IIT KANPUR
Indian Institute of Technology Kanpur

PROFESSIONAL
CERTIFICATE COURSE IN

GENERATIVE AI AND MACHINE LEARNING

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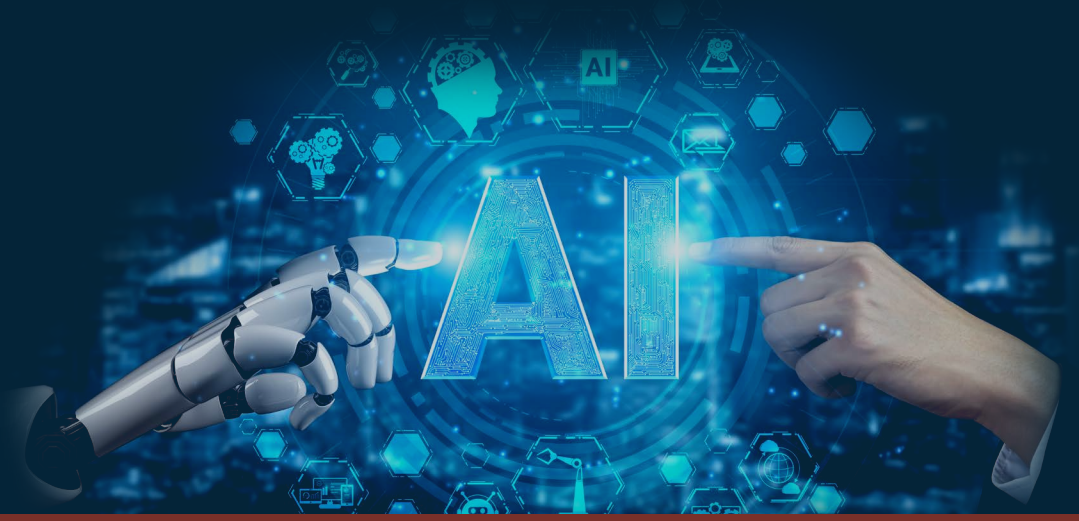
About the Program

Generative AI stands as a transformative force reshaping interactions across industries. By revolutionizing content creation, streamlining product design, and redefining customer interactions, it drives a significant shift in business operations. Automated content generation allows efficient production of personalized marketing materials, while AI-optimized product design accelerates innovation cycles. Virtual assistants powered by Generative AI enhance customer service, offering quick and intelligent responses. Advanced data analysis facilitates informed decision-making, and personalized recommendation systems enhance user experiences. This versatile technology also contributes to enhanced cybersecurity, language translation, and immersive employee training, reshaping traditional business models and fostering a dynamic, technology-driven landscape.

Our Generative AI and Machine Learning program, in partnership with E&ICT Academy at IIT Kanpur, offers an immersive learning experience at the forefront of this dynamic field. Featuring live virtual classes led by industry experts, interactive hands-on projects with integrated labs, self-paced video content, masterclasses from IIT Kanpur faculty, and collaborative learning with peers, this program equips participants with sought-after skills and practical knowledge of cutting-edge processes, tools, and techniques. The innovative curriculum encompasses the latest industry advancements, emerging trends, and essential topics, including generative AI, prompt engineering, large language models, machine learning, deep learning, computer vision, natural language processing, speech recognition, and reinforcement learning.

Upon successful completion of the program, participants earn a program completion certificate from E&ICT Academy, IIT Kanpur, and gain access to Simplilearn's Career Assistance services, including expert resume writing and personalized interview preparation, to help them advance their careers.



About E&ICT Academy, IIT Kanpur

Established in 1959, IIT Kanpur is among the most prestigious institutes in India. It has consistently ranked in the top five engineering institutes in India over the past several decades, and many of the institute's alumni are leaders in academia and industry around the globe. IIT Kanpur offers courses in sciences, engineering, humanities, and management.

Electronics & ICT Academy (E&ICT Academy) at IIT Kanpur was established in 2016 in partnership with the Ministry of Electronics and Information Technology (MeitY), Government of India. It is mandated to provide industry-focused and industry-driven hands-on courses in Electronics & ICT. It strives to narrow the gap between the academic approach to Electronics & ICT domains as currently provided by educational institutes and the practically-oriented approach as demanded by the industry.

E&ICT Academy, IIT Kanpur has collaborated with Simplilearn to deliver this program. Simplilearn's award-winning immersive learning model delivered via live virtual classes focuses on applied learning to create immediate career impact.

Key Features of the Program

- Program completion certificate from E&ICT Academy, IIT Kanpur
- Curriculum delivered in live virtual classroom sessions by seasoned industry experts
- Exposure to the latest AI advancements, such as generative AI, LLMs, and prompt engineering
- Interactive live-virtual masterclasses presented by esteemed IIT Kanpur faculty
- Earn official trophy and badges for ‘Microsoft Azure AI Fundamentals’ on the Microsoft Learn portal
- 25+ hands-on projects and 3 industry-oriented capstone projects
- Seamless access to integrated labs
- Access to a wide array of AI tools such as ChatGPT, DALL-E 2, TensorFlow, Keras, and more
- Simplilearn's JobAssist to help you get noticed by top hiring companies

Eligibility Criteria

For admission to this Generative AI and Machine Learning course, candidates should have:

- A bachelor's degree with an average of 50 percent or higher marks
- Basic understanding of mathematics and programming concepts
- Preferably 2+ years of formal work experience

Application Process

The application process consists of three simple steps:

Step 1

Submit an Application

Complete the application including a brief statement of purpose explaining your interest and qualifications for the program

Step 2

Application Review

A panel of admissions counselors will review your application and statement of purpose to determine whether you qualify for acceptance.

