Advanced Machine Learning

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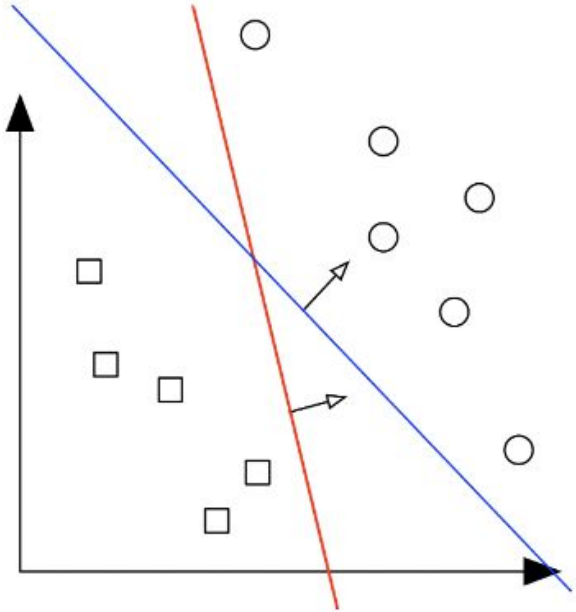
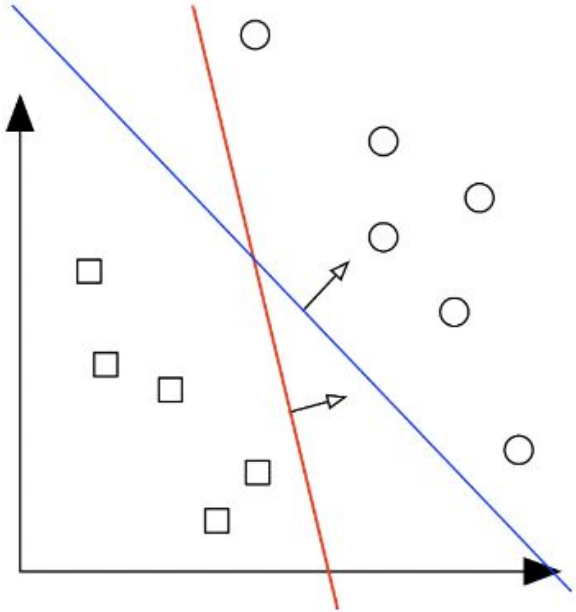
Support Vector Machines (SVM)

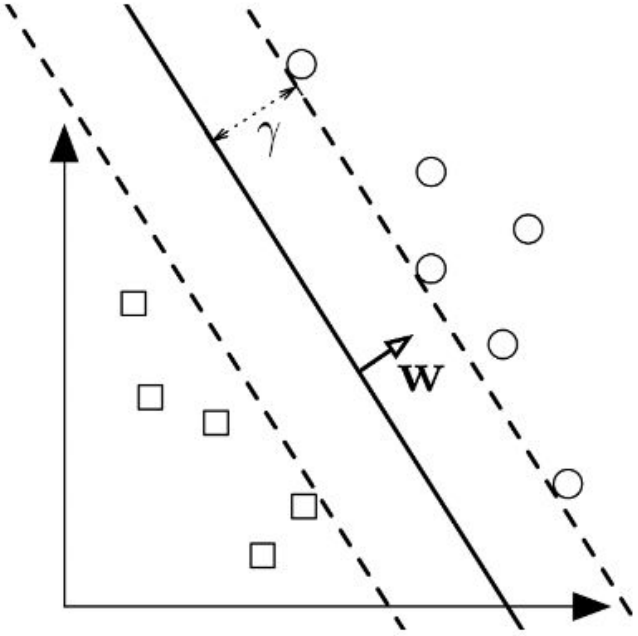
Question: For a linearly separable dataset, what is the best separating hyperplane?



