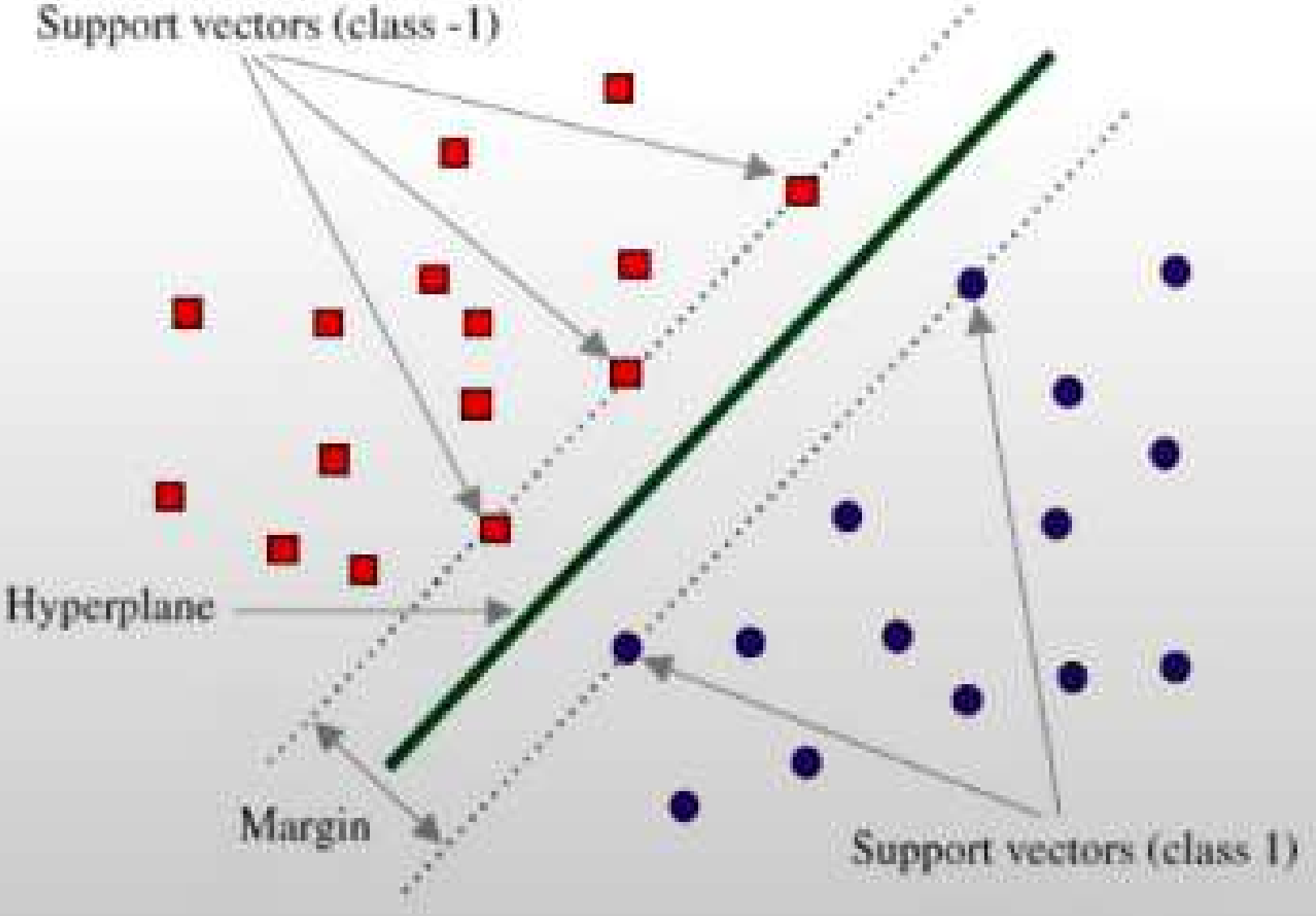
Support vectors (class -1)
Hyperplane
Margin
Support vectors (class 1)

Support Vector Machine Classifier

Hyperplane:

Hyperplane is a line (in 2d space) or a plane that separate the data points into 2 classes.

