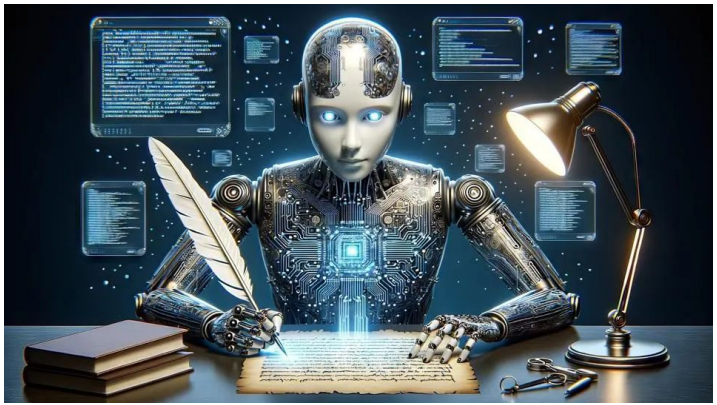
Master Generative AI in Bangla



Boktiar Ahmed Bappy

Data Scientist and Mentor with more than **5 years** of working experience in the field of **Python**, **Machine Learning, Deep Learning, MLOps, Generative AI, and Robotics systems**. Hands-on experience on **Classification, Regression, Clustering, Computer vision, Natural language processing, and Transfer learning models** to solve challenging business problems.

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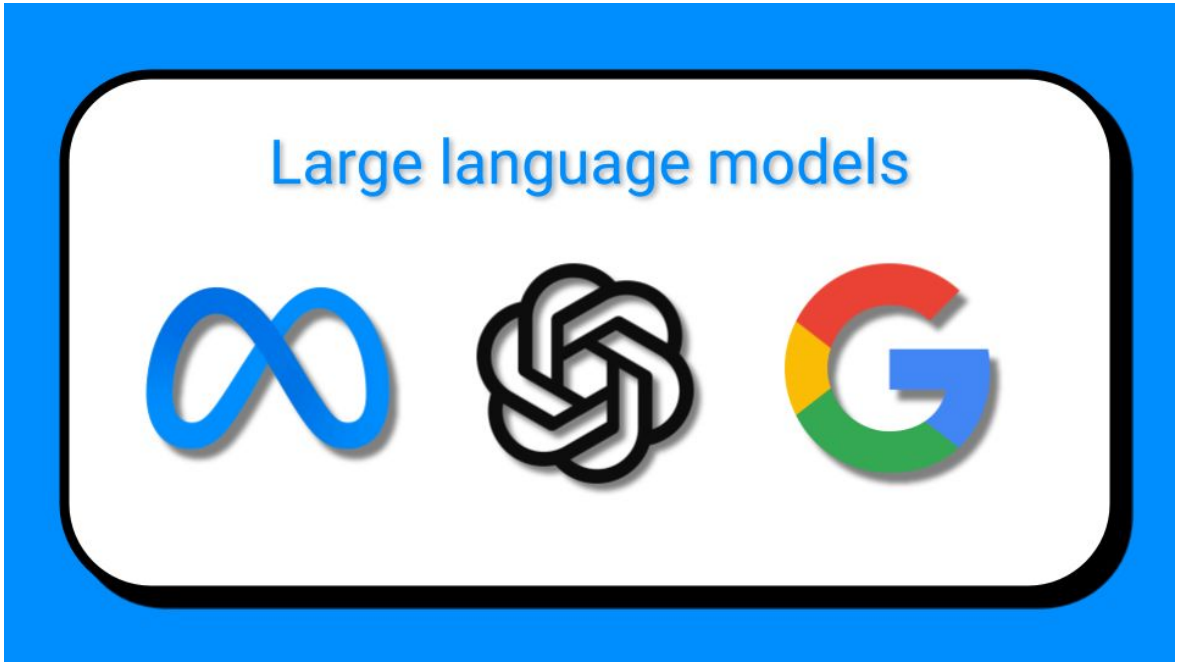
What you will learn?

- Generative AI?
- Text Preprocessing and Text Embedding
- Large Language Models **(LLMs)**
- Huggingface Platform and its API
- OpenAI
- Prompt Engineering
- LangChain
- Vector Database
- Llama Index
- Open Source LLM models
- Retrieval-Augmented Generation (RAG)
- 20 + End to End Project with Deployment
- Cloud Generative AI - AWS Bedrock, GCP Vertex AI

Prerequisite

- Python Programming
- Basics of NLP understanding link RNN, Attention
- Your Dedication

Generative AI



- **ChatGPT**
- **Google Gemini**
- **Meta Llama**

What is Generative AI?

Generative AI generate new data based on training sample.Generative model can generate Image,Text, Audio, Videos etc. data as output.

So generative AI is a very huge topics,

- Generative Image model
- Generative Language model

Generative Model:

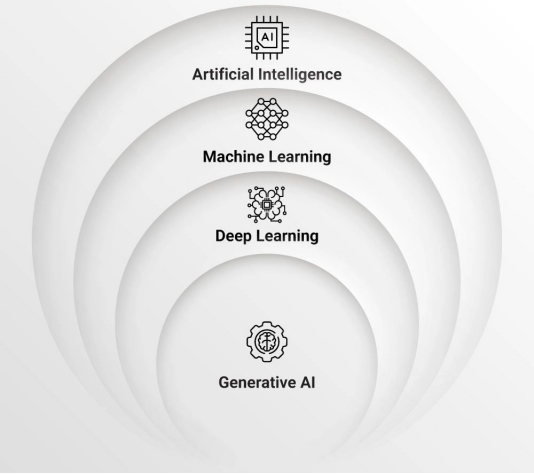
Questions

Responses

Why are generative models required?

