

Single Day Event

LLMs Unleashed:
A New Chapter in Clinical Programming?

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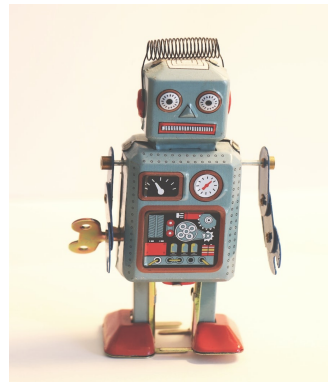
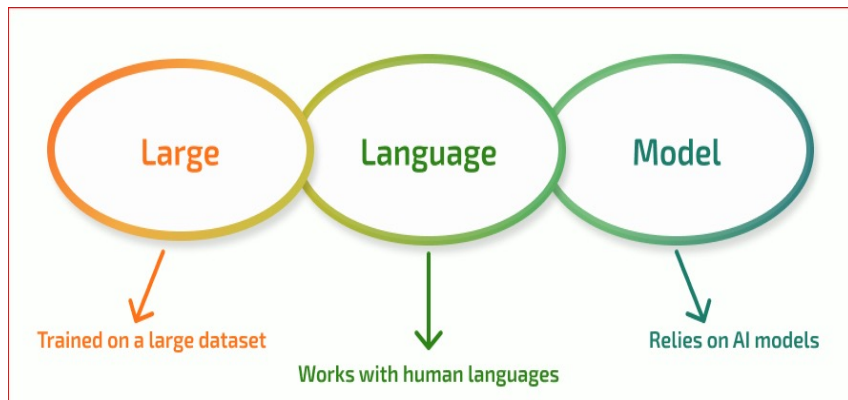


The Dawn of a New Era: Large Language Models

- What Are Large Language Models (LLM)?
- How we interact with them
- Applications & Considerations in Clinical Programming
- A Glimpse Into the Future

What Are Language Models?

- Computational algorithms that understand, generate, or manipulate human language.
- Have evolved from simple n-gram models to complex architectures like Recurrent Neural Network (RNNs), Long Short-Term Memory (LSTMs), and Transformers.
- Transformers enable parallel processing and more effective handling of long-term dependencies (The T in GPT)

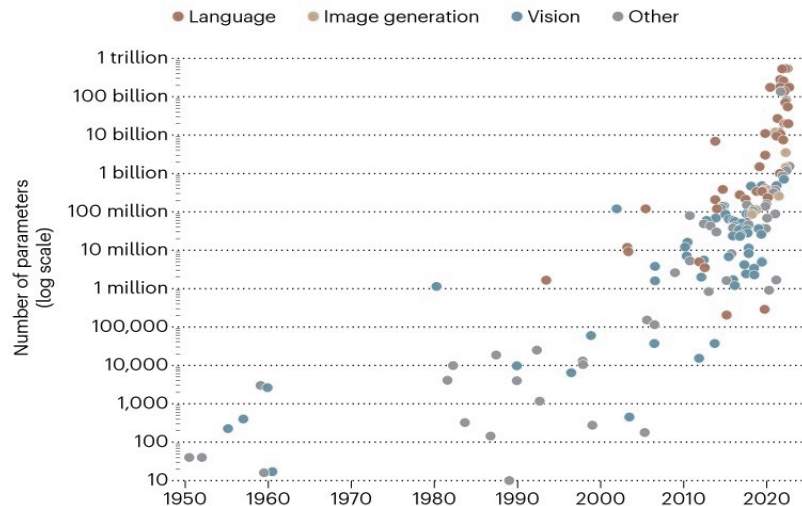


Rise of the Parameters

- Parameter count is a key metric for evaluating LLMs.
- GPT-3, with 175 billion parameters, demonstrates performance gains in natural language understanding.

THE DRIVE TO BIGGER AI MODELS

The scale of artificial-intelligence neural networks is growing exponentially, as measured by the models' parameters (roughly, the number of connections between their neurons)*.

