Assignment 5

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Questions solved in this Assignment.

① → Explore few feature selection & extraction Algorithms.

- **MFCC (mel-frequency cepstrum coefficients)**

In audio processing MFC is a short-term power spectrum of a sound, based on LCT of of a log power spectrum on a non-linear mel scale of frequency.

MFCC are coefficients that collectively make up MFC. They are derived from a type of cepstral representation of a audio clip. the difference b/w the MFC & MFCC is the spacing of frequency bands which approximates the human auditory system response. frequency wraping can also allow for better representation of sound.

- **SVD - Singular Value Decomposition.**

SVD is basically a matrix factorisation technique in which a matrix is decomposed into 3 matrices. It has some intresting Algebric properties & conveys imp. geometrical & theoritical insights about linear transformation

$$A \rightarrow U \Sigma V^T$$

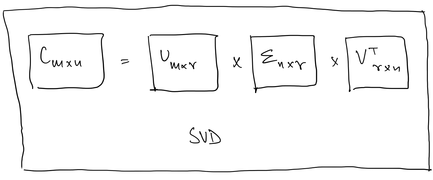
here,

A → Initial linear matrix to be decomposed.

U → m×n matrix of orthogonal eigen vectors of AA^T

V^T → transpose of n×n matrix containing orthogonal eigen vectors of A^TA

Σ → a n×n diagonal matrix of singular values which are the sq. root of the eigen value of A^TA



- **PCA Principle Component Analysis.**

- A statistical procedure which converts a set of observations of possibly co-relleated into a set of linearly uncorellated variable called principle components using an orthogonal transformation.

- The aim is to perform dimentionality reduction while preserving as much of the randomness in the high dimentional space as possible.

- It performs a co-ordinate rotation that aligns the axis with the direction of max. variance.

- the main limitation of PCA is that it does not consider the class separability since it does not take into account the class label of the feature vector.

- **LDA (Linear Discriminant Analysis)**

- The objective of LDA is to perform Dimentionality reduction while preserving as much of the class discriminatory as possible.

- PCA ignores class labels & focuses on finding the principle components that maximise the variance in the given data thus it is an unsupervised Algorithm, on the other hand LDA is supervised Algorithm. that intends to find linear Discriminants that represent those axis which maximize separation b/w different classes.