10-Day Generative AI Course Content

Day	Topic	Details Covered
1	Introduction to Generative AI	- Overview of AI and ML - What is Generative AI? Definitions and key concepts - Generative vs. Discriminative models - Historical context and evolution of Generative AI - Popular generative models: GANs, VAEs, Transformers - Ethical considerations and biases in generative models
2	Deep Learning Foundations for Generative AI	- Deep Learning fundamentals and neural networks - Key concepts: feedforward networks, backpropagation, gradient descent - CNNs for image generation - RNNs for language modeling - Intro to frameworks (TensorFlow, PyTorch) for generative modeling
3	Generative Adversarial Networks (GANs)	- Structure and components of GANs - Types of GANs: DCGAN, StyleGAN, CycleGAN - Training dynamics of GANs - Challenges: mode collapse, instability - Applications: image synthesis, super-resolution, style transfer
4	Variational Autoencoders (VAEs)	- Overview of VAEs and applications - GANs vs. VAEs - Encoder-decoder architecture and latent space - Training objectives: Evidence Lower Bound (ELBO) - Hands-on: building a simple VAE for image generation
5	Transformers and Language Models	- Transformer architecture and attention mechanism

		- Large language models (LLMs): GPT, BERT, T5 - Text generation using Transformers - Prompt engineering, zero-shot/few-shot learning - Hands-on: text generation with GPT-3 or similar models
6	Diffusion Models and Emerging Techniques	- Understanding Diffusion models - Practical applications: text-to-image generation - Comparisons to GANs and VAEs - Other techniques: Normalizing flows, Autoregressive models - Case study: DALL-E, Stable Diffusion
7	Applications of Generative AI in Domains	- Text generation: chatbots, summarization, content creation - Image generation: art, restoration, design - Video generation: deepfakes, animation, video prediction - Audio generation: speech synthesis, music, sound design - Ethical and legal considerations
8	Fine-tuning and Customizing Models	- Fine-tuning pre-trained models - Transfer learning for specific tasks - Applications: fine-tuning GPT, DALL-E - Tools and frameworks for fine-tuning and transfer learning
9	Evaluation and Metrics in Generative AI	- Evaluation for text, image, audio generation - Metrics: FID, BLEU, perplexity - Human-in-the-loop evaluation - Addressing biases in evaluation - Setting up A/B testing and user feedback
10	Capstone Project: Building a Generative AI Project	- Project design from concept to execution - Steps: data collection, preprocessing, model training - Fine-tuning and optimization - Deploying models as APIs or in applications

- Final presentations: showcasing results and feedback