Generative AI: Introduction and Applications

Throughout the course, I learned:

- **AI fundamentals**: AI simulates human intelligence to perform tasks like problem-solving, speech recognition, and decision-making.
- **Generative AI**: A branch of AI that creates new content—texts, images, voices, and videos—using technologies like large language models, GANs, VAEs, and transformers.
- **Real-life applications**: AI powers personalized recommendations (e.g., Netflix, Spotify), smart home devices, and advanced chatbots that support scalability and multilingual service.
- **Key technologies**: You explored machine learning, deep learning, and neural networks, as well as natural language processing (NLP), computer vision, and robotics.
- **Career opportunities**: Roles such as AI engineer, data scientist, and AI strategist are in demand. You're encouraged to keep learning and specialize in areas of interest.
- **Ethical considerations**: Responsible AI use involves addressing privacy, bias, transparency, and human oversight.

Course Glossary: Introduction to Artificial Intelligence (AI)

Term	Definition
AI algorithms	Programming that tells the computer how to learn to operate on its own, thereby enabling it to attain artificial intelligence (AI).
AI-driven predictive maintenance systems	Using AI in production control, to monitor and detect missing materials or quality issues.

AI-driven robotics	Robots powered with AI that are augmented with a variety of sensors.
AI-driven energy management systems	Using AI in production control to manage and optimize energy production, distribution, and consumption within energy systems.
AI-powered quality control systems	Using AI in production control, to manage quality by enhancing efficiency, accuracy, and decision-making capabilities in various fields.
Augmented intelligence	Technology that enhances human capabilities by providing AI-powered tools and assistance.
Authorization	The process of determining whether an authenticated user has the right to perform an operation.
Automation	The techniques involving technology, programs, robotics, or processes to achieve minimal human intervention.
Big data stores	A larger, more complex data set, especially from new data sources.
Big data	A dynamic, large, and disparate volume of data being created by people, tools, and machines.
Biometric	Application of statistical analysis to biological data of individuals by means of unique physical characteristics.
Carbon footprints	The greenhouse gases produced by digital technology resources, devices, tools, and platforms.

Chatbots	Computer programs that simulate human conversation to provide information, answer questions, and perform tasks via text or voice interactions.
Claude models	Advanced AI language models, designed for natural language understanding and generation. They are similar to OpenAI's GPT series and are used in various applications such as chatbots, content creation, and other AI-driven tasks that require language processing capabilities.
Cloud computing	A technology that stores and uses data and services over the internet instead of keeping everything on your computer.
Cobots or collaborative robots	AI-driven robots that can work alongside humans in a shared workspace to enhance efficiency and increase productivity. Unlike traditional robots, cobots are designed to interact directly with people, making automation more accessible and versatile.
Cognitive	The term involves intellectual activities such as thinking, reasoning, and problem-solving.
Cognitive computing	A technology that can evaluate an individual's performance and offer personalized recommendations. It provides enhanced functionality, adaptability, and intelligence across various domains.
Cyberattack	An attempt targeting to damage a computer network, computer information system, or personal digital devices.
Cybersecurity	Protection of information technology of individuals and organizations from cyberattacks.

Data analysis	Process that involves cleaning, transforming, and modeling data to uncover useful information to aid business decision-making.
Data augmentation	The process of generating data from the existing data to train machine learning models.
Dashboards	Tool to present a bird's-eye view of the complete picture while also allowing you to drill down into the next level of information for each parameter. These are easy to comprehend for an average user, make collaboration easy between teams, and allow you to generate reports on the go.
Dall-E model	A multimodal model developed by OpenAI that exhibits the ability to generate images that precisely match the input text or prompt.
Data scientist	Data professionals who develop algorithms, build predictive models, and uncover patterns and trends in large data sets. They apply statistical analysis, especially inferential statistics, machine learning, and predictive modeling, to extract insights from data and make predictions.
Data readiness	The technique involves removing inconsistencies, filling gaps, and ensuring the data is relevant to the problem of the data.
Deepfake	Altering of an image or recording to misrepresent someone as doing or saying something that was not actually done or said.
Deep learning	Deep learning is a specialized subset of machine learning. Deep learning layers algorithms to create a neural network, which is an artificial replication of the brain's structure and functionality.

Digital landscape	The digital landscape encompasses all hardware, software, and content involved in digital advertising, which is where businesses and customers interact.
Digital data source	The digital location where the data is held in a data table, object, or other storage format.
E-commerce	A platform for buying and selling products and services, transmitting funds and data over the internet.
Edge computing	The practice of processing data closer to the source of generation rather than relying on centralized data centers.
Edge AI	A type of AI that lives on the device itself rather than relying on the cloud.
Electronic health records (EHRs)	A digital version of patient-centered records that makes information available in real time.
Encryption	A method of encoding data so that only authorized individuals can comprehend the information.
Generative AI	AI that is capable of creating new content (text, images, music, audio, and video) and responding to human conversations.
Generative AI: Variational autoencoders (VAEs)	VAEs are a type of generative AI model that works by transforming input data through encoding and decoding. They have three main parts: an encoder network, a latent space, and a decoder network.

