Faculty of Computers and Artificial Intelligence

Computer Science Department

2021/2022

CS 395 Selected Topics in CS-1

Research Project

Report Submitted for Fulfillment of the Requirements and ILO's for Selected Topics in CS-1 course for Fall 2021

Team No. 59

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I. NUMERICAL DATASET

1. Project Introduction

a. Dataset Name

(Human Activity Recognition with Smartphones)

b. Number of classes and their labels

(6
WALKING, WALKING*UPSTAIRS, WALKING*DOWNSTAIRS, SITTING, STANDING, LAYING)

c. Dataset Samples Numbers

(10299 rows 564 columns)

d. Training, Validation and Testing

(8239 2060 2060)

2. Implementation Details

a. Extracted Features

(561 features were extracted for each x, y and z
their names: mean, Standard deviation, median, max, min, energy, simple moving average ,iqr, entropy, arcoeff, correlation,

the dimension of resulted features)

b. Cross-validation

With CV = 10

[0.97281553 0.94174757 0.89320388 0.96990291 0.97378641 0.98543689 0.96893204 0.97184466 0.95631068 0.97667638]

c. Artificial Neural Network (ANN)

- **Hyper-parameters**
- optimizer is “adam”
- batch size=64
- epochs=10
- kernel initializer is 'normal'
- loss is sparse categorical cross entropy
- metrics is accuracy
- validation split is 0.2
- verbose is 1

Support Vector Machine (SVM)

- **Hyper-parameters**

C-parameter is 0.1

gamma=0.001

Kernel is linear

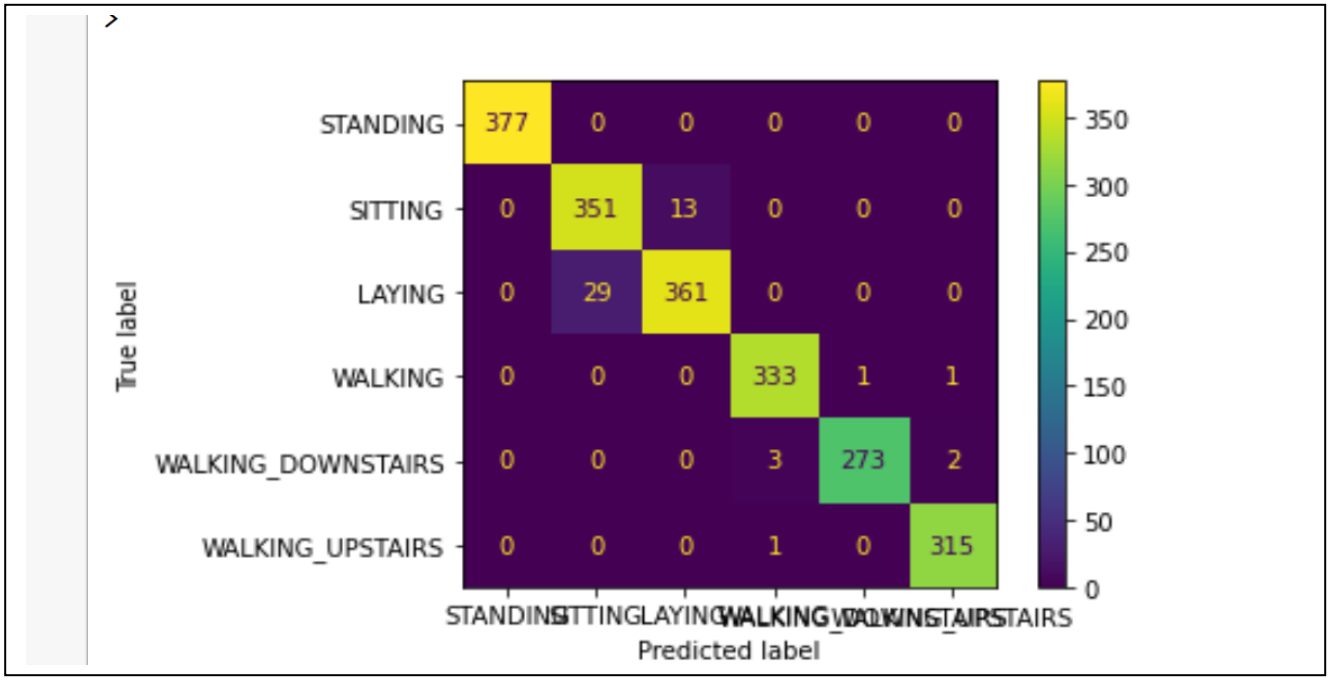
3. Models Results

For each model you should show all these results for your model on testing data (loss curve, accuracy, confusion matrix, ROC curve)

