

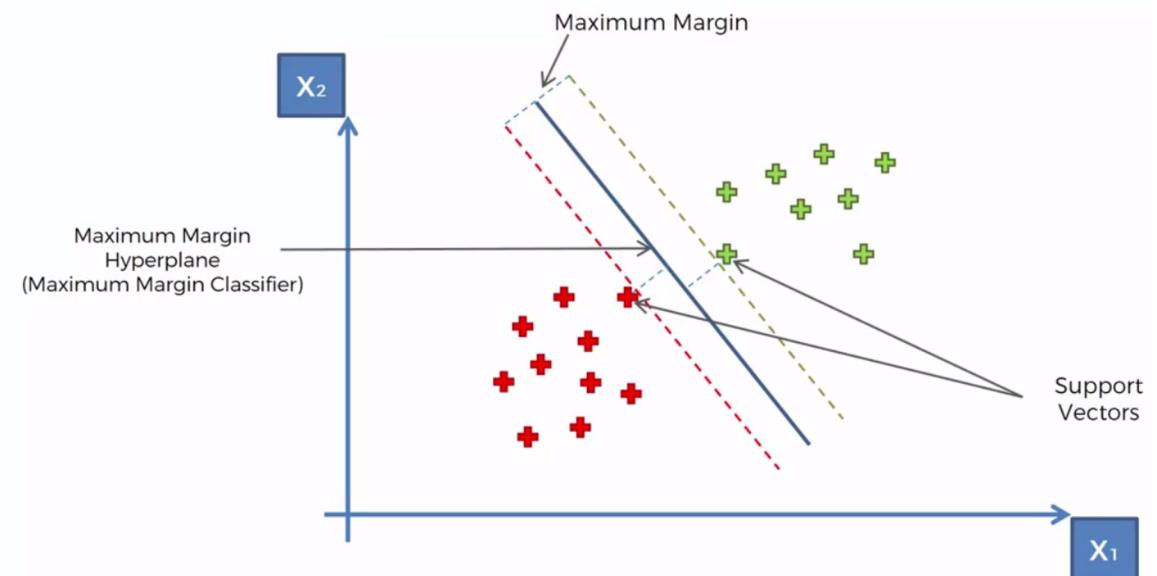
Basic Machine Learning: Support Vector Machine

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Goal

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Understanding the top five supervised algorithms
which is Support Vector Machine algorithm.



Outline

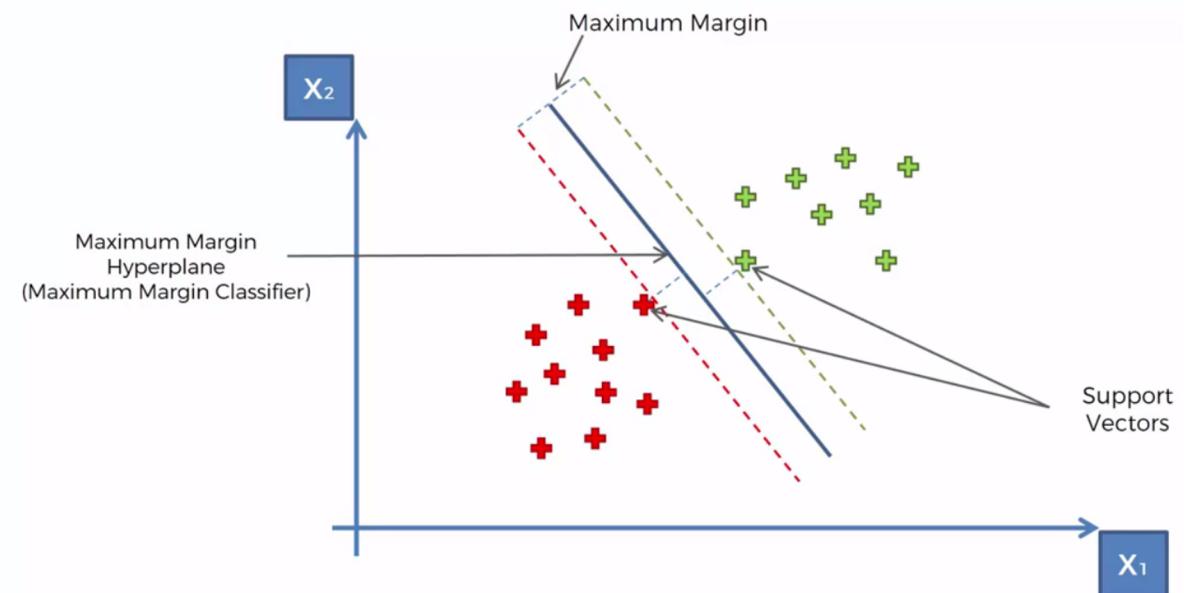
Outline

- Support Vector Machine Algorithm
 - Concept
 - Application

Content

Support Vector Machine (Concept)

