LLMS

WHAT LLM(Large Language Models) IS ?

By Senior Student Qirat Saeed

LARGE LANGUAGE MODELS

What LLM is?

- LLM stands for Large Language Models, are very deep learning models that are pertained on vast data.

- The encoder and decoder extract meanings from a sequence of text and understand the relationships between words and phrases in it.

- Transformer LLMs are capable of unsupervised training, although a more precise explanation is that transformers perform self-learning. It is through this process that transformers learn to understand basic grammar, languages, and knowledge.

- They can understand and generate like human language. They learn to generate and predict text. Examples of LLMs are Gemini, Deep Seek and GPT-4 and any more.

- ✓ Autoregressive language models
- ✓ Encoder-decoder models
- ✓ Transformer-based models
- ✓ Pre-trained and fine-tuned models
- ✓ Multilingual models

Importance of LLMs

LLMs process vast amounts of textual data using neural networks (mainly the Transformer architecture) to predict and generate language. They **learn patterns**, **relationships**, and **structures** in language, enabling them to answer questions, write essays, generate code, and more all without explicitly being told the rules of grammar or logic.

How LLMs works?

- **Training on Massive Data:** LLMs (Large Language Models) are trained on **terabytes of text** from books, websites, articles, code, etc.

- **Tokenization:** Text is broken into small pieces called token (words, parts of words or characters)

- **Neural Network Architecture (Transformer) :** LLMs use a deep learning architecture called a **Transformer**, which is especially good at understanding **context** and **relationships** in text.

✓ Better decision-making

✓ Deep insights

✓ Higher efficiency and productivity

✓ Improved customer relations

✓ Lower risks

✓ Personalized client approach

✓ Saved costs

- **Self-Attention Mechanism:** This mechanism lets the model weigh the importance of different words in a sentence.

- **Learning Patterns:** LLMs don't memorize facts — they learn patterns in language from massive amounts of text. They predict the next word based on what words usually come before or after it. For example, they know "capital of France" is likely followed by "Paris" because they've seen that pattern many times. They don't store answers — they just guess what fits best based on the context. That's why they can sometimes make mistakes or sound unsure.

- **Fine-Tuning & Alignment:** After basic training, LLMs are fine-tuned on specific tasks and then aligned using human feedback.
This helps them follow instructions better, avoid harmful responses, and act more like helpful assistants.

Step 1
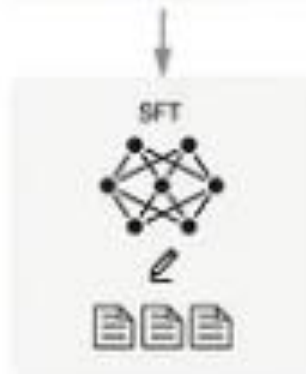
Collect demonstration data and train a supervised policy.

A prompt is sampled from our prompt dataset.

Explain reinforcement learning to a 6 year old.

A labeler demonstrates the desired output behavior.

We give treats and punishments to teach...

This data is used to fine-tune GPT-3.5 with supervised learning.

SFT

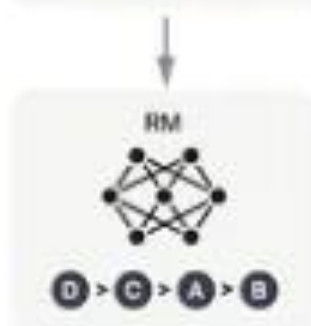## Step 2

Collect comparison data and train a reward model.

A prompt and several model outputs are sampled.

Explain reinforcement learning to a 6 year old.

A: In reinforcement learning, the agent is...
B: Explain rewards...
C: In machine learning...
D: We give treats and punishments to teach...

A labeler ranks the outputs from best to worst.

D > C > A > B

This data is used to train our reward model.