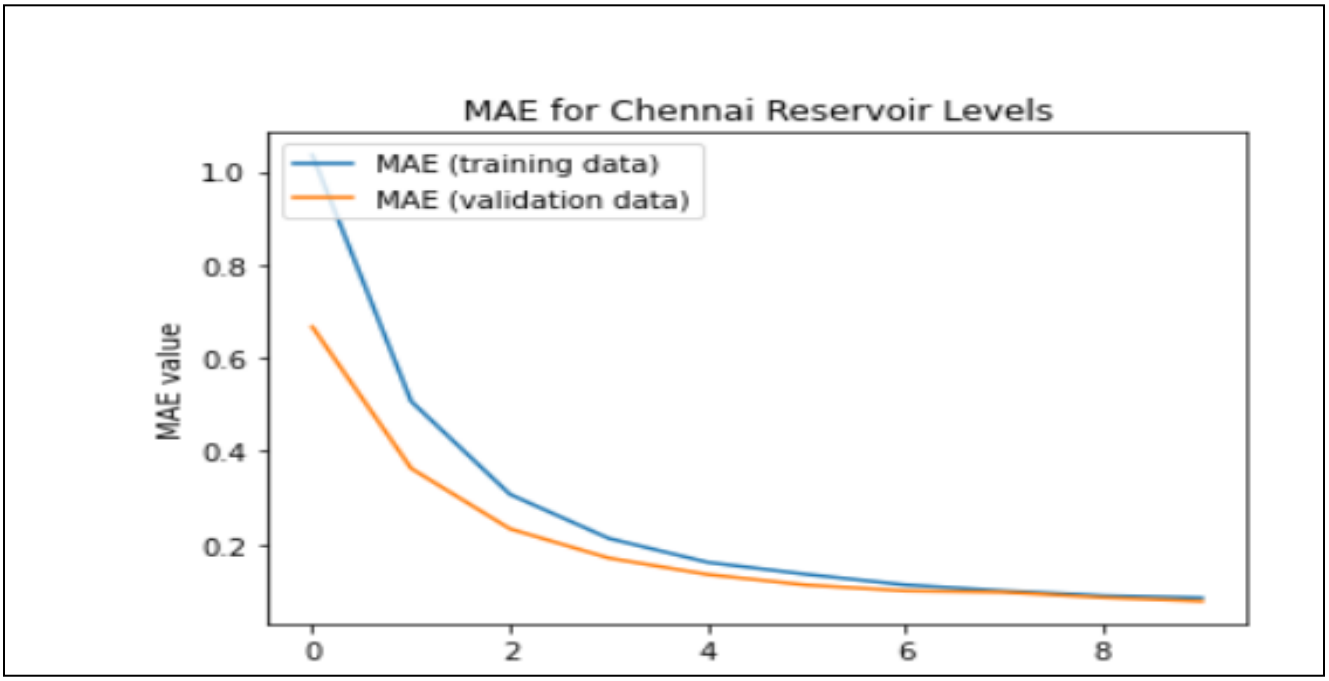
a. ANN Results

Accuracy → 98%

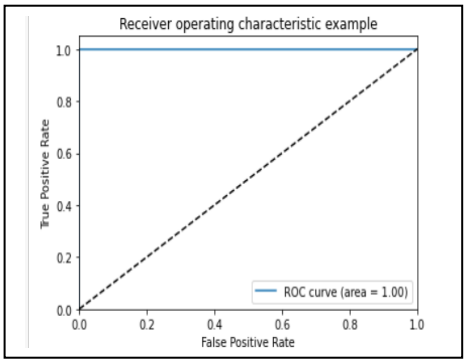
Confusion Matrix

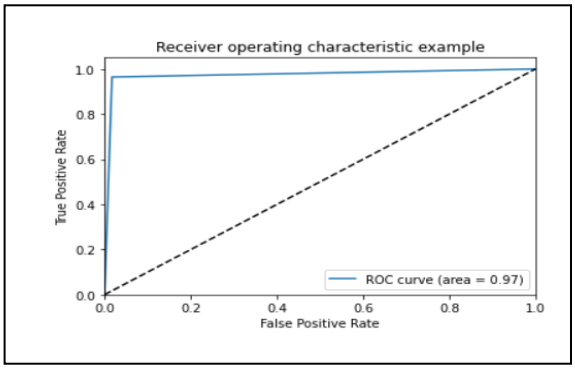


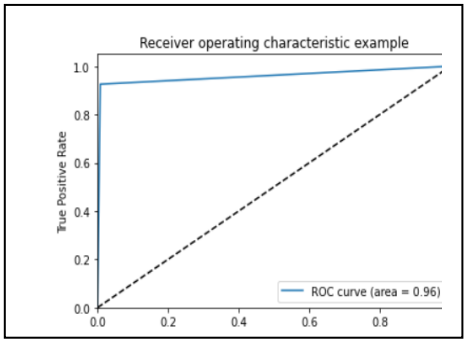
Loss Curve

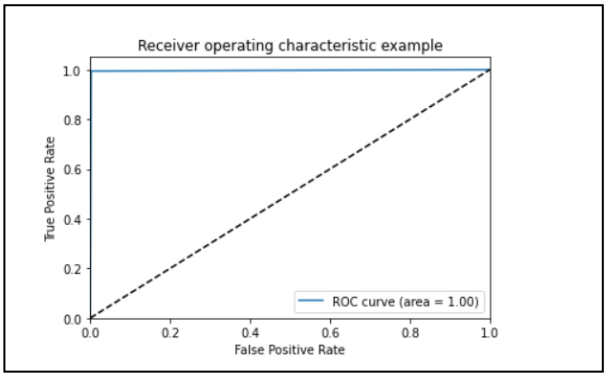


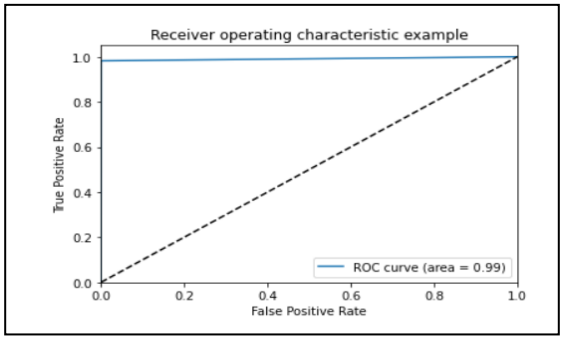
ROC Curve