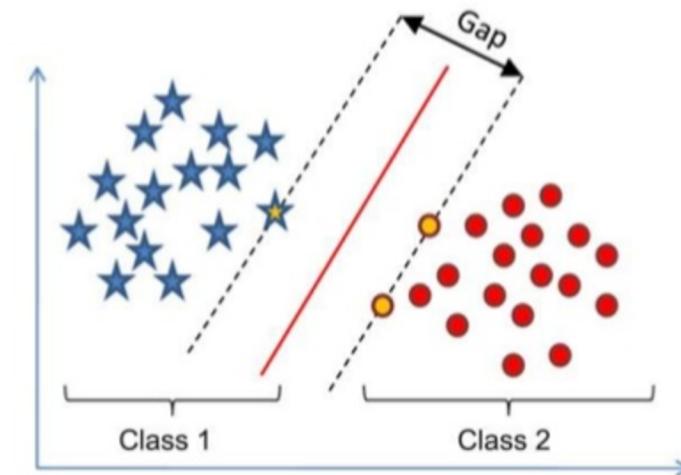
- Top 5 supervised algorithms
- Can be used for Classification & Regression problems
- Can generalize linear & nonlinear model
- Names in scikit-learn:
 - SVC (SVM Classifier)
 - SVR (SVM Regressor)



Support Vector Machine (Concept)

- Find solution (hyperplane) with fewest errors
- Maximize margin separator to improve generalization