Step 3

Admission

Selected candidates can join the program by paying the admission fee

Talk to an Admissions Counselor

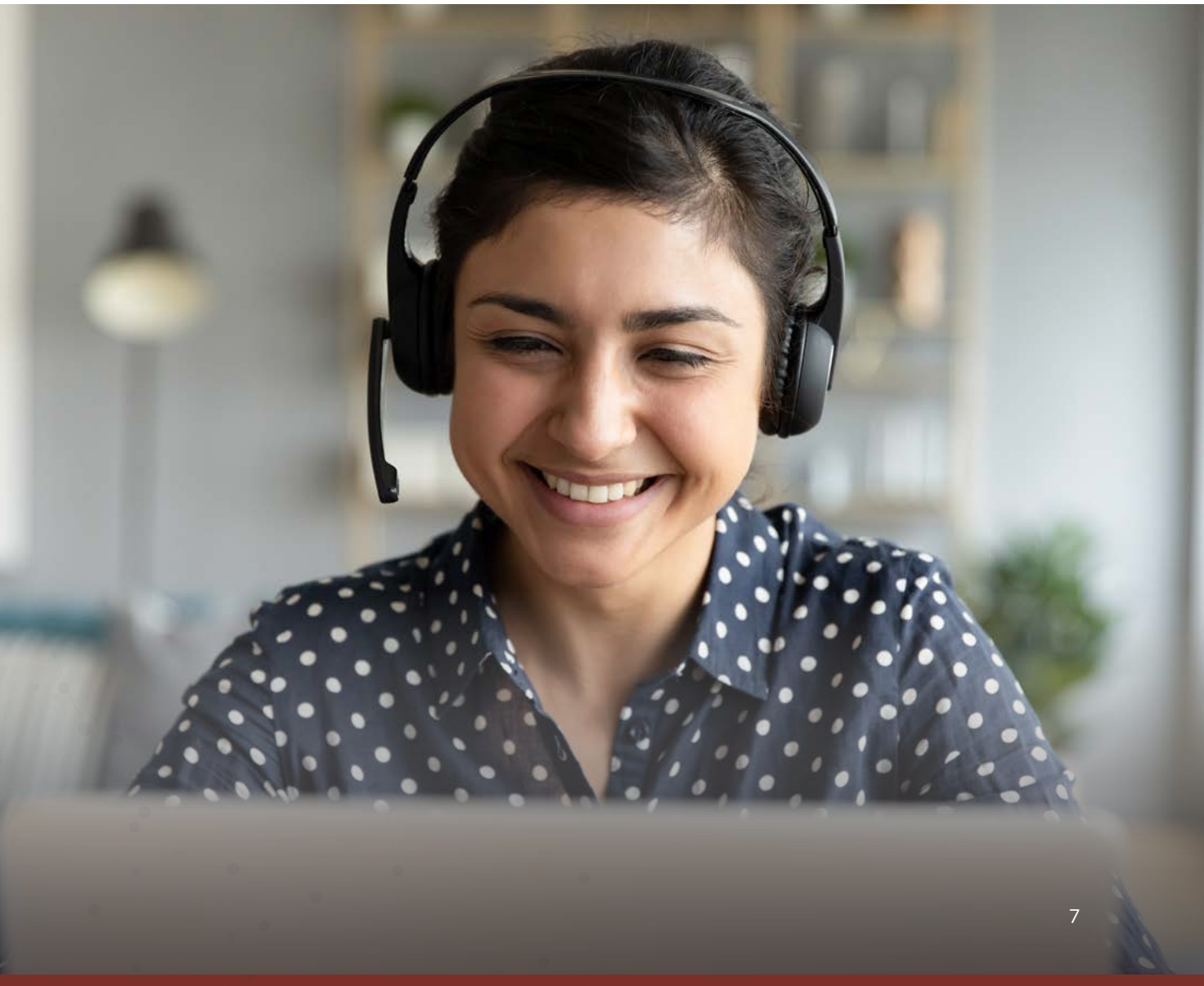
Our team of dedicated admissions counselors is prepared to address your questions or concerns about this Generative AI and Machine Learning program.

Our team is available to:

- Answer your questionsabout the application process
- Discuss your financing options
- Provide insight into the curriculum, program outcomes and more

Inquire Now

Contact us | 1-800-212-7688



Who Should Enroll in this Program?

The Generative AI & Machine Learning program caters to professionals from diverse backgrounds and industries who are eager to enhance their AI and Machine Learning skills. This program fosters a dynamic learning environment that benefits from multiple perspectives by bringing together individuals from various fields.

