

AI

Summer of Code



Getting Started with LLMs

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Head, Data
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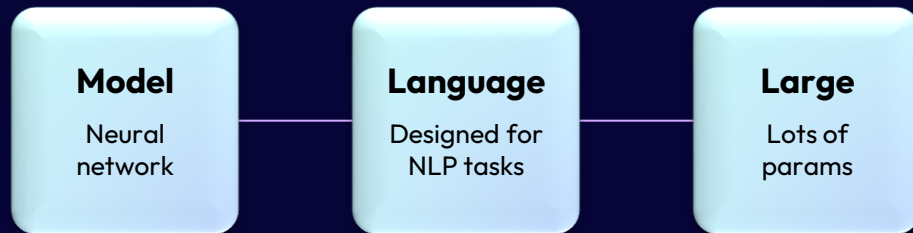
About

- **Academic background:** Physics, Math, Stats
- **Areas of Interest:** Core ML, probabilistic models, experimentation & statistical inference, NLP, AI Engineering
- **Recent work:** real-time fraud detection, multilingual conversational AI, generative analytics, OCR and DocAI (KIE/verification)
- **Industries covered:** Agnostic
- **Fun fact**



Introduction

LLM stands for **Large** Language Model.



Some Properties

- Architecture – transformers (self attention)
- Training – self-supervised (autoregressive or masked LM) + finetuning (downstream)
- Scale – data-hungry (millions to trillions of params), optimised weights
- Generalisability – wide range of natural language tasks
- Intelligent? – no genuine understanding

Key Timelines



In the Beginning

'50s – 80s

Symbolic AI & rule-based systems (ELIZA)

Statistical methods, start of connectionism

Statistical Revolution

'90s – 2000s

Rise of probabilistic models (n-gram)

Neural networks (feedforward, RNN)

Deep Learning Age

2010s

Word embeddings

Sequence modelling (RNN, LSTM)

Attention mechanism

Age of Transformers

2017 & beyond

Rise of attention mechanism. Pretraining with masked modelling

Parameter scaling.

LLM Capabilities



```
graph LR; 1((1)) --- 2((2));
```

1

NLU / NLG

Ability to complete and generate text in a wide range of niches.

Engage in meaningful, context-aware conversations with users (customer support bots, virtual assistants, conversational AI systems).

Ability to summarise long text, paraphrase and rewrite.

2

Retrieval & Question Answering

Ability to answer questions using general knowledge or provided context. Powerful for search engines, virtual assistants and educational tools.

Intent understanding and effective retrieval of relevant information makes them improve search results.

LLM Capabilities



3

Coding Copilot

Assist developers in completing code snippets, suggesting functions, and debugging. Generate technical documentation from code or explain code in simple language.

Code completion tools: Codex (OpenAI), Github Copilot, AlphaCode (DeepMind), TabNine, IntelliCode (MS).

4

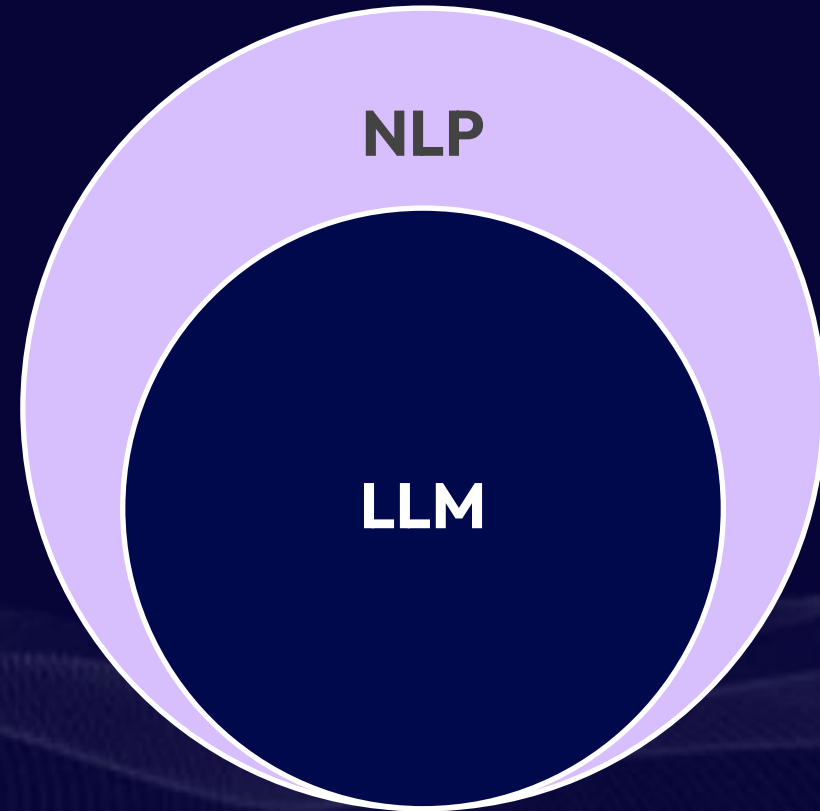
Data Analysis & Interpretation

Automatic generation of reports from raw data to provide insights and summaries.

Generative analytics enables running analysis using prompts. Conversational analytics uses NLQ to query databases and fetch data for non-technical users.

NLP vs LLM

- Natural Language Processing is an entire field of AI.
- It covers many techniques: tokenization, parsing, stemming, lemmatization, named entity recognition, part-of-speech tagging, machine translation, sentiment analysis.
- Traditional NLP methods utilise n-gram models, hidden Markov models (HMMs), support vector machines, etc. Modern approaches use neural networks like RNNs, LSTMs, and transformers.
- LLMs rely on the transformer architecture, and are used to solve NLP tasks. This makes LLM a subset of NLP.



An Overview of Leading LLMs



```
graph LR; 1((1)) --- 2((2)); 1 --- OM[Open Models]; 2 --- CM[Closed Models];
```

1

Open Models

Llama 3, Llama 3.1, Mixtral 8x22b,
Mixtral 8x7b, Mistral Large, Qwen2,
Command-R

2

Closed Models

Claude 3.5, Gemini 1.5, Gemini Ultra,
GPT-4, GPT-4 Turbo, GPT-4o

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