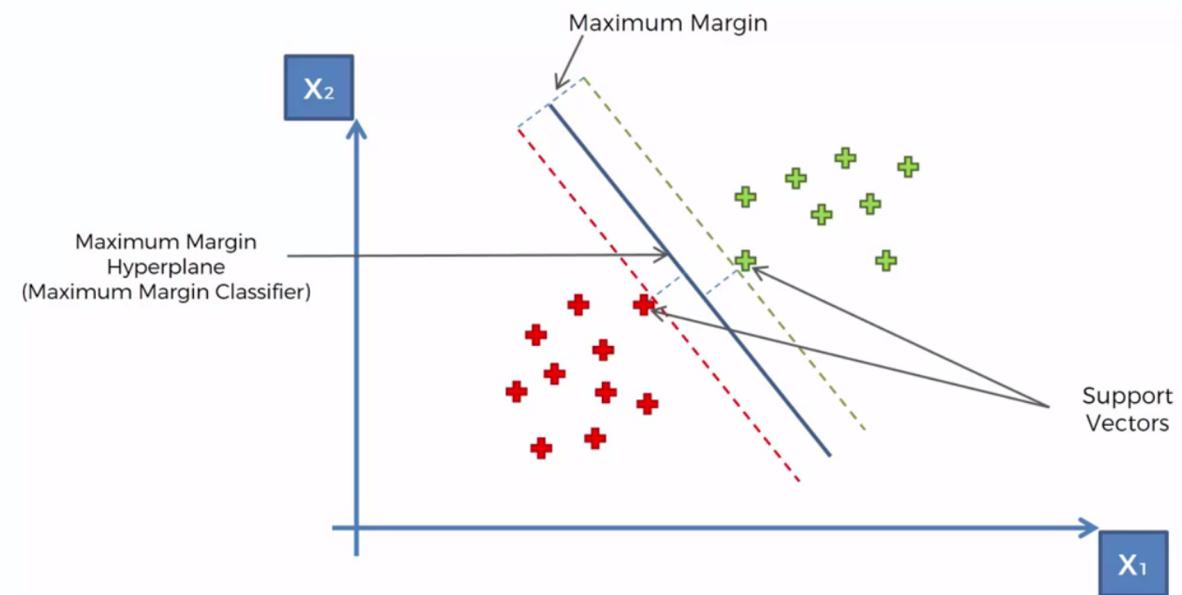
Basic concept of SVM



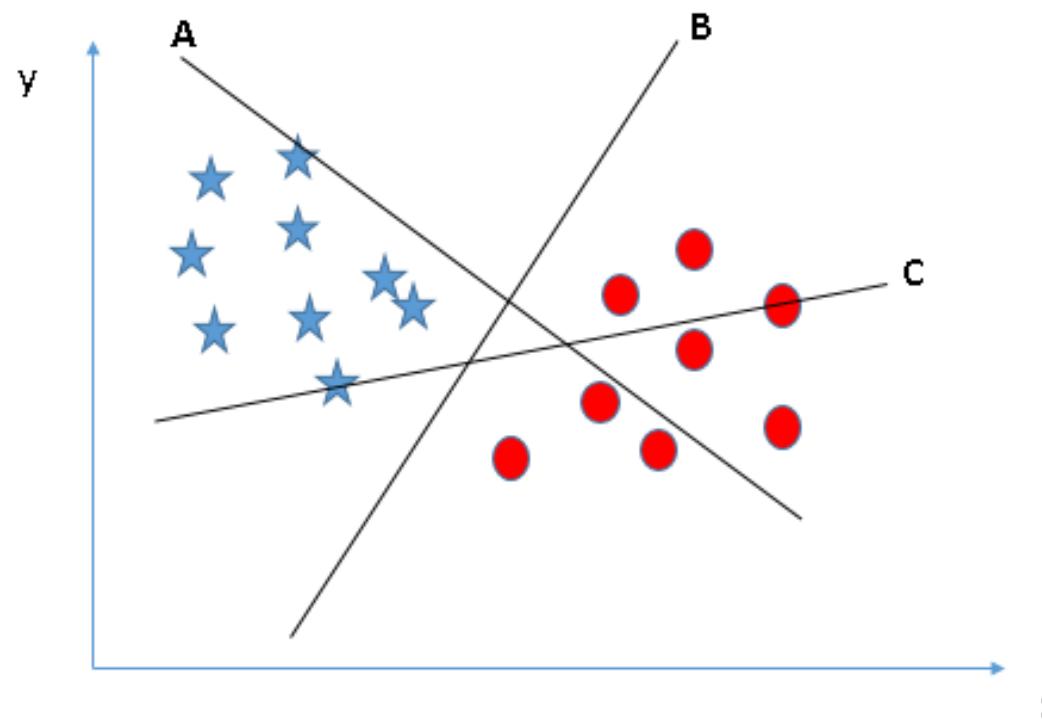
Find a linear decision surface ("hyperplane") that can separate classes and has the largest distance (i.e., largest "gap" or "margin") between border-line patients (i.e., "support vectors")

Support Vector Machine (Concept)

- What is Support Vector?
- The borderline data points that is “supporting” the construction of the hyperplane
- More support vectors doesn’t mean better
- What is Margin?
- (Perpendicular) gap between classes
- Higher margin = better separating hyperplane

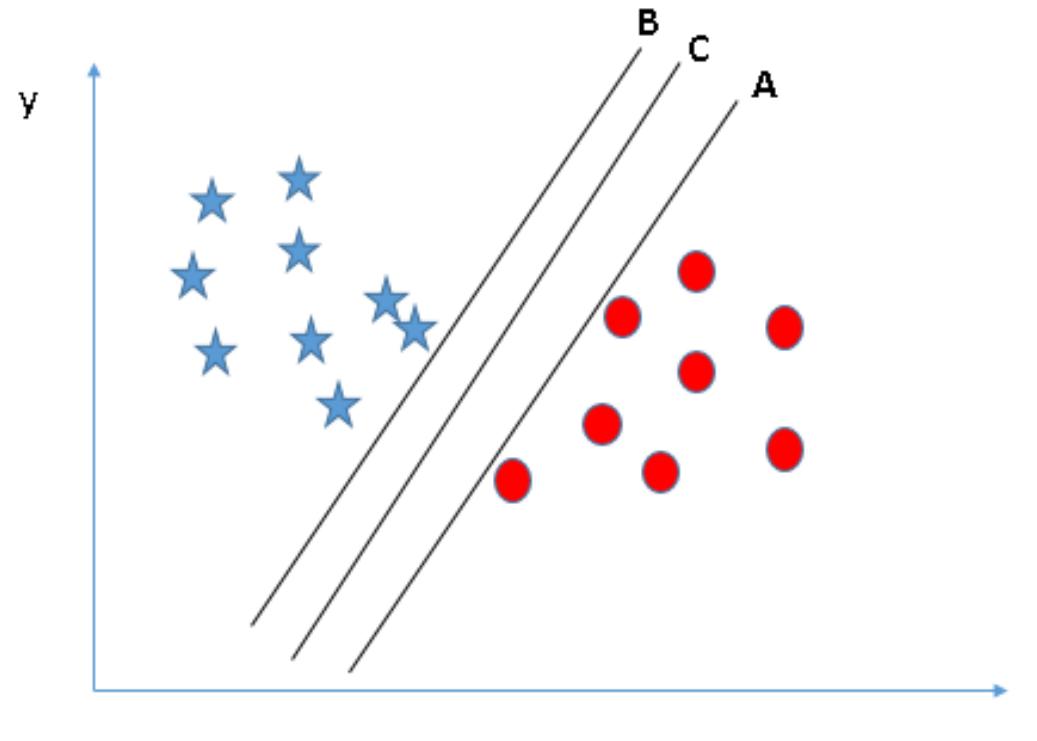


Support Vector Machine (Concept)