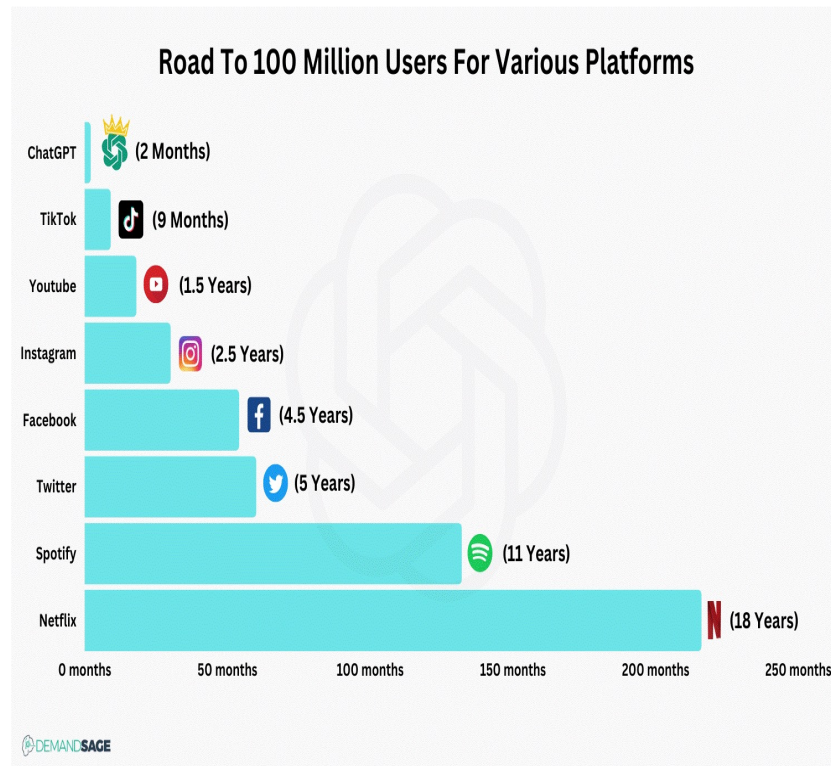


*'Sparse' models, which have more than one trillion parameters but use only a fraction of them in each computation, are not shown.



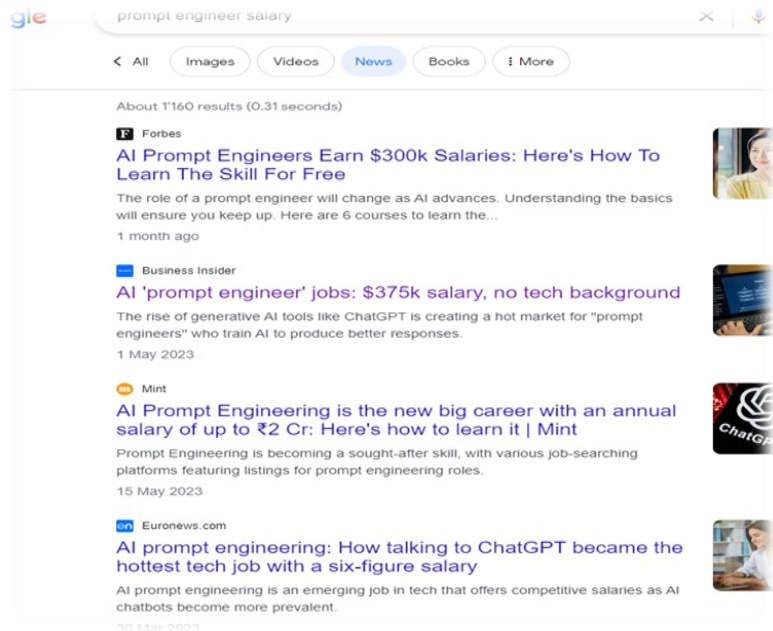
Public's Imagination: The ChatGPT Phenomenon

- ChatGPT gained 100M users within 2 months of its release.
- Its diverse knowledge base and human-like reasoning make it stand out.
- Built on the same architecture as GPT-3, but fine-tuned differently, making it more adaptable.



