

# Lab 3: Support Vector Machines

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## 1 Implementation of SVM :

### 1.1 Problem Statement

In this lab we implemented the Support Vector Machine using the CVOXPT package generating our own dataset. Three varieties of data - Linear separable data, Linear separable but overlapping and Circular separated dataset, were generated and three different kernels, Linear Kernel, Gaussian Kernel and Polynomial kernel, were used for our purpose.

## 2 Data generation and Train/Test set:

For this lab we need to generate three different datasets as above told. For each variety we generated points for two classes '+1' and '-1' each is having 100 points. Linear separable data is generated using the function *lin\_seperable\_data()*. Overlapped Linear separable data is generated using function *lin seperable overlap data()*. Circle separated data is generated in the function *circular\_data()*. Data is splitted into the training set and Test-set in the function *split\_train\_test()* and for each dataset 180 points are taken in the training set and rest 20 are taken for the test-set.

## 3 Observation and plots

All the following observations are taken on the width i.e.,  $s = 5$  and power i.e.,  $q = 3$ .

- For linearly Separable Data :

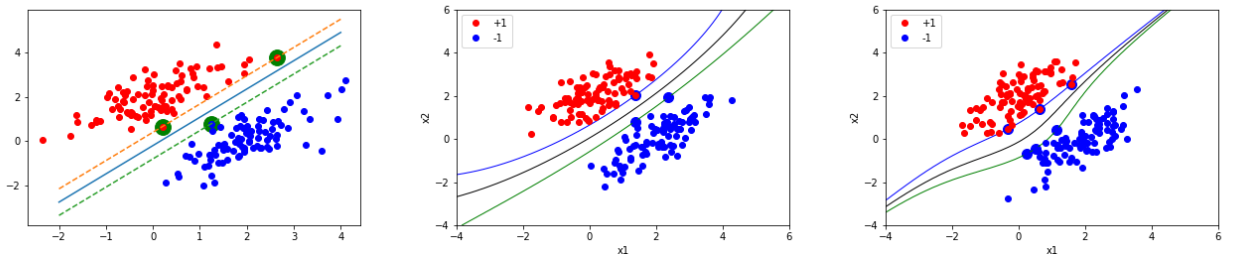


Fig 1:LinearKernel

Fig 2:PolynomialKernel

Fig 3:GaussianKernel

– Accuracy Observed

- \* Linear Kernel: 100%
- \* Polynomial Kernel: 100%
- \* Gaussian Kernel: 100%

• For Overlapped linearly Separable Data :

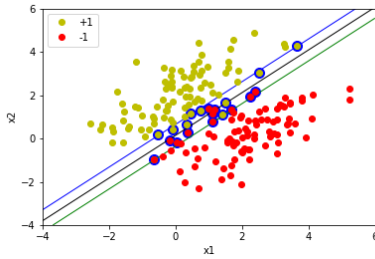


Fig 1:LinearKernel

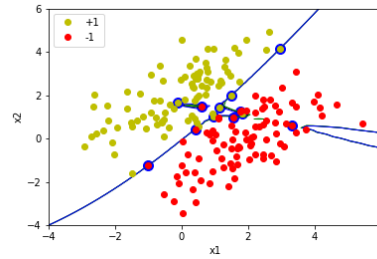


Fig 2:PolynomialKernel

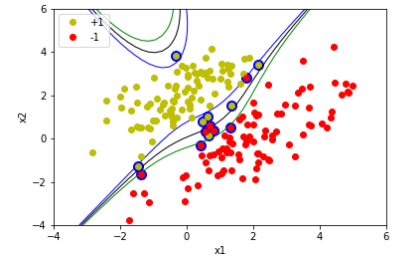


Fig 3:GaussianKernel

– Accuracy Observed

- \* Linear Kernel: 100%
- \* Polynomial Kernel: 100%
- \* Gaussian Kernel: 95%

• For Circle Separable Data :

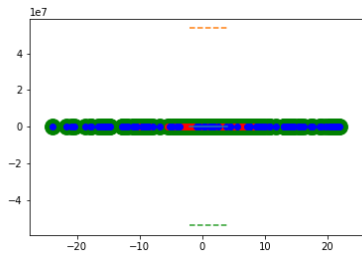


Fig 1:LinearKernel

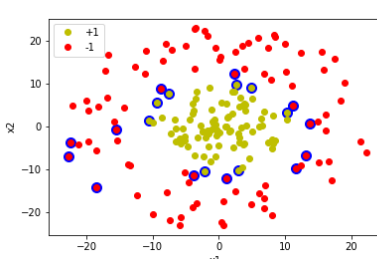


Fig 2:PolynomialKernel

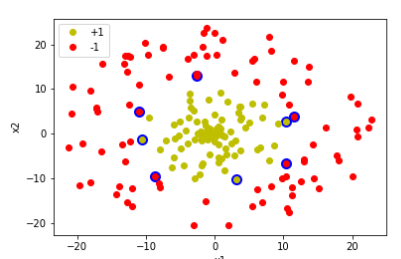


Fig 3:GaussianKernel

– Accuracy Observed

- \* Linear Kernel: 50%
- \* Polynomial Kernel: 100%
- \* Gaussian Kernel: 80%