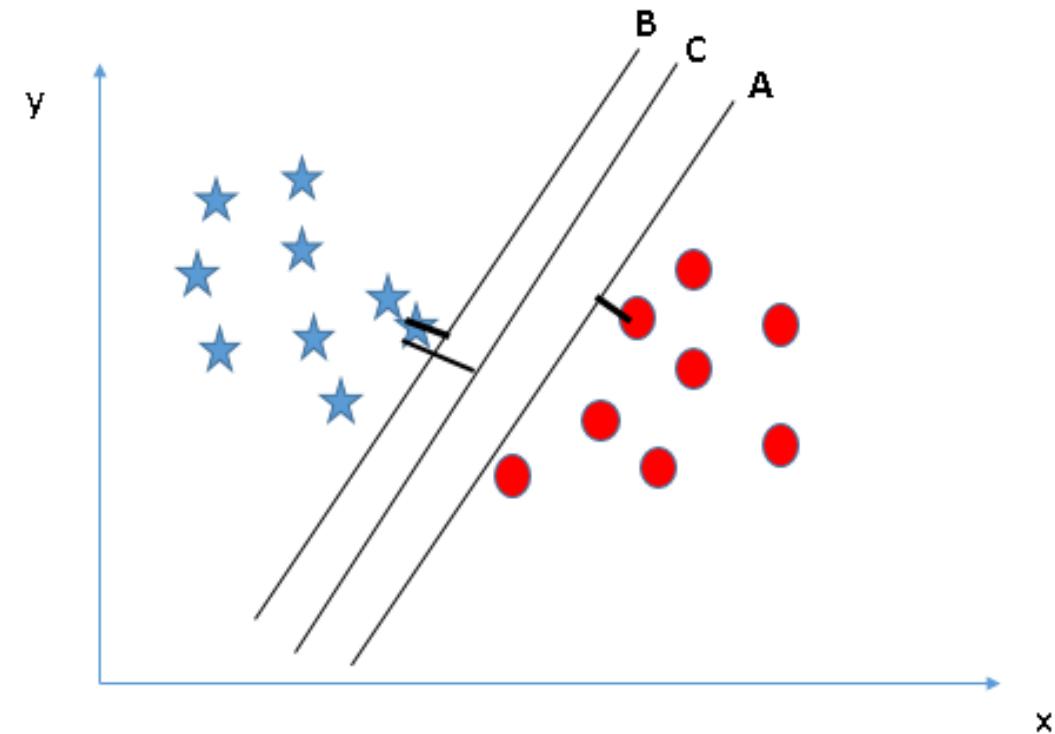


Scenario 1

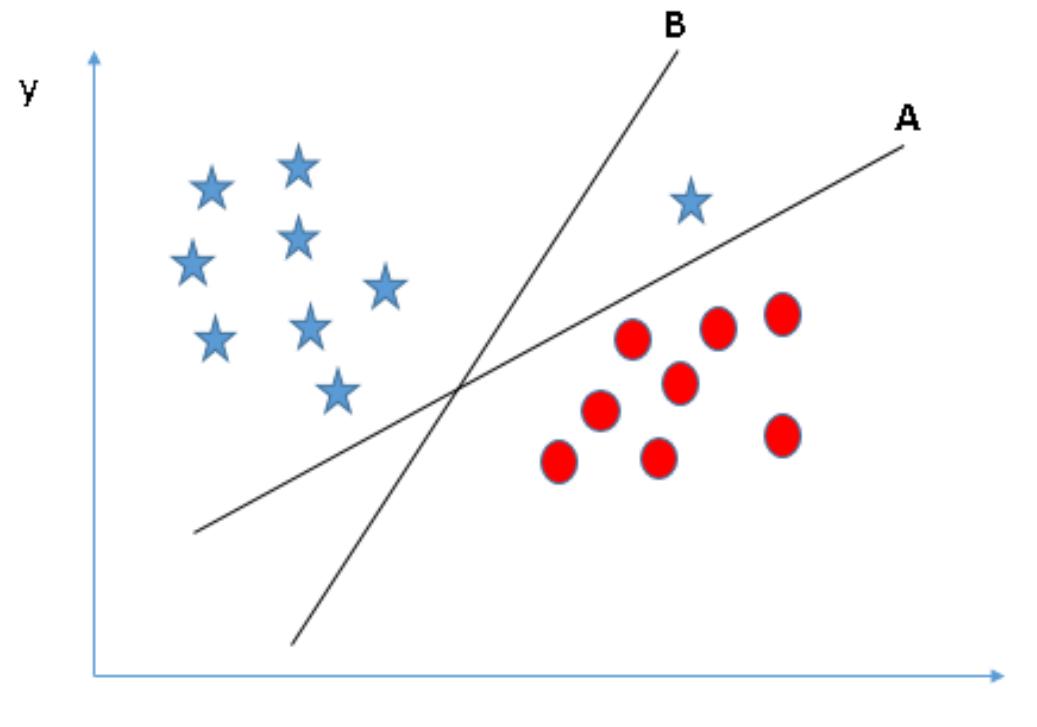
Support Vector Machine (Concept)



