

# Challenges and Applications of Large Language Models

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Presented by  
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# Introduction

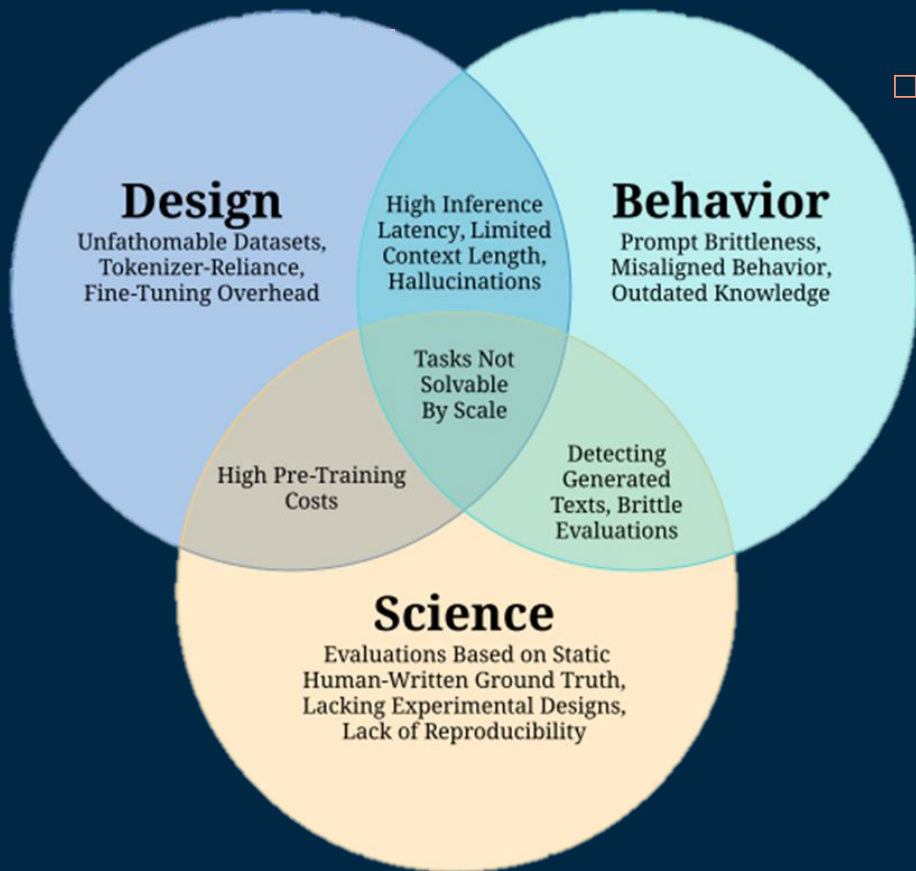
- Rapid advancements in natural language processing (NLP) capabilities
  - Examples: GPT-3, PaLM, ChatGPT, Gemini
- Challenge: Keeping up with fast-paced research
- Purpose of the paper: Identify open problems and review applications and challenges
  - Literature review, easily readable

# LLM Challenges

- Paper groups challenges into 3 areas
  - Design: decisions taken before deployment
  - Behavior: challenges occur during deployment
  - Science: hinder academic progress

## ▲ Challenge

This box highlights a challenge.



# Design Challenges

- Unfathomable Datasets
  - Pre-training datasets have grown so rapidly in size and diversity that no individual can manually check or understand all the data
    - Duplicates, benchmark contamination, inclusion of personally identifiable information (PII)
- Tokenizer Reliance
  - Computational overhead, language dependence, inability to handle novel words, fixed vocabulary sizes, and hurt interpretability
- High Pre-Training Costs
  - Compute hours
  - Potential solutions: optimizing training recipes and objectives

# Behavioral Challenges

- Prompt Brittleness
  - Small prompt variations can drastically change model outputs, requiring extensive prompt engineering
- Misaligned Behavior
  - Models often generate untruthful, biased or toxic text, requiring better alignment techniques
- Outdated Knowledge
  - Pretrained knowledge can become inaccurate over time
  - Updating models is costly and updating isolated facts without side effects remains difficult

