ML - Assignment 2

60004210210
Amartya Mishra
COMPS - C31

1) No. kmeans & gaussian Mixture Model (GMM) will generally not produce same cluster for a given dataset / data.

K - Means

It is a centroid based clustering Algorithm. It works by initially assigning a fixed No. of centroids at random location
Then it iteratively arranges the data point to the clustered centroid

Gaussian Mixture Model

GMM is probabilistic clustering model that assumes the data is generated by a massive gaussian distribution
It uses Expectation minimization.

Hence K - means & GMM make different assumpt & hence produce different cluster appropriation.
The choice of Algorithm depends on the characteristics of the data.

2) Hidden Markov Model is a statistical model that is used to describe the probabilistic relationship between a sequence of observation & a sequence of hidden states.

Applications:

1) Speech recognition:
can model statistical properties of words or sentences to recognize patterns.

2) Gesture Recognition:
used to model different gestures based on ~~obje~~ observed movements.

3) Bio informatics
Protein structure prediction, sequence alignment & model various biological sequence.

4) Robotics & Autonomous System.
Localization & mapping

5) Independent Component Analysis
It is used to seperate mixed signals into their original independent components
It assumes that input is a combination of sources By finding the linear transformation that maximizes the statistical independence of the components.

DATE:

ICA can be used to extract components
It leverages non gaussian nature of signals.

4) Deep Neural Network: They are NN based are composed of multiple layers of nodes which attemp to model high level abstraction in data.
It consist of I/P layer, multiple hidden layer & output layer.
Each set of layer contains nodes for computation

They are capable of learning features that can be used for various task.

C0004210210
Amartya Mishra
COMPS - C31

Machine learning Assignment 2

A+

Q1.

a) Video Surveillance :
Application :

Machine learning can be used in video surveillance for various tasks such as object detection, activity recognition & anomaly detection.

It can help automatically detect & track objects of interest, identifying suspicious behaviour & alerting security personals in real time.
There many such more application in almost all fields of industry from face detection, motion detection to automatic tag detection etc.

Suitable ML Technique :
Convolution Neural Networks (CNN's) are commonly used for such task due to their ability to effectively analyze spatial features in image or frames of videos

b) Sentiment Analysis :

→ Application :
Sentiment Analysis involves determining the

Sentiments or opinion Expressed in text.

It could be extracted from:

- Social Media Post
- Product reviews
- customer feed backs

- Such technology can be used by businesses to understand customer opinions or analyze user feed back for product improvement.

Suitable Methods:

- NLP - Natural language processing models.
- RNN - Recurrent Neural Networks.
- Transformer Models : EBPTA.

(c) Image recognition :

Application:
It involveds identifying & classifying objects or patterns with image.
It is used in various Applications

→ Medical diagnosis
→ Autonomous vehicles
→ facial Recognition.

Suitable ML Techniques:

Convolution Neural Network - CNN are most suitable techniques for image recognition tasks