Scenario 2

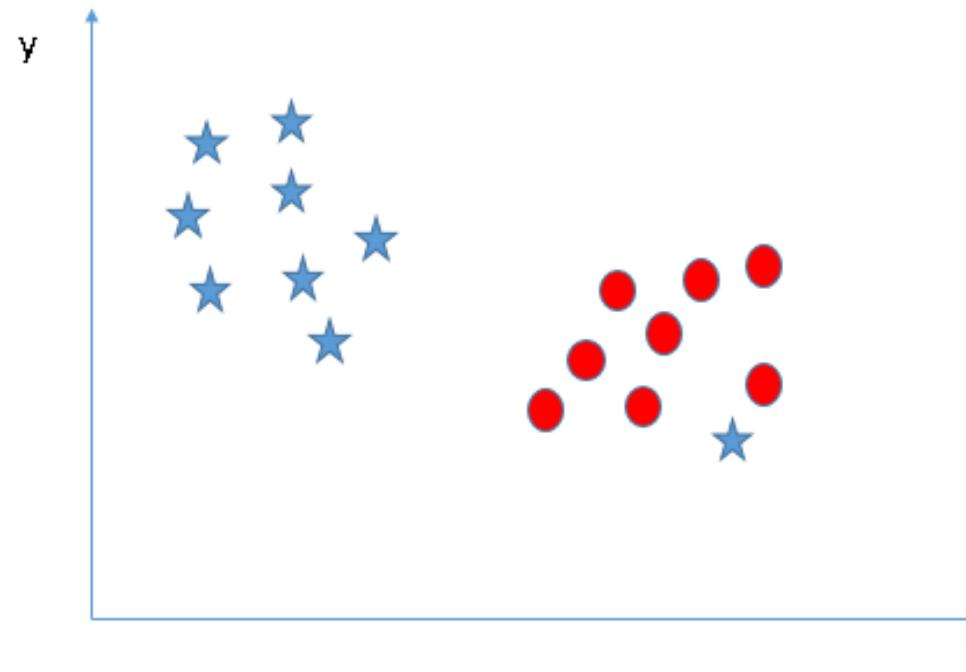


Support Vector Machine (Concept)

