

Pattern Recognition and Machine Learning

Lab - 11 Assignment Report

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Question 1.

Pre-Processed the dataset by handling missing values and normalizing the data. Split in the ratio 70:20:10 for train-test-validation.

Applied Dimensionality reduction on dataset using PCA($n_components=2$).

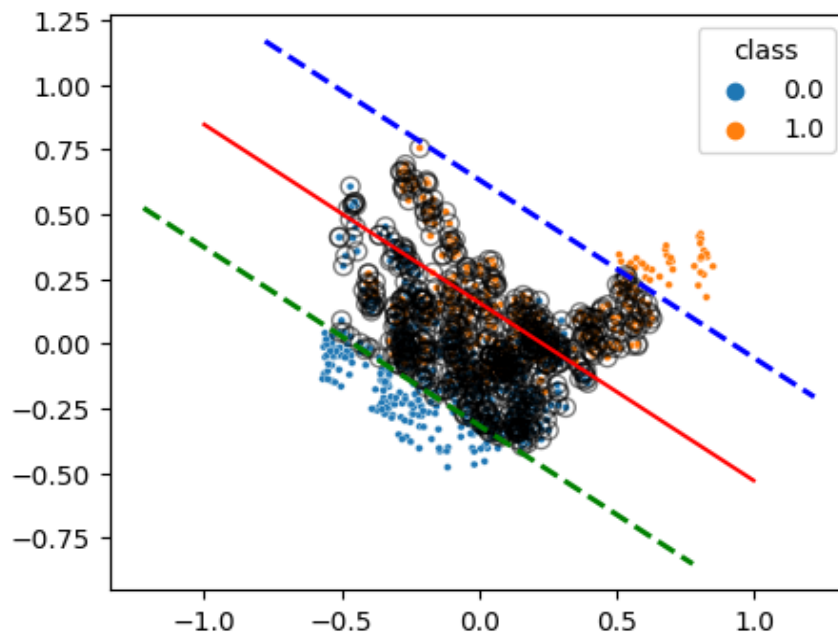
Question 2.

Trained an SVM classifier using Sklearn library. Analyzed the performance (classification accuracy) for different values of 'C'.

For C = 0.03125:

Accuracy: 0.6626506024096386

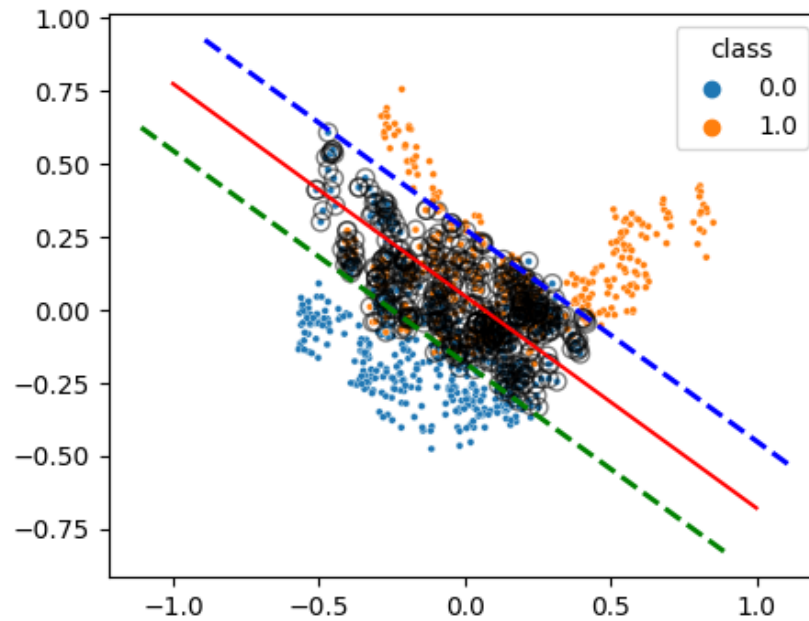
Decision Boundary:



For C = 0.5:

Accuracy: 0.7710843373493976

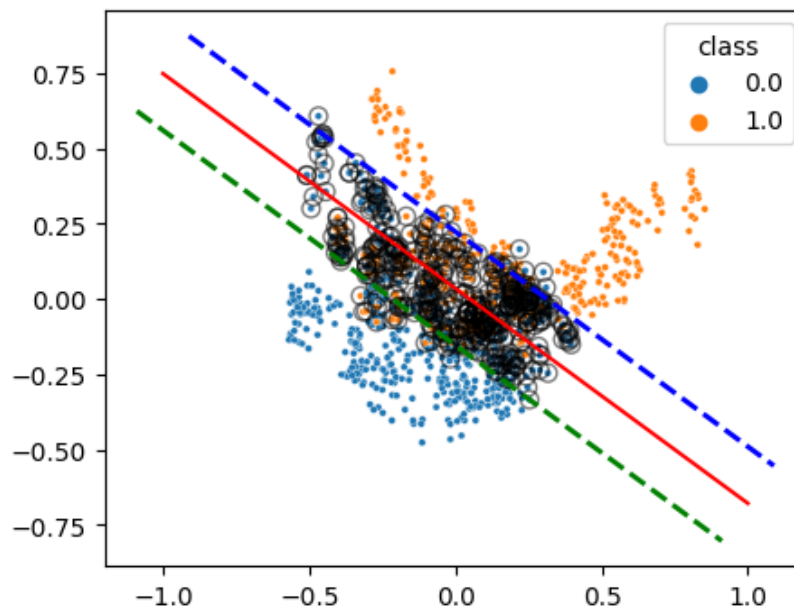
Decision Boundary:



For C = 8:

Accuracy: 0.7590361445783133

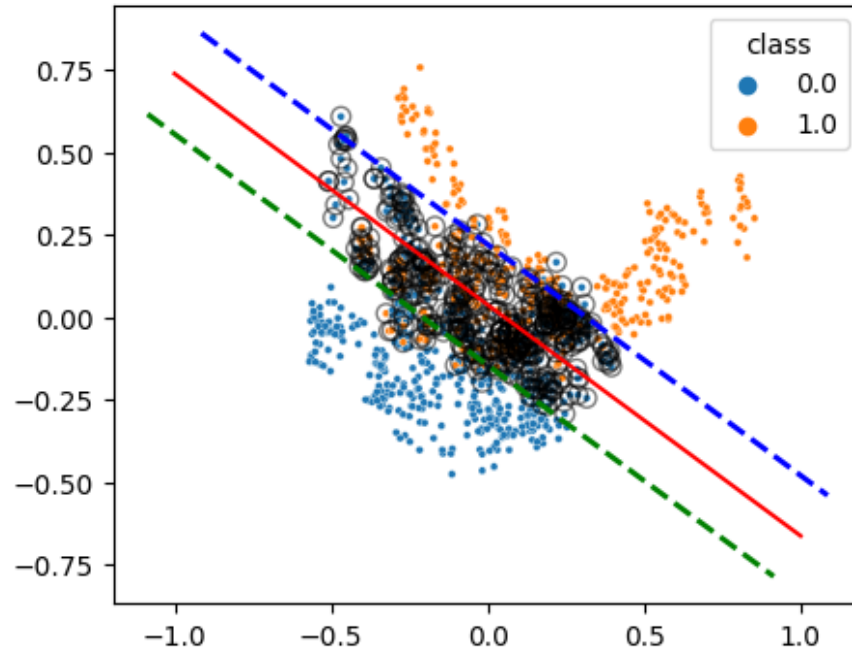
Decision Boundary:



For C = 128:

Accuracy: 0.7590361445783133

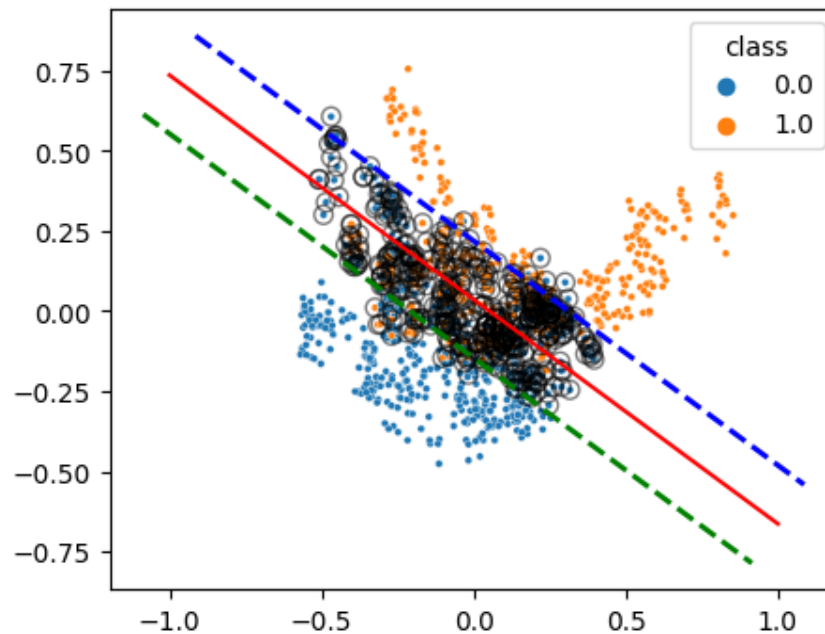
Decision Boundary:



For C = 32768:

Accuracy: 0.7590361445783133

Decision Boundary:



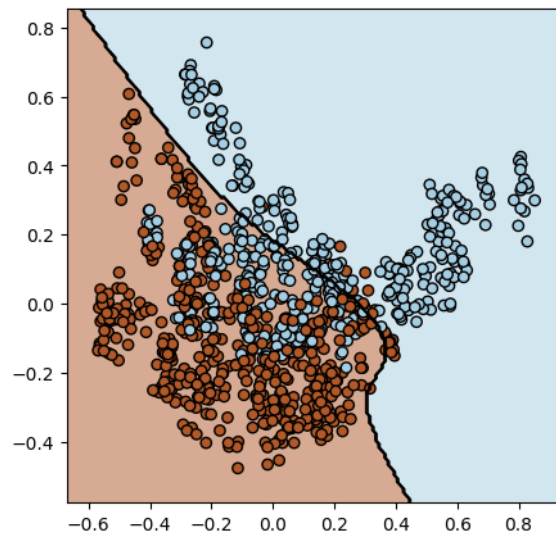
Question 3.

Used various types of kernels(RBF, Linear, Quadratic etc) and trained the SVM model using the Sklearn library. Plotted the decision boundary for different svm models trained.

For Kernel = 'Poly':

Accuracy: 0.6626506024096386

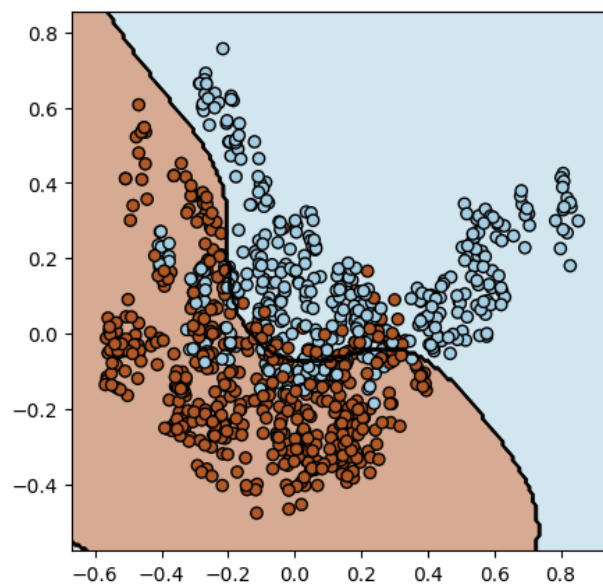
Decision Boundary:



For Kernel = 'rbf':

Accuracy: 0.8674698795180723

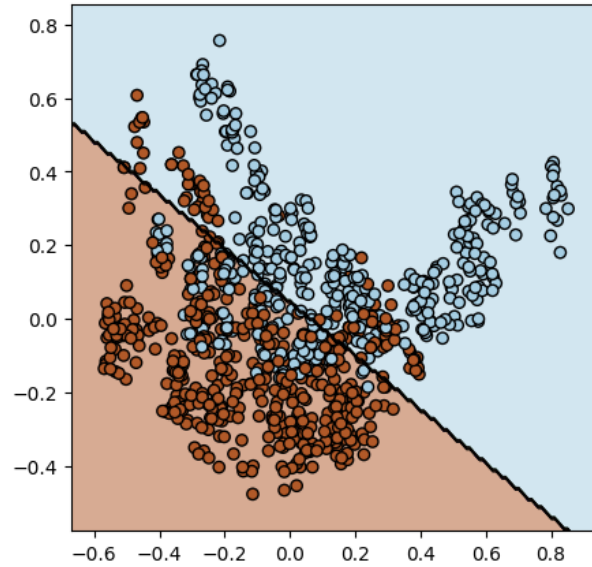
Decision Boundary:



For Kernel = 'linear':

Accuracy: 0.7710843373493976

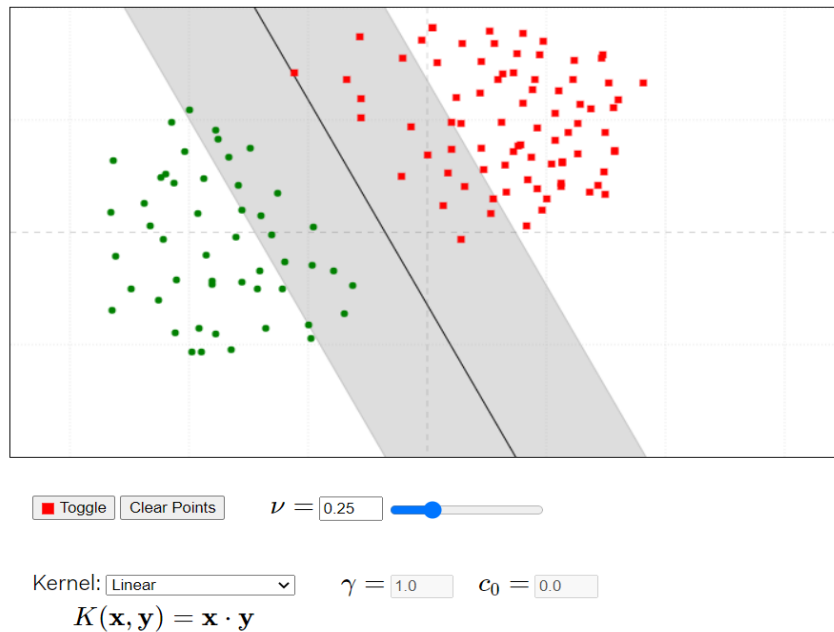
Decision Boundary:



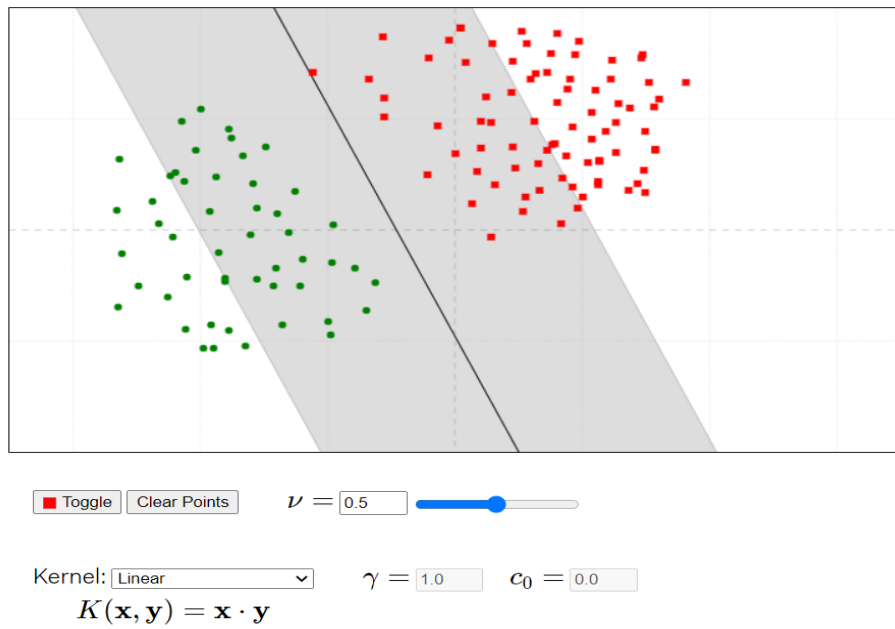
Question 4.

Varying values of ν and linear kernel:

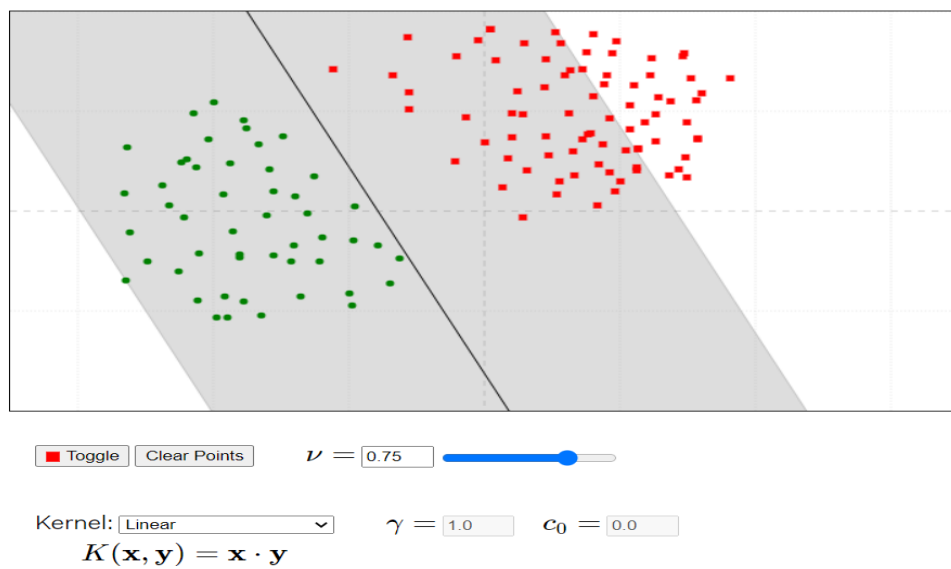
For $\nu = 0.25$:



For $\nu = 0.5$:

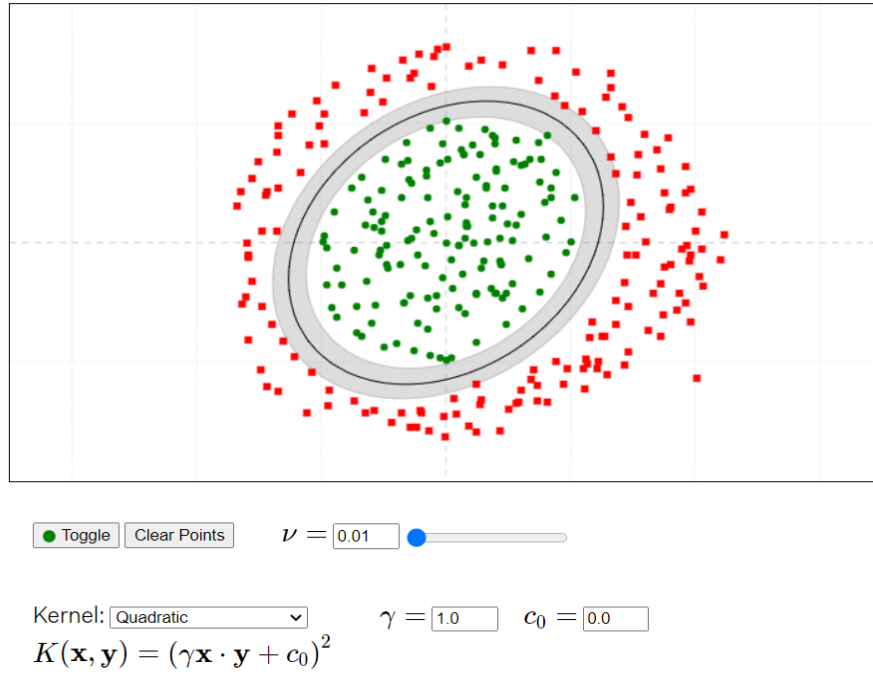


For $\nu = 0.75$:

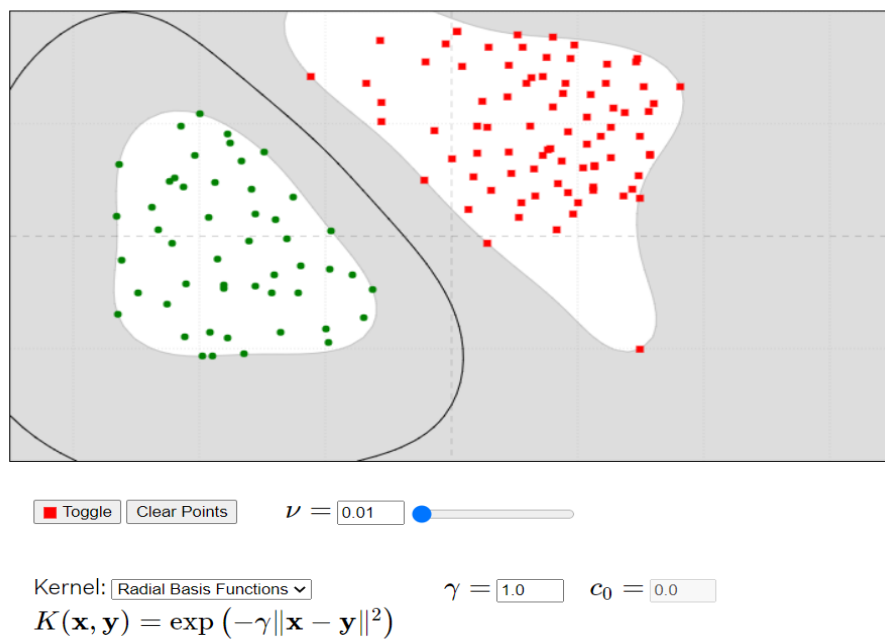


Varying Kernels:

Quadratic Kernel:

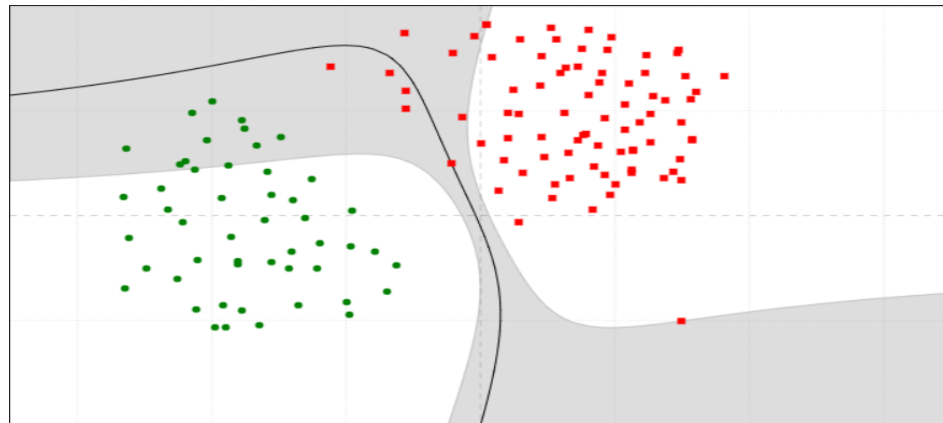


Radial Basis Function Kernel:



Sigmoid Kernel:

Note: you may have to **disable your adblocker** for this demo to work.



☐ Toggle

$\nu = 0.16$



Kernel:

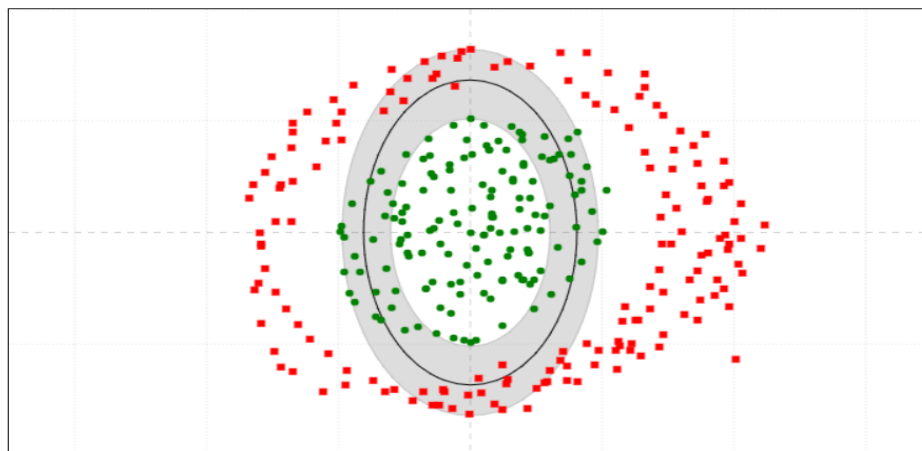
$\gamma = 1.0$

$c_0 = 0.0$

$$K(\mathbf{x}, \mathbf{y}) = \tanh(\gamma \mathbf{x} \cdot \mathbf{y} + c_0)$$

Varying values of γ and Quadratic kernel:

For $\gamma = 0.001$:



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$\nu = 0.01$



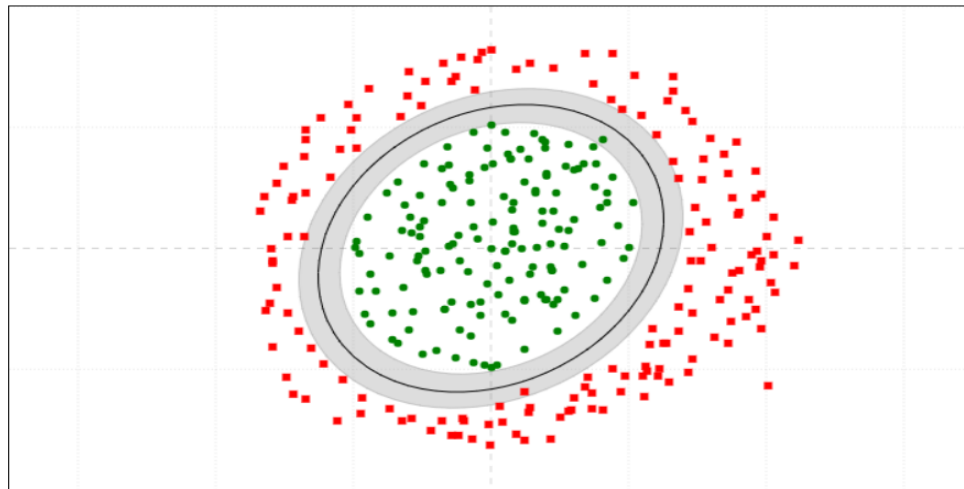
Kernel:

$\gamma = 0.001$

$c_0 = 0.0$

$$K(\mathbf{x}, \mathbf{y}) = (\gamma \mathbf{x} \cdot \mathbf{y} + c_0)^2$$

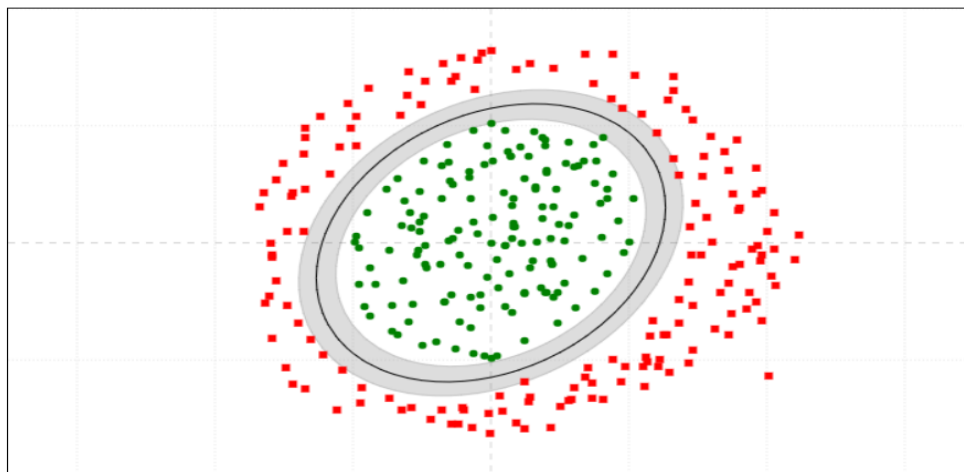
For $\gamma = 0.1$:



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Kernel: $\gamma =$ $c_0 =$
 $K(\mathbf{x}, \mathbf{y}) = (\gamma \mathbf{x} \cdot \mathbf{y} + c_0)^2$

For $\gamma = 0.5$:

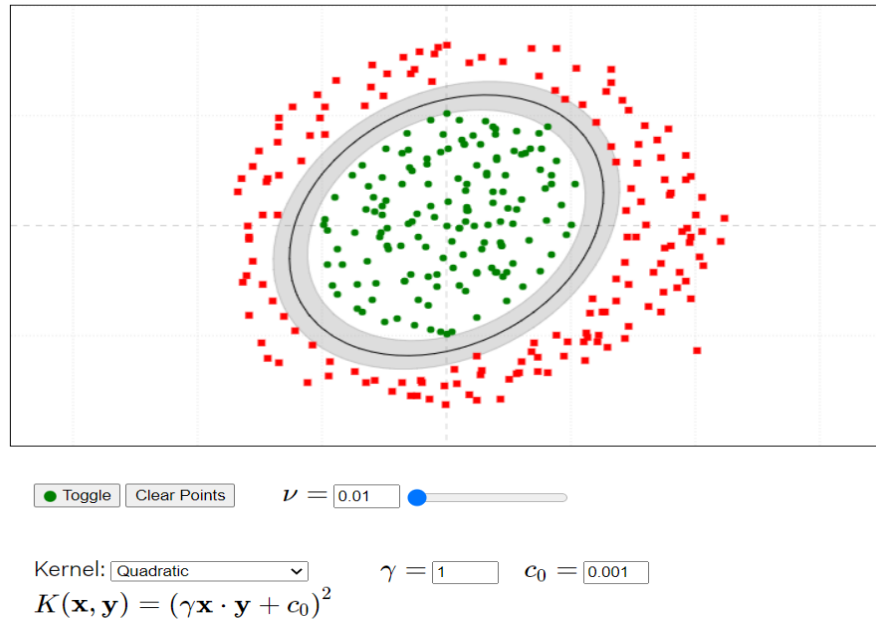


☐ Toggle $\nu =$

Kernel: $\gamma =$ $c_0 =$
 $K(\mathbf{x}, \mathbf{y}) = (\gamma \mathbf{x} \cdot \mathbf{y} + c_0)^2$

Varying values of C0 and Quadratic kernel:

For $C_0 = 0.001$:



For $C_0 = 1$:

