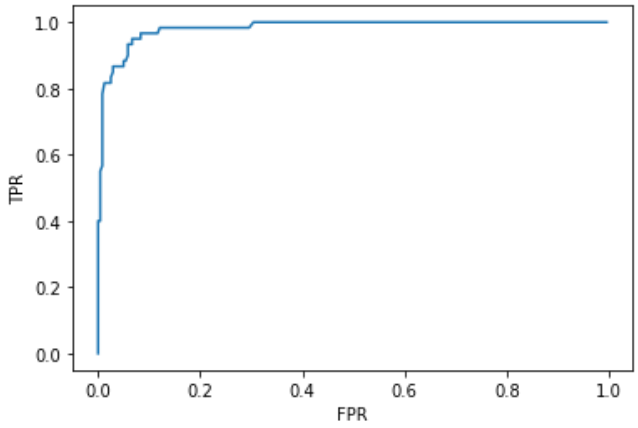
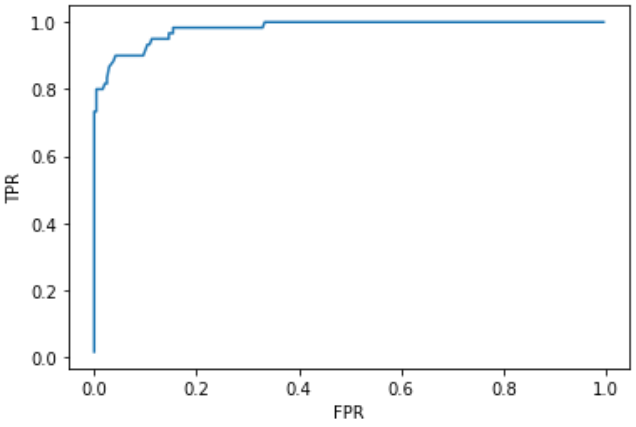
Assignment - 3 Sequential Learning

3A - Number Audio Data (HMM and DTW)