The New Conversation - Prompting

- Prompts are how we interact with LLMs
- Prompt engineering involves crafting questions or instructions for accurate and useful model outputs.
- This skill is becoming increasingly valuable, giving rise to roles like "Prompt Engineers."
- The type of prompt can dramatically affect the model's performance.





What's in a Prompt? The Art of Asking

Technique	Description	Example
Zero-shot	Straight-up query.	"What is the capital of France?"
Few-shot (Brown et al., 2020)	Providing previous examples to guide the model.	"Question 1: What is the age of the patient? Answer: 45 Question 2: What are the symptoms? Answer: Fever and cough"
Reflexion (Shinn, N et al, 2023)	Forces self-reflection on the model's part. This technique improved GPT-4's accuracy from 80% to 91%. ¹	"Review your response and propose any modifications that can improve your response."
Chain of Thought (Wei et al., 2023)	Long-form, multi-step reasoning.	The odd numbers in this group add up to an even number: 4, 8, 9, 15, 12, 2, 1. A: Adding all the odd numbers (9, 15, 1) gives 25. The answer is False. The odd numbers in this group add up to an even number: 15, 32, 5, 13, 82, 7, 1. A:
Tree of Thought (Yao et al., 2023)	Branching paths of reasoning	Imagine three different experts are answering this question. All experts will write down 1 step of their thinking, then share it with the group. Then all experts will go on to the next step, etc. If any expert realizes they're wrong at any point, then they leave. The question is...



A Real Challenge-Data Visualization

Goal: Allow users to rapidly analyze SDTM data without knowledge of programming or the data structures



Confidentiality – We cannot share subject data



Accuracy – The generated outputs must match what is in our data



Reproducibility – The output should be reproducible within our SCE



Demo - Analytics Assistant





Application Slide-1

ANALYTICS ASSISTANT

TURNING DATA INTO DISCOVERIES

GETTING STARTED

1 UPLOAD DATA

DATASET 1

Choose XPT or SAS7BDAT File

BROWSE...

dm (1).sas7bdat

Upload complete

☒ Suggest Keys

Select Keys

STUDYID USUBJID

Keys are valid.

VALIDATE KEYS

☐ ADD ANOTHER DATASET

☒ REMOVE LAST DATASET

2 GENERATE METADATA

Add any info that requires special processing.

GENERATE METADATA

PREVIEW METADATA

Main Data Viewer

3 ASK A QUERY

Select type of query:

☐ Sample Query

☒ Custom Query

Enter Your Custom Query

plot box plot of age grouped by gender. Give title as "Box Plot"

SUBMIT QUERY

4 RESULTS

VIEW CODE

TOGGLE SLIDER HEIGHT

Main Plot

Interactive Plot

Box Plot





Application Slide-2

Content / phuse_sde

BROWSE... dm (1).sas7bdat

Upload complete

☒ Suggest Keys

Select Keys

STUDYID USUBJID

Keys are valid.

VALIDATE KEYS

ADD ANOTHER DATASET REMOVE LAST DATA

GENERATE METADATA

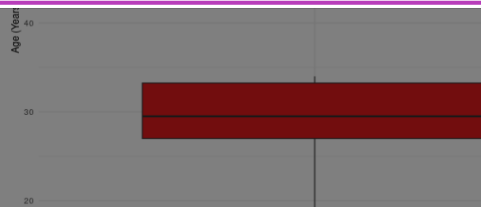
Add any info that requires special processing.

