Generative AI

Course objective:

1. Define Gen AI
2. Explain how it works
3. Describe Gen AI Model Types
4. Describe Generative Applications

AI:

It is the development of a computer systems with the theory and methods to build machines that think and act like humans.

*** *Simply, AI is the branch of computer science that deals with the creation of intelligence Agents, which are systems that can reason, and learn, and act autonomously.* ***

Machine learning:

****It gives computers the ability to learn without explicit programming.* ***

Subset Representation:(<<-)

AI <<- ML <<- Deep Learning <<- Generative AI

Here, AI is the superset under which the remaining comes.

Deep Learning:

It is a type of ML that uses **"artificial Neural Networks "**, allowing them to process more complex patterns than machine learning.

Here Artificial Neural Networks are inspired by the human brains.

Generative AI:

Definition: It is a subset of deep learning, which means it uses Artificial neural networks, and they can process both labelled and unlabelled data using supervised, unsupervised and semi-supervised methods.

**** Simply, it is a type of AI, that can create a new content based on existing data. Gen AI models learn the pattern and structure of their training data, and then generate new data with similar characteristics. ****

=> The process of learning from existing content is called training and results in the creation of a statistical model.

=> When given a prompt, GenAI uses this statistical model to predict what an expected response might be - and this generates new content.

LLM (Large language Models) are also a subset of deep learning. LLM is a type of ML model that can perform NLP tasks like:

- generating text
- Translate text from one lang to another

It can generate any kind of content like it can be an image, or a code, or text, or a video and it can be anything.

In general, they are divided into two types;

1. Generative

2. Discriminative

Discriminative:

- Used to predict or classify
- Typically trained on a dataset of labelled data
- Learns the relationship between the features of the data points and the labels.

Generative:

- Generates new data that is similar to data it was trained on.
- It Understands the distribution of data and how likely a given example is
- Ex: Predict next word in a sequence

Predictive ML Models (VS) GenAI Models:

1. Predictive: It learns the relationship between data and label, finally it generates the output a new label.

But,

2. GenAI: It learns the patterns in unstructured content, and generates the output a new content.

Gen language models: They generates the result from the text we are given.

It learns from the patterns of text and creates the results.

Input: text

Output: Video / Text / Audio / Decision

Generally, we use a method called "Diffusion" to generate images from text.

How it works?

Pre-Training:

- Large amounts of data
- Billions of parameters
- Unsupervised Learning

Components:

It basically has A **" Transformer Model "** that has two components:

1. **Encoder**: It encodes the input sequence and passes it to the decoder.

2. **Decoder**: It learns how to decode the representation for a relevant task.

In Transformers, Hallucinations are words or phrases that are generated by the model that are often nonsensical or grammatically incorrect.

They are caused by numerous factors, including the model trained on not enough data or the model is trained on noisy or dirty data.

They make the output difficult to understand. They can be an incorrect or misleading information.

Prompting:

What is prompt?

It is a short piece of text. Which is given to LLM as an input.

And it can be used to control the output of the model.

Prompt Design: The quality of the input determines the quality of the output.