# 1 Generative and Probabilistic Models 08

1.1 Introduction:

Overview of generative models and their importance in AI,

Fundamentals of Probability theory and generative modeling,

Introduction to GANs, VAEs and other generative models.

Significance of generative models,

Challenges with generative models.

1.2 Probabilistic Models:

Gaussian Mixture Models (GMMs),

Hidden Markov Models (HMMs),

Bayesian Networks,

Markov Random Field (MRFs),

Probabilistic Graphical Model.

# 2 Generative Adversarial Network 07

2.1 Basics of GAN :

Generative Adversarial Networks (GANs) architecture,

The discriminator model and generator model,

Architecture and Training GANs,

Vanilla GAN,

Architecture. GAN variants and improvements

(DCGAN, WGAN, Conditional GAN, CycleGAN),

Challenges- Training instability and model collapse,

GAN applications in image synthesis and style transfer.

[Decoding the Basic Math in GAN — Simplified Version | by Lakshmi Ajay | Towards Data Science](https://towardsdatascience.com/decoding-the-basic-math-in-gan-simplified-version-6fb6b079793)

# 3 Variational Autoencoders 07

3.1Introduction:

Basic components of Variational Autoencoders(VAEs),

Architecture and training of VAEs the loss function,

Latent space representation and inference,

Applications of VAEs in image generation.

3.2 Types of Autoencoders:

Undercomplete autoencoders,

Sparse autoencoders,

Contractive autoencoders,

Denoising autoencoders,

Variational Autoencoders

(for generative modeling)

# 4 Transfer Learning 05

4.1 Introduction to transfer learning

Basic terminologies,

Pre-trained model and data sets,

Feature extraction and fine tune transfer learning,

Recent advancement in transfer learning :

self- supervised learning and meta learning.

[A Comprehensive Hands-on Guide to Transfer Learning with Real-World Applications in Deep Learning](https://towardsdatascience.com/a-comprehensive-hands-on-guide-to-transfer-learning-with-real-world-applications-in-deep-learning-212bf3b2f27a)

# 5 Ensemble learning 06

5.1 Ensemble Classifiers:

Introduction to Ensemble Methods.

Bagging and random forests,

Boosting algorithms : AdaBoost Stacking and blending models,

Extreme Gradient Boosting (XGBoost):

XGBoost Regression and classification.

# 6 Nascent Technologies in AI 06

6.1 Convergence of AI with Augmented / virtual reality techniques

for product and process development

Limitations of 2D Learning Environments,

Evolution of virtual worlds and immersive technologies,

Definition and concepts of Augmented Reality,

Definition and concept of the Metaverse,

Characteristics and components of the Metaverse,

Challenges and opportunities in the Metaverse ecosystem,

AI in the realm of emerging quantum computing

Words of Sangeeta Ma’am:

No Question bank

last module study Metaverse

all ppt fo through it

also study KL JS and earth mover

XG Boost and why it performs better although sequential