Receiver operating characteristic example
True Positive Rate
False Positive Rate
ROC curve (area = 1.00)


Receiver operating characteristic example
True Positive Rate
False Positive Rate
ROC curve (area = 0.97)

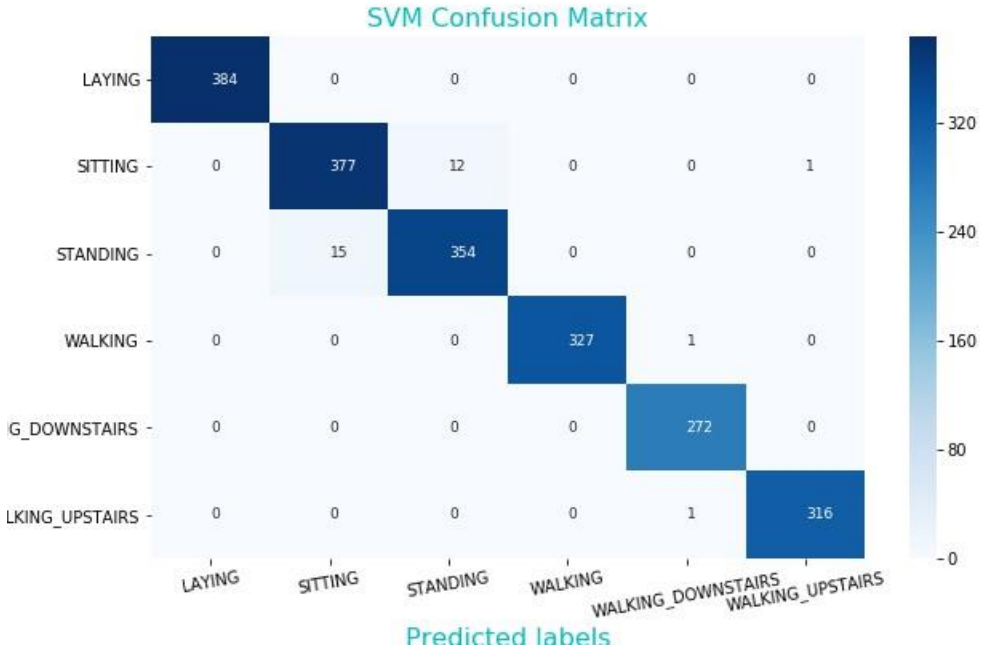

Receiver operating characteristic example
True Positive Rate
ROC curve (area = 0.96)


