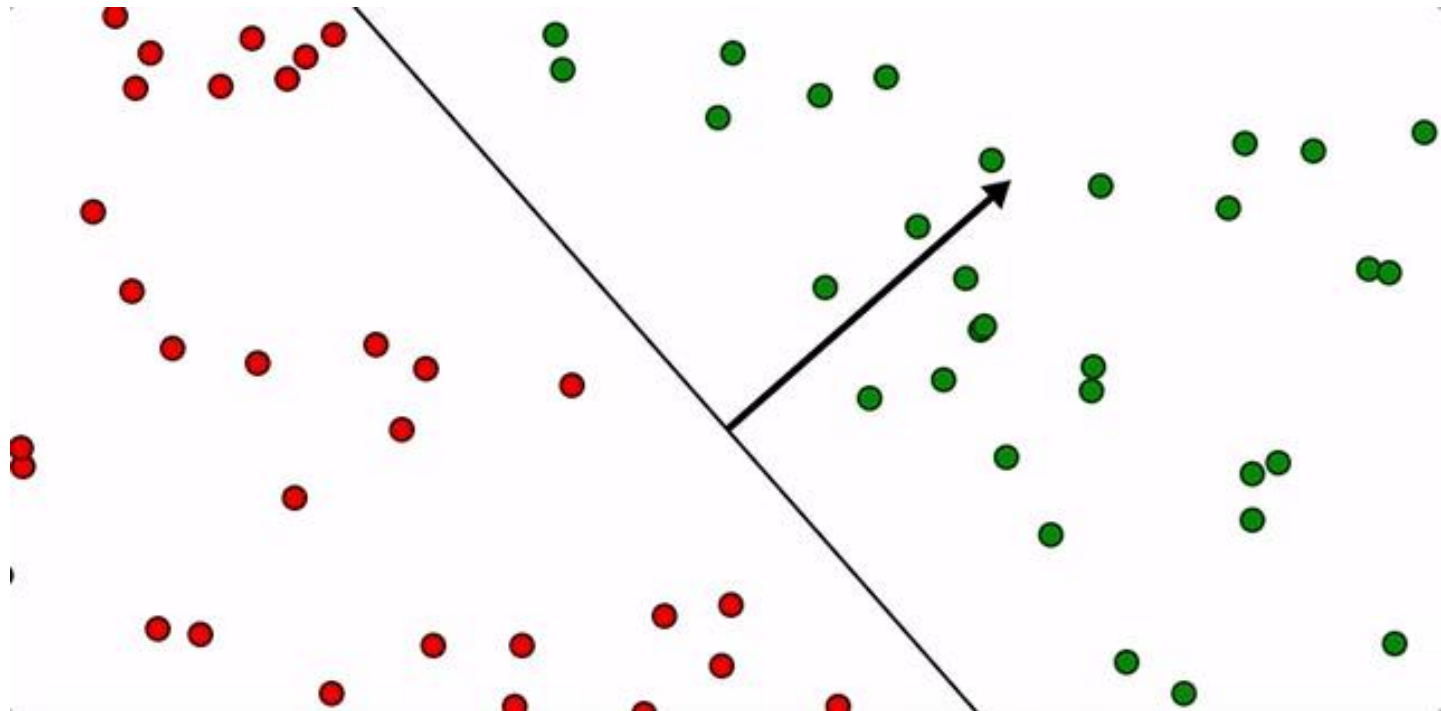
- Margin 3: Margin between the line is given