This program is best suited for, but not limited to, those pursuing or currently employed in these roles:

- IT Professionals
- Data Professionals
- Software Engineers
- Product Managers
- Technology Consultants
- Recent Graduates
- Aspiring AI & ML Professionals

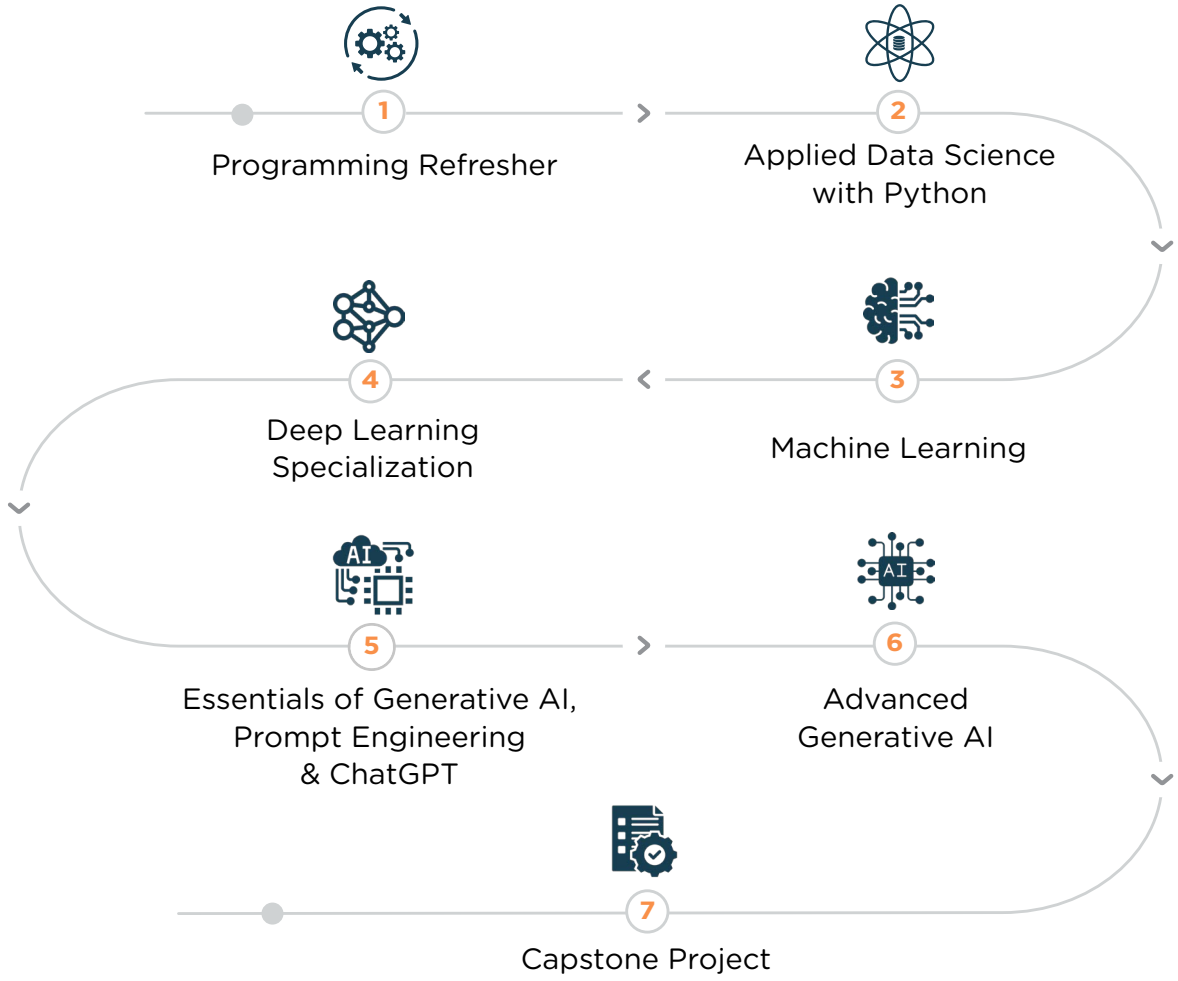
Program Outcomes

By participating in this program, you will:

- Explore the latest trends in AI, such as generative AI, prompt engineering, large language models, and ChatGPT, among others.
- Understand the various generative models including Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and transformer models.
- Gain insights into how attention mechanisms significantly enhance the functionality of transformers.
- Comprehend the complex architecture and essential components that make up large language models.
- Evaluate the underlying design principles of advanced models such as GPT, BERT, and their counterparts.
- Understand the significance of prompt engineering in tailoring outputs for specific needs.
- Assess the most appropriate scenarios for applying different types of Generative AI models.
- Develop the ability to fine-tune Large Language Models (LLMs) for specific applications.
- Achieve competence in benchmarking and evaluating the capabilities of LLMs for different tasks.
- Engage in critically analyzing the performance and limitations of Generative AI models across various application domains.
- Gain comprehensive knowledge of AI and ML, encompassing their meaning, purpose, scope, stages, applications, and impacts.
- Conduct scientific and technical computations utilizing the SciPy package and its sub-packages, such as Integrate, Optimize, Statistics, IO, and Weave.

- Develop expertise in mathematical computation by utilizing the NumPy and scikit-learn packages.
- Master supervised and unsupervised learning concepts, recommendation systems, and time series modeling.
- Validate machine learning models and interpret various accuracy metrics.
- Gain insight into deep learning and its practical applications.
- Comprehend neural networks and navigate through data abstraction layers, everaging tools like Keras for building computer vision applications.
- Perform distributed and parallel computing, harnessing the power of high-performance GPUs.
- Explore the realm of natural language processing (NLP) and natural language generation.
- Learn how to apply machine learning and deep learning techniques to NLP.
- Execute text-to-speech conversion with automated speech recognition.
- Utilize Python and TensorFlow to gain a solid understanding of reinforcement learning theory.
- Acquire the skills to solve reinforcement learning problems through a range of strategies.