Receiver operating characteristic example
True Positive Rate
False Positive Rate
ROC curve (area = 1.00)

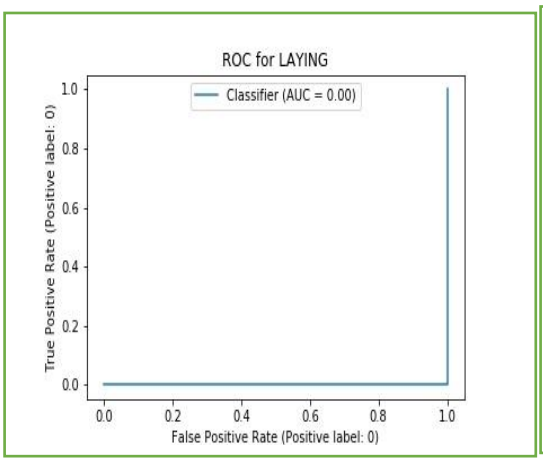

Receiver operating characteristic example
True Positive Rate
False Positive Rate
ROC curve (area = 0.99)

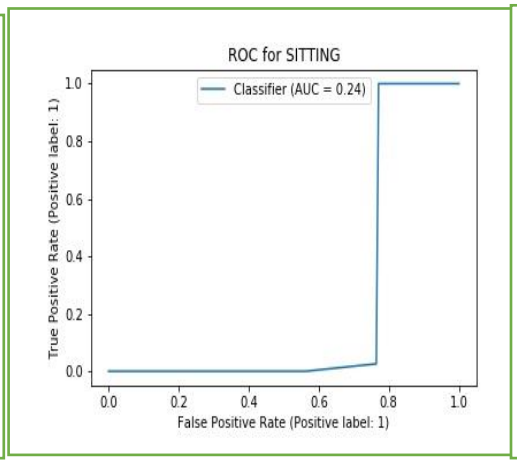
b.SVM Results

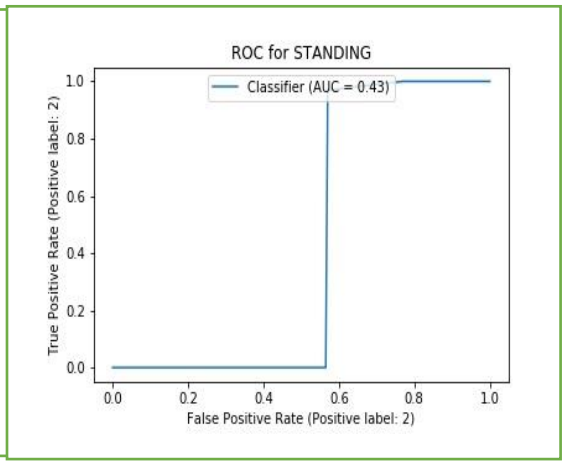
Confusion Matrix

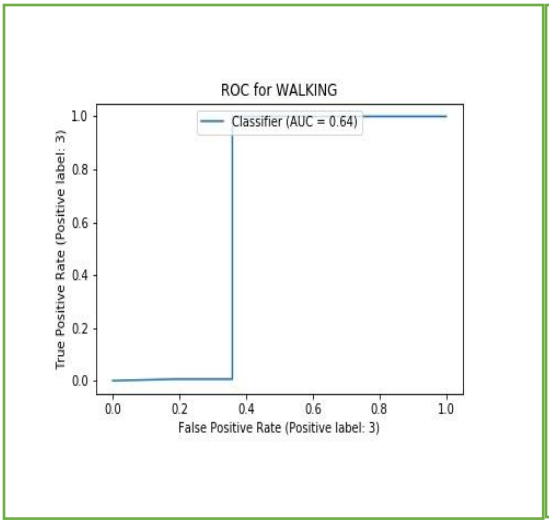


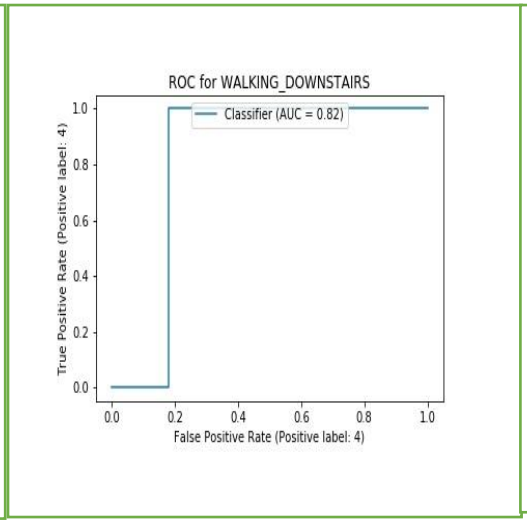
ROC :