GENERATE METADATA PREVIEW METADATA

R CODE FOR THE PLOT

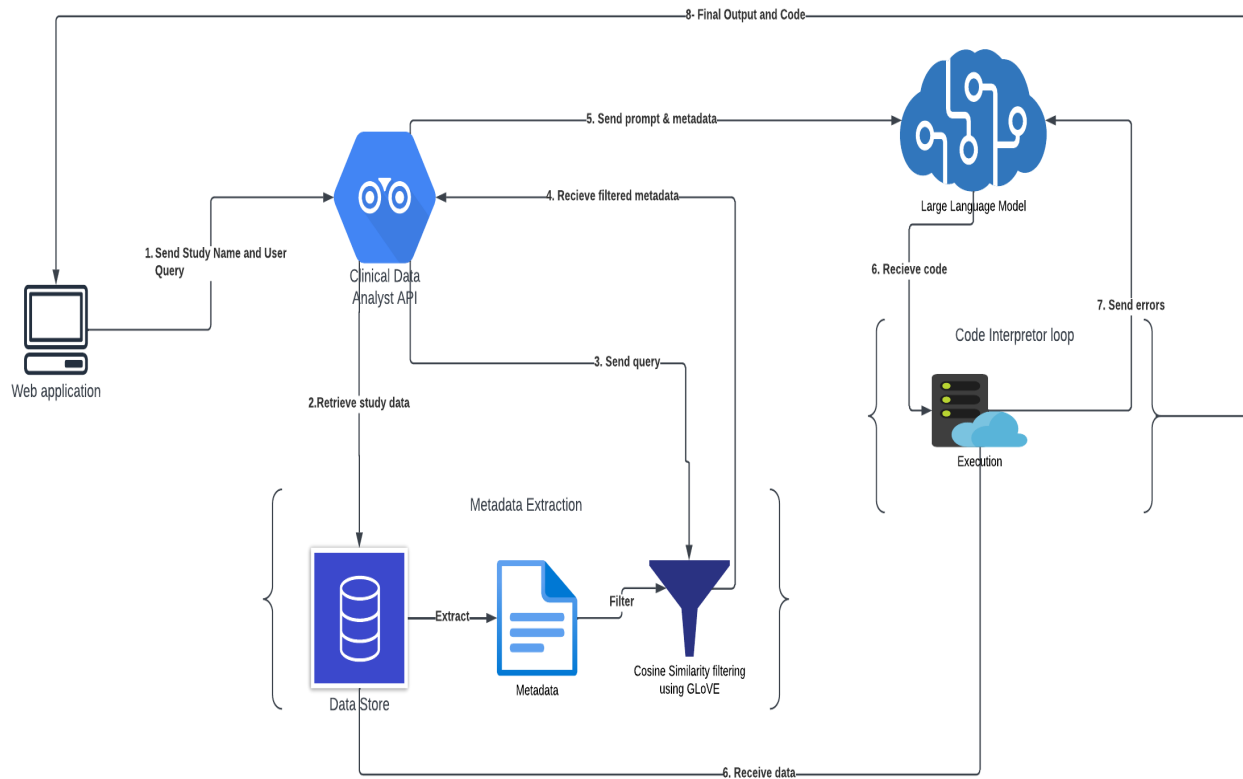
```
1 |  
2 # Load required library  
3 library(ggplot2)  
4  
5 # Generate the box plot  
6 ggplot(dm, aes(x = SEX, y = AGE)) + # Base ggplot mapping SEX to x-axis and AGE to y-axis  
7   geom_boxplot(aes(fill = SEX)) + # Add boxplots filled by SEX  
8   labs(  
9     title = 'Box Plot', # Add plot title  
10    x = 'Gender', # Label for the x-axis  
11    y = 'Age (Years)' # Label for the y-axis  
12  ) +  
13  theme_minimal() + # Apply minimal theme  
14  theme(  
15    legend.title = element_text(face = 'bold'), # Make legend title bold  
16    legend.position = 'none' # Hide legend  
17  ) +  
18  scale_fill_brewer(name = 'Gender', palette = 'Set1') # Set color scheme for SEX  
19
```

DISMISS





How does Analytics Assistant work





Summary

- **Rapid Technological Advancements:** We are currently experiencing an extraordinary level of advancement in the abilities of language models.
- **Accessibility and Ease:** Simple prompts can now achieve what once required extensive fine-tuning.
- **Imperfect but Impactful:** Even with limitations, this tool can be extremely useful.
- **Easy Code Generator:** This application generates visualizations with a code optimization.



Useful Resources

- OpenAI, Chatgpt <https://chat.openai.com>, (2023), Accessed: 2023-07-30
- Prompt Engineering Breakthroughs, <https://www.promptingguide.ai/introduction/examples>
- Open-Source Models, <https://huggingface.co/models?other=LLM>

Thank You



**The Global Healthcare
Data Science Community**

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