Learning Path



Electives

- Advanced Deep Learning & Computer Vision
- NLP & Speech Recognition
- Reinforcement Learning
- Microsoft Azure AI Fundamentals
- Academic Masterclass

Programming Refresher

This course provides you with essential Python programming skills that will serve as the building blocks for your entire program journey. You will learn how to implement artificial intelligence (AI) and machine learning (ML) algorithms, conduct data analysis, and construct intelligent systems effectively using Python.

Learning Outcomes:

- Learn about procedural and object-oriented programming
- Understand the benefits and advantages of utilizing Python
- Install Python and its integrated development environment (IDE)
- Familiarize yourself with the Jupyter Notebook and its usage
- Implement Python identifiers, indentation, and comments effectively
- Identify Python's data types, operators, and string functions
- Learn about different types of loops in Python
- Explore the scope of variables within functions
- Explain the concepts of object-oriented programming (OOP) and its characteristics
- Describe methods, attributes, and access modifiers in Python
- Gain an understanding of multi-threading

Topics Covered

- Fundamentals of Programming
- Introduction to Python Programming
- Python Data Types and Operators
- Conditional Statements and Loops in Python
- Python Functions
- Object-Oriented Programming Operators
- Threading

Applied Data Science with Python

This course provides comprehensive coverage of key concepts in data science, encompassing essential topics such as data preparation,model development, and evaluation. Throughout the course, you will develop a strong understanding of fundamental Python concepts such as strings, Lambda functions, and lists. Additionally, you will explore various essential tools and libraries, including NumPy for efficient array manipulation, linear algebra for mathematical foundations, and statistical concepts such as measures of central tendency and dispersion, skewness, covariance, and correlation. The course also delves into hypothesis testing methods such as the Z-test, T-test, and ANOVA while emphasizing data manipulation techniques using Pandas. Furthermore, you will acquire data visualization skills using popular libraries like Matplotlib, Seaborn, Plotly, and Bokeh.

Learning Outcomes:

- Explain the fundamental principles and applications of data science
- Explore the processes involved in data preparation, model building, and evaluation
- Apply Python concepts, including strings, Lambda functions, and lists
- Develop a strong understanding of NumPy and its application in array indexing and slicing
- Gain familiarity with linear algebra principles and their relevance in data science
- Understand the role of calculus in linear algebra applications
- Calculate and interpret measures of central tendency and dispersion
- Grasp statistical concepts such as skewness, covariance, and correlation
- Understand the concepts of the null hypothesis and alternate hypothesis
- Examine different hypothesis tests, including the Z-test and T-test
- Understand the concept of ANOVA (Analysis of Variance)

- Work effectively with pandas' primary data structures: Series and DataFrame
- Use Pandas to load, index, reindex Utilize pandas to load, index, reindex, and merge dataand merge data.
- Prepare, format, normalize, and standardize data using techniques like data binning
- Construct visually appealing and informative graphs using Matplotlib, Seaborn, Plotly, and Bokeh

Topics Covered

- Introduction to Data Science
- NumPy
- Linear Algebra
- Statistics Fundamentals
- Probability Distributions
- Essentials of Python Programming
- Advanced Statistics
- Working with Pandas
- Data Analysis
- Data Wrangling
- Data Visualization
- End-to-End Statistics Application in Python

Machine Learning

This course provides comprehensive coverage of various types of machine learning and their practical applications. You will explore the machine learning pipeline and delve into topics such as supervised learning, regression models, and classification algorithms. You will also study unsupervised learning, including clustering techniques and ensemble modeling. Evaluate machine learning frameworks like TensorFlow and Keras, and build a recommendation engine with PyTorch.