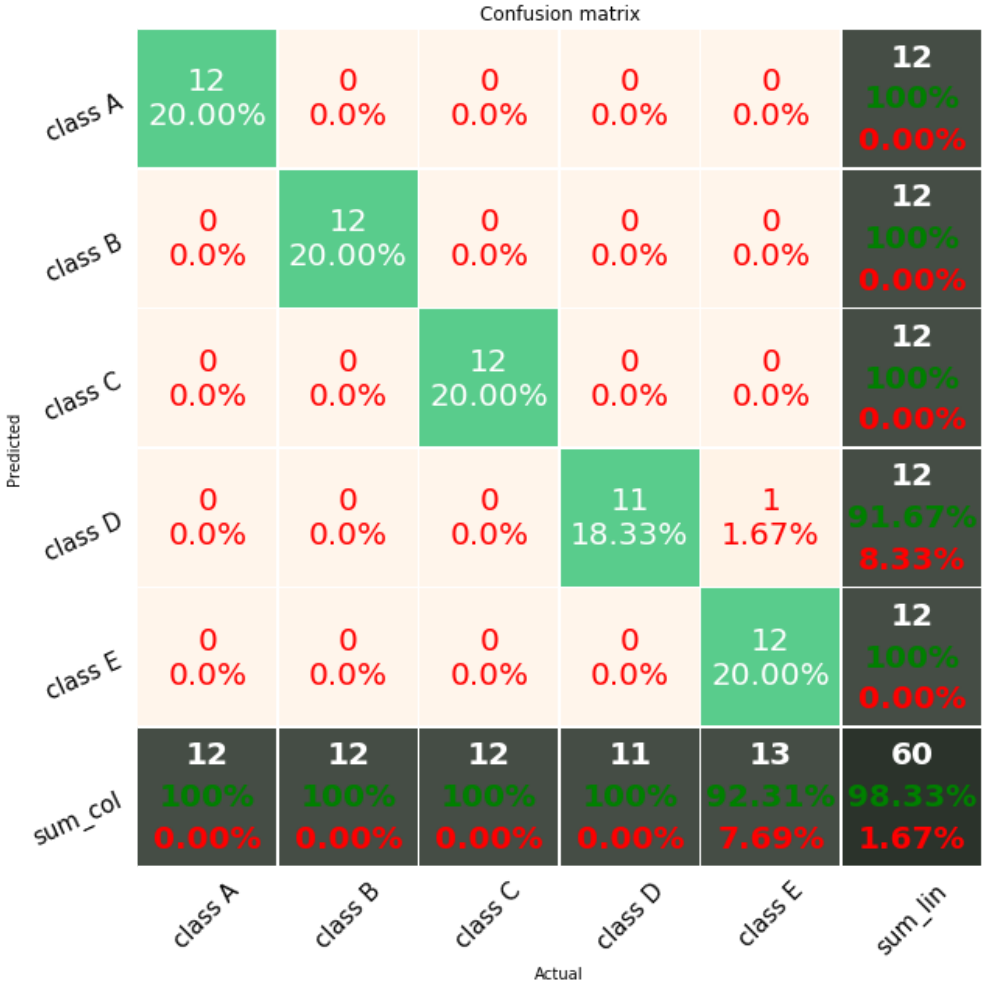


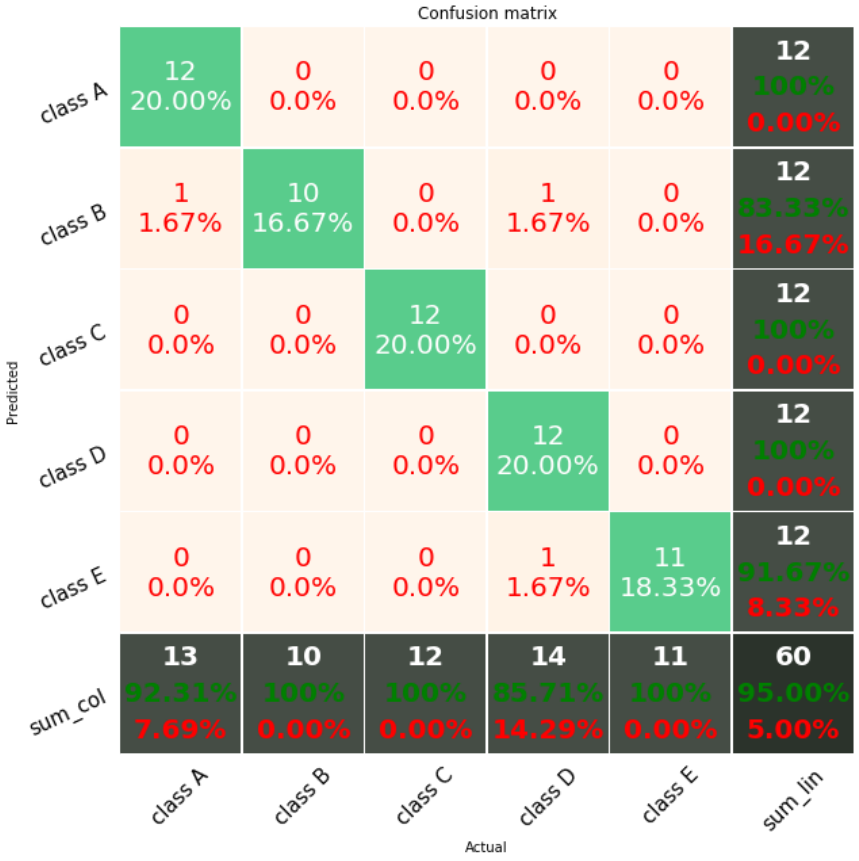
ROC HMM



ROC DTW

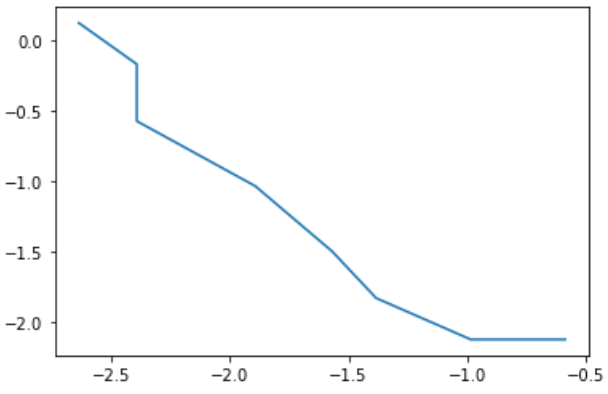
Confusion matrix of HMM



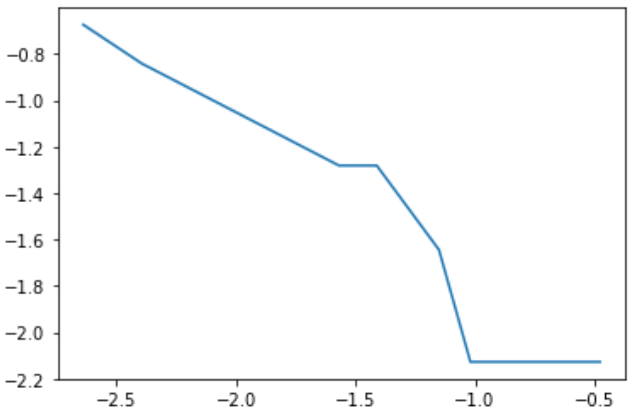


Confusion matrix for DTW

DET for HMM



DET for DTW



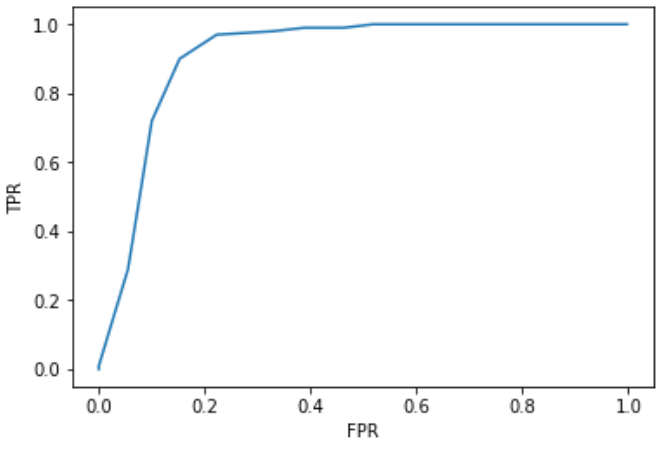
Observations and Approach

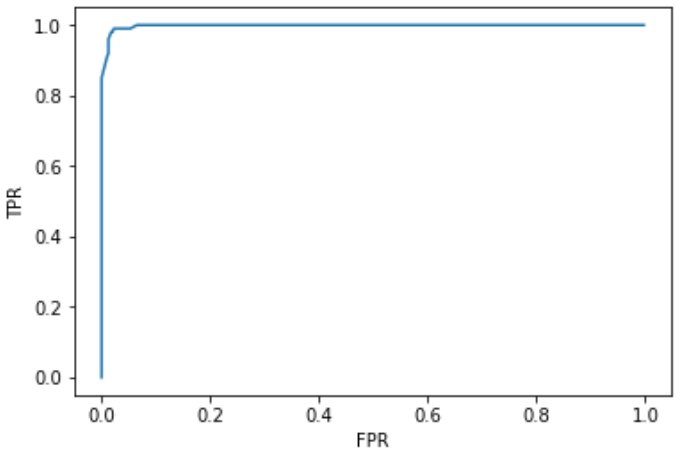
1. Firstly , we classified the given training data into k classes by K-means algorithm.
2. This class data is passed on to the HMM for training and no. of states is set with m and delta is set to 0.001 (ref. Used the given hmm code)

3. The output is transition matrix which we now use to classify development data.
4. For the above data the best results are obtained at k = m = 20.
5. This development data can also be classified with Dynamic Time Warping of each data point with the entire training data.
6. Upon increasing the number of states upto some value accuracy increases if we still try to increase our model overfits data, decreasing accuracy.
7. Reference A - 1, B - 4, C - 6, D - o, E - z