Generative AI: Generative adversarial networks (GANs)	GANs involve two neural networks: the generator and the discriminator. The generator creates new data samples, and the discriminator checks if the data is real or fake.
Generative AI: Autoregressive models	Autoregressive models create data sequentially, considering the context of earlier generated elements. These models predict the next element in the sequence based on the previous one.
Generative AI: Transformers	Transformers are generally used in natural language processing (NLP) tasks. They consist of encoder and decoder layers, enabling the model to effectively generate text sequences or perform cross-language translations.
Generative AI: Unimodal models	Unimodal models process inputs and generate outputs within the same modality.
Generative AI: Multimodal models	Multimodal models handle inputs from one modality and produce outputs in a different modality.
Hallucinations	A phenomenon where AI can produce outputs that are inaccurate or completely fabricated. The phenomenon highlights the importance of critical thinking when using AI-generated content.
Internet of Things (IoT)	A network of physical devices connected to the internet that collect and share data for processing and analysis. These devices can be sensors, cameras, or other devices that generate data.
Inventory management	The process of tracking, controlling, and usage of inventory from purchase to the sale of the goods.

Interactive learning environment	A dynamic learning setup where learners actively engage with content, instructors, and peers through digital or physical interactions to enhance learning.
Large language model (LLM)	A type of AI program that can recognize and generate text. LLMs are pretrained on large amounts of data.
Machine learning	The branch of AI and computer science focuses on using data and algorithms to imitate how humans learn, gradually improving accuracy. It helps systems learn and improve at forecasting, much like how people learn from experience.
Machine learning models	Computer programs that aim to train the computers to identify patterns within new data and make predictions.
Machine learning engineers	Programmers who construct the algorithms, systems, models, and frameworks that enable machines to learn and perform functions independently and effectively.
Meta's Llama models	An accessible, open-source LLM designed for developers, researchers, and businesses to build, experiment, and responsibly scale their generative AI ideas.
Natural language processing (NLP)	Machine learning technology that enables computers to interpret and comprehend human language.
Neural networks	Computational models that are influenced by the human brain's neural structure.

Neurons in AI	An artificial neural network consists of interconnected nodes known as neurons. The neurons take incoming data, like the human brain's neurological network, and learn to make decisions over time.
Neural network: Perceptron	The simplest type of artificial neural network consisting of only input and output layers.
Neural network: Feed-forward	A type of artificial neural network in which information flows in one direction, that is, in the forward direction. Each neuron in a layer receives input from neurons in the previous layer and then passes its output to neurons in the next layer.
Neural network: Deep feed-forward	A type of neural network that is similar to the feed-forward network with just more than one hidden layer.
Neural network: Modular	A type of neural network that combines two or more neural networks to arrive at the output.
Neural network: Convolutional neural network (CNN)	A type of neural network that is particularly well-suited for analyzing visual data.
Neural network: Recurrent neural networks (RNNs)	A type of neural network where the neurons in hidden layers receive an input with a specific delay in time. This allows the RNN to consider the context of the input.
IBM watsonx Assistant	A conversational AI solution that empowers a broader audience, including non-technical business users, to effortlessly build generative AI Assistants.

OpenAI	A private AI research laboratory that aims to develop and direct AI in ways that produce services.
Predictive analytics	A method that predicts future outcomes by using historical data combined with statistical modeling, data mining techniques, and machine learning.
Rehabilitation robots	Robots that help patients recover mobility and strength, offering personalized therapy.
Reinforcement learning	A category of machine learning technology that trains software to make decisions to achieve the most optimal results.
Robo-advisors	An online application that uses AI algorithms to offer automated, algorithm-driven investment suggestions, portfolio management, and financial planning services.
Robots	Machines with complex systems made up of several key components such as sensors, actuators, and controllers.
Robotics	A technology that involves designing, constructing, and operating robots, where the machines can perform tasks by themselves or with some help.
Robotic process automation (RPA)	A type of computer software that helps create, use, and control virtual robots. These robots act like humans when they work with digital systems and software.
Salesforce Marketing Cloud	An AI-driven marketing automation platform that uses machine learning algorithms to segment customers, target them with personalized messages, and optimize campaign performance.

Sentiment analysis	Processing digital text using AI to analyze and determine if the emotional tone of the message is positive, negative, or neutral.
Smart grids	An electricity network that uses digital technologies to monitor and manage the transport of electricity from sources to meet the varying electricity demands of end users.
Smart home	A technology that allows homeowners to control appliances, thermostats, lights, and other devices remotely using a smartphone or tablet through an internet connection.
Speech-to-text (STT)	A technology that changes spoken words into written text using neural networks.
Supervised learning	A category of machine learning technology that uses labeled datasets to train algorithms to predict outcomes and recognize patterns.
Strong AI or generalized AI	A type of AI system that replicates advanced human functions, such as reasoning, planning, and problem-solving.
Super AI or conscious AI	A type of AI system that is superintelligent by being self-aware and intelligent enough to surpass the cognitive abilities of humans.
Statistical analysis	The process of collecting large volumes of data and then using statistics and other data analysis techniques to identify trends, patterns, and insights.
Statistical methods	Methods useful to ensure that data is interpreted correctly and apparent relationships are meaningful and not just happening by chance.

Text-to-speech (TTS)	A type of assistive, "read aloud," technology that reads digital text aloud.
Unsupervised learning	A category of machine learning technology that uses algorithms to analyze and cluster unlabeled data sets.
Virtual assistance	AI-powered software applications designed to assist users with various tasks, such as setting reminders, providing information, and managing schedules.
Voice assistance	They can be interacted with using voice commands. Users can speak to these assistants to perform tasks, ask questions, and control other devices.
Video analytics	Use of advanced AI and machine learning algorithms to monitor, analyze, and manage large volumes of video.
Weak AI or narrow AI	AI that is focused on one narrow task.