NAUTILUS PRINCIPLE

Generative AI

Industry Transformation Syllabus

Unlocking New Horizons

2023

Content

Overview

Generative AI has emerged as a game-changer for companies grappling with the challenges of unstructured data and content generation. In today's data-driven landscape, various business sectors, such as IT companies, financial corporations, healthcare organizations, and manufacturing firms etc., rely heavily on large volumes of diverse textual data, images etc. With the increasing demand for cross-lingual capabilities, Generative AI has gained paramount importance.

Generative AI is the backbone of transformative technologies like language models and creative content generation, shaping industries such as media, entertainment, marketing, and research.

This comprehensive course on Generative AI comprises of three main components: Fundamental Concepts of Generative AI, Applications of Generative AI, and Deep Learning for Generative AI.

Overview

What You'll Learn

Participants will gain profound insights into all three components, mastering algorithms that enable machines to create content, simulate human behavior, and generate imaginative solutions. Embrace the future of AI innovation and unlock limitless possibilities with Generative AI. Several case studies will be used to demonstrate the application of these concepts in business context.

How You'll Learn

- **Expert-Led Sessions:** Through expert-led sessions, participants explore the landscape of Generative AI, delving into its various applications and how it's reshaping industries worldwide.
- **Hands-On Learning:** Engage in practical exercises that offer hands-on experience with Generative AI tools and frameworks. Gain the skills and confidence to apply these concepts directly to the business challenges.
- **Domain-Specific Applications:** Discover how Generative AI can be leveraged in your specific industry, from content generation, design, and marketing to personalized customer experiences and predictive analytics.
- **Collaborative Project:** Work in teams to tackle real-world business scenarios using Generative AI, fostering a collaborative environment that fosters creativity and innovation.

What You'll Gain

- **Gain a competitive edge:** Revolutionize your business strategies with innovative AI solutions tailored to your industry's needs.
- **Foster Innovation & Accelerate Growth:** Equip your team with the skills to create cutting-edge products and services through the power of Generative AI.
- **Accelerate Growth:** Tap into new markets and revenue streams by leveraging AI-driven insights and predictive capabilities.
- **Future-Proof your business:** Embrace the AI revolution and position your organization for sustainable success in an AI-driven world.

Key Program Details

Live-Online
Sessions

30-50
Hours

Case-studies
Projects

Assignments

Tools & Libraries

python, pandas, SQL, GitHub, R, Apache Spark

Syllabus

Pre-requisites

Programming Knowledge of **Python** and in-depth understanding of **Machine Learning** concepts.

Knowledge of **Deep Learning frameworks** such as **Tensor Flow/ Keras/ PyTorch** would be beneficial.

Syllabus

Core Units

1. Introduction to Generative AI & LLMs (Foundation Models)

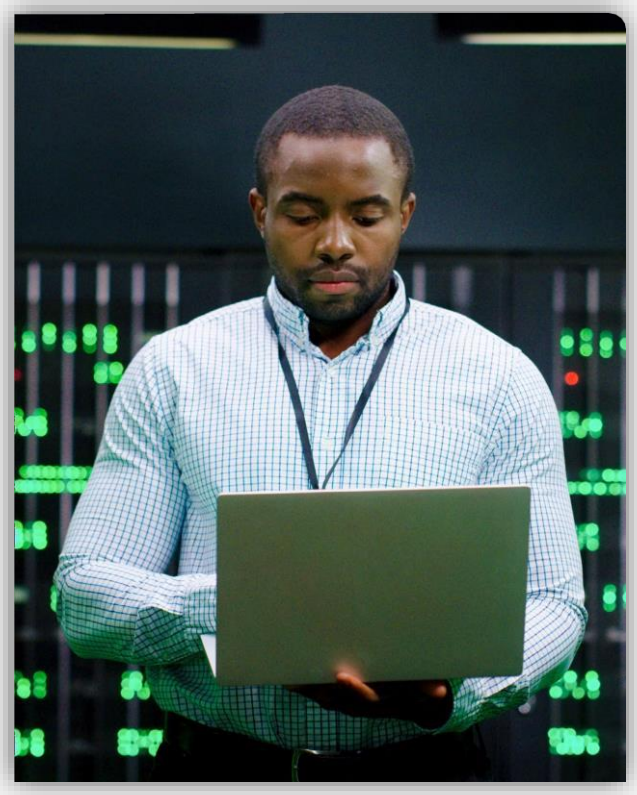
- Overview of Generative AI and its applications in various industries
- Introduction to Large Language Models (LLMs) and their significance.
- Transformer Architecture, Auto encoding and Auto-regressive models
- Examples of popular LLMs, such as GPT, Llama and their versions.
- Understanding how LLMs work and their strengths and limitations