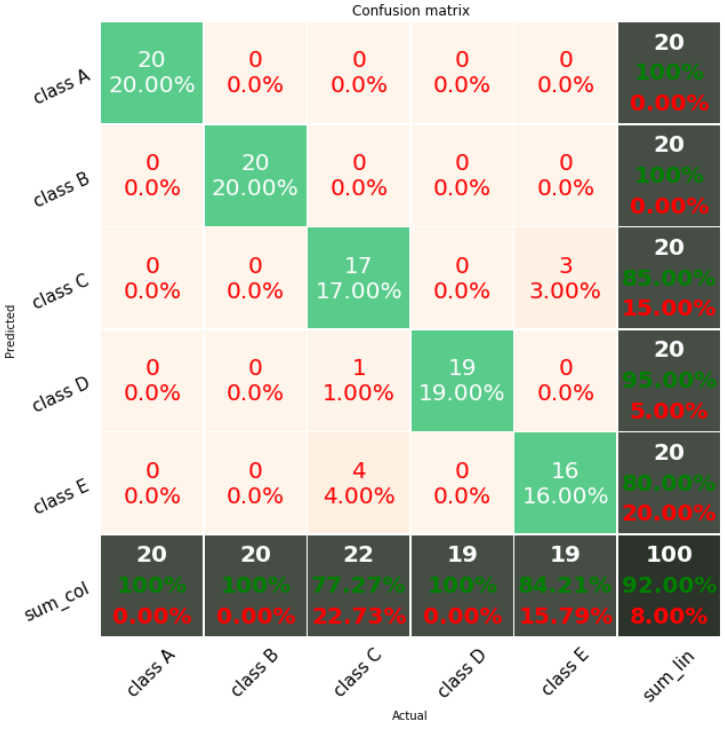
For Different K values	Accuracy Percentage
3	84
10	90
20	98