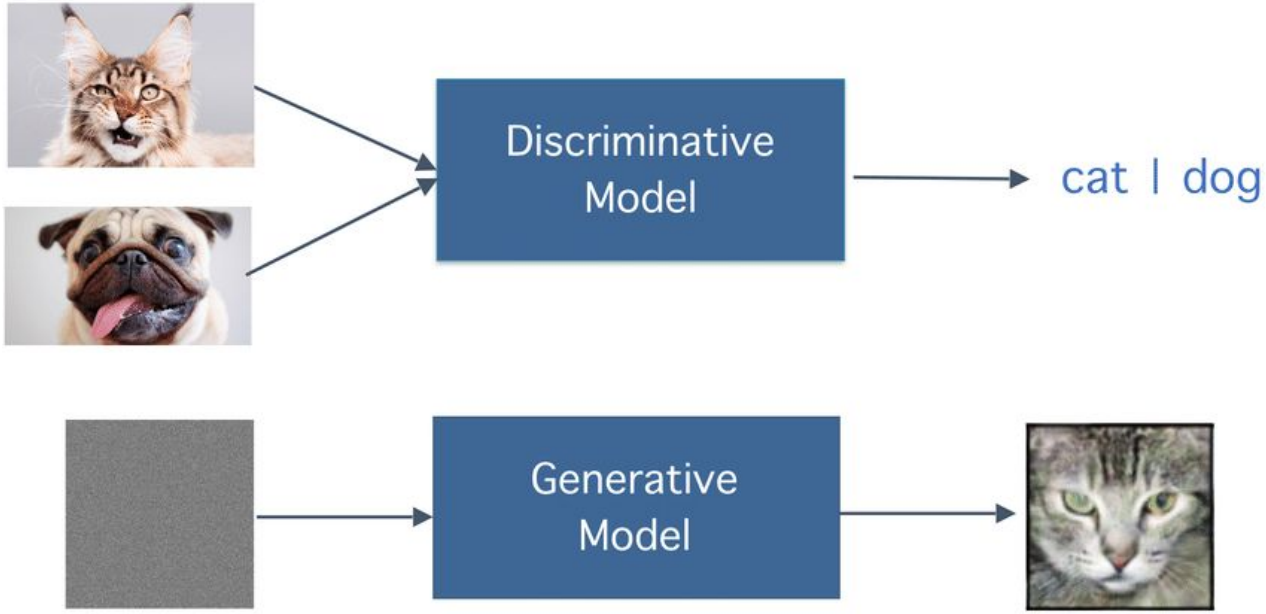
- Understand Complex Pattern from Data
- Content generation
- Build Powerful Application

Where Generative AI Exists.

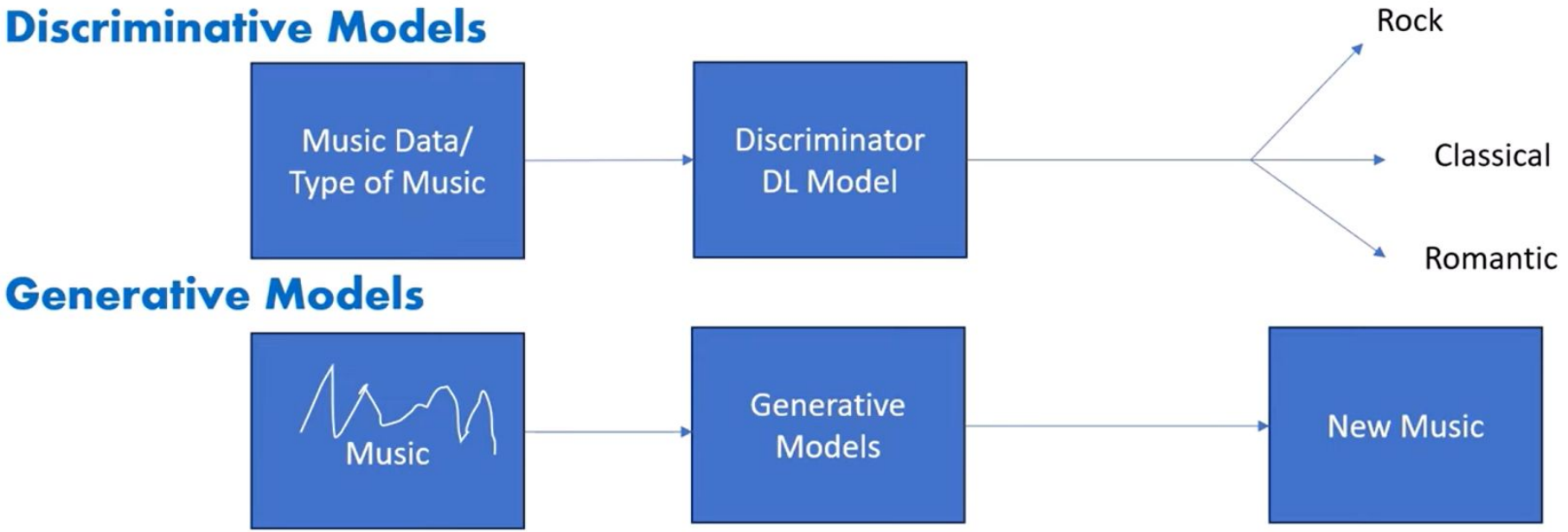


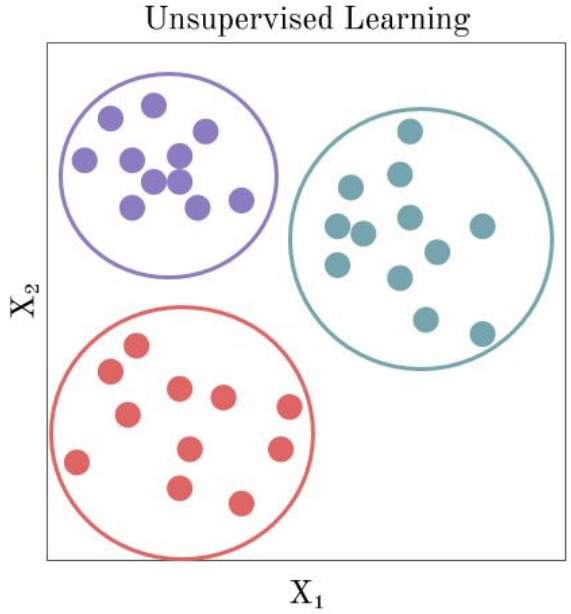
- Machine Learning is the subset of Artificial Intelligence
- Deep Learning is the subset of Machine Learning
- Generative AI is the subset of Deep Learning

