DAY 1: INTRODUCTION TO GENERATIVE AI

Introduction
Generative AI is a tool that can write text, create pictures, or compose music for you.

Generative AI refers to a type of artificial intelligence that is capable of creating new content based on its understanding of patterns and relationships in the data.

In the case of ChatGPT, generative AI is used to create text-based responses to user input. Generative AI is the core technology behind ChatGPT.

———————————————————————

Training Data
AI doesn't learn the same way humans do; it analyzes data and creates connections using math. In order to create connections, it needs lots of Relevant data.

Training data can be anything from text to images to websites! The more diverse and high-quality the training data, the better our AI will be.

Remember, if we put garbage data in, we'll get garbage data out!

———————————————————————

Encoding Training Data
We transform text, images, or other data into a series of vectors that the AI can process. This process is called **encoding**. These vectors are essentially lists upon lists of numbers.

———————————————————————

Creating a Probability Distribution
During **training**, the AI looks at the encoded data and learns the underlying structure of the data to be able to generate coherent data. The training phase involves learning about word associations and co-occurrence patterns. This is called **probability distribution**. "What is the probability of A occurring given B has already occurred?". An example would be "P(A|B)."

The AI might start doing more complex math and asking more complex questions. Such as "What is the probability of A occurring given B, C, and D have already occurred?" The probability distribution provides a complete description of the probabilities of all possible occurrences.

—————————————————————————

Extra Learning and Filtering
AI can benefit from feedback and unsupervised learning. The initial versions of ChatGPT used **reinforcement learning** and **human feedback** to do additional training. This involves a rubric that "rewards" or "penalizes" the algorithm depending on the correctness of the guess. Sometimes, a human in the loop is needed to test the outputs too.

It might also be necessary to remove harmful or incorrect connections the AI built from training data. After enough human intervention, they might feel comfortable relying more on **unsupervised learning**. Later versions of GPT used this method.

—————————————————————————

User Input
Once we provide a prompt or question, ChatGPT encodes our input just like it did with the training data.

—————————————————————————

Generating Content
ChatGPT uses the knowledge it has gained from its training data to generate a response. It is Predicting the most likely sequences of words, phrases, or sentences that would form a suitable reply.

Sometimes, ChatGPT might NOT form a suitable reply. This would be called "Hallucinations". This can be a situation where the AI produces outputs that may not be accurate, factual, or relevant.

This can happen for a few reasons:
- Ambiguity in the input: If the user input is vague or unclear, ChatGPT might struggle to generate a relevant response, causing it to create content that appears to be a hallucination.
- Lack of specific knowledge: If ChatGPT hasn't encountered enough relevant information about a specific topic, it might fill in gaps with incorrect or unrelated details.
- Limitations of the model: Although GPT-# is a powerful AI model, it's not perfect. It may not always generate accurate, factually correct, or contextually appropriate responses, leading to hallucinations in some cases.

We should always double-check any data it gives us.

————————————————————————

Decoding and Outputting Content
Once the generative model generates content, we need to transform it back into something the user can understand.
This process is called **decoding**. To the user, this whole process happens very quickly. This is because the generative model is created ahead of time.

————————————————————————

The Process:
- Collect Training Data
- Encode Training Data
- Train and Create a Probability Distribution
- Extra Learning & Filtering: Reinforcement Learning or Unsupervised Learning
- Collect and Encode User Input
- Generate Content
- Decode and Output Generated Content