RM

D > C > A > B

Step 3

Optimize a policy against the reward model using the PPO reinforcement learning algorithm.
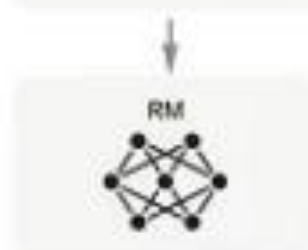
A new prompt is sampled from the dataset.

Write a story about otters.

The PPO model is initialized from the supervised policy.

PPO

The policy generates an output.
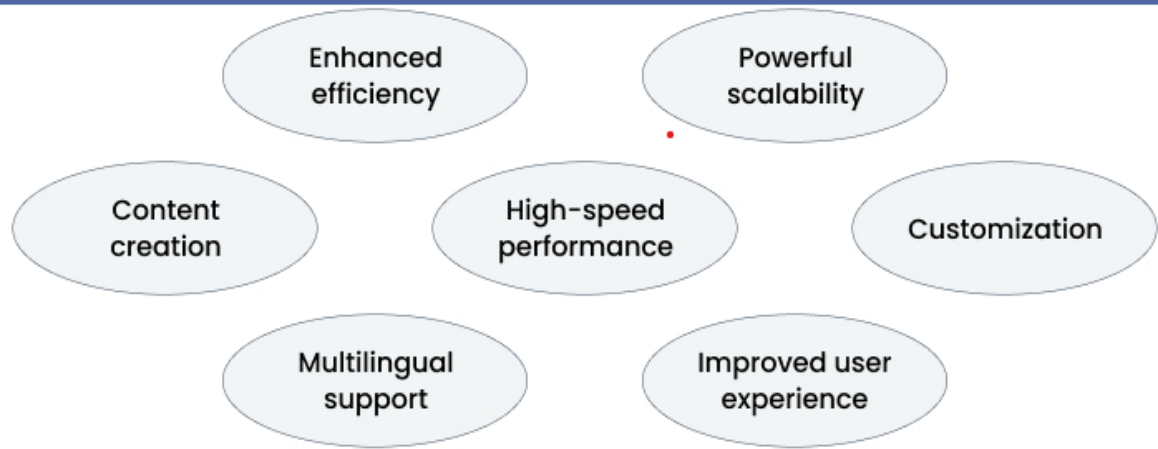
Once upon a time...

The reward model calculates a reward for the output.

RM

The reward is used to update the policy using PPO.
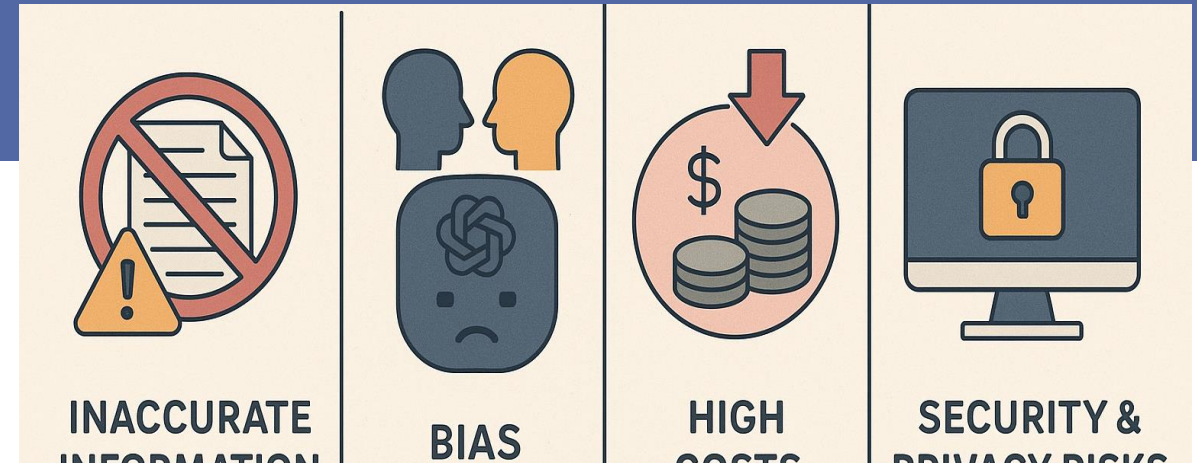
r_k

# Advantages and Disadvantages of LLMs

Advantages of LLMs:

- Text summarization, translation, and content creation.