Support Vectors:

Support Vectors are the data points which lie nearest to the hyperplane. If theses data points changes, the position of the hyperplane changes.

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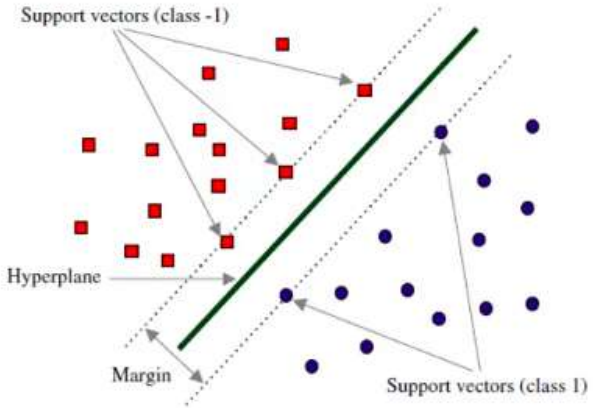

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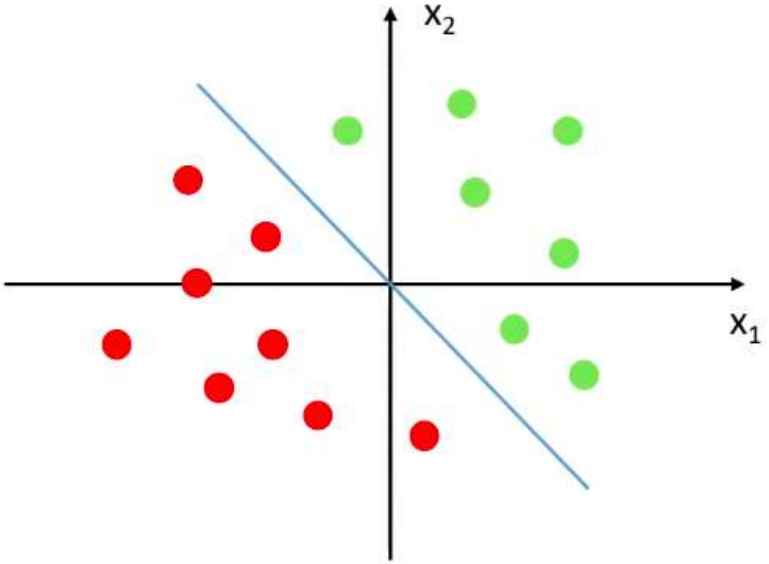
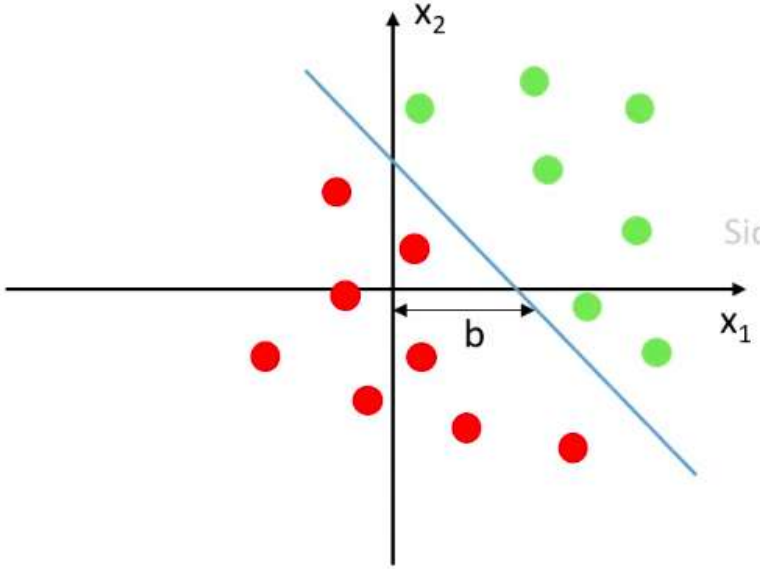
Support Vector Machine Classifier



