Training Course on Foundations of Generative AI

Professional Development Training Course Outline

Category	Data Science	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Generative AI, a revolutionary subfield of **Artificial Intelligence (AI)** and **Machine Learning (ML)**, has rapidly transformed various industries by enabling machines to **create novel, realistic content**. Unlike traditional AI that focuses on analysis and prediction, generative models learn underlying data distributions to produce entirely new instances, including **images, text, audio, and synthetic data**. This burgeoning technology, powered by advanced **deep learning** architectures, is at the forefront of innovation, driving unprecedented opportunities for **automation, creativity, and personalization** across diverse sectors. Understanding its fundamental principles and practical applications is crucial for professionals seeking to leverage this transformative capability.

Training Course on Foundations of Generative AI: Core Concepts, Architectures (GANs, VAEs, Diffusion Models) dives deep into the **core concepts, architectures, and practical applications** of leading generative models. Participants will gain a robust understanding of **Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and Diffusion Models**, along with the foundational **deep learning** principles that underpin them. Through hands-on exercises, real-world **case studies**, and expert-led instruction, attendees will develop the essential skills to build, train, and deploy generative AI solutions, empowering them to drive innovation and unlock new possibilities within their organizations.

Programme Curriculum

Training Course on Foundations of Generative AI: Core Concepts, Architectures (GANs, VAEs, Diffusion Models)

Introduction

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Course Duration

5 days

Course Objectives

1. Grasp the fundamental concepts and principles of generative artificial intelligence and its distinct role within the broader AI landscape.
2. Solidify understanding of essential deep learning components, including neural networks, backpropagation, and optimization algorithms.
3. Gain in-depth knowledge of Generative Adversarial Networks (GANs), their generator-discriminator dynamic, and their training methodologies.
4. Understand the probabilistic framework of Variational Autoencoders (VAEs), their latent space representation, and their application in data generation.
5. Delve into the cutting-edge **Diffusion Models**, grasping their noise-reduction process for high-fidelity content generation.
6. Acquire practical skills in implementing and training GANs, VAEs, and Diffusion Models using popular deep learning frameworks like **TensorFlow and PyTorch**.
7. Learn effective **prompt engineering** techniques for guiding generative models to produce desired and accurate outputs.
8. Understand and apply key evaluation metrics for generative AI models, such as FID, Inception Score, and perceptual quality assessments.
9. Develop the ability to generate realistic and novel content, including **AI-generated images, synthetic text, and innovative designs**.
10. Recognize and discuss the critical **ethical considerations, bias, and responsible AI practices** associated with generative technologies.
11. Explore strategies for optimizing and deploying generative AI models for real-world applications and scalable solutions.
12. Analyze diverse **industry-specific applications** of generative AI across sectors like healthcare, finance, media, and product design.
13. Cultivate a mindset for continuous learning and innovation in the rapidly evolving field of generative AI and its future trends.

Organizational Benefits

- Automate content creation, data augmentation, and prototyping, freeing up human resources for higher-value tasks and significantly boosting operational efficiency.

- Leverage generative AI for rapid ideation, design iteration, and personalized product offerings, leading to faster time-to-market and competitive differentiation.
- Enable hyper-personalized marketing content, intelligent chatbots, and tailored recommendations, fostering deeper customer engagement and loyalty.
- Minimize manual effort in content generation, design, and data synthesis, leading to substantial cost savings and optimized resource allocation.
- Generate synthetic datasets for training and analysis, enabling robust data exploration and informed strategic decisions without compromising privacy.
- Develop in-house expertise in a cutting-edge technology, positioning the organization as an **AI innovator** and attracting top talent.
- Foster a culture of **responsible AI development**, understanding and mitigating risks associated with bias, misinformation, and ethical implications.

Target Audience

1. Data Scientists.
2. Machine Learning Engineers.
3. AI/ML Developers.
4. Researchers & Academics
5. Product Managers
6. AI Enthusiasts.
7. Creative Professionals.
8. Business Leaders & Strategists

Course Outline

Module 1: Introduction to Generative AI & Deep Learning Fundamentals

- Defining Generative AI: From discrimination to creation.
- Core Concepts: Latent space, data distribution, sampling.
- Deep Learning Refresher: Neural networks, activation functions, backpropagation.
- Optimization Techniques: Gradient Descent, Adam, learning rate.
- **Case Study:** Early applications of generative models in basic image noise reduction.