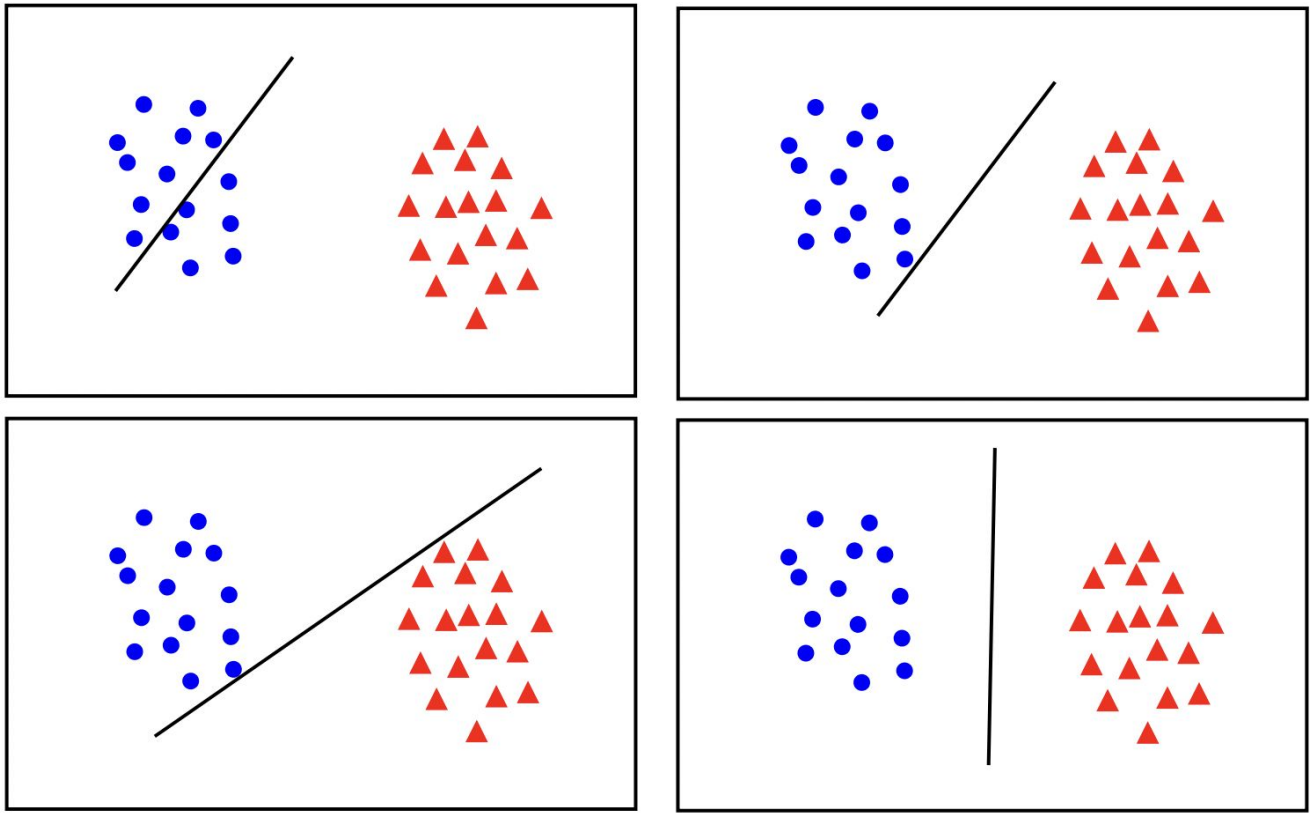
Support Vector Machines (SVM)

Answer: It is the hyperplane that maximizes the margin, i.e., the distance from the hyperplane to the closest point across both classes

