



Start-Tech Academy

# Support Vector Machines

## What

Support vector machine (SVM) is an extension of the support vector classifier which uses **Kernels** to create non linear boundaries

### Kernels

Some functional relationship between two observations.  
Some popular kernels

1. Linear
2. Polynomial
3. Radial



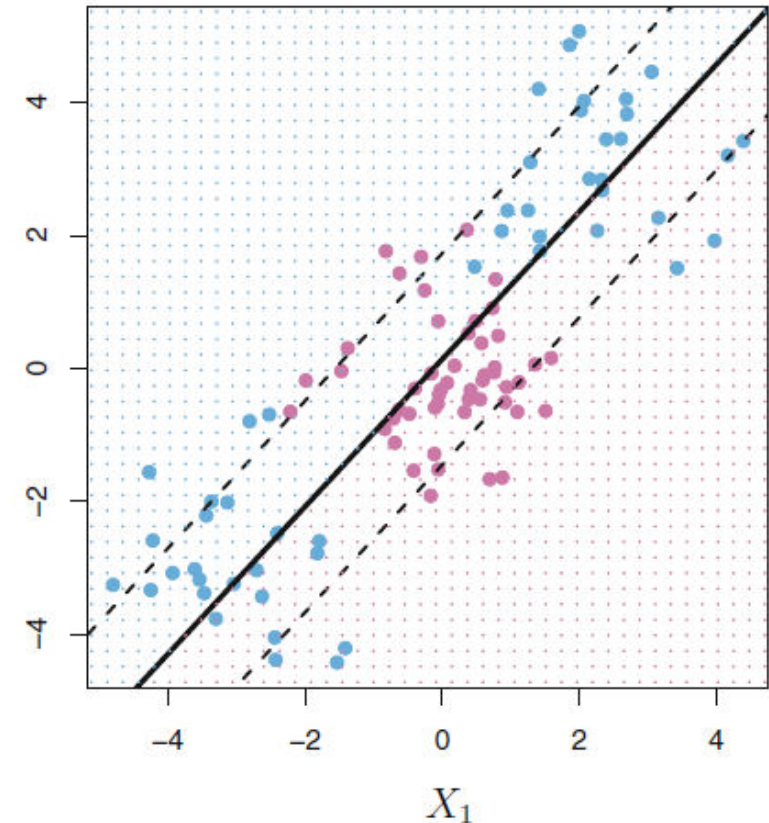
# Support Vector Machines

## Linear Kernel

Linear kernel takes inner product of two observations

$$K(x_i, x_{i'}) = \sum_{j=1}^p x_{ij} x_{i'j}$$

This kernel effectively is a support vector classifier

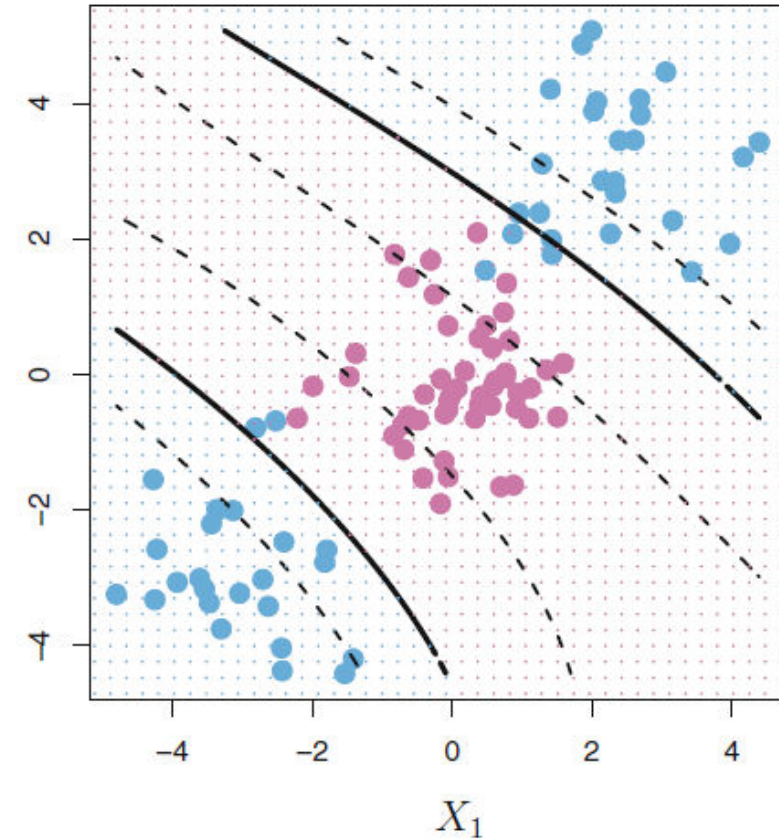


# Support Vector Machines

## Polynomial Kernel

Polynomial kernel uses power function to create non linear boundaries

$$K(x_i, x_{i'}) = \left(1 + \sum_{j=1}^p x_{ij} x_{i'j}\right)^d$$



# Support Vector Machines

## Radial Kernel

Radial kernel uses radial function to create radial boundaries

$$K(x_i, x_{i'}) = \exp\left(-\gamma \sum_{j=1}^p (x_{ij} - x_{i'j})^2\right)$$

$\gamma$  is a positive constant

Gamma defines how much influence a single training example has. The larger gamma is, the closer other examples must be to be affected.

<https://cs.stanford.edu/~karpathy/svmjs/demo/>