Module 2: Generative Adversarial Networks (GANs)

- GAN Architecture: Generator and Discriminator roles and interaction.
- Adversarial Training: The minimax game and loss functions.
- GAN Variants: DCGANs, WGANs, CycleGANs, StyleGANs.
- Challenges in GAN Training: Mode collapse, instability, evaluation metrics.
- Case Study: Generating hyper-realistic human faces using StyleGANs (e.g., ThisPersonDoesNotExist.com).

Module 3: Variational Autoencoders (VAEs)

- Autoencoder Fundamentals: Encoder-decoder structure, dimensionality reduction.
- VAE Theory: Probabilistic approach, latent space regularization, ELBO.
- Sampling from VAEs: Generating diverse and meaningful data.
- Disentanglement & Interpretability: Understanding the latent dimensions.
- **Case Study:** VAEs for drug discovery and molecular design in pharmaceutical research.

Module 4: Diffusion Models

- Diffusion Process: Forward (noisy) and reverse (denoising) steps.
- Score-Based Models: Understanding the underlying mathematical framework.
- Denoising Diffusion Probabilistic Models (DDPMs): Architecture and training.
- Conditional Generation: Guiding diffusion models with text prompts or images.
- **Case Study:** High-fidelity image generation and editing with Stable Diffusion and DALL-E 2.

Module 5: Advanced Generative Model Concepts & Techniques

- Transformers in Generative AI: Self-attention mechanisms and their role in text generation.
- Autoregressive Models: PixelRNN/CNN for image generation, WaveNet for audio.
- Flow-Based Models: Exact likelihood estimation and invertible transformations.
- Multi-modal Generative AI: Generating content across different data types (text-to-image, image-to-text).
- **Case Study:** OpenAI's GPT models for advanced natural language generation and conversational AI.

Module 6: Prompt Engineering and Control over Generation

- Fundamentals of Prompt Design: Crafting effective prompts for desired outputs.
- Prompt Engineering Techniques: Few-shot learning, chain-of-thought, persona-based prompting.
- Controlling Generation: Guiding models for specific styles, content, and constraints.
- Ethical Prompting: Avoiding bias and harmful content generation.
- **Case Study:** Leveraging prompt engineering for targeted marketing content creation and personalized customer responses.

Module 7: Evaluation, Fine-tuning, and Deployment

- Quantitative Evaluation Metrics: FID, Inception Score, BLEU, Perplexity.
- Qualitative Assessment: Human perceptual studies, diversity, and realism.
- Fine-tuning Pre-Trained Models: Adapting models to specific datasets and tasks.
- Deployment Strategies: Cloud platforms (AWS, Azure, GCP), ONNX, serving models at scale.
- **Case Study:** Fine-tuning a pre-trained image generation model for specific brand aesthetics in advertising.

Module 8: Ethical AI, Responsible Use, and Future Trends

- Bias in Generative Models: Identification, mitigation, and ethical implications.
- Deepfakes & Misinformation: Understanding the risks and countermeasures.
- Copyright & Intellectual Property: Navigating ownership in AI-generated content.
- Responsible AI Frameworks**:** Principles and practices for ethical development.
- **Case Study:** Discussions on ethical challenges and best practices in using generative AI for journalistic content and legal applications.

Training Methodology

This course employs a **blended learning approach** designed for maximum engagement and practical skill development. The methodology includes:

- **Interactive Lectures:** Core concepts explained with clear visuals and real-world examples.

- **Hands-on Coding Labs:** Practical exercises using Python, TensorFlow, and PyTorch for implementing and experimenting with generative models.
- **Live Demos:** Instructor-led demonstrations of model training, generation, and deployment.
- **Case Study Analysis:** In-depth discussion and analysis of real-world generative AI applications and their impact.
- **Collaborative Projects:** Group work on challenging problems to foster teamwork and applied learning.
- **Q&A Sessions:** Dedicated time for participants to ask questions and receive expert guidance.
- **Resource Sharing:** Access to curated readings, code repositories, and supplementary materials.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price

23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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