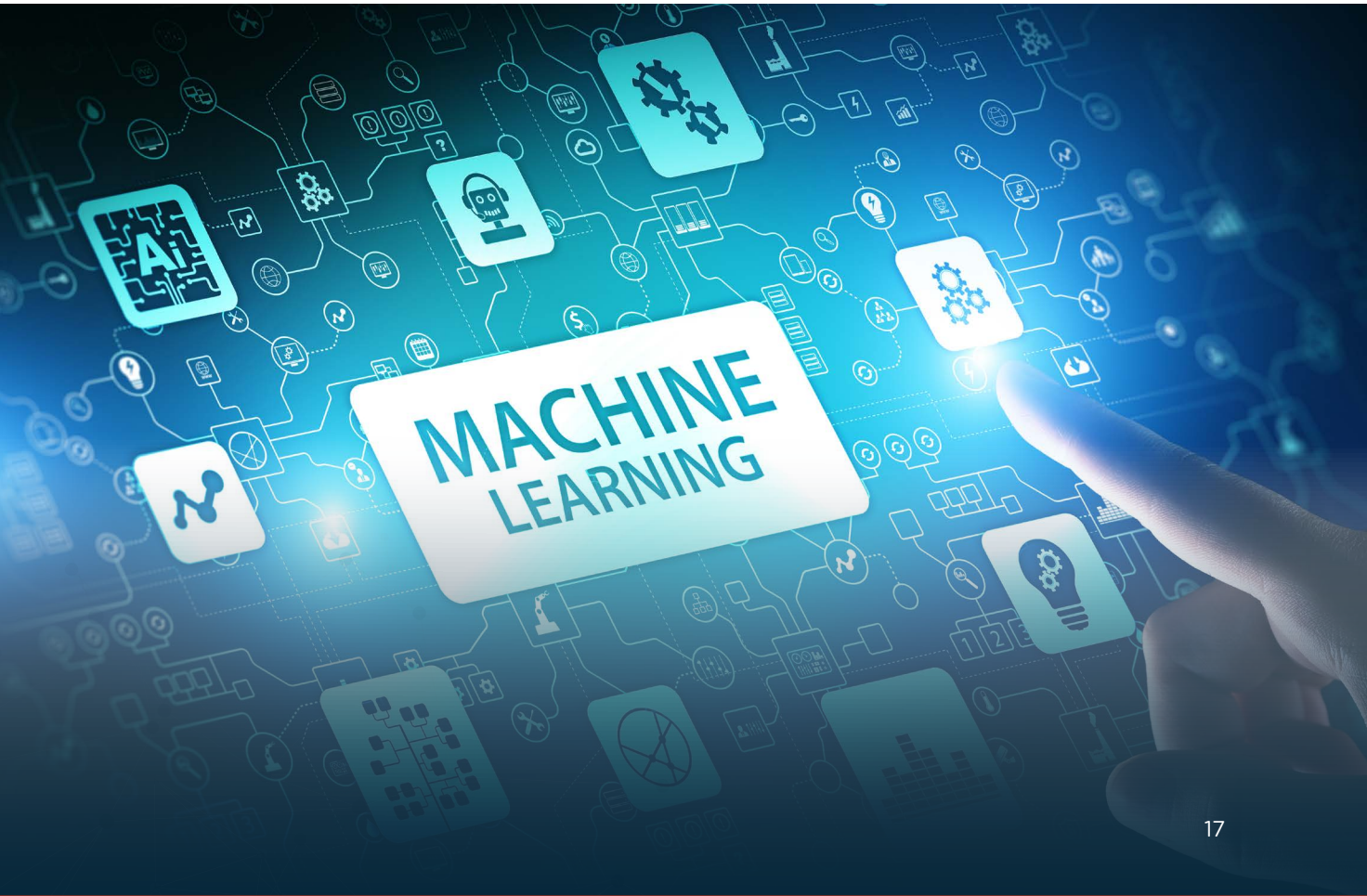
Learning Outcomes:

- Examine the different types of machine learning algorithms and their characteristics
- Analyze the machine learning pipeline and understand the operations involved in MLOps
- Learn about supervised learning and its real-world applications
- Understand the concepts of overfitting and underfitting, and learn how to detect and prevent both
- Analyze different types of regression models and their applications
- Identify linearity between variables and create correlation maps
- List various types of classification algorithms and understand their applications
- Master different types of unsupervised learning techniques
- Determine when to use unsupervised algorithms and explore different clustering methods
- Examine various ensemble modeling techniques such as bagging, boosting, and stacking

- Evaluate different machine learning frameworks, including TensorFlow and Keras
- Build a recommendation engine using the PyTorch library

Topics Covered:

- Machine Learning Fundamentals
- Classification Models and Applications
- Supervised Learning
- Ensemble Learning
- Regression Models and Applications
- Recommendation Systems
- Unsupervised Learning



Deep Learning Specialization

This comprehensive course provides the necessary skills to deploy deep learning tools using AI/ML frameworks. You will explore the fundamental concepts and applications of deep learning and understand the distinctions between deep learning and machine learning. The course covers a range of topics, including neural networks, forward and backward propagation, TensorFlow 2, Keras, performance improvement techniques, model interpretability, convolutional neural networks (CNNs), transfer learning, object detection, recurrent neural networks (RNNs), autoencoders, and creating neural networks in PyTorch. By the end of the course, you will have a solid foundation in deep learning principles and the ability to effectively build and optimize deep learning models using Keras and TensorFlow.

Learning Outcomes:

- Gain an understanding of the differences between deep learning and machine learning.
- Learn about the practical applications of deep learning.
- Understand different types of neural networks
- Master the concepts of forward propagation and backward propagation in deep neural networks (DNN)
- Get introduced to modeling and performance improvement techniques in deep learning
- Comprehend hyperparameter tuning and model interpretability
- Learn about dropout and early stopping techniques and their implementation
- Learn about dropout and early stopping and how to implement them.

- Master convolutional neural networks (CNNs) and object detection
- Grasp the fundamentals of recurrent neural networks (RNNs)
- Understand the basics of PyTorch and learn how to create a neural network using PyTorch

Topics Covered:

- Introduction to Deep Learning
- Artificial Neural Networks
- TensorFlow
- Model Optimization and Performance Improvement
- Transformer Models for Natural Language Processing (NLP)
- Convolutional Neural Networks (CNNs)
- Object Detection
- Deep Neural Networks
- Transfer Learning
- Getting Started with Autoencoders
- Recurrent Neural Networks (RNNs)

Essentials of Generative AI, Prompt Engineering & ChatGPT

This course provides a foundational understanding of Generative AI models, specifically focusing on ChatGPT. Participants will acquire an all-encompassing grasp of the fundamentals of generative AI and its scope, prompt engineering, explainable AI, conversational AI, ChatGPT, other popular large language models and much more.

