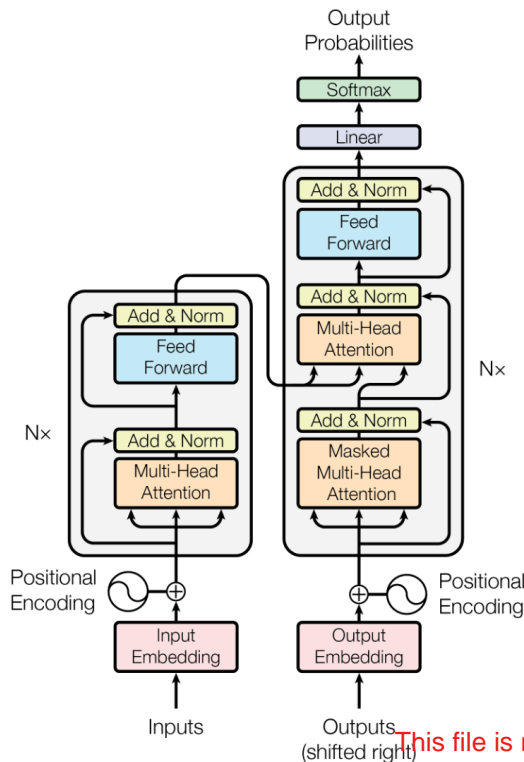


Outline

In this session, we'll discuss:

- Introduction to Large Language Models (LLMs)
- Training of LLMs
- Evaluation of LLMs
- Applications of LLMs
- Prompting

Large Language Models



- An LLM is a transformer neural network
 - Large: Billions of parameters
 - Language: Trained specifically for language tasks
 - Model: Transformer
- Usually, LLM is a reference to a generative decoder

Large Language Models

- GPT1 – 2018
- GPT2 – 2019
- GPT3 – 2020
- chatGPT – 2022
- PaLM, LLaMA, Claude, FLAN, Mixtral, Gemini, ...
- https://huggingface.co/spaces/HuggingFaceH4/open_llm_leaderboard

Large Language Models

- GPT-3 was the first model that was truly spectacular.
 - 175Bn parameters
 - Trained on 300Bn tokens
- GPT-4 is even bigger
 - It took ~3 months to train
- In 2022, OpenAI bought ~30,000 NVIDIA GPUs.
 - Tens to hundreds of millions of dollars

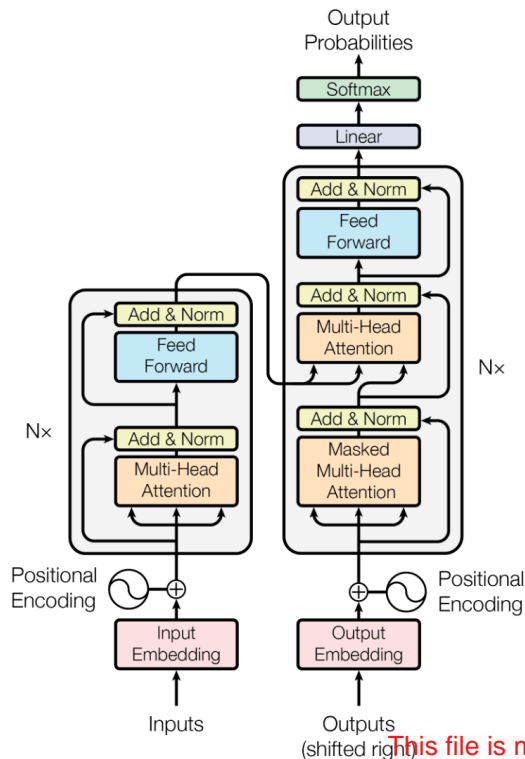
LLM Expectations

- Articulate
- General Knowledge
- “Creativity”

LLM Caution

- Specific domain knowledge
- Bias
- Hallucination

Training



- Web-scale data aggregation
 - Legal issues?
- Separation
- Tokenization (probabilistic)
 - Dictionary
- Training
 - My name is Dan and I work at UT.

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Training

- Fine tuning
- Reinforcement learning human-human feedback
- Textbooks are all you need

Evaluation

- GLUE
 - Collection of 9 language tasks
- BLEU
 - Language translation
- ROGUE
 - Summarization and translation
- HellaSwag
 - Common sense inference

Multi-Modal LLM

- Use an LLM to generate an image
- Use an LLM to describe an image

Prompts

- A **prompt** is the input text you feed to an LLM
 - How much wood could a
 - How many meters are in a mile?
- The LLM then predicts the next word, repeatedly, until the predicted next word is [EOS]
- Some prompts will get better responses than others!
 - Why?

Prompt Engineering

- Can we write a prompt that is more likely to get a good response?
 - YES: Prompt engineering!
- Can we guarantee a perfect answer by engineering a prompt?
 - NO!

Prompt Engineering

- Control model behavior
- Get constrained outputs
- Higher output quality
- Automate operations

Prompt Engineering Limitations

- High sensitivity
- Common sense
- Exception handling
- Debugging

Prompt Engineering

- Template
 - Translate this sentence from English to Spanish:
- Fill in the blank
 - The first person to walk on the moon was _____
- Multiple choice
 - Which of the 3 options below is correct?

Prompt Engineering

- Instructional
 - Write a neutral-tone sales pitch in 300 words for a pair of socks
- Iterative
 - Start with a broad prompt and narrow it based on LLM's output
- Ethically aware
 - LLMs may avoid answering certain questions

Applications

- Healthcare
 - DocBot
 - Personalized treatment plans
- Retail
 - Virtual shopping assistant
- Tech
 - Code generation
 - Marketing campaign management

Applications

- Retrieval Augmented Generation (RAG)
 - Submit a query
 - Search a database for relevant entries
 - Use found entries in prompt to LLM

RAG Systems

- Take a large database of documents.
- Embed every entry in the database.
 - Sentence-transformers
- Compare the query's embedding to each embedding in the database.
 - Return top k results
- Engineer a prompt to LLM to include questions and relevant results.
 - Answer the following question using the context below.

RAG Software

- Pinecone/FAISS/LangChain
- C3 AI
- Westlaw Precision

Ethics

- Ethical usage of AI
- Ethical training of AI
- Guardrails

Conclusion

Here's a brief recap:

- LLMs are used to generate text.
- They are trained using a large corpus of text.
- There are MANY applications of LLMs in practice.
- Prompt engineering is important to get appropriate responses.