$w^T x = \text{Label}$



$w^T x + b = \text{Label}$

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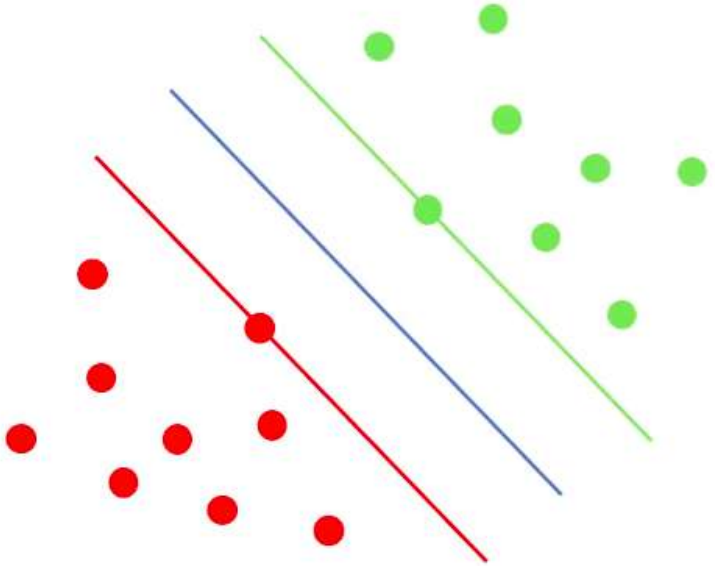
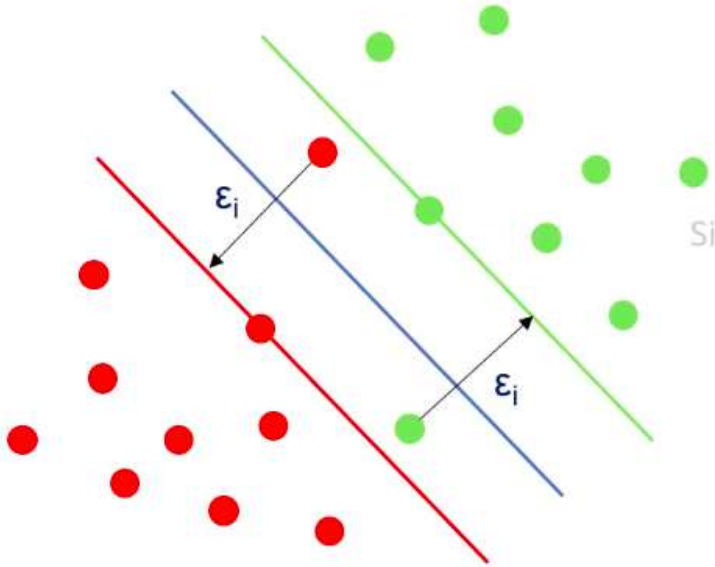
Support Vector Machine Classifier