Learning Outcomes:

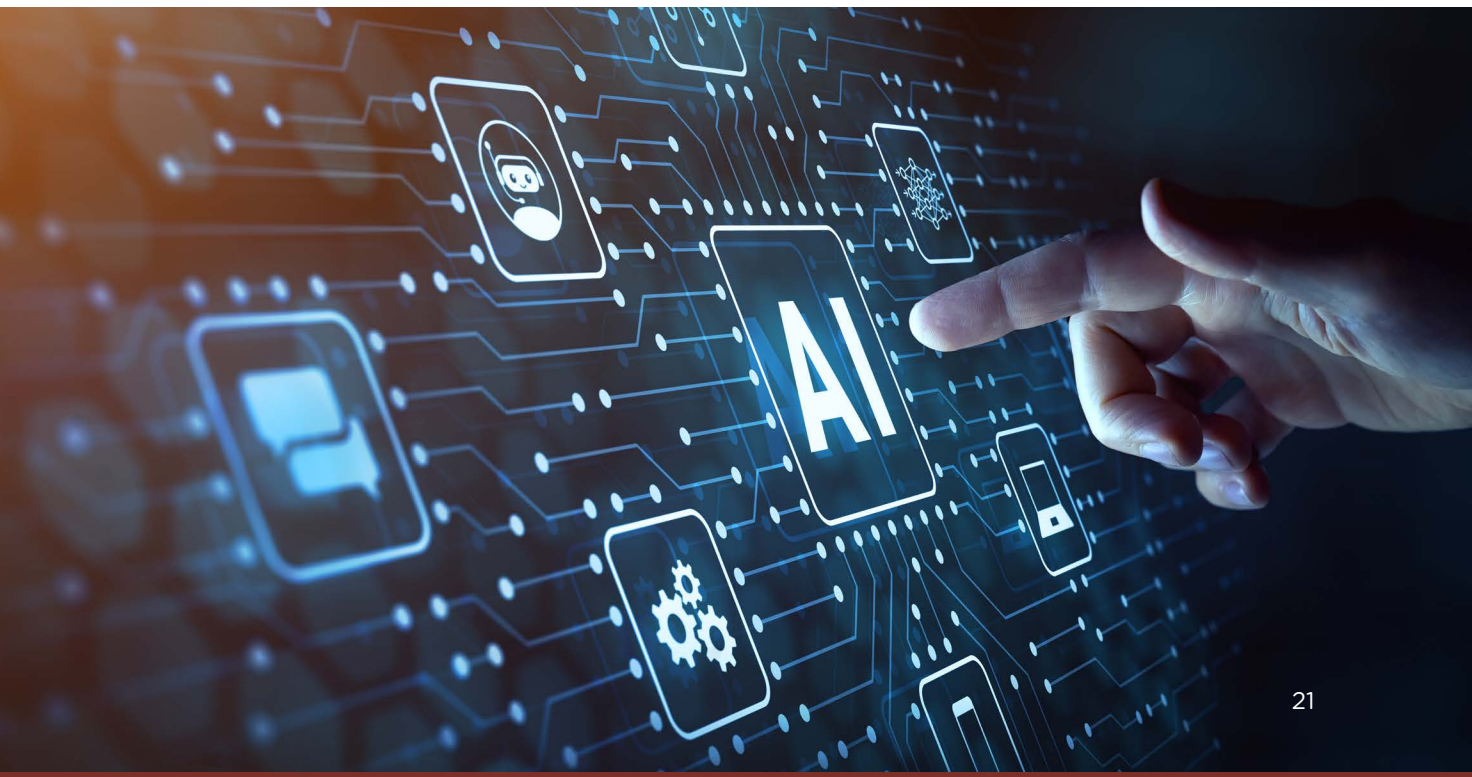
Upon completion of the course, participants will be able to:

- Understand the fundamentals of generative AI models, including various types and working principles
- Comprehend the concept of explainable AI, recognize its significance, and identify different approaches to achieve explainability in AI systems
- Apply effective prompt engineering techniques to enhance the performance and control the behavior of generative AI models
- Develop a deep understanding of ChatGPT, including its mechanisms, notable features, and limitations
- Identify and explore diverse applications and use cases where ChatGPT can be leveraged
- Gain exposure to fine-tuning techniques to customize and optimize ChatGPT models for specific tasks and domains
- Recognize the ethical challenges of generative AI models and ChatGPT and develop strategies for responsible data usage, bias mitigation, and misuse prevention
- Understand the potential of generative AI to revolutionize industries and delve into prominent generative AI tools
- Identify and implement security measures to protect ChatGPT from unauthorized access and ensure safe and non-offensive content generation

- Learn techniques to monitor ChatGPT for performance issues and identify and debug incorrect or unexpected outputs
- Understand how to maintain and update ChatGPT models with the latest features and improvements
- Gain insights into the future of generative AI, its challenges, and the necessary steps to unlock its full potential

Topics Covered:

- Introduction to Generative AI Models
- Explainable AI
- Prompt Engineering
- ChatGPT
- Deploying and Scaling ChatGPT
- Ethical Considerations in Generative AI Models
- The Future of Generative AI
- Large Language Models
- Fine-tuning ChatGPT



Advanced Generative AI

Take a plunge into the groundbreaking Generative AI concepts with this advanced course. As part of this course, you will thoroughly explore neural networks, LLMs and their architectures, and the different types of generative models such as VAEs, GANs, Autoencoders, and Transformer-based models. You will also delve into the popular Gen AI models like GPT, BERT, and T5 and how to benchmark them. Through hands-on learning, you'll get first-hand experience of developing and deploying a conversational chatbot that can engage in meaningful dialogues.

