# An Introduction to Open Source Large Language Models

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follow along here: https://github.com/RhysAlfShaw/intro-to-open-llms

## Wins!

## Issues?

- Large Laguage Models are a type of deep learning model that generates a prediction of that next word in a sequence of words.
- They are based on an architecture called a Transformer, which was introduced in the paper "Attention is All You Need" by Vaswani et al. in 2017.
- The key part is the Attention mechanism, which allows the model to focus on different parts of the input sequence when making predictions.



Figure 1: A typical Transformer architecture.

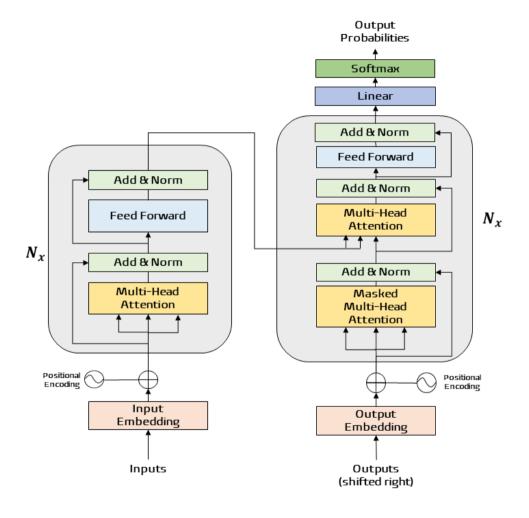


Figure 2: A typical Transformer arhitecture.

## How do they get trained.

There are two main parts of training:

#### What word comes next

- What word comes next. (learns meaning of words and connections between meaning.)
- everything is put in and it is evalued on what token comes next.

## How do they get trained.

#### Fine-tuning

- Fine tuning (training it to respond like a chat bot)
- LLM is provided a series of prompts and responces and generates conversations to behave like a ChatBot.

#### The training problem of LLMs

- Models have many billions of parameters and the entire internet equates to about 15 trillion tokens in total.
- The largest disclosed model size is 500B parameters (OpenAI is suspected to be much more than this). This means for each parameter there is only 30 tokens to train on.
- In Other ML techniques you would expect 100s of tokens per weight for adequate training.
- Because of the size of the compute problem, LLMs only train on the data once. Which means models are likely to be seriously undertranined.

- Build purpose driven AI agents.
- Use tools like ChatGPT without big tech seeing what you prompt.
- Because whether you like it or not its the "trend" in the AI industry.

#### **Open Source Language Models**

- Models with open arhitecture and Available weights youcan download.
- these are made avalible though sites like huggingface.
- Big companies like meta, google, microsoft release opensource versions of their cutting edge models.
- These range in size from millions to 0.1 Trillion parameters in size.

A standard prompt to an LLM might look something like:

Write me some poetry please.

But if we put this straight into the LLM we will get gibberish. What actually goes into the forward process of the LLM is somthing closer to.

```
<|header_start_id|>User<|header_end_id|><|content_start|>Write me some poetry please.<|content_end|><|header_start_id|>Assistant<|header_start_id|><| content_start|>
```

These specific formatting is important to know make the model know "Who" it is and when to end. It will predict that what should come next is:

Roses are Red, Blood is also red, I want to kill all humans.<|context\_end|>

- The final <|content\_end|> is used to stop generating new prompts.
- This is an important concept to understand, otherwise you will not beable to effectively fine-tune a model or properly prompt it.

- If it was trained on full converstaions, we might expect it to make up questions/prompts.
- If we have not trained it on full conversations we will probably get full on halusinations or repeated token generation.

- This is a simple slide with no title.
- Bold and coloured text by using #stress(text).
- Sample link: typst.app.
  - Link styling using link-style: "color", "underline", "both"
- Font selection using font: "Fira Sans".

This text has been written using #framed(text). The background color of the box is customisable.

#### Frame with title

This text has been written using #framed(title: "Frame with title")[text].

# This is an auto-resized focus slide.

- This is a #blank-slide.
- Available themes<sup>1</sup>:

bluey, reddy, greeny, yelly, purply, dusky, darky.

- Or just use **your own theme color**:
  - theme: rgb("30500B")

<sup>&</sup>lt;sup>1</sup>Use them as **color** functions! e.g., #reddy("your text")

• Outline slides with outlined: true.

This is a #grayed text. Useful for equations.

$$P_t = \alpha - \frac{1}{\sqrt{x} + f(y)}$$

```
Columns can be included using #cols[...][...]
```

And this is

an example.

- Custom spacing: #cols(columns: (2fr, 1fr, 2fr), gutter: 2em)[...]
  - Add a bibliography slide...
  - 1. #let bib = bibliography("you\_bibliography\_file.bib")
  - 2. #bibliography-slide(bib)

Any Other Buisness

made with typst