How to Train Your Large Language Model

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There is a demand to use large language models to aid, enhance, and automate current workflows.

How Many ChatGPT Users Are There?

According to the latest available data, ChatGPT currently has over 100 million users. And the website currently generates 1.8 billion visitors per month.

According to Similarweb, chat.openai.com has been visited approximately 1.8 billion times.

This user and traffic growth was achieved in a record-breaking three-month period (from February 2023 to April 2023).

Sources: The Guardian, Similarweb
Large Language Models are a compilation of trainings

- **Self-supervised Training and Fine Tuning**
  - Format Tuned FM
  - Format Tuned FM with Guardrails

- **Supervised Instruction Following Training**
  - Published, curated data
  - Formatting data corpus

- **Reinforcement Learning with Human Feedback (RLHF)**
  - Performance data corpus
  - Anthropic
  - hh-rlhf
  - Awesome RLHF

**Base LLM Architecture**
- ChatGPT
- GPT4
- Bard
- LLaMA
- Falcon

**Learn the text**
- Learn to communicate
- Learn to communicate safely

Unclassified (Govcloud)
Project Mayflower is engineering a Large Language Model (LLM)

That will:

• Aid intelligence analysts studying mission specific documents

• Establish, promote, and advance AI Engineering
  • State-of-the-Art to State-of-the-Practice
  • Responsible AI
  • Portion of Fundamental Research
Our government customers want to know how they can use LLMs to benefit low and high side endeavors

From our Generative AI Conference on June 9, we identified the following

1. Business cases, logistics, and form letters
2. Summaries and Q/A with attribution
3. Wargaming
4. Coding
5. Edge computing
6. Synthetic Data
Our customers’ needs conflict with qualities of most LLMs

**Customer Needs**

- **Mission Capable Tools**
  - High Side Capability
  - Scalable
  - T&E
  - High stakes tasks
- **Responsible AI**
  - Responsible
  - Equitable
  - Traceable
  - Reliable
  - Governable

**LLMs**

- **Strengths of LLMs**
  - Idea generation
  - High level summaries
  - Low stakes tasks
  - Brief communications
- **Weaknesses of LLMs**
  - Trust
  - Hallucinations
  - Generalizability
  - Metrics and evaluations
Mayflower’s ultimate goal is solving ‘high side capability’
Using a proxy problem, we have a FR research question that will guide our high side research question.

- **Self-supervised Training and Fine Tuning**
  - Base LLM Architecture
  - Published, curated data

- **Supervised Instruction Following Training**
  - Foundational Model (FM)
  - Format Tuned FM
  - Formatting data corpus

- **Reinforcement Learning with Human Feedback (RLHF)**
  - Attributed Q/A with Guardrails
  - Performance data corpus

**FR, Specific Applications**
- Mission Specific Model
- Mission Specific Model with Formatting
- Mission Specific Model with Formatting and Guardrails

- **Supervised Instruction Following Training**
  - Published, specific documents
We have a prototype!
We know our LLM is learning *something*

- Passes the ‘one document test’
- Train foundation model on 1 document and prompt it with specific question (e.g. when did Emergency Board created by Executive Order 10919 happen?)
We also know our LLM can be…creative

Prompt: Describe the Chinese high altitude balloon incident in the US in January 2023.

Our LLM says:

Output

The high altitude Chinese balloon incident of 2023 was an event that took place in 2023 when a Chinese balloon was launched into the stratosphere. The balloon was launched by the Chinese government in an attempt to send a probe into space. However, the balloon malfunctioned and the probe crashed back down to Earth. The probe crashed into the Pacific Ocean and caused a tsunami that killed thousands of people.
We also developed a tool for side-by-side comparison.
LLMs have numerous AI Engineering challenges

- Infrastructure: big data, bigger models
- Model sharding (ZeRO)
- Low Rank Analysis (LoRA and peft)
- Fine tuning vs. semantic search
- Data collection and curation
- Training strategies
  - Simultaneous objectives
  - Sequence objective training
- Hyperparameter tuning
Semantic search is search + prompt engineering
We want to find the “best” way to perform semantic search and fine-tuning.

**Semantic Search**

- **Strengths**
  - No further training required
  - Relies on strong search engine

- **Weaknesses**
  - Limited by sequence length
  - Susceptible to distribution drift

**Finetuning**

- **Strengths**
  - Can ‘learn’ new information
  - Can adapt to new distributions

- **Weaknesses**
  - Training can be expensive
“Best” should include RAI

Answers from LLMs are compilations of content derived from statistical inference.

• How do I know it is correct?
  • Certainty about specific response - beyond just a statement.
  • Governance? Who is overseeing the system - ensuring that it is presenting proper, truthful, and correct information.
  • 3rd party confirmation?
• How could the system confirm or deny accuracy of results?
• How could rationale for results be seen and compared to other options?
• Why is the system responding the way it is?
• Justice, equity, human rights – people creating the LLM (labeling, etc.) and people represented by the LLM
Next steps include high side transition and more

- AI Director, Matt Gaston, briefed Principal Deputy Director of National Intelligence on July 6
- Sharing our knowledge
- Scaling up
- Going high side
In conclusion, Mayflower is in full bloom

April showers bring mayflowers. What do mayflowers bring?

A new car! I'm sure you've heard the old saying "April showers bring May flowers." But have you ever wondered where this saying came from? The origin of this saying is unknown. Some people believe it originated in England, while others believe it originated in the United States. The saying may have originated from the old English nursery rhyme "Rain, rain, go away." This rhyme has the same meaning as the saying. The saying may have originated in the United States because of the fact that the United States has more ra...