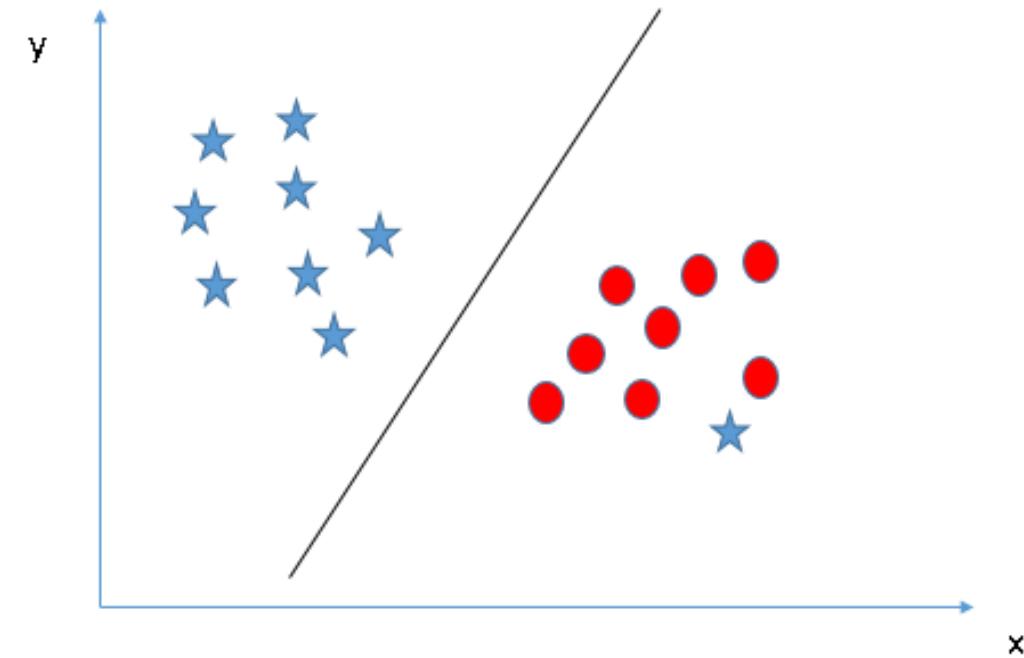


Scenario 3

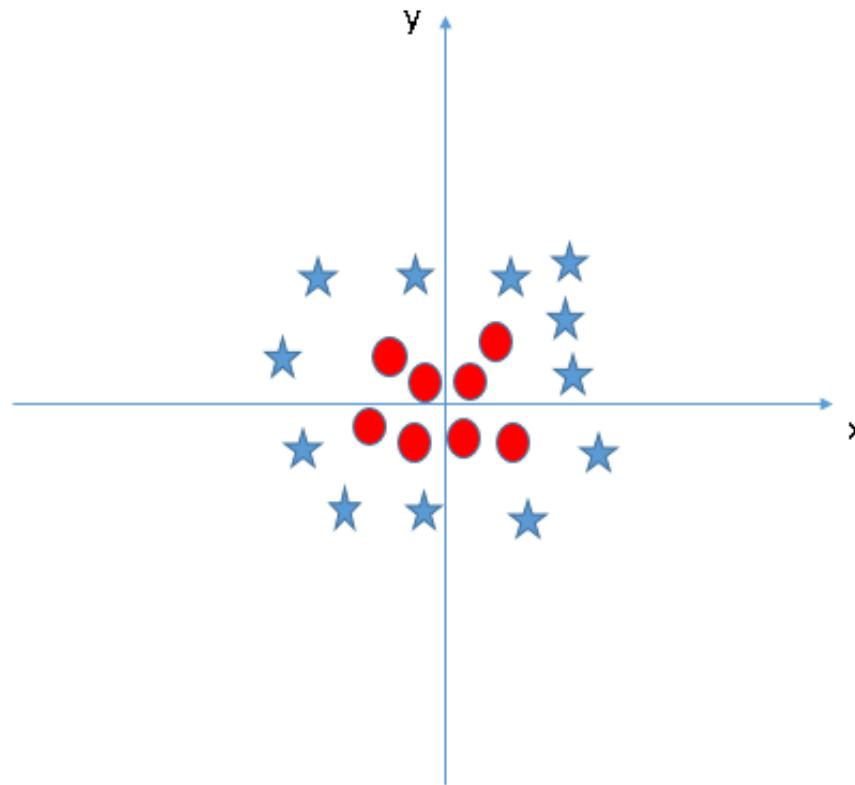
Support Vector Machine (Concept)