Learning Outcomes:

Upon completion of the course, participants will be able to:

- Understand the crucial role of Transformers in the landscape of modern AI applications.
- Analyze how well neural network architectures are suited for tasks that involve generation.
- Identify and clearly explain the foundational concepts that drive generative models.
- Comprehend the complex architecture and essential components that make up large language models
- Evaluate the underlying design principles of advanced models such as GPT, BERT, and their counterparts.
- Recognize how the specific architecture of a model determines its capabilities in language processing.
- Distinguish among various generative model types, including VAEs, GANs, Transformers, and Autoencoders.
- Assess the most appropriate scenarios for applying different types of generative AI models.
- Gain insights into how attention mechanisms significantly enhance the functionality of Transformers.

- Evaluate the role and effectiveness of attention mechanisms across diverse generative tasks.
- Discuss the importance of attention mechanisms in improving both the interpretability and performance of models.
- Analyze and contrast the architectural nuances and goals of popular generative AI models like GPT and BERT.
- Understand the critical role of benchmarking in the assessment of generative AI models.
- Engage in a critical analysis of the performance and limitations of generative AI models across various application domains.
- Develop a deeper understanding of advanced strategies for crafting effective prompts in AI models:
- Analyze and utilize advanced strategies for crafting prompts that steer models towards intended outputs.
- Investigate methods for refining prompts to draw out particular responses from language models.
- Identify and mitigate potential biases in prompt design and their effects on model behavior.

Topics Covered:

- Introduction to Generative Models
- Large Language Models Architecture
- Types of Generative AI Models
- Attention Mechanisms and Transformers
- Popular Generative AI Models
- Benchmarking & Evaluating Models
- Advanced Prompt Engineering Techniques

Capstone Project

The capstone project allows you to implement the skills you will learn throughout this program. You will solve industry-specific challenges by leveraging various AI and ML techniques. The capstone project is the final step in the core learning path and will help you showcase your expertise to employers.

Learning Outcomes:

The capstone project will enhance your understanding of the Artificial Intelligence decision cycle, including performing exploratory data analysis, building and fine-tuning a model with cutting-edge AI-based algorithms and representing results.

Electives

Advanced Deep Learning and Computer Vision

In this advanced course, you will gain in-depth knowledge and practical skills in computer vision and deep learning techniques. The course covers various topics, including image formation and processing, convolutional neural networks (CNNs), object detection, image segmentation, generative models, optical character recognition, distributed and parallel computing, explainable AI (XAI), and deploying deep learning models. By the end of the course, you will have the expertise to tackle complex computer vision challenges and successfully deploy deep learning models.

Natural Language Processing and Speech Recognition

This advanced course comprehensively explores applying machine learning algorithms to process vast amounts of natural language data. It focuses primarily on natural language understanding, feature engineering, natural language generation, automated speech recognition, speech-to-text conversion, text-to-speech conversion, voice assistance devices, and building Alexa skills. By the end of the course, you will have a deep understanding of the science behind natural language processing and speech recognition, enabling you to develop advanced applications in these areas.

Reinforcement Learning

This course delves into the core concepts of reinforcement learning (RL), providing you with the knowledge and skills to solve RL problems using various strategies in Python and TensorFlow. You will learn the theoretical foundations of RL and gain practical experience in applying RL algorithms as a problem-solving strategy. By the end of the course, you will be equipped with the skills to use reinforcement learning in diverse applications and scenarios effectively.

Microsoft Azure AI Fundamentals

This course provides an introduction to the basic concepts of artificial intelligence(AI) and the Microsoft Azure services that can be utilized to develop AI solutions. It's not intended to train students to become professional data scientists or software developers, but to increase understanding of typical AI tasks and the Azure services that can handle them. The course format is self-paced with online resources on the Microsoft Learn platform.

Academic Masterclass

Engage in enlightening online interactive masterclasses led by distinguished faculty members from the esteemed institution of IIT Kanpur. These masterclasses provide invaluable insights into the latest advancements in technology and techniques across the expansive domains of Data Science, Artificial Intelligence (AI), Generative AI (GenAI), and Machine Learning. Through comprehensive discussions and presentations, you will deepen your understanding of the cutting-edge developments shaping these fields, equipping you with the knowledge and expertise required to remain at the forefront of innovation in the ever-evolving landscape of technology.

Tools Covered

Industry Projects

Project 1:

Create a Virtual Assistant with Generative AI

Develop a conversational chatbot that can engage in meaningful dialogues, answer questions, provide recommendations, and assist with tasks based on the documents provided.

Project 2:

Predicting Employee Iteration with Machine Learning

Build a machine learning model that predicts employee attrition rate at a company by identifying patterns in their work habits and desire to stay with the company.

Project 3:

Explore the Road Safety of Autopilot Feature with Data Analysis

Examine accident data involving Tesla's auto-pilot feature to assess the correlation between road safety and the use of auto-pilot technology.

Project 4:

Create An AI Recommendation Engine to Improve Marketing

Use AI to categorize images of historical structures and conduct exploratory data analysis (EDA) to build a recommendation engine that improves marketing initiatives.