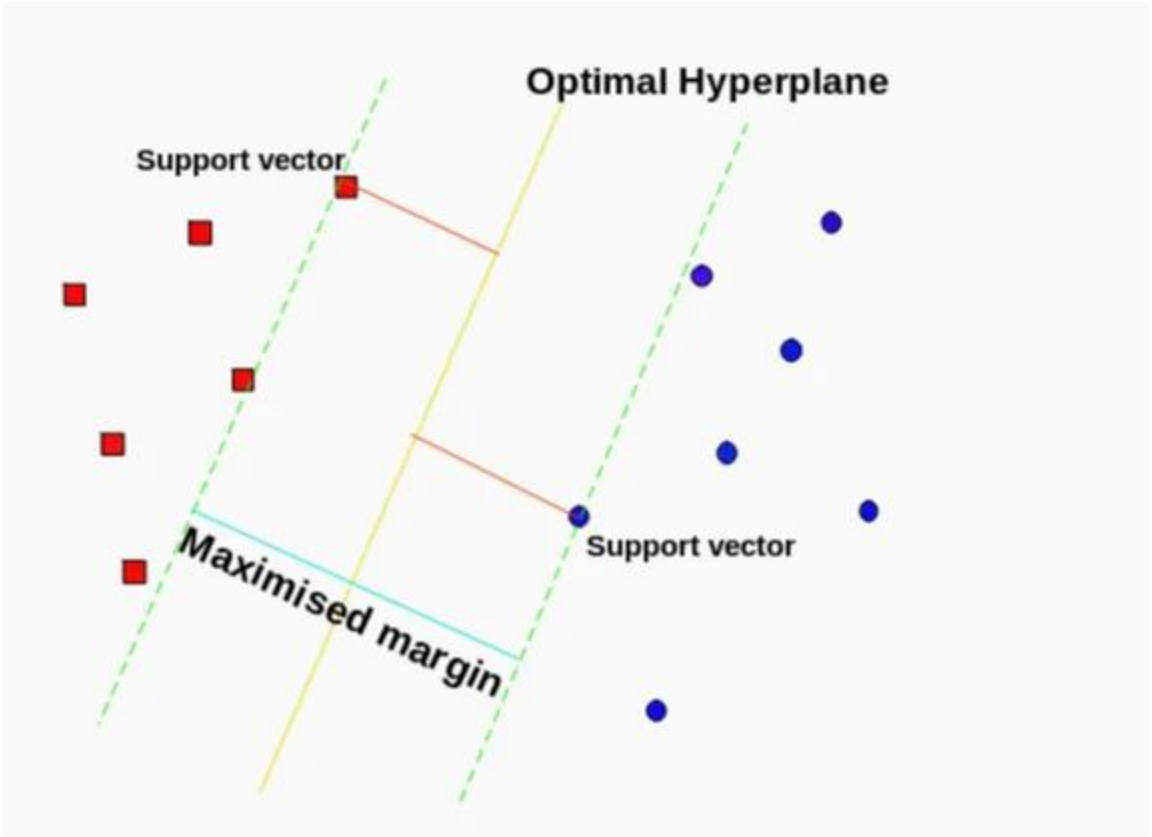




Support Vector Machines (SVM)



