

Unit V Deep Generative Models

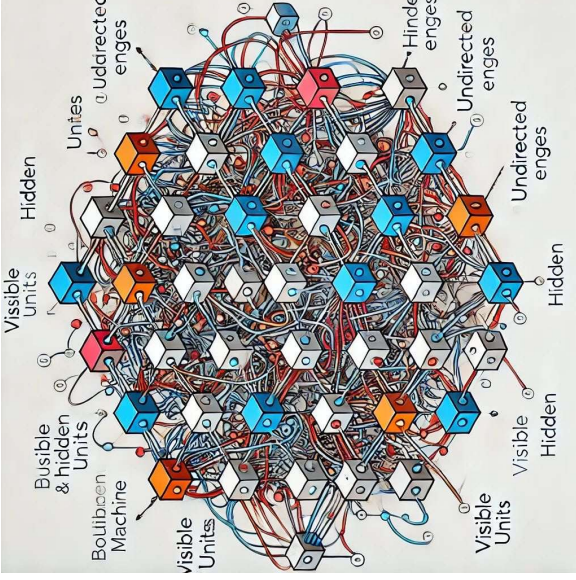
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Introduction to Deep Generative Models

- Deep Generative Models generate new data samples similar to training data.
- Used in image synthesis, text generation, and data augmentation.
- Examples: Boltzmann Machines, Deep Belief Networks, GANs.

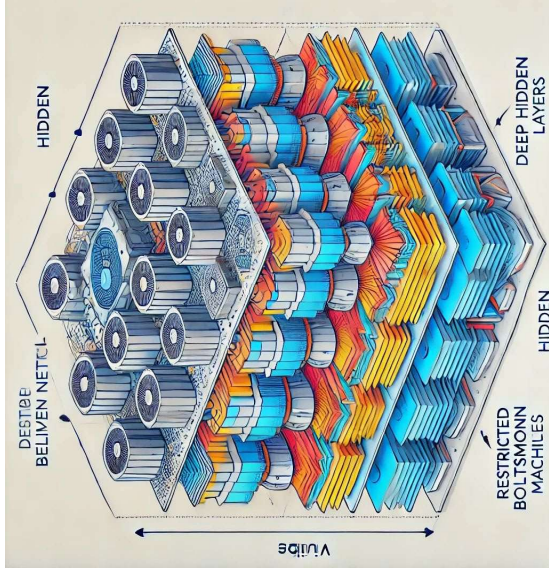
Boltzmann Machine

- Energy-based model using stochastic neural networks.
- Consists of visible and hidden units.
- Uses a probabilistic approach to learn representations.



Deep Belief Networks

- Composed of multiple layers of Restricted Boltzmann Machines (RBMs).
- Trained layer-by-layer using contrastive divergence.
- Effective for unsupervised learning and data generation.



Deep Boltzmann Machines

- Similar to DBNs but with undirected connections between layers.
- Jointly trained using Markov Chain Monte Carlo (MCMC).
- Used for feature extraction and generative tasks.

Generative Adversarial Network (GAN)

- GAN consists of two networks: Generator and Discriminator.
- Generator creates new data samples.
- Discriminator evaluates if samples are real or fake.
- Trained using adversarial process.

Discriminator Network

- Classifies input data as real or fake.
- Uses convolutional neural networks (CNN).
- Provides feedback to improve Generator.

Generator Network

- Creates synthetic data samples.
- Uses deconvolutional layers.
- Trained to fool the Discriminator.

Types of GAN

- Vanilla GAN – Basic architecture.
- Conditional GAN – Conditions generation on class labels.
- DCGAN – Uses convolutional layers for better quality.
- CycleGAN – Translates between image domains.
- StyleGAN – Generates high-quality images.

Applications of GAN Networks

- Image generation and enhancement.
- Data augmentation.
- Super-resolution.
- Style transfer.
- Synthetic data generation.

GAN for Detection of Real or Fake Images

- GANs are used to detect deepfake images and videos.
- Discriminator network learns to differentiate real from synthetic data.
- Applications in media authentication and security.

ChatGPT

- ChatGPT is based on Transformer architecture.
- Uses large-scale language models (LLMs).
- Trained on massive datasets to generate human-like text.
- Used for conversation, coding assistance, and content generation.

Conclusion

- Deep Generative Models generate high-quality data samples.
- GANs and other models enable creative applications.
- Future developments include improved training and higher fidelity.