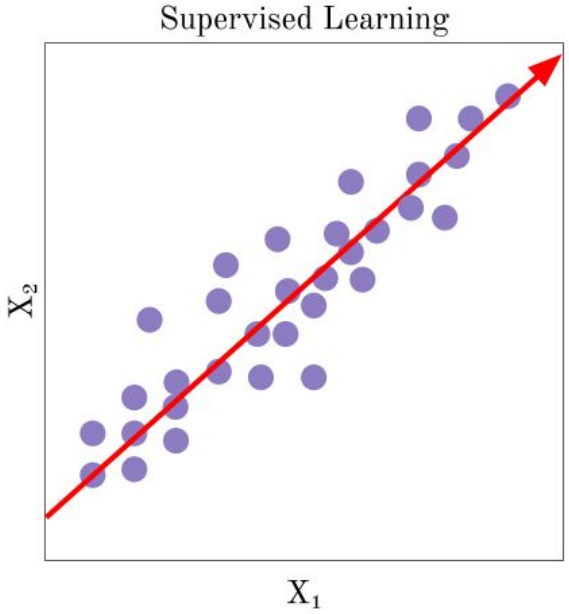
Discriminative vs Generative Model



Discriminative vs Generative Model





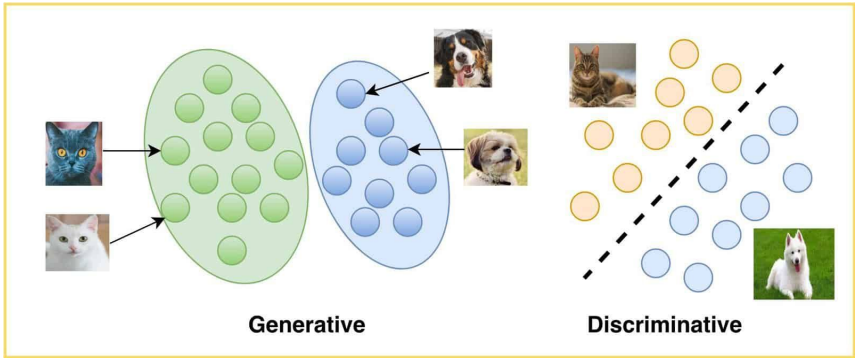


Clustering:

- K-Means
- DBScan

Classification & Regression:

Generative AI is a subset of deep learning and Generative models are trained on huge amount of data. While training the generative model we don’t need to provide a label data, It is not possible when we have a huge amount of data, So, it's just try to see the relationship between the distribution of the data. **In Generative AI we give unstructured data to the LLM model for training purpose.**



What is LLMs?

Large Language Models (LLMs) are foundational machine learning models that use deep learning algorithms to process and understand natural language. These models are trained on massive amounts of text data to learn patterns and entity relationships in the language.

It is a language model which is responsible for performing task such as **text** to **text generation , text to image generation and image to text generations.**

What makes LLM so Powerful?

- In case of LLM, one model can be used for a whole variety of tasks like:-

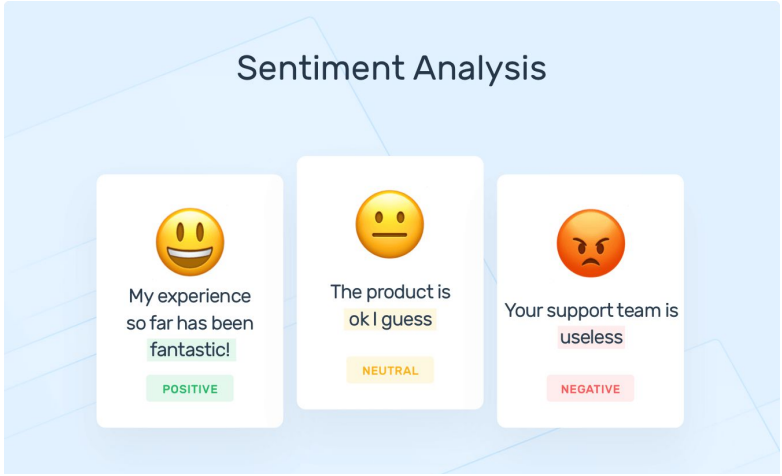
Text generation, Chatbot, summarizer, translation, code generation

& so on …

So, LLM is subset of Deep Learning & it has some properties merge with Generative AI

Why LLM so Powerful?

- Train the model for a specific task



Few milestone in large language model

- Gemini
- GPT
- XLM
- T5
- Llama
- Mistral
- Falcon

Generative AI

End to end Pipeline

End to end Generative AI Pipeline

Generative AI pipeline is a set of steps followed to build an end to end GenAI software

Break the problem down into several sub-problems, then try to develop a step-by-step procedure to solve them. Since language processing is involved, we would also list all the forms of text processing needed at each step. This step-by-step processing of text is known as a pipeline.