Maximizing Margin



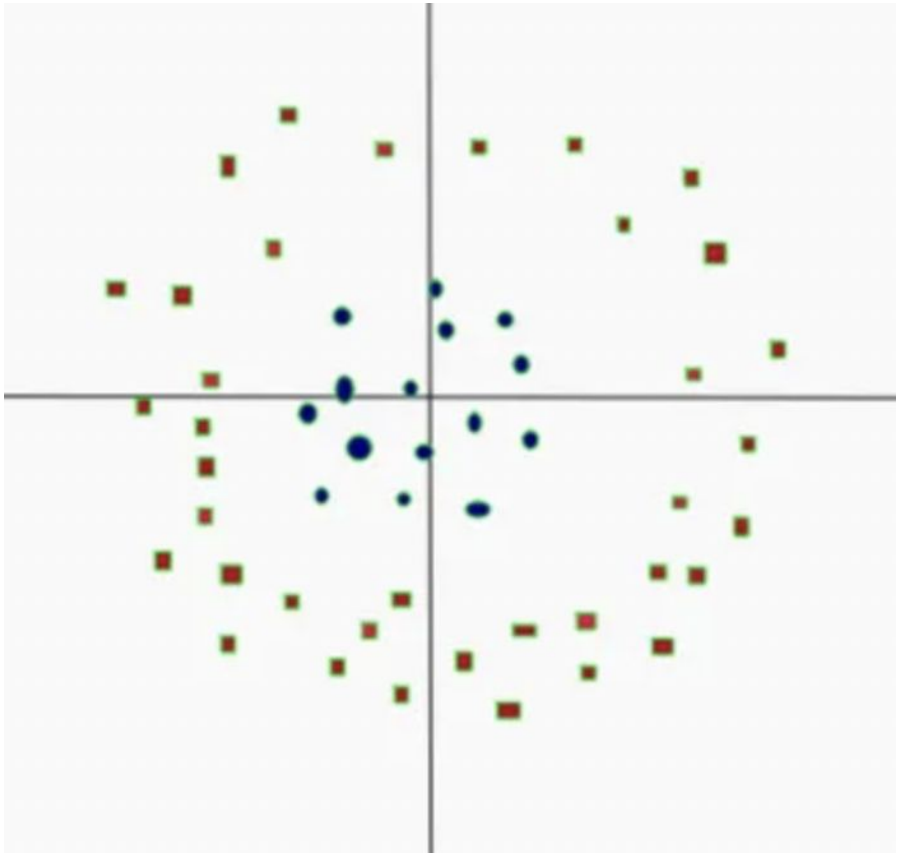
Maximizing Margin

$$\max_{\mathbf{w},b} \gamma(\mathbf{w}, b)$$

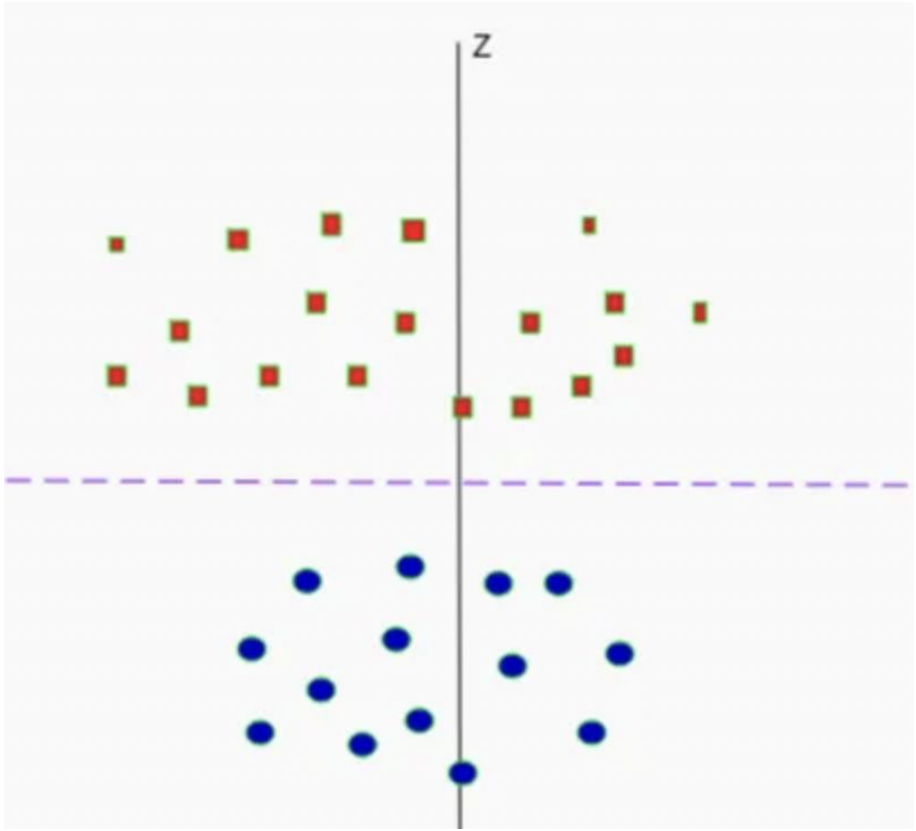
$$\forall i \; y_i(\mathbf{w}^T x_i + b) \geq 0$$

$$\gamma(\mathbf{w}, b) = \min_{\mathbf{x} \in D} \frac{|\mathbf{w}^T \mathbf{x} + b|}{\|\mathbf{w}\|_2}$$

SVM for non-linear dataset



SVM for non-linear dataset



SVM for non-linear dataset