Hard Margin



Soft Margin

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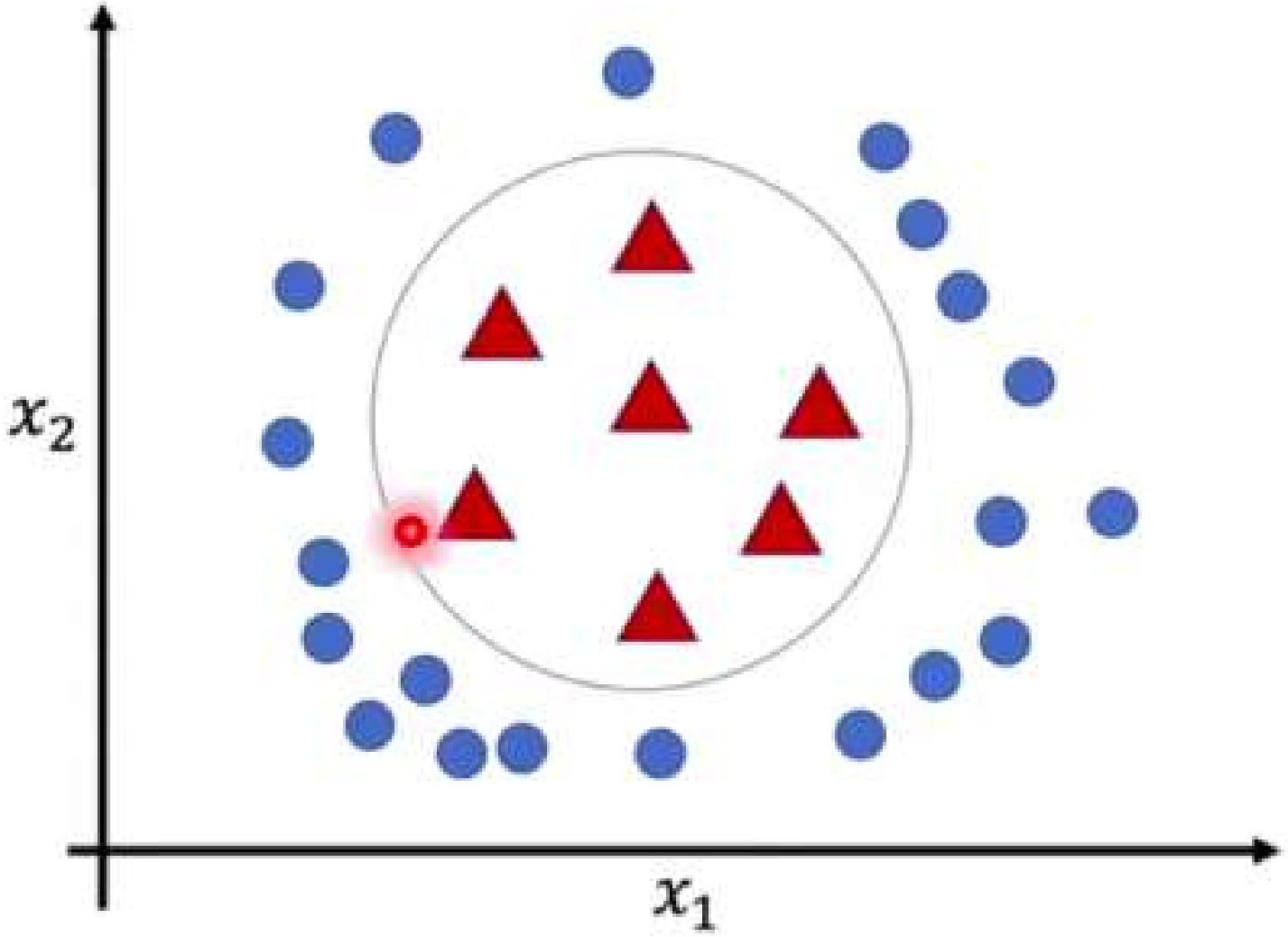

