

Lab Assignment 10 – Support Vector Machines

Build different **Support Vector Machines Classifiers** using **Sklearn** for classifying hand written digits in MNIST dataset. Do a comparative study of the SVM with other classification models.

Steps

1. **Dataset:** Download MNIST the dataset (using keras package). The dataset contains 70000 grayscale images and 10 classes.
2. **Preprocessing:**
 - Flatten the image matrices into 1D vector
 - Normalize the pixel values into 0 to 1 range
3. **SVM Classification:** Build SVM model from Sklearn with default parameters. Use the LinearSVM as well as SVC models from the Sklearn package for implementation. Predict the labels in the testing set. Apply classification metrics such as accuracy, confusion matrix, precision, recall, f-measure, ROC Curve etc. Visualize the classification metrics as graphs.
4. **Comparative Study:** Compare the SVM models with 7 classification models such as Perceptron, Logistic Regression, Decision Tree Classification, Random Forest Classification, Adaboost Classification, Gradient Boost Classification and Neural Network (from keras). Plot the bar graphs of precision, recall, f-measure and accuracy. Plot the confusion matrix of models individually. Plot the ROC curves of different models in same line graph.
5. **Playing with SVM Models:** Change the hyper parameters of the SVM classification models and improve their accuracy on testing set. Play with hyperparameters such as kernel function, C, gamma value of rbf kernel. Check the model accuracy for the testing data for each setup.

Suggested Packages: Numpy, Pandas, Sklearn and Keras