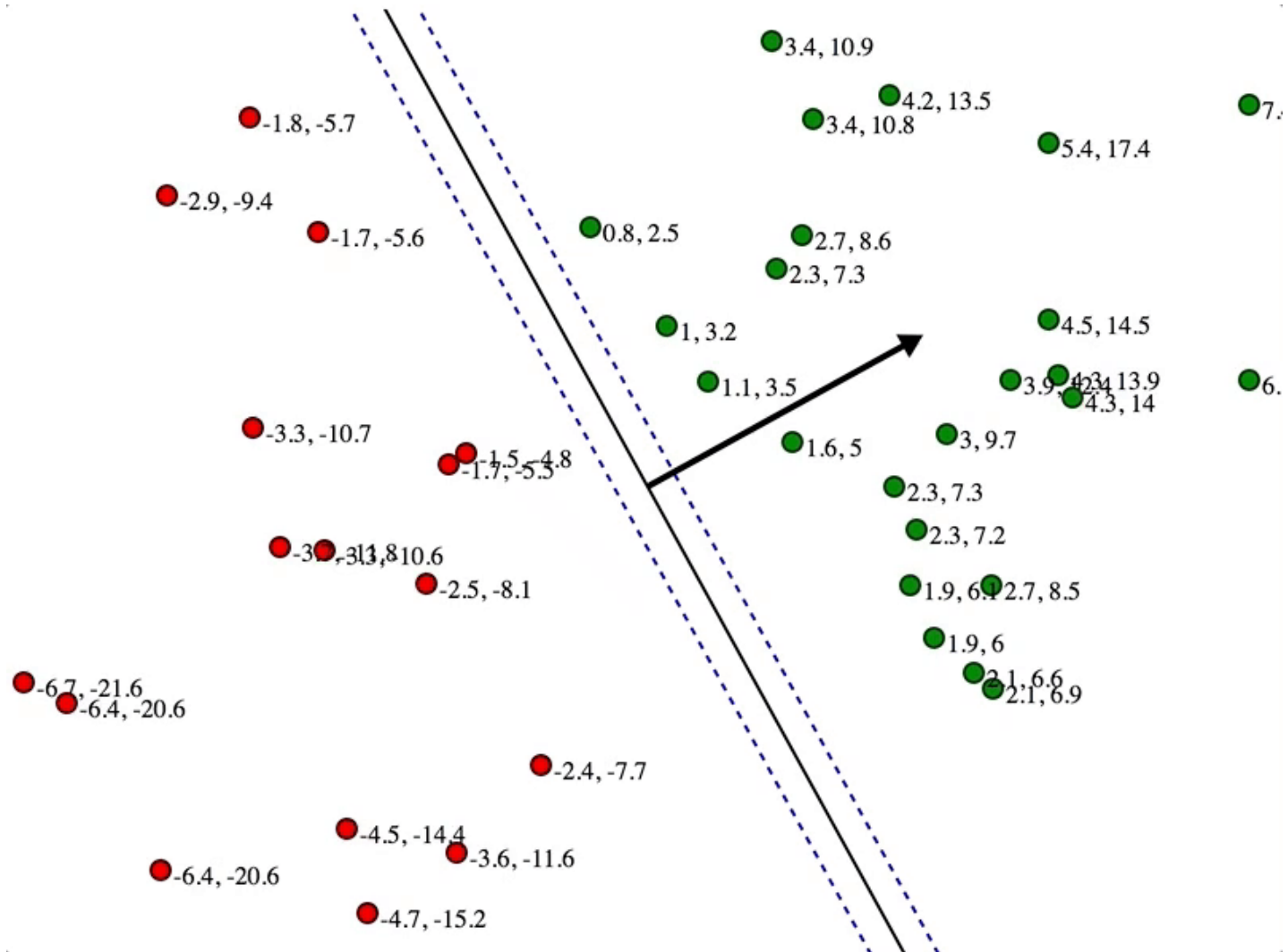
SVM - Intuition

- Among all possible margin, SVM tries to maximize the margin (Margin 3)

Linear classifier- perceptron



SVM- It tries to maximize the margin



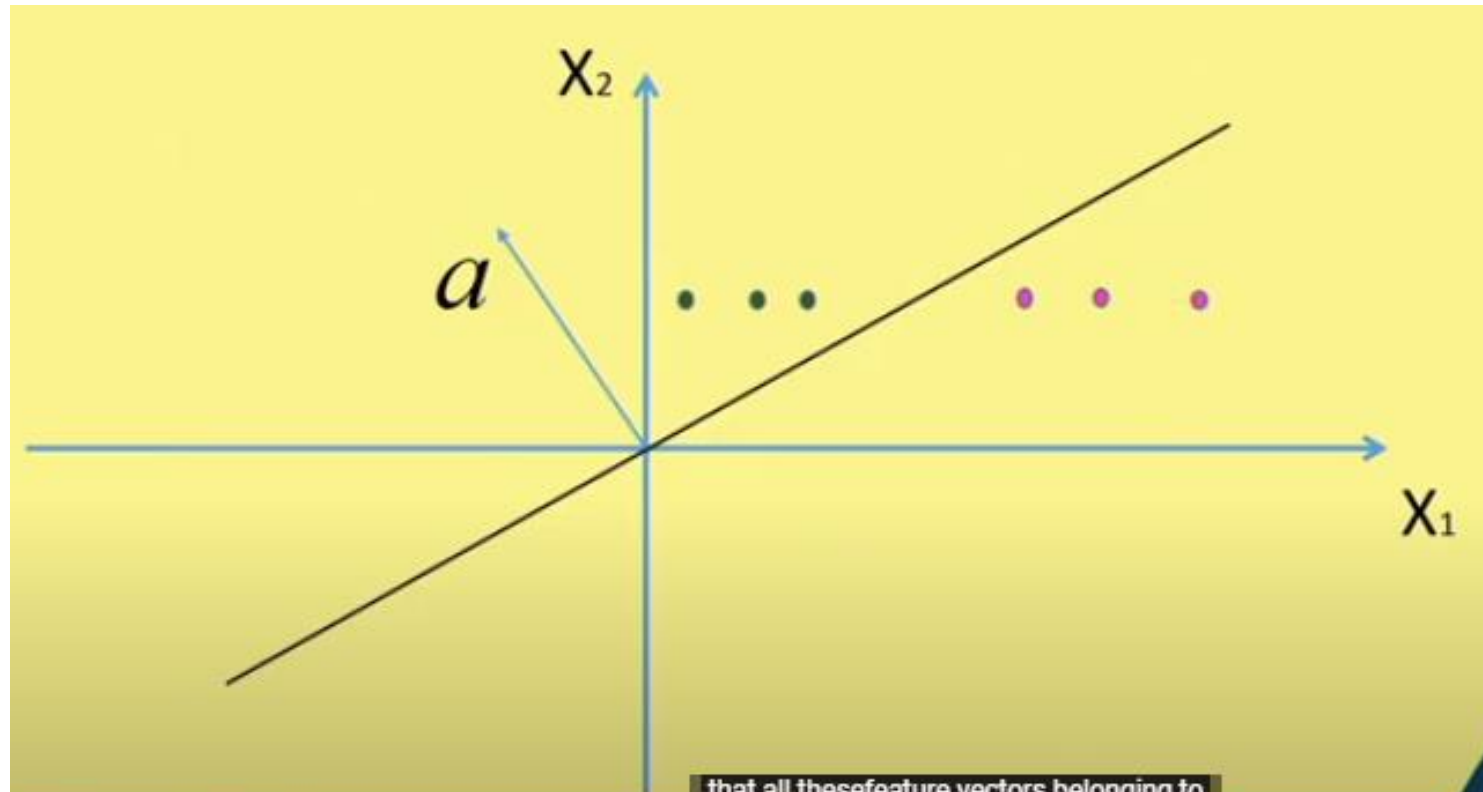


Thank you

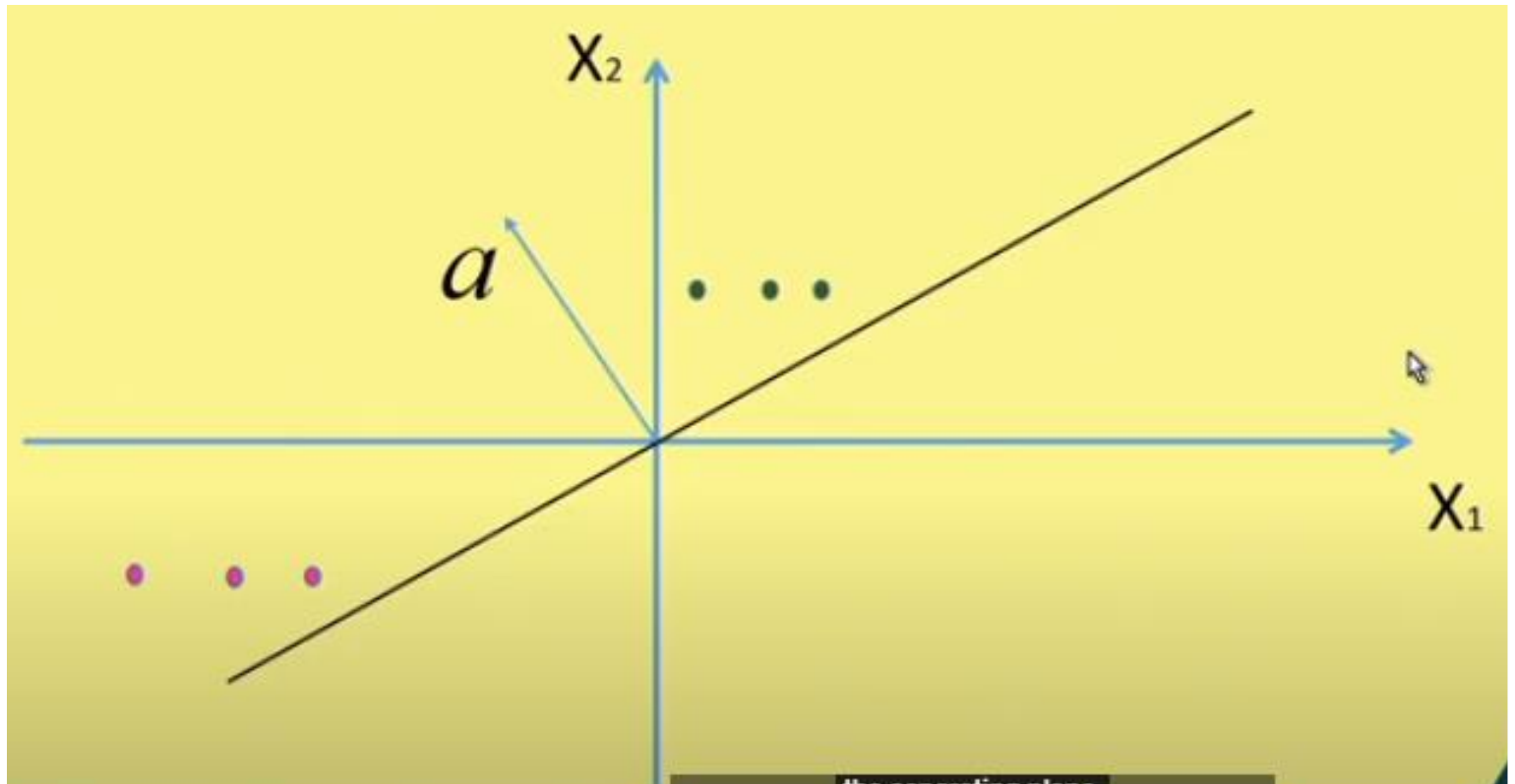
Additional slides



Linear Classifier



Linear Classifier



$$\begin{bmatrix} 7 & 4 & 3 \\ 4 & 1 & 8 \\ 6 & 3 & 5 \\ 8 & 6 & 1 \\ 8 & 5 & 7 \\ 7 & 2 & 9 \\ 5 & 3 & 3 \\ 9 & 5 & 8 \\ 7 & 4 & 5 \\ 8 & 2 & 2 \end{bmatrix}$$

A) Eigen values = $\begin{bmatrix} 1.769 \\ 1.927 \\ 1.304 \end{bmatrix}$, and Eigen Vectors = $\begin{bmatrix} 0.64 & 0.38 & -0.66 \\ 0.69 & 0.10 & 0.72 \\ -0.34 & 0.91 & 0.20 \end{bmatrix}$,

second Eigen value= 1.927, second Eigen vector= $\begin{bmatrix} 0.38 \\ 0.10 \\ 0.91 \end{bmatrix}$

B) Eigen values = $\begin{bmatrix} 1.769 \\ 0.097 \\ 0.034 \end{bmatrix}$, and Eigen Vectors = $\begin{bmatrix} 0.64 & 0.38 & -0.66 \\ 0.69 & 0.10 & 0.72 \\ -0.34 & 0.91 & 0.20 \end{bmatrix}$

second Eigen value= 0.097, second Eigen vector= $\begin{bmatrix} 0.38 \\ 0.10 \\ 0.91 \end{bmatrix}$

C) Eigen values = $\begin{bmatrix} 1.769 \\ 0.972 \\ 0.314 \end{bmatrix}$, and Eigen Vectors = $\begin{bmatrix} 0.64 & 0.38 & -0.66 \\ 0.69 & 0.10 & 0.72 \\ -0.34 & 0.91 & 0.20 \end{bmatrix}$

second Eigen value= 0.927, second Eigen vector= $\begin{bmatrix} 0.38 \\ 0.10 \\ 0.91 \end{bmatrix}$

D) Eigen values = $\begin{bmatrix} 1.769 \\ 0.927 \\ 0.304 \end{bmatrix}$, and Eigen Vectors = $\begin{bmatrix} 0.64 & 0.38 & -0.66 \\ 0.69 & 0.10 & 0.72 \\ -0.34 & 0.91 & 0.20 \end{bmatrix}$

second Eigen value= 0.927, second Eigen vector= $\begin{bmatrix} 0.38 \\ 0.10 \\ 0.91 \end{bmatrix}$