- Efficient handling of customer service or internal documentation queries.

- LLMs are trained on vast, diverse datasets, making them adaptable to multiple domains without task-specific like Healthcare, Software development etc.

Disadvantages of LLMs:

- LLMs sometimes give answers that sound right but are actually wrong. Example is ChatGPT.

- If not handled carefully, LLMs can accidentally reveal sensitive or personal data from what they've learned. That's a concern for privacy and security.

- LLMs don't actually "understand" like humans do. They just predict words based on patterns. This means they can miss the point or give shallow answers in complex situations.
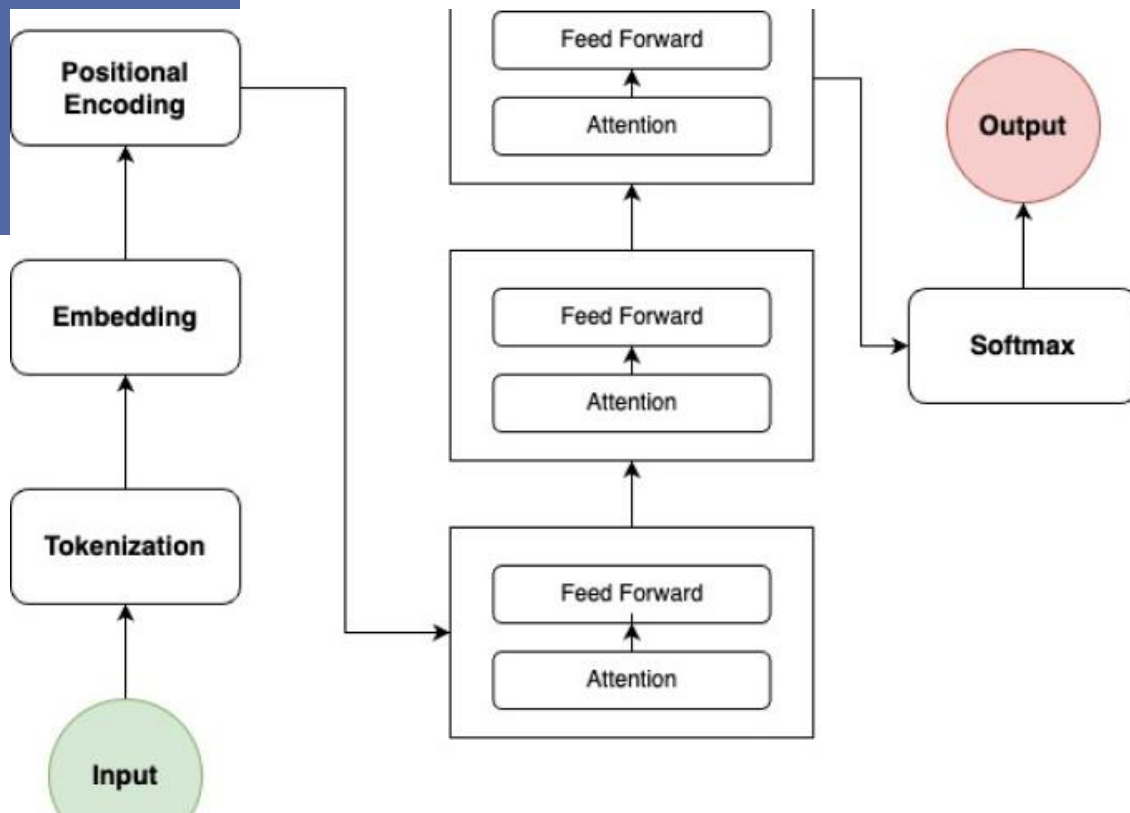
Transformer Architecture