Generative AI Pipeline

- Data acquisition
- Data Preparation
- Feature engineering
- Modeling
- Evaluation
- Deployment
- Monitoring and model updating

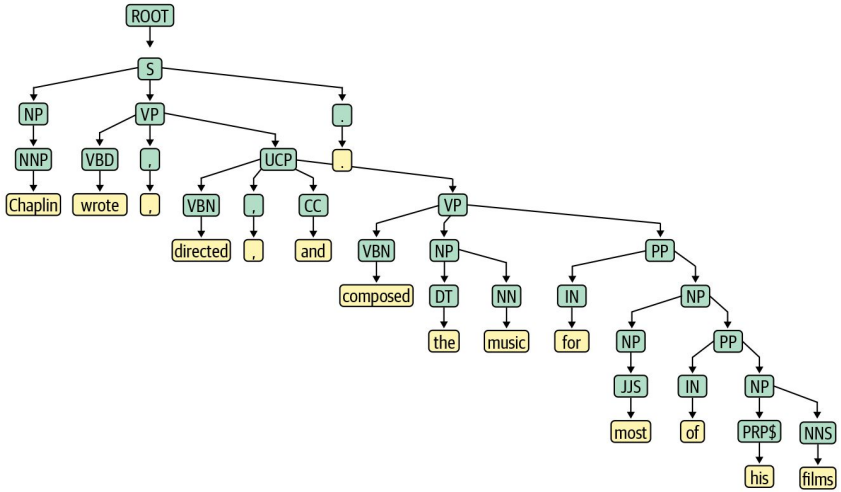
Input

Chaplin wrote, directed, and composed the music for most of his films.

Tokenization with Lemmatization

POS Tagging

Parse Tree



Coreference Resolution

Generative AI

Data Preprocessing

Generative AI

Data Representation

Generative AI

Text Classification Practical

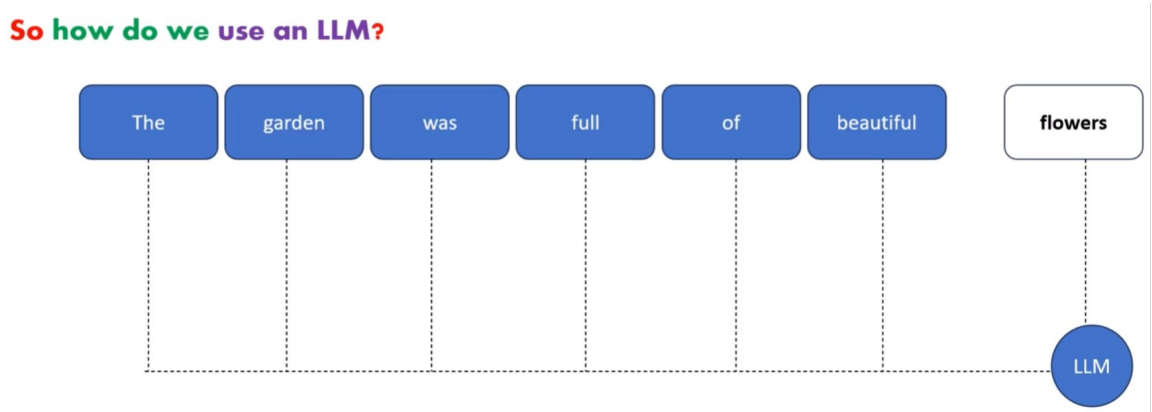
Generative AI

Large language models (LLMs)

What is LLMs?

A large Language model is a trained deep learning model that understands and generate text in a human like fashion.

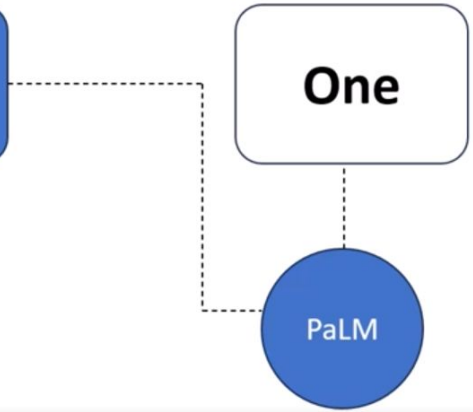
LLMs are good at Understanding and generating human language



It’s raining cats and

dogs

I have two apples and I eat one, I’m left with



Why we call it Large Language Model?

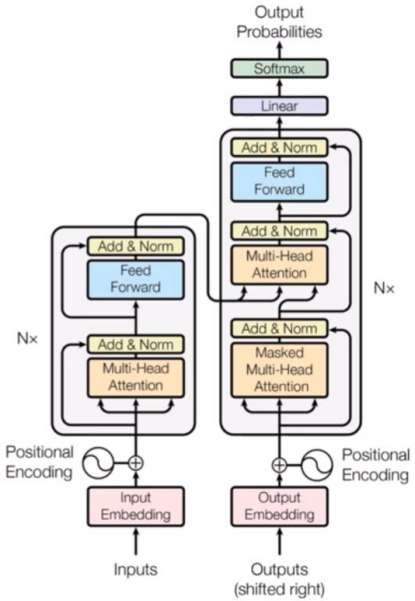
Because of the size and complexity of the Neural Network as well as the size of the dataset that it was trained on.

Researchers started to make these models large and trained on huge datasets

That they started showing impressive results like understanding complex Natural Language and generating language more eloquently than ever.

LLMs Model Core Architecture

Large Language models are based on transformer a type of Neural Network Architecture invented by Google.