2. Training Large Language Models

- Exploring the data requirements for training LLMs effectively.
- Overview of pre-training and fine-tuning processes for LLMs.
- Discussion on the computational resources and infrastructure needed for training.
- Generative Configuration – Top_p, Top_k, Temperature

3. In-Context Learning/Prompt Engineering - Enhancing Model Outputs

- Understanding the concept and significance of prompt engineering
- Strategies for designing effective prompts
- Techniques for controlling model behavior and output quality
- Best practices for prompt engineering in generative AI



4. Cost Optimization Strategies for LLM Training & Aligning to Human values

- Techniques for optimizing model architectures to reduce training expenses
- Overview of transfer learning/fine-tuning and how it can save time and resources
- Instruction Fine Tuning
- Parameter Efficient Fine Tuning (PEFT) with adapters - LoRA, QLoRA, Soft Prompts
- Reinforcement Learning with Human Feedback

5. LangChain: Simplifying Development with Language Models

- Overview of the LangChain framework and its components
- Streamlining application development using LangChain
- Examples of applications built with LangChain

6. LLM Powered Applications

- Using the LLM in applications.
- Retrieval Augmented Generation (RAG) with embeddings in vector stores (chromadb, milvus, etc.)
- Integrating LLMs into existing products or services.

7. Generative Image Models

- Understanding the basics of generative models and their applications in image generation
- Autoencoders: Structure, encoding, and decoding
- Variational Autoencoders (VAEs): Probabilistic approach to generate data
- Introduction to GANs and their architecture.
- Multi-modal Generation: Combining text and images for generation tasks
- Workings of diffusion models
- How OpenAI CLIP embeddings can be used for various tasks.
- Image and Text Retrieval using CLIP embeddings and building recommendation engine.

8. Use Cases of Generative AI

- Overview of the various domains and industries benefiting from Generative AI
- Case studies highlighting successful implementations
- Potential future applications and emerging trends

9. Responsible AI - Ethical Considerations in Generative AI

- Addressing ethical challenges related to LLMs, such as bias and misinformation.
- Understanding the responsible use of generative AI in content creation.
- Guidelines for deploying LLM-powered applications responsibly

Hands-On Exercises

In this practical exercise, participants will have the opportunity to apply prompt engineering and customization techniques to GPT or ChatGPT models. Through a step-by-step guided process, they will learn how to craft effective prompts, control model behavior, and optimize the output to meet specific requirements.

Learning Goals:

- Understand the concept and importance of prompt engineering in tailoring the behavior and responses of GPT or ChatGPT models.
- Learn how to formulate well-designed prompts that guide the model towards desired outputs and generate contextually appropriate responses.
- Explore techniques to control and fine-tune the model's behavior to avoid bias, maintain fairness, and ensure ethical use in various applications.
- Apply strategies for customizing the language model to suit specific domains or industries, making it more valuable and relevant for particular use cases.
- Gain hands-on experience in using prompt engineering to improve the performance and output quality of GPT or ChatGPT, making the most of its generative capabilities.