Scenario 4

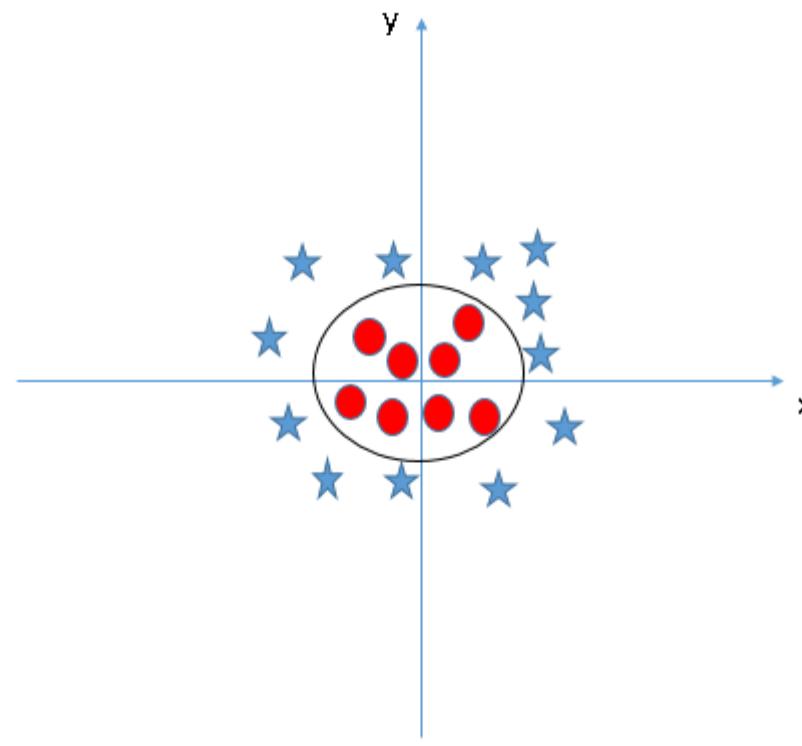
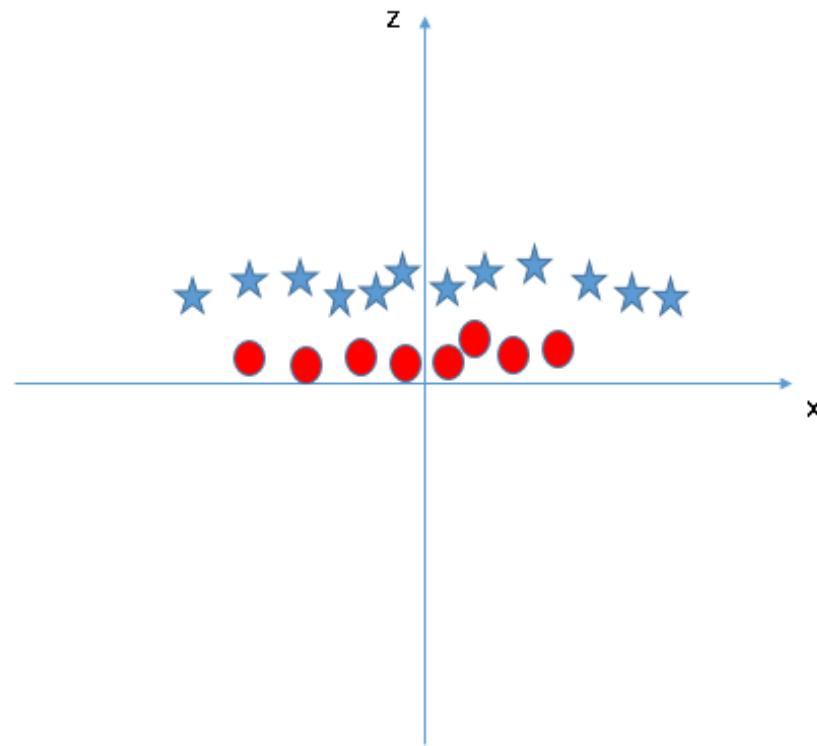


Support Vector Machine (Concept)



Scenario 5

Support Vector Machine (Concept)

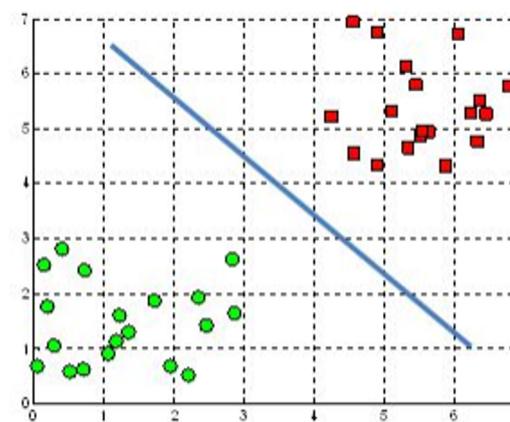


Scenario 6

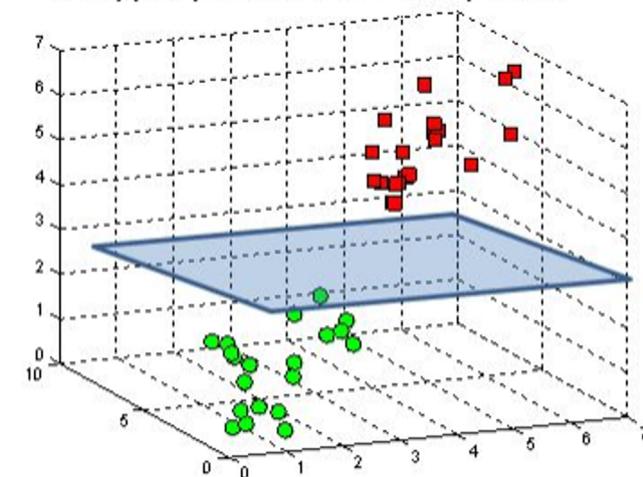
Support Vector Machine (Concept)

- What is Decision Surface?
- Hyperplane is a linear decision surface that splits the space into two parts
- Hyperplane is a binary classifier