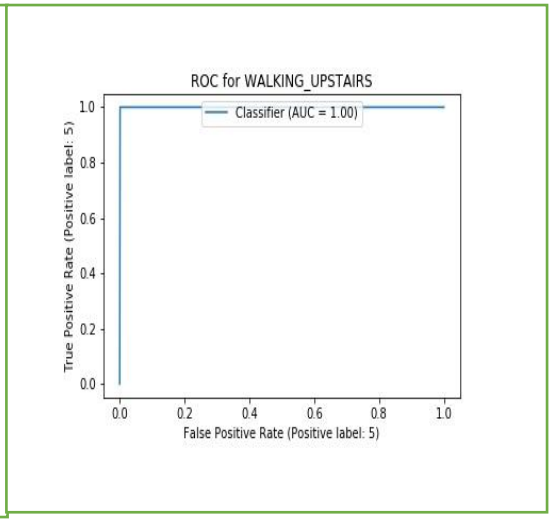




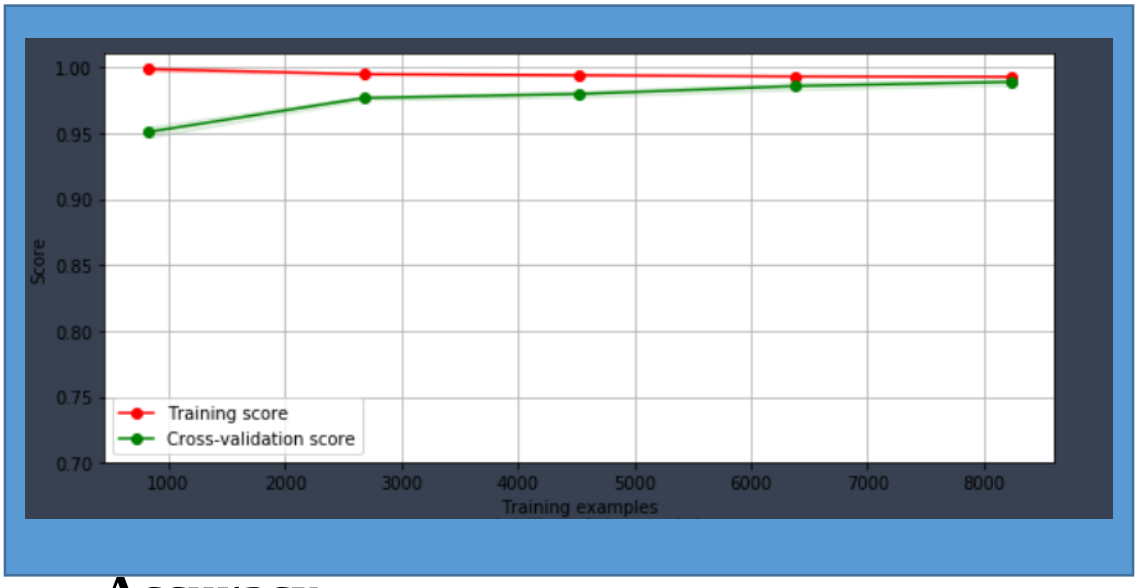








Learning Curve:



Accuracy

99%

II. IMAGE DATASET

1. Project Introduction

a. Dataset Name

Fashion MINST

b. Number of classes and their labels

Number of Classes 10

0-T-shirt/top
1- Trouser
2- Pullover
3- Dress
4- Coat
5-Sandal
6-Shirt
7-Sneaker
8-Bag
9Ankle boot

c. Dataset Images Numbers and size

(The total number of images in dataset=70000, and it's divided for 60000 training and 10000 for testing , all classes have the same number of images)

d. Training, Validation and Testing

ANN: The number of images used in training=48000, validation=12000 and testing=10000.