Topics Covered:

- Exercises on Prompt Engineering & Customizations using GPT or ChatGPT

Building a Gen-AI Portfolio

Capstone project offers an excellent opportunity to hone the skills necessary for Gen-AI expertise. Throughout the process, participants will engage in distinct capstone projects, allowing them to demonstrate their capabilities and talents effectively.

These guided projects serve as a practical way to apply knowledge and gain valuable experience in Gen-AI.

Building a Generative AI Portfolio

Mini Project-1
Hands-On

Your first project comes up fairly in the beginning of the program. For this project, you'll be given a lightweight introduction to each step of the Prompt Engineering Method. You'll then be guided through those steps with helpful tips and instructions. This first project is designed to build your foundational knowledge and practice these important steps before applying your knowledge to the second capstone.

Mini Project-2

Your second project follows the same Prompt Engineering Method steps as the first one, but with less guidance. You'll:

- Come up with a project idea and proposal
- Define Task & Desired Output
- Design the Prompt
- Test & Refine
- Deploy & Monitor
- Document and present your work

Each of these steps will be their own submission.

Capstone Project (optional)

You can also enroll in a capstone project after this training to develop and deploy Gen-AI applications as part of your chosen competence track (see the subsequent pages for details).

Choose Your Competency Expertise Track

Hone your skills in a specific area of expertise by **choosing one** of our competency track options

NAUTILUS PRINCIPLE

Option 1

Generative Models

(Code Generation & Data Augmentation)

This track focuses on various generative model architectures and their applications, enabling participants to understand, implement, and leverage these models for creative tasks, data augmentation, and more.

Capstone Project

The capstone project "Generative Models for Developers" aims to explore the application of generative models, particularly variational autoencoders (VAEs) and generative adversarial networks (GANs), to enhance code generation and data augmentation tasks in software development.

Objective	The project aims to generate realistic code samples, automate code synthesis, and improve the performance of machine learning models in software-related tasks.

Methodology	Literature Review & Data Collection
	Model Design & Implementation
	VAE-based Code Generation System
	GAN based Data Augmentation Pipeline
	Evaluation & Insights

Outcomes	A functioning code generation system based on VAEs, capable of generating syntactically and semantically accurate code snippets.
	A GAN-based data augmentation pipeline that enriches software development datasets, leading to improved generalization in machine learning models.

Option 2

Natural Language Processing

(Conversational AI System)

This track focuses on comprehensive understanding of Natural Language Processing (NLP) techniques and advanced AI models, enabling participants to build sophisticated language understanding systems using Generative AI.

Capstone Project

The capstone project "Language Understanding System" focuses on pushing the boundaries of language comprehension and generation by leveraging cutting-edge models and architectures, such as transformer-based models and advanced transfer learning techniques.

Objective	The project aims to build a Gen-AI-powered language system capable of performing complex language tasks with human-like understanding and responsiveness.

Methodology	Literature Review & Data Collection
	Model Selection
	Pre-processing & Tokenization
	Model Training & Fine-Tuning
	Multi-Modal Integration
	User Interaction & Feedback

Outcomes	An advanced Gen-AI-powered NLP system capable of understanding and generating human-like language responses.
	Insights into the strengths and limitations of transformer-based models and transfer learning for NLP tasks.

Option 3

Computer Vision

(Advancing Vision Understanding)

This track help participants to develop expertise in leveraging generative models to push the boundaries of computer vision tasks and develop advanced AI-driven visual applications.

Capstone Project

The Capstone Project on Gen-AI Computer Vision focuses on developing an advanced computer vision system powered by exploring the potential of GANs and VAEs in image synthesis, style transfer, and content generation, this project contributes to advancing the field of computer vision and the creative possibilities of AI.s

Objective	The project aims to develop a powerful Gen-AI computer vision system capable of understanding visual data, generating realistic images, and enhancing the capabilities of existing computer vision models.

