



# Topics Covered in GenAI class

Topics covered in GenAI class by Sudarsun Santhiappan, PhD during the period May 3rd to May 20th - 2024

## Basics of Machine Learning

1. What is Machine Learning?
2. What is Difference between Population and Sample?
3. Probability mass function
4. Cumulative mass function
5. Generating Random Sample
6. What is mean by Reducing the Error
7. What is Model?
8. Linear Regression?
9. Polynomial Regression
10. What is Degrees in Polynomial Function
11. What is Continuous Data and Continuous Functions
12. Discreet Data and Discreet Function

13. Finite Set, Infinite Set, Countable Set and Uncountable Set
14. What is Gradient Decent and Why we need it?
15. Vector Space
16. Why Matrix?
17. Local minima and Global Minima
18. Lagrange Concept
19. Bias Variance tradeoff
20. Gradient Decent, Mini Batch and Stochastic Gradient Descent
21. What is Epoch and Steps

## Classification

1. Discriminative classifier
2. Category data, Label Data
3. What is HULL?
4. Single Linkage
5. Centroid
6. Far Distance
7. Converting Classification to Regression
8. Sigmoid Function

## Neural Network

1. Input Layer
2. Hidden Layer
3. Activation Function Linear, Sigmoid and Softmax

## Convolutional Neural Network

1. Feature extraction

2. Applying Kernel/Filter
3. Padding and Stride
4. Adding Nonlinearity
5. Pooling
6. Activation Function (reLu)

## **GAN - Generative Adversarial Networks**

1. Discriminator Neural Network
2. Generator Neural Network
3. Passing Fake data(Noise) and Real data to get the Probability

## **RNN - Recurrent Neural Network**

1. Activation Function TanH
2. What is Vanishing Gradients and Exploding Gradients

## **LSTM - Long Short Term Memory**

1. Gates - Forget Gate, Memory Gate, Output Gate, Input Gate
2. One to One
3. Many to One
4. Many to Many(Generating after the Input)
5. Many to Many(Continuous Data)

## **Transformers**

1. BERT(mlm) vs GPT(clm)
2. Masked Language Model vs Causal Language Model
3. Auto Encoder vs Autoregressive
4. MASK training with BERT encoder

5. Striding based training in GPT decoder
6. Freezing the encoder to Fine tuning.