SVM: The number of images used in training=60000 and testing=10000

2. Implementation Details

a. Extracted Features

N/A

b. Cross-validation

N/A

c. Artificial Neural Network (ANN)

℘ Hyper-parameters

Inintial learning rate=0.01
Optimizer=adam
batch size=32
no. of epochs=30

d. Support Vector Machine (SVM)

℘ Hyper-parameter

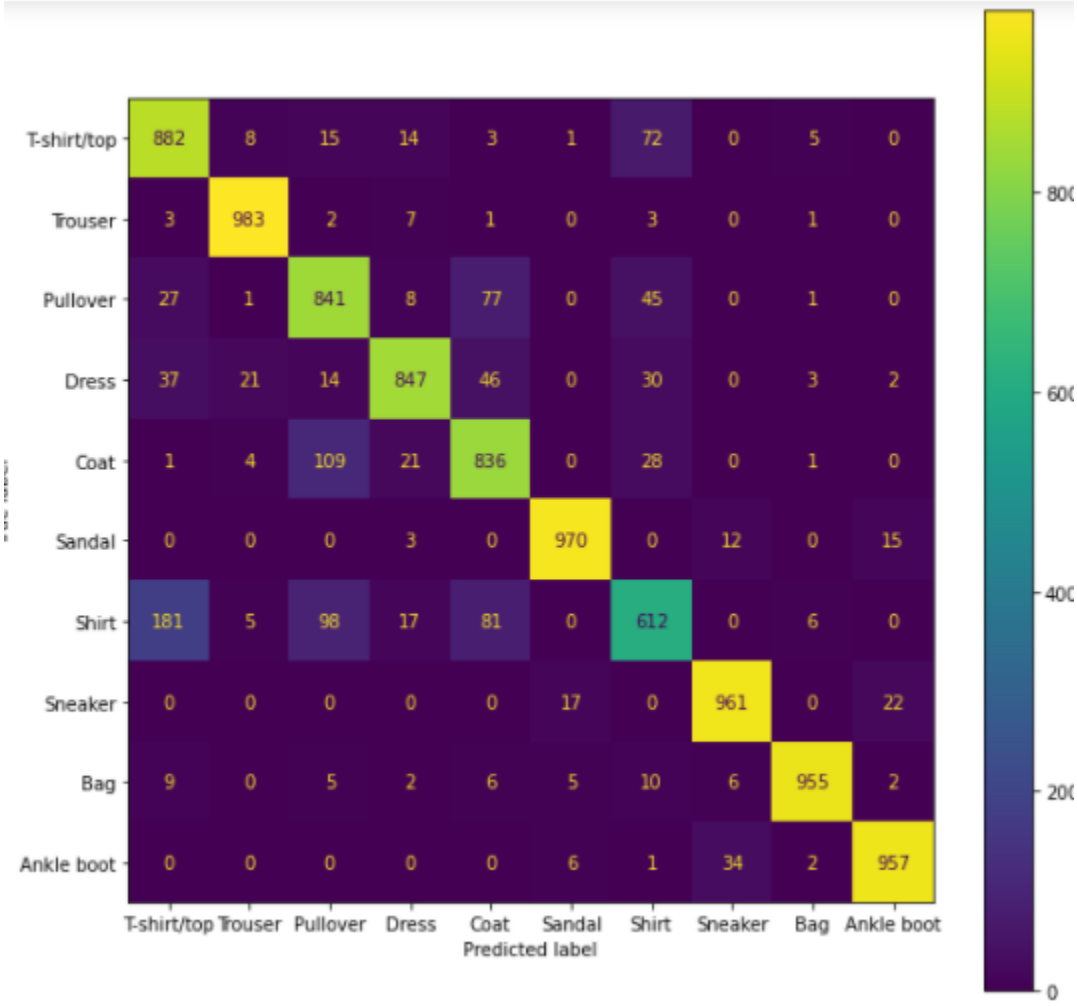
- Kernel=Linear
- Random_state=20
- Tol=1e-5
- C=1