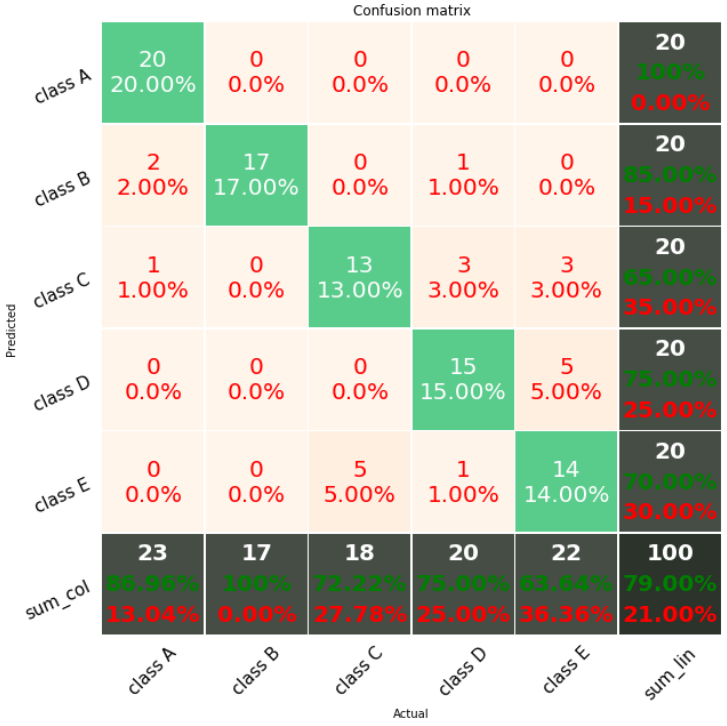
3A - Letters Written Data



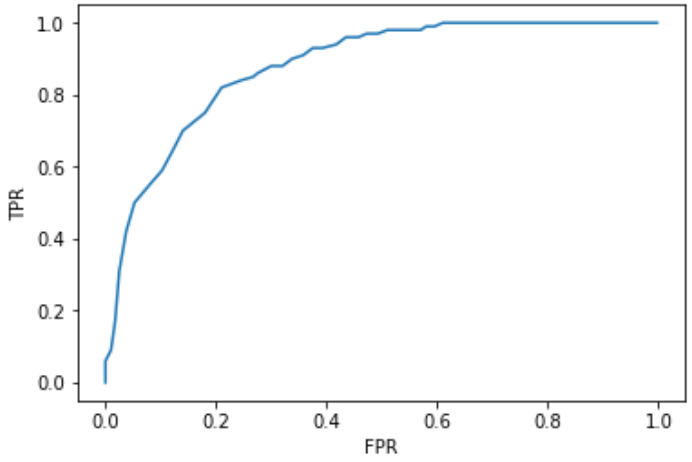


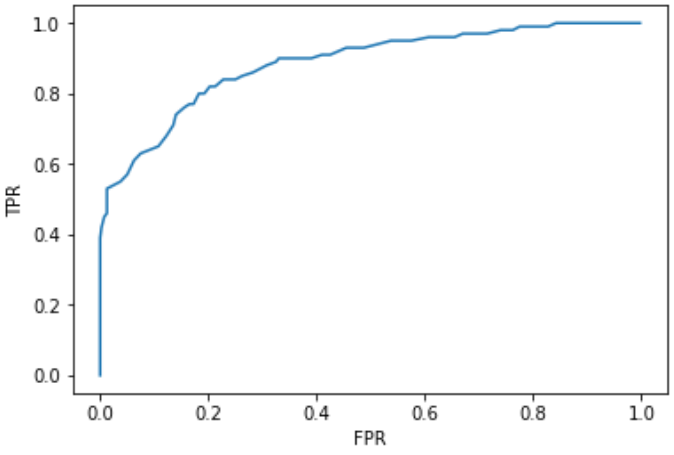
ROC HMM **Confusion matrix of HMM and DTW(Norm)** **ROC DTW**



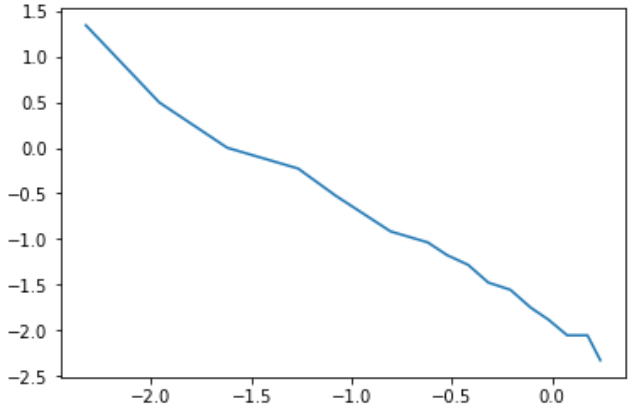


Confusion and ROC plots (Not normalized)

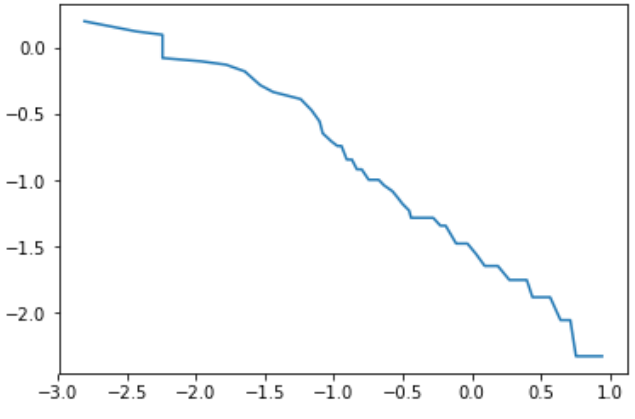




DET for HMM



DET for DTW



Observations and Approach

1. Given data is coordinates of strokes, firstly its normalised and fed to K-Means.
2. Output of these is Trained for HMM and tested similar to the above audio input.
3. For the above data the best results are obtained for normalized at k = 20, m = 12.
4. We observed that this data requires normalizing because the data given may not have values to the same scale.
5. Reference A - a, B - aI, C - chA, D - dA, E - lA

3B - Sequence Audio Data

Results

1. 46z
2. z4
3. 44
4. z6
5. z66

Observations and Approach

1. Output of our trained data (transition matrix) of individual symbols are concatenated in all possible ways.
2. The development data is tested with the new train data and classified.
3. 40% of given test data is getting classified into correct sequence.
4. This results are obtained at k = m = 20.

3B - Sequence Written Data

Results

1. dA_lA_dA
2. dA_chA_aI
3. chA_aI_aI
4. aI_aI_aI
5. dA_dA_dA

Observations and Approach

1. Out of 22 given development data we are accurately able to match 14 sequences, which is around 65%
2. For multiple letters, lA and dA are identified as chA sometimes.
3. Not normalizing the data resulted in poor results when tested on development data
4. This results are obtained at k = 20, m = 12.