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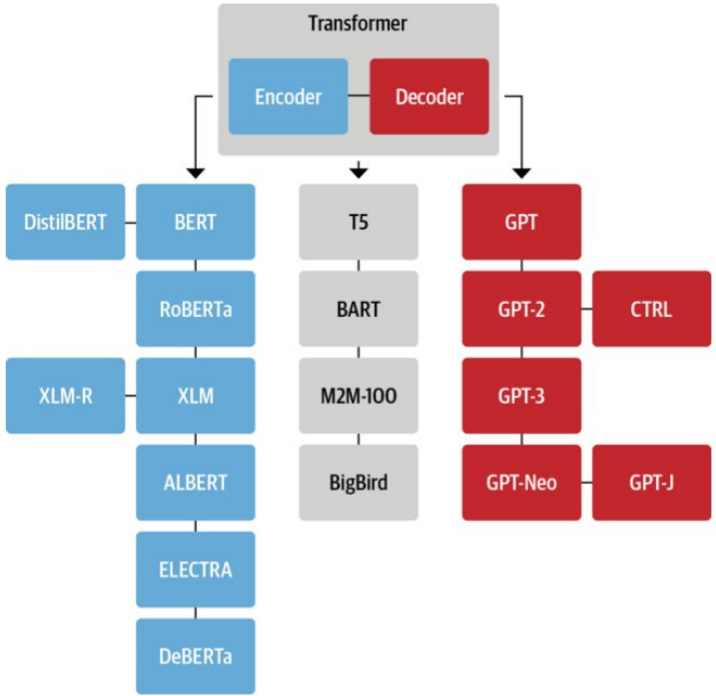
Few milestone in large language model

- **Gemini:** was developed by Google
- **GPT:** GPT stands for "Generative Pre-trained Transformer".The model was developed by OpenAI
- **XLM:** Cross-lingual Language Model Pretraining by Guillaume Lample, Alexis Conneau.
- **Llama:** It was created by Meta AI
- **Megatron:** Megatron is a large, powerful transformer developed by the Applied Deep Learning Research team at NVIDIA
- **M2M-**100: multilingual encoder-decoder (seq-to-seq) model researchers at Facebook

Transformer Tree



OpenAI Based LLM models

MODELS	DESCRIPTION
GPT-4	A set of models that improve on GPT-3.5 and can understand as well as generate natural language or code
GPT-3.5	A set of models that improve on GPT-3 and can understand as well as generate natural language or code
GPT base	A set of models without instruction following that can understand as well as generate natural language or code
DALL·E	A model that can generate and edit images given a natural language prompt
Whisper	A model that can convert audio into text
Embeddings	A set of models that can convert text into a numerical form
Moderation	A fine-tuned model that can detect whether text may be sensitive or unsafe
GPT-3 Legacy	A set of models that can understand and generate natural language

Other Open Source Models

- Mistral
- Llama
- Gemini
- Falcon
- Claude
- MPT-30B
- Stablelm

So on ….

What can LLMs be used for?

- Text Classification
- Text Generation
- Text Summarization
- Conversation AI like chatbot, Question Answering
- Speech recognition and Speech identification
- Spelling Corrector

So on……

Prompt Designing

All the text that we feed into an LLM as input is called a prompt and this whole art is known as prompt design, which is about figuring out how to write and format prompt text to get LLMs to do what you want

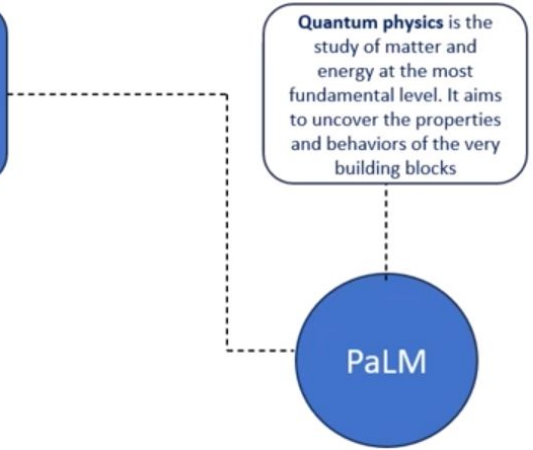
It’s raining cats and

I have two apples and I eat one, I’, left with

The approach using a single command to get an LLM to take on a behavior is called Zero Shot Learning

Write me a poem about Ada Lovelace in the style of Shakespeare

Explain the Quantum Physics to me like I'm five years old



Few Shot Learning

In addition, to just providing an instruction it can be helpful to show the model what you want by adding examples this is called few shot learning because we showed the model a few examples

Like here is a prompt for translating from English to French

First, we provide an instruction as shown below

Convert the text from English to French

Then we give some examples establishing the text pattern

Few Shot Learning

Convert the text from English to French

Peppermint: menthe poivrée
Desert cactus: Cactus du désert

Potato: pomme de terre

Lipstick: Rouge à lèvres
Orange Juice: du jus d'orange
Sparkling water: Eau gazeuse

Instruction

Examples Establishing the Text Pattern

Prompt
Output

Generative AI

In depth Intuition of Transformer

Generative AI

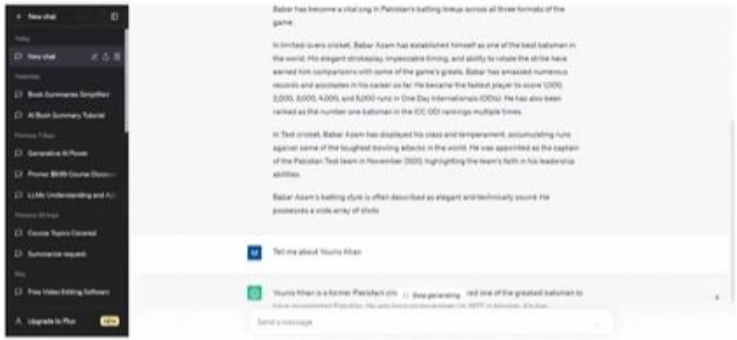
How ChatGPT is Trained

How ChatGPT was trained?