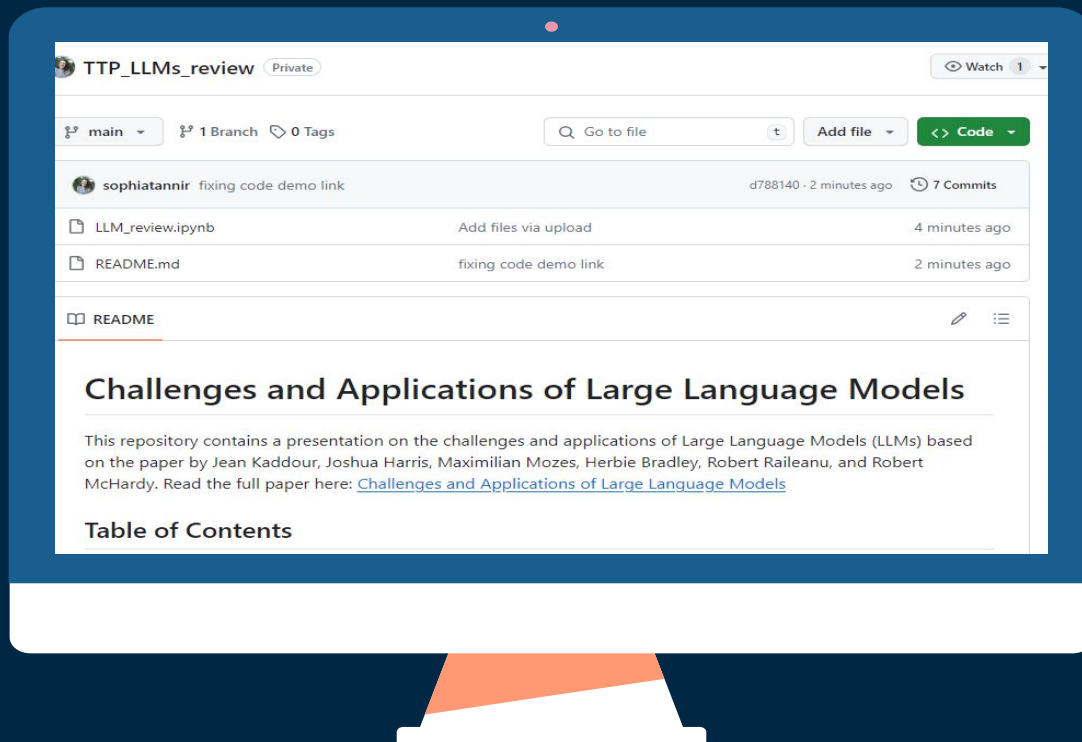
# Scientific Challenges

- Brittle Evaluations
  - Evaluation results are very sensitive to small test set or metric changes
- Reliance on Static Human Evaluations
  - Limitations as models exceed human abilities
- Lacking Experimental Designs
  - Lacking Experimental Designs: Computational constraints on studies

# Applications of LLMs



# CODE DEMO: CHALLENGES



[https://github.com/sophiatannir/TTP\\_LLMs\\_review](https://github.com/sophiatannir/TTP_LLMs_review)



# Critical Analysis

- What was overlooked by the authors?
  - Lack of ethics section or mentioning
- What could have been developed further?
  - Explaining why simplistic solutions to problems aren't effective
- Were there any errors?
- Have others disputed the findings?
- *Related Work* section of paper
  - Paper does note work similar to that of the paper, and that develops further into ideas mentioned

# Discussion + Q&A Session

- Questions for class:
  - Considering the large size of datasets used in training LLMs, what strategies could be implemented to ensure these datasets are balanced and free of biases without compromising the diversity and richness of the data?
  - Based on this paper's classification of problem areas (design, behavior, science) what area would hallucinations be in?
- Possible Discussion Questions
  - Which of the challenges is the furthest from being solved?
  - What domain can will grow the most with LLM applications?
  - What domain faces the most challenges with LLM applications?

# Citation

- Kaddour, J., Harris, J., Mozes, M., Bradley, H., Raileanu, R., & McHardy, R. (2023, July 19). Challenges and applications of large language models. arXiv.org. <https://arxiv.org/abs/2307.10169>

# Additional Resources: Related Works

- [A Survey of Large Language Models](#)
- [Judging LLM-as-a-Judge with MT-Bench and Chatbot Arena](#)
- [A Survey on Evaluation of Large Language Models](#)
- [Challenges and Applications of Large Language Models](#)

The background is a dark blue gradient. It features several thin, vertical white lines of varying lengths. Scattered throughout are small squares in light blue, pink, orange, and teal. Some squares are solid, while others are outlined.

# Thank you!

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