Methodology	Literature Review & Data Collection
	Model Selection
	Pre-processing & Augmentation
	Model Training & Fine-Tuning
	System Integration & Ethical Consideration
	User Interaction & Feedback

Outcomes	An advanced Gen-AI computer vision system capable of image synthesis and creative content generation.
	Insights into the capabilities and limitations of GANs and VAEs for computer vision tasks.

Option 4

Creative Applications

(Artificial Creativity)

This track aims to leverage the power of Generative AI to develop innovative and thought-provoking creative applications across various domains, including art, music, storytelling, and design.

Capstone Project

The Capstone Project on Gen-AI Creative Applications is a visionary exploration into the realms of artificial creativity. By harnessing advanced generative models, this project seeks to push the boundaries of AI-driven creativity, opening new avenues for human-machine collaboration and artistic expression.

Objective	The project aims to develop a versatile and interactive AI framework capable of generating innovative and thought-provoking artistic content across various domains, fostering responsible AI-driven creativity, and redefining the boundaries of artificial creativity.

Methodology	Literature Review & Data Collection
	Model Selection
	Pre-processing & Augmentation
	Model Training & Fine-Tuning
	System Integration & Ethical Consideration
	User Interaction & Feedback

Outcomes	An innovative and interactive Gen-AI creative framework capable of generating artistic content across multiple domains.
	Insights into the potential of generative models in fostering human-AI collaboration and artistic expression.

Option 5

Deployment & Scalability

(Scalable & Efficient AI)

This track focuses on exploring state-of-the-art techniques and technologies that enable the seamless deployment of AI solutions across various computing environments, including cloud, edge devices, and distributed systems.

Capstone Project

The Capstone Project on 'Gen-AI scalability' enable participants to create AI solutions that are not only efficient and scalable but also adaptable to changing user requirements and resource constraints

Objective	The project aims to build robust and scalable AI deployment pipelines to meet the demands of real-world applications and handle large-scale data processing while maintaining optimal performance and resource efficiency.

Methodology	Literature Review
	Technology Selection
	Model Optimization
	Distributed Training & Performance Monitoring
	Resource Management
	Model Versioning & Evaluation

Outcomes	A scalable and efficient AI deployment infrastructure capable of handling large-scale data processing and diverse workloads.
	Insights into best practices for optimizing AI models and deploying them across various computing environments.

NAVEEN KUMAR BHANSALI

Mr Naveen Kumar Bhansali is the instructor for this program on Generative-AI

Industry Experience:

- Co-founder - CTO & AI Head at BlitzAI (No-code AI platform)
- 18 years of industry experience as AI advisory consultant, AI solution architect and engineer, data scientist, big data architect.
- Headed AI and Big Data multi-million-dollar projects in Latin America, EMEA, USA and Southeast Asia for EMC Technologies.
- Delivered production grade solutions for clients across the globe.
  - o Telecom: TIM Brazil, Hawaiian Telecom USA, MTN Nigeria
  - o Finance: AMEX USA, Itau Brazil, Bank of Thailand, Bank of Ayudhya (Thailand)
  - o Insurance: FWD Hong Kong
  - o Retail: ASOS UK, StyleUnion India
  - o Manufacturing: Embraer Brazil o MedTech: Exdion India

Academic Experience:

- Adjunct Faculty for more than 10 years at IIM Bangalore (Ranked among top 30 business schools in the world).
- IIMBx Instructor for "AI for Managers", covering Deep Learning and Generative AI. (https://iimbx.iimb.ac.in/ai-for-managers/)
- CFA Level 2
- Vice President of Analytical Society of India.
- Conducted hundreds of workshops and trained 1000s on Artificial Intelligence, Deep Learning etc. for corporates such as CISCO, JP Morgan, General Motors, EMC, Fidelity, Global Analytics India Pvt Ltd, etc. and several academic institutions across India.

Customer Analytics at Flipkart.com

Breaking Barriers:Micro-Mortgage Analytics

Ready for the next step?