SVM in 2 dimensions

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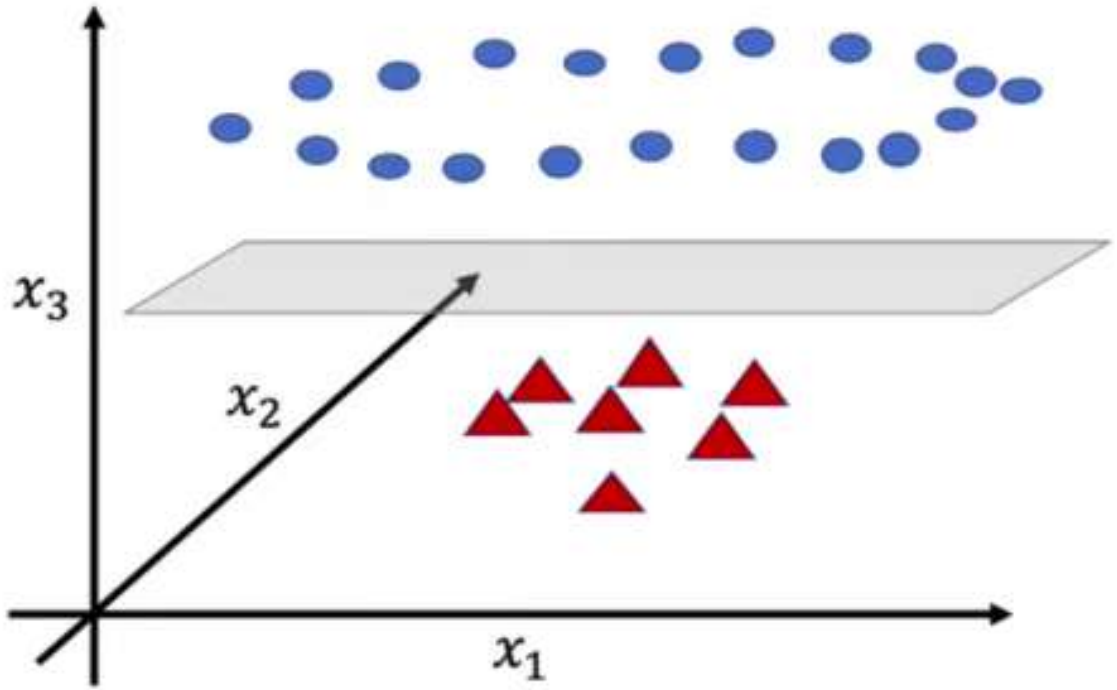
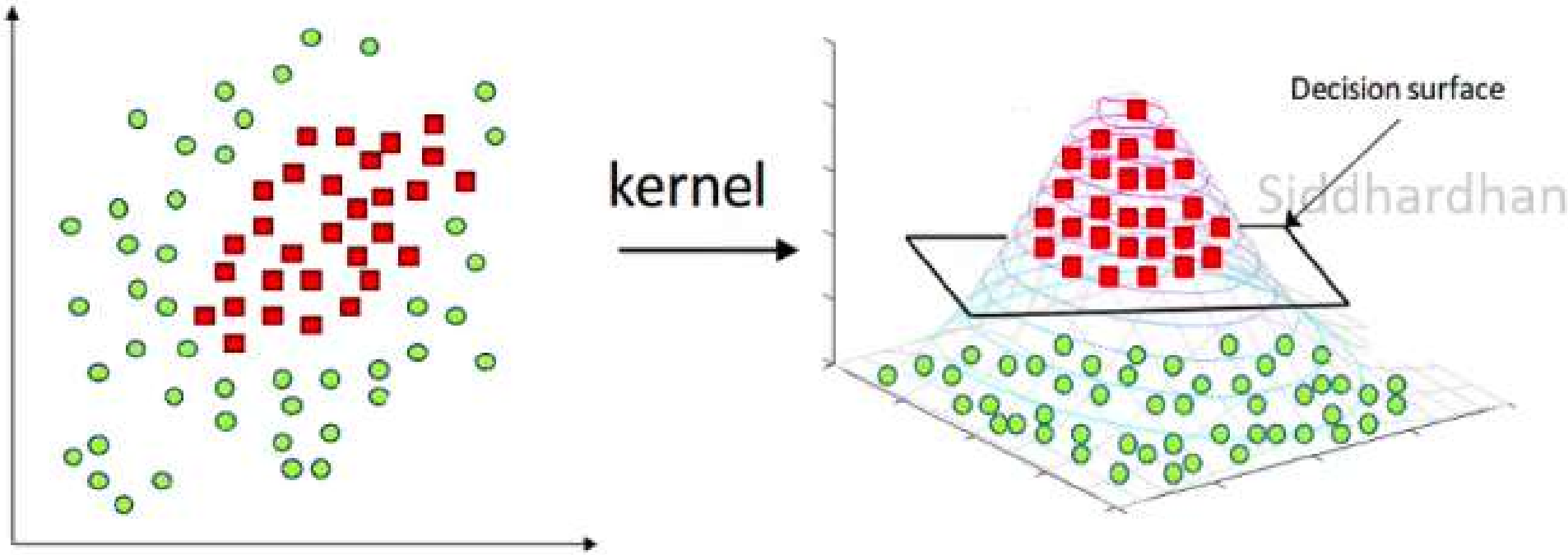
Kernel