Decoder & Encoder in LLMs Models
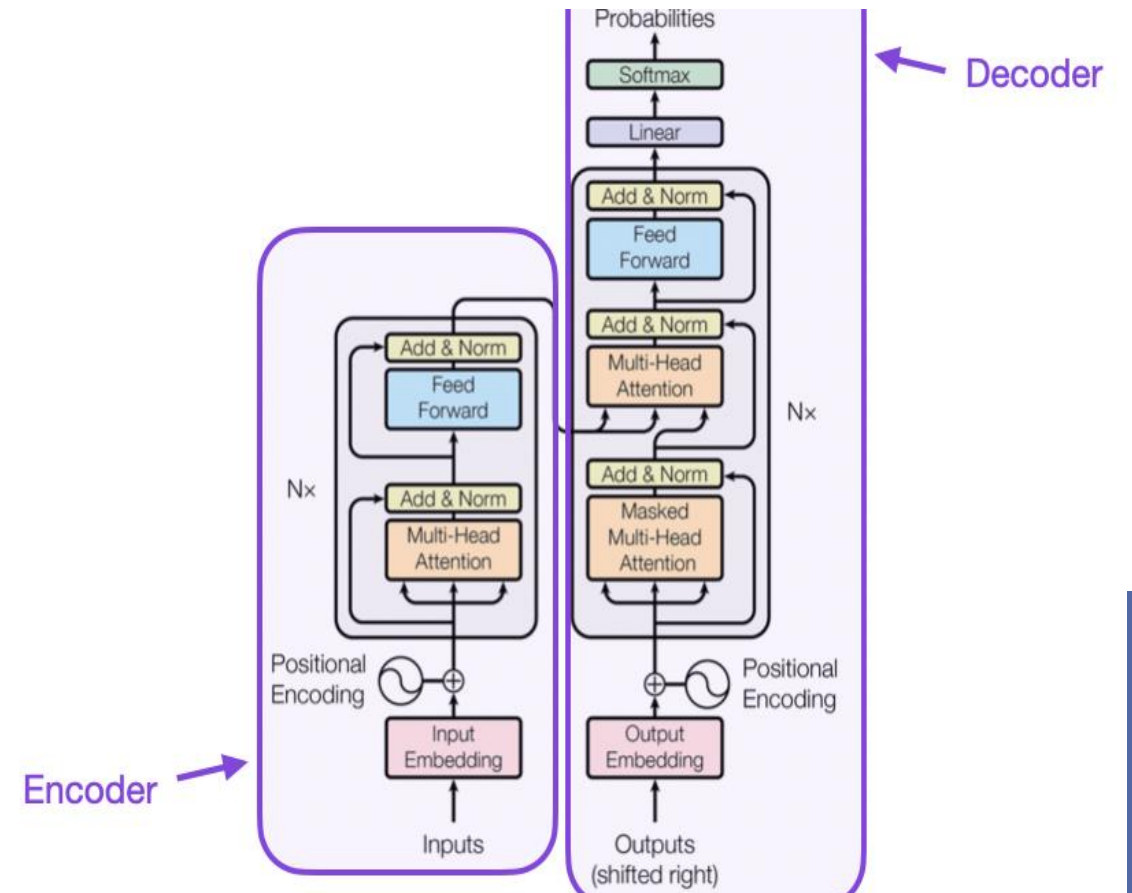
Large Language Models (LLMs)

- LLM (Large Language Model) summarization uses language models to generate concise summaries of longer texts, extracting key points and main ideas. These models, like the ones used in chatbot technology, can understand the context of a document and produce a shorter version that captures the essence of the original content. This is valuable for quickly understanding large amounts of information.