Project 5:

Utilize Deep Learning to Automate Ship Detection

Use deep learning concepts, such as CNN, to automate a system that detects and prevents faulty situations resulting from human error and identifies the type of ships

Project 6:

Explore Feature Analysis with EDA and Statistics

Perform feature analysis to understand the features of water bottles using EDA and statistical techniques to understand their overall quality and sustainability.

Project 7:

Understand the Real Estate Parameters with Feature Engineering

Use feature engineering to identify the top factors that influence price negotiations in the homebuying process.

Project 8:

Use Cluster Analysis for Song Classification

Perform cluster analysis to create a recommended playlist of songs for users based on their user behavior.

Project 9:

Customer Acquisition with EDA and Statistics

Use exploratory data analysis and statistical techniques to understand the factors that contribute to customer acquisition for a retail firm.

Project 10:

Utilize Time Forecasting to Forecast for the Food Industry

Use data science techniques, such as time series forecasting, to help a data analytics company forecast demand for different items across restaurants.

Project 11:

Use Cluster Analysis for Song Classification

Perform cluster analysis to create a recommended playlist of songs for users based on their user behavior.

Project 12:

Build Facial Recognition for Healthcare System with Deep Learning

Leverage deep learning algorithms to develop a facial recognition feature that helps diagnose patients for genetic disorders and their variations.

Program Certificate:

E&ICT Academy, IIT Kanpur has chosen to collaborate with Simplilearn for online professional programs. Simplilearn's award-winning immersive learning model delivered via live virtual classes focuses on applied learning methods to create immediate career impact. In addition to world-class learning, learners will also gain access to lifetime self-learning content.


E & ICT Academy, IIT Kanpur
(A joint initiative of MeitY & IIT Kanpur)

Certificate

This is to certify that
Dr. / Mr. / Ms. **Student Name**
has successfully completed the certification course on
Professional Certificate Course in Generative AI and Machine Learning

Date of Issue: 15-06-2023

Prof. B. V. Phani
Chief Investigator E & ICT Academy, IIT Kanpur

Upon completing this Generative AI and Machine Learning program, you will receive a program completion certificate from E&ICT Academy, IIT Kanpur. You will also receive certificates from Simplilearn for the individual courses completed in the learning path.
These certificates will testify to your skills as an expert in the field of AI & Machine Learning.

Industry Certificate:


Microsoft

John Doe

has successfully completed

Microsoft Azure AI Fundamentals

April 17, 2024

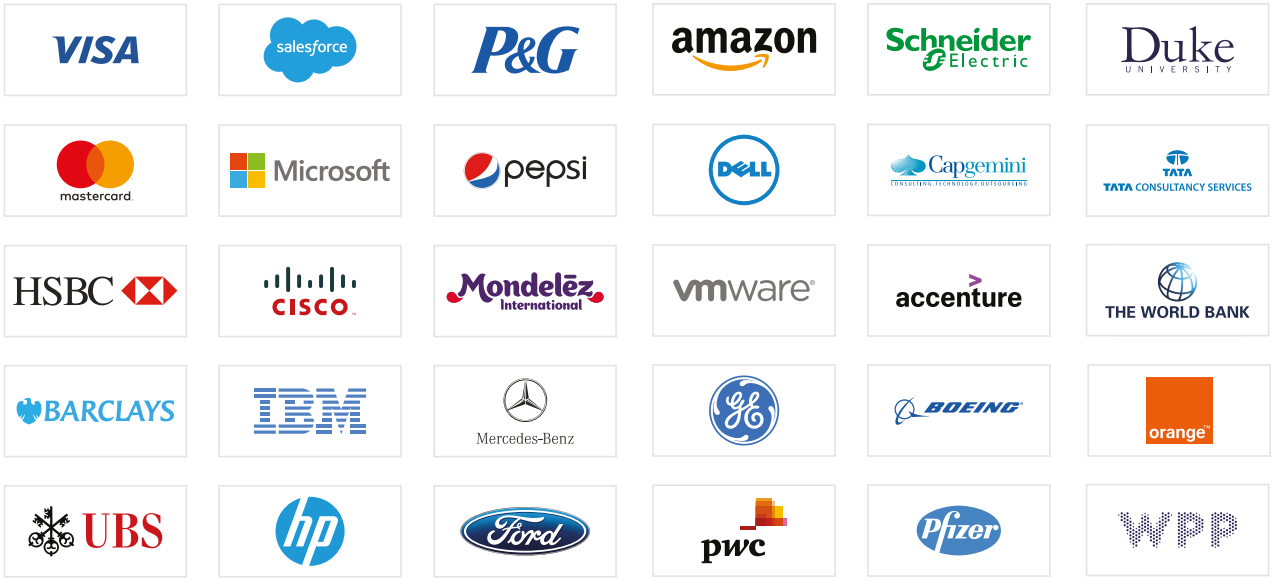
Satya Narayana Nadella

Collaborating with Microsoft:

- Get an official certificate/trophy/ badge hosted on the Microsoft Learn portal
- Acquire an official Microsoft learning path completion transcript

Corporate Training

Top clients we work with:



Features of Corporate Training

- Tailored learning solutions
- Flexible pricing options
- Enterprise-grade learning management system (LMS)
- Enterprise dashboards for individuals and teams
- 24X7 learner assistance and support

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