SVM in 3 dimensions


kernel
Decision surface
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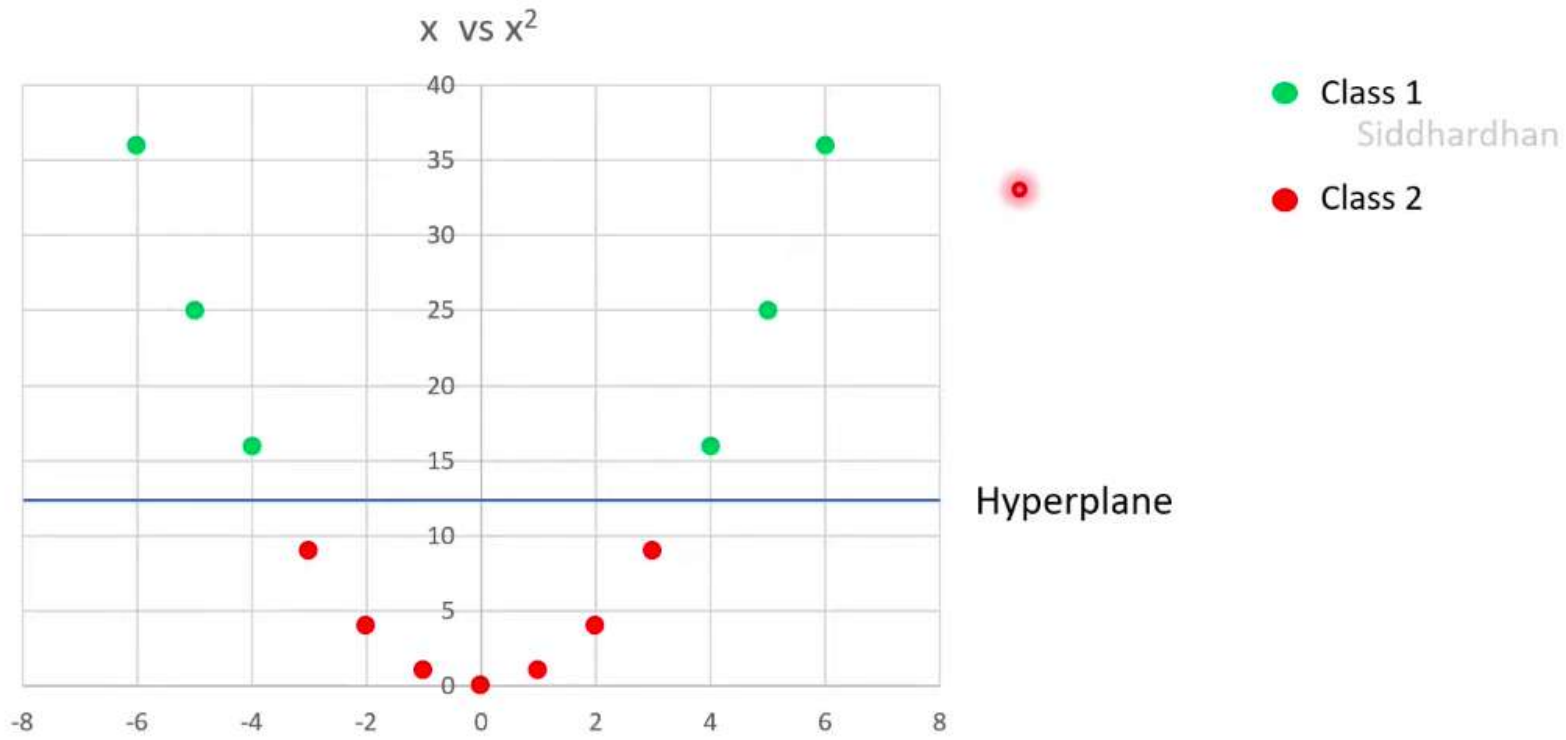
SVM Kernels

