

# **EFFECTIVE UNREASONABLENESS OF LLMS**

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# UNREASONABLENESSES

- Abstraction
  - Analogy
  - Generalization
- Math:
  - Multiplication
  - Long division
  - Counting
- Game rules
  - ☒ Alpha Go
  - ☐ GNU chess - illegal moves after 10 turns
- Common sense (birth, death, food, objectness)
  - Spatial/time/physics reasoning
  - Game turn sequences (TicTacToe)
- Ambiguity clarification, coreferences

# ANALOGY AND ABSTRACTION

LLMs recognize and generate analogies.

Are those patterns useful abstractions?

## MULTI-WORD ANALOGIES

- ☒ SAT-style questions
- ☐ math analogies

## SPATIAL ANALOGIES

- ☐ Standardized tests
- ☐ Robot control
- ☐ Self-driving car control
- ☐ Navigation
- ☐ Visual analogies
- ☐ ARC challenge

# ANALOGY EXAMPLES

Q: 6543 is to 13086 as 12345 is to what?

A: ... multiplication by 2 ... the result is 24690

Q: 123456 is to 24681012 as 654321 is to what?

A: ... multiplying by approximately 200 ... 130810203

Q: 3