3. Models Results

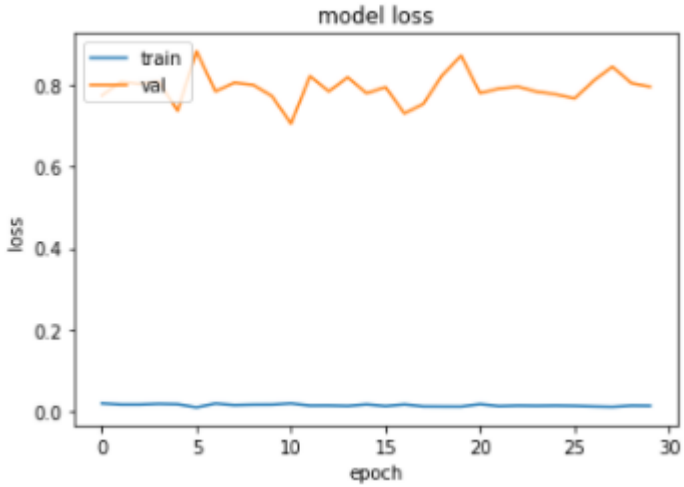
a. ANN Results

Accuracy=88.8%

Confusion Matrix

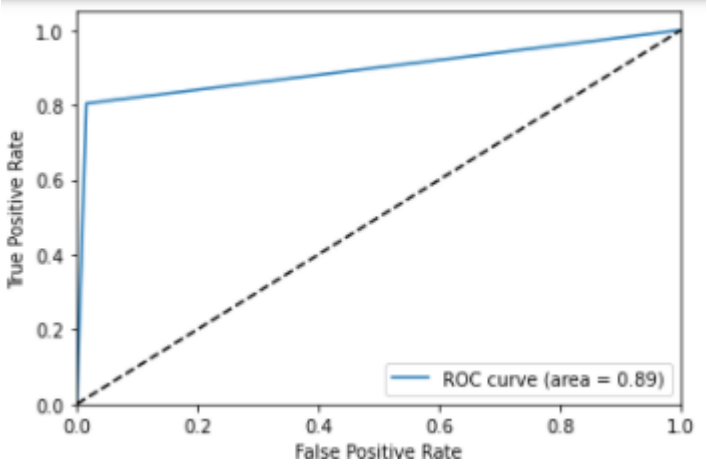


Loss Curve

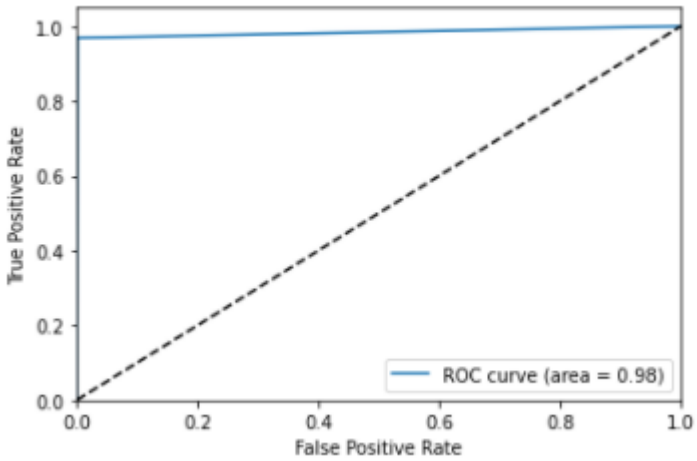


ROC

Class:0