Feature (x)	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
x^2	36	25	16	9	4	1	0	1	4	9	16	25	36



Types of SVM Kernels

1. Linear Kernel :

$$K(x_1, x_2) = x_1^T x_2$$

2. Polynomial Kernel:

$$K(x_1, x_2) = (x_1^T x_2 + r)^d$$

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3. Radial Basis Function (rbf) Kernel :

$$K(x_1, x_2) = \exp(-\gamma . ||x_1 - x_2||^2)$$

4. Sigmoid Kernel :

$$K(x_1, x_2) = \tanh(\gamma . x_1^T x_2 + r)$$

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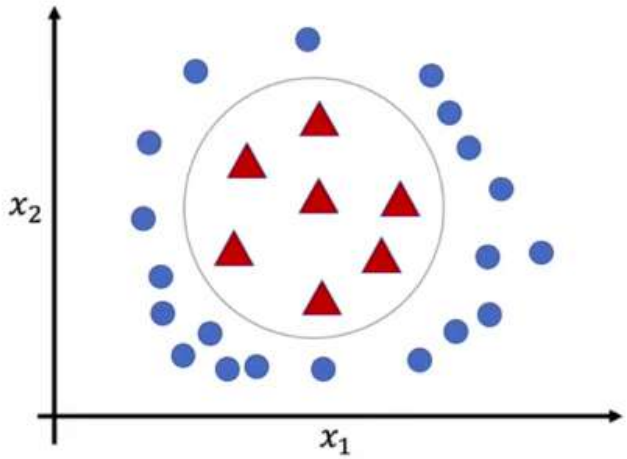
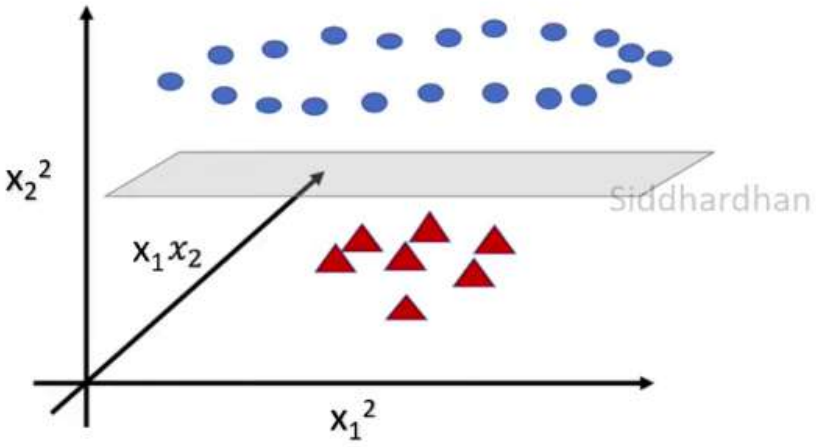
Support Vector Machine Classifier



SVM in 2 dimensions

Kernel



SVM in 3 dimensions