Internally using a LLM which is gpt-3.5 or gpt-4
It has trained on a large amount of data which is available all over the internet.

1. Generative pre-training
2. Supervised fine-tuning
3. Reinforcement learning

ChatGPT



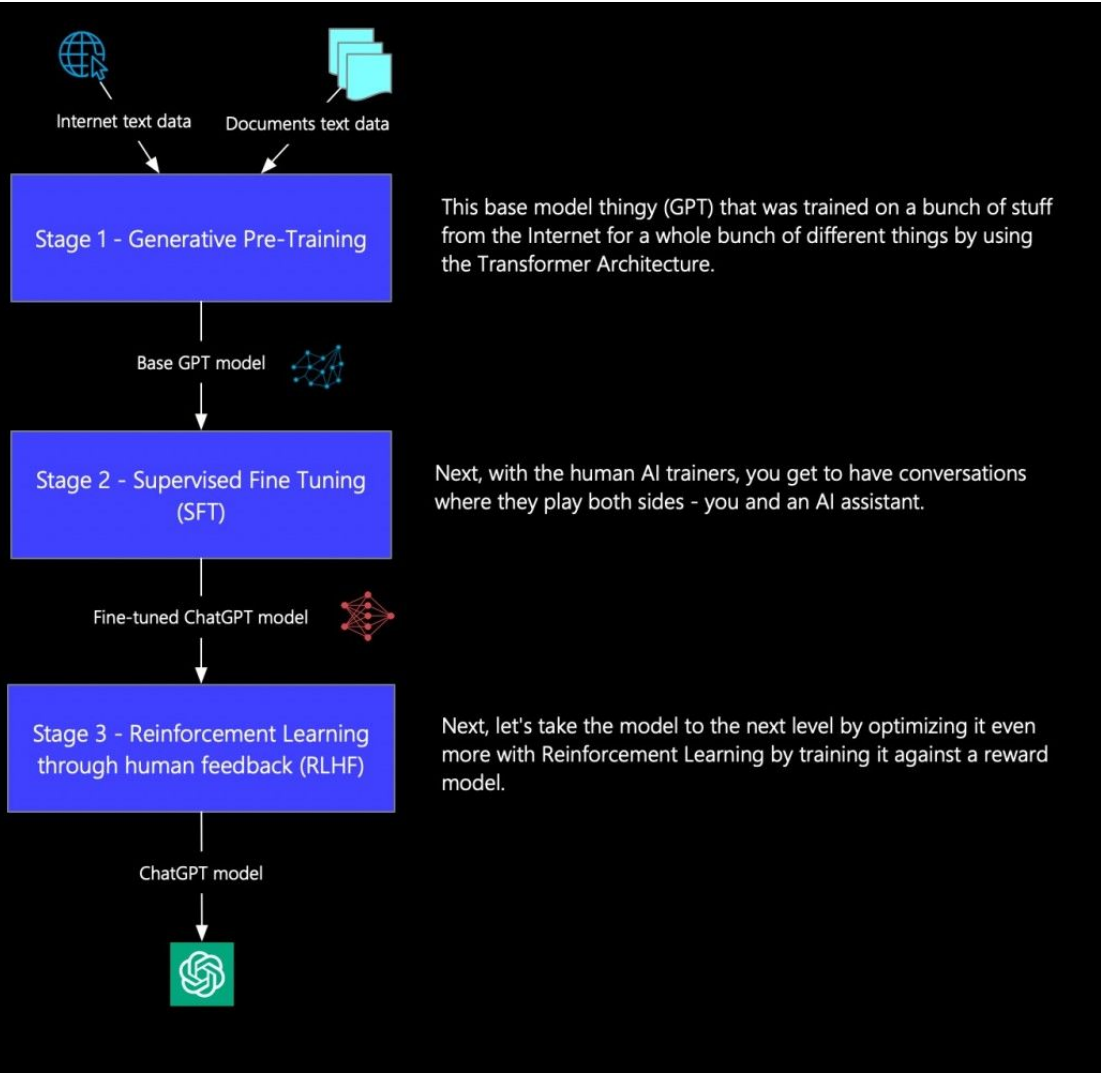
Application

OpenAI API

GPT-3.5

GPT-4

LLM

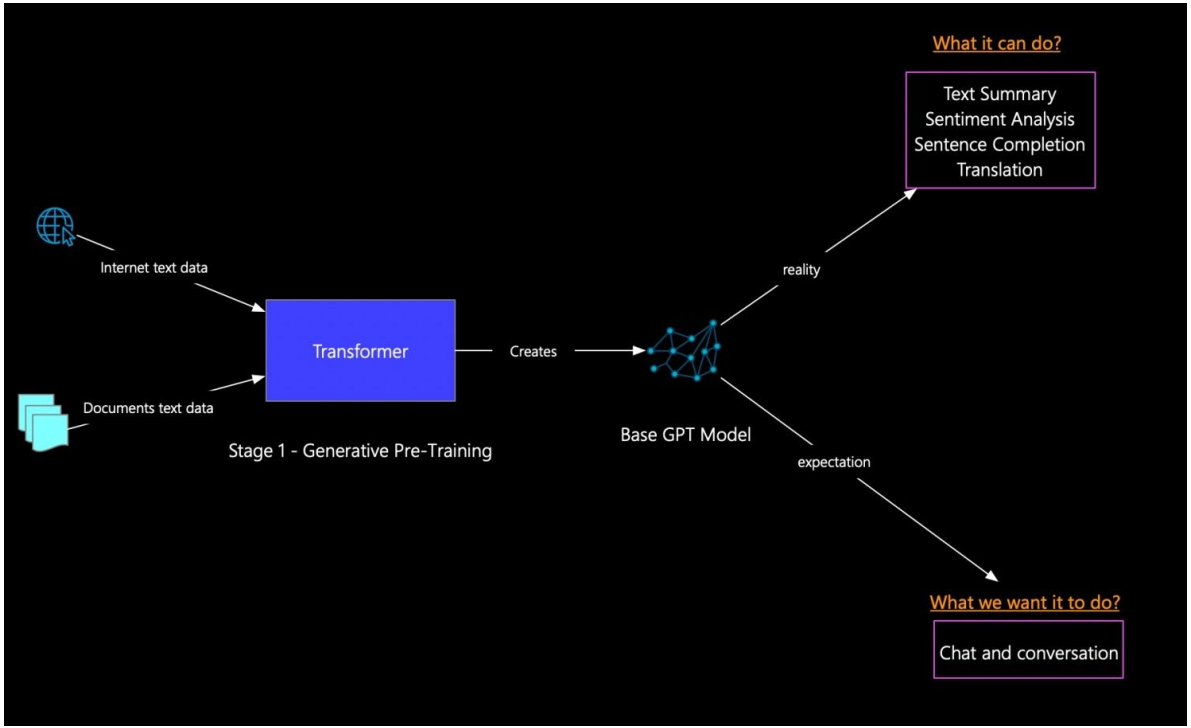


This base model thingy (GPT) that was trained on a bunch of stuff from the