A hyperplane in \mathbb{R}^2 is a line



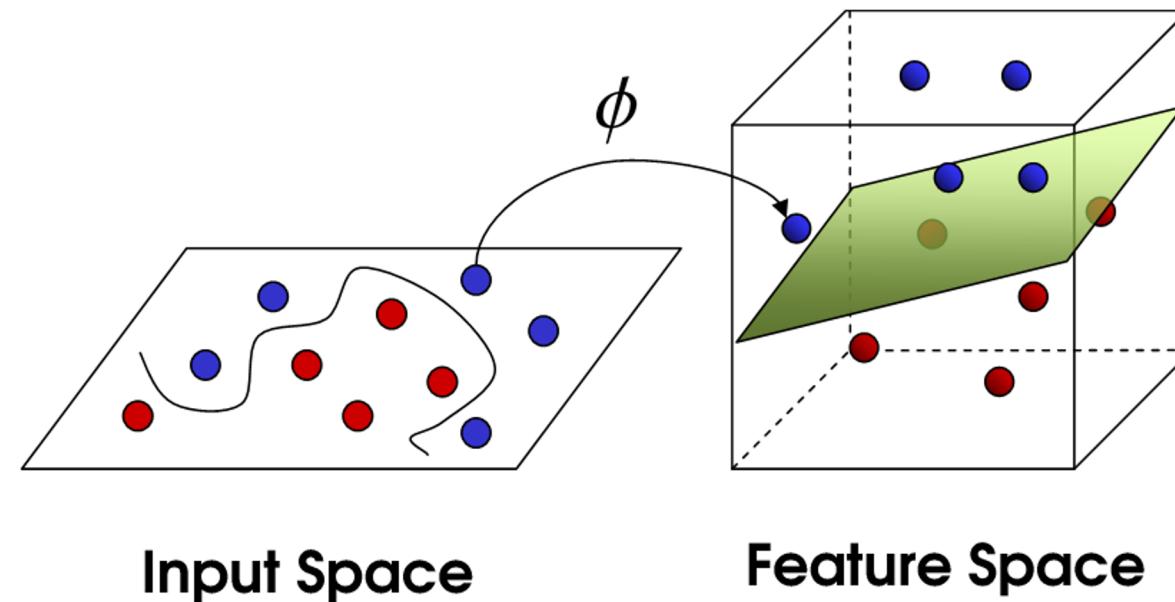
A hyperplane in \mathbb{R}^3 is a plane



A hyperplane in \mathbb{R}^n is an $n-1$ dimensional subspace

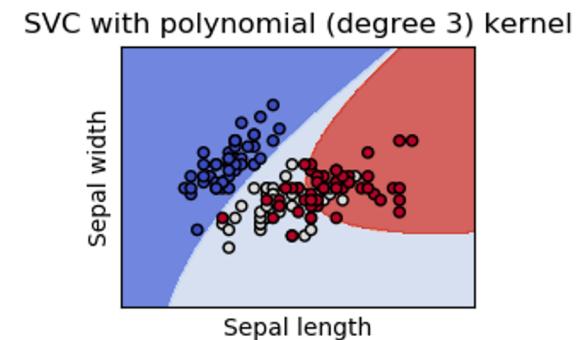
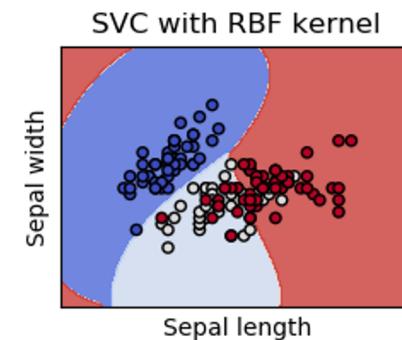
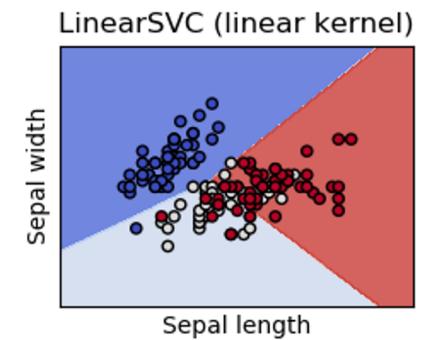
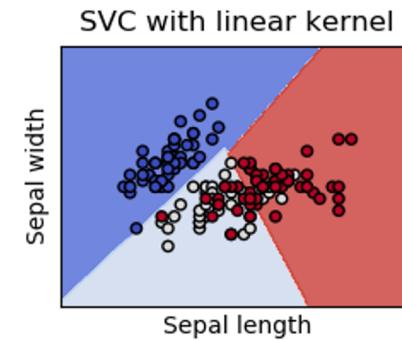
Support Vector Machine (Concept)

- Sometimes our data is linearly separable, But sometimes it is not!



Support Vector Machine (Concept)

- What is SVM Kernel?
- Kernel: Mapping function that transforms a given space into some other (usually very high dimensional space)
- They can provide both linear and nonlinear model



Thanks!