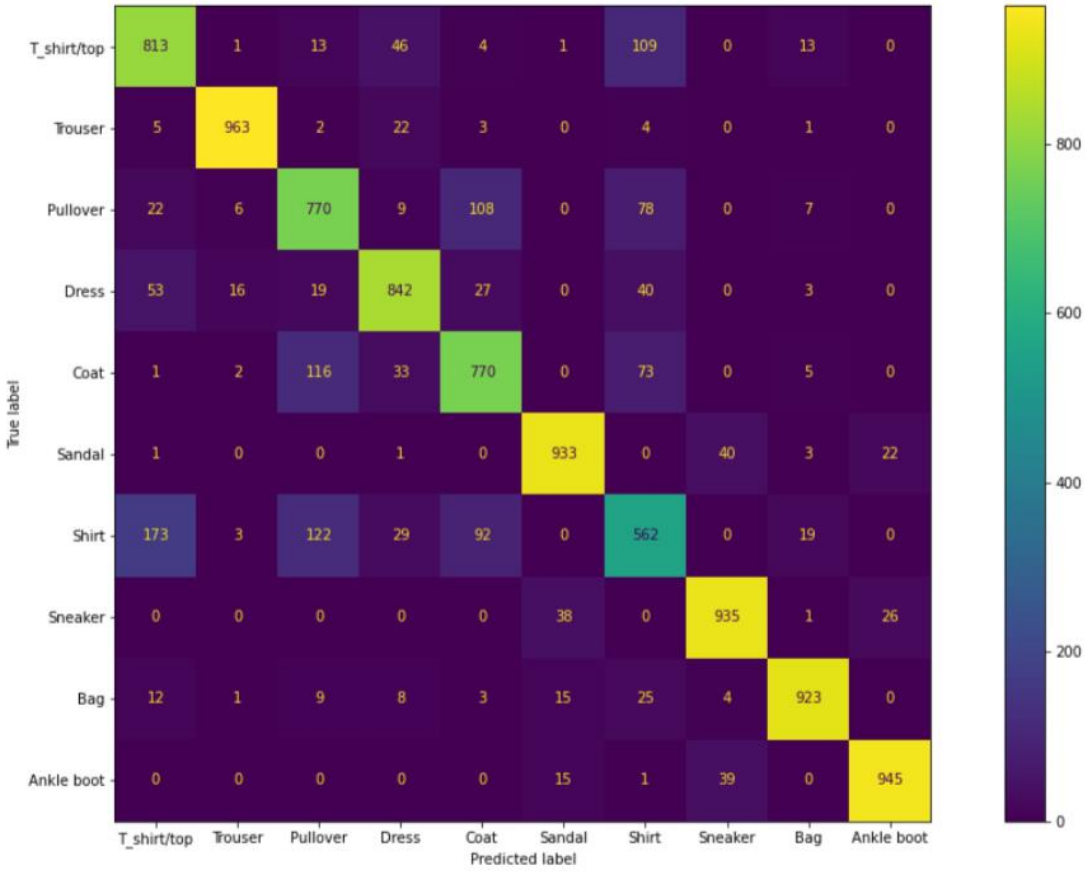


Class:1

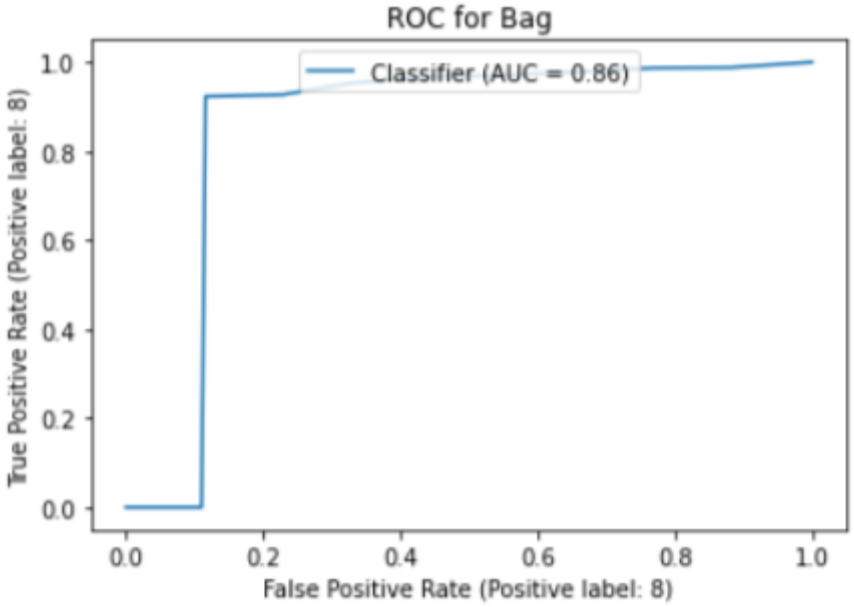


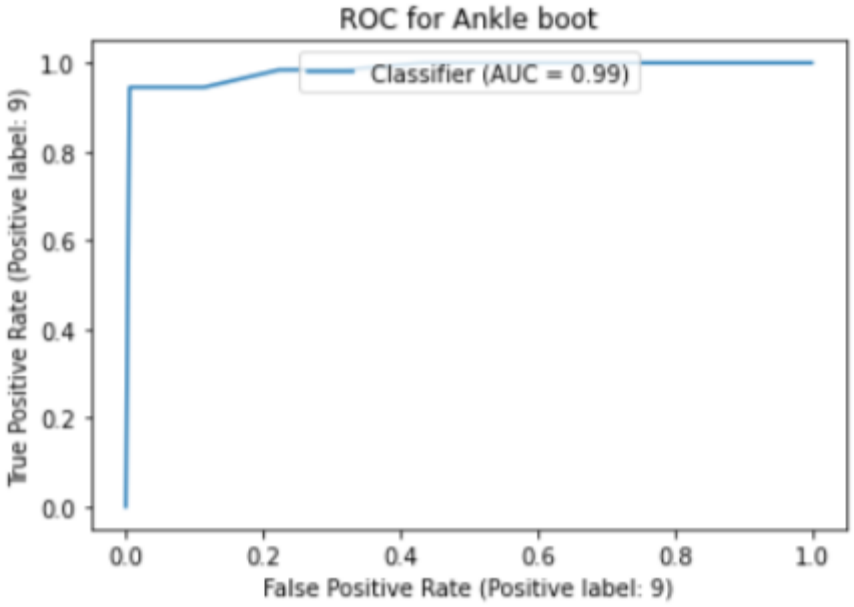
b.SVM Results

Accuracy: 84.56%
Confusion matrix:



Roc Curve:
Class 8 & 9





Learning Curve