Internet for a whole bunch of different things by using the Transformer Architecture.

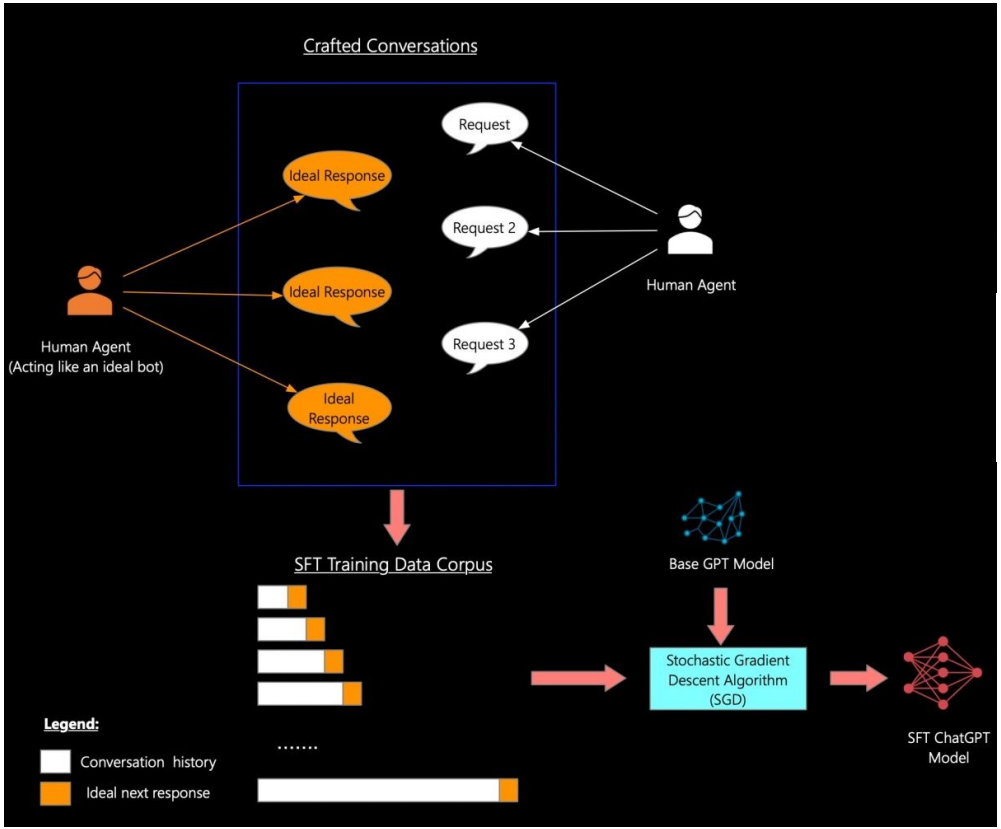
Next, with the human AI trainers, you get to have conversations where they play both sides - you and an AI assistant.

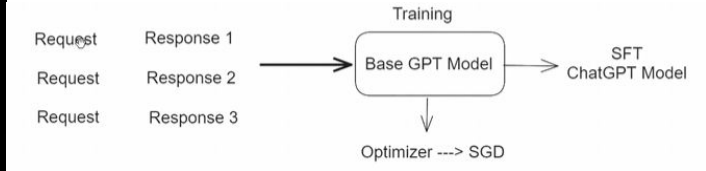
Next, let's take the model to the next level by optimizing it even more with Reinforcement Learning by training it against a reward model.

Generative Pre-Training

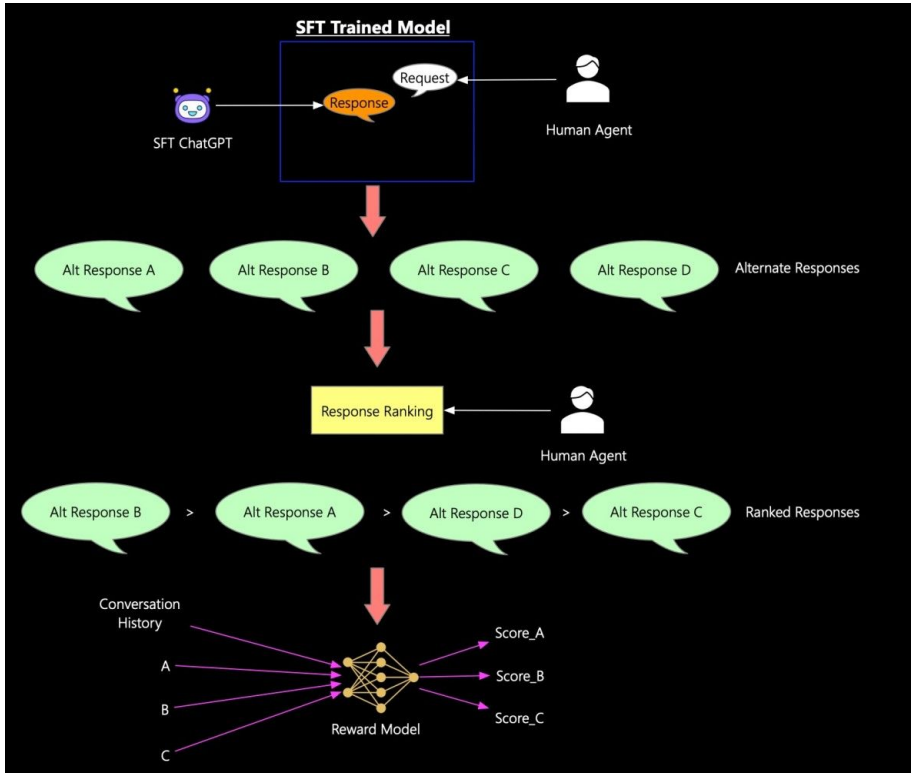


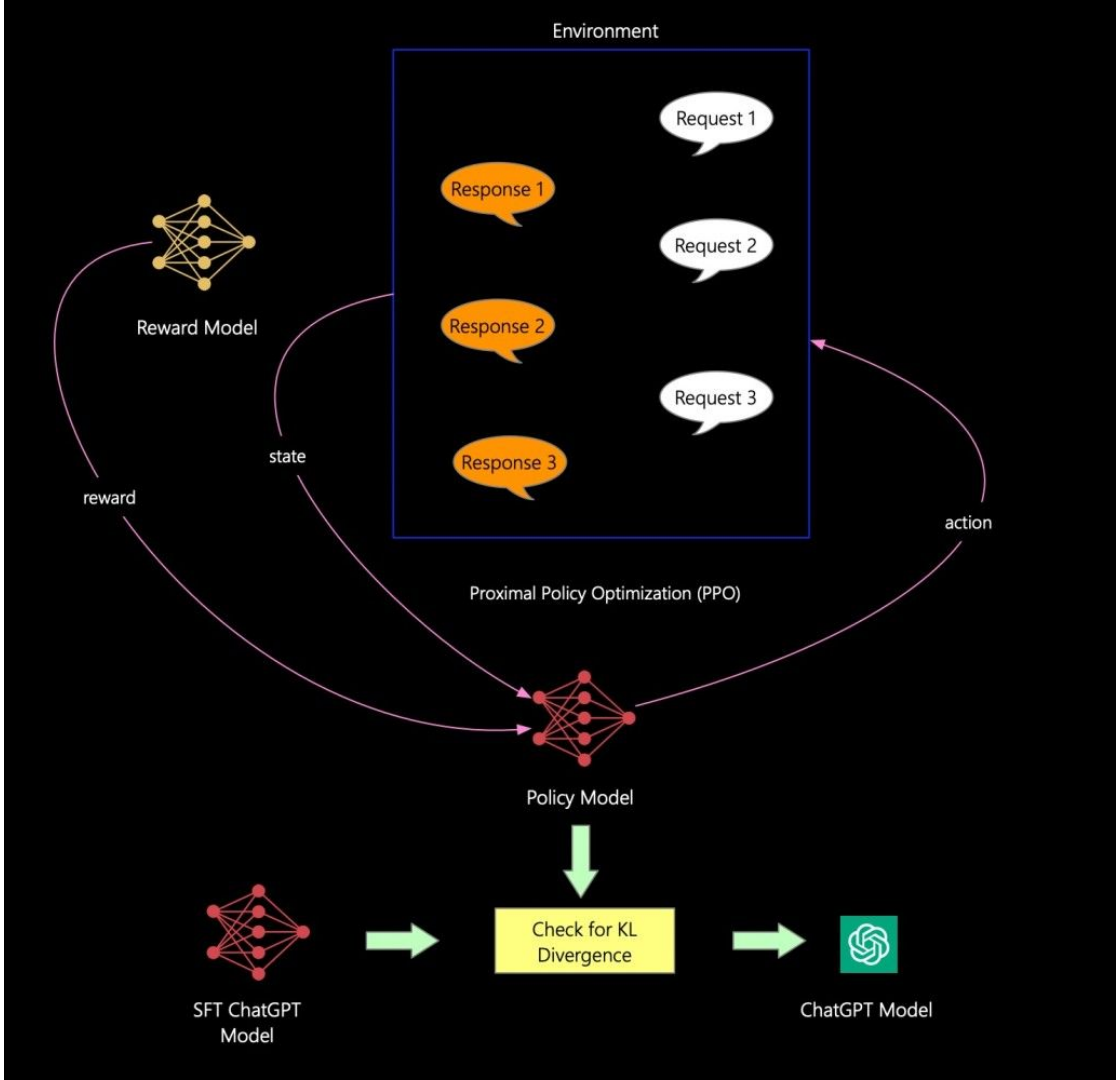
Supervised Fine-Tuning (SFT)





Reinforcement Learning through Human Feedback (RLHF)




Environment
Request 1
Response 1
Request 2
Response 2
Request 3
Response 3
Reward Model
state
reward
action
Proximal Policy Optimization (PPO)
Policy Model
Check for KL Divergence
SFT ChatGPT Model
ChatGPT Model

Generative AI

Hugging Face

Generative AI

OpenAI

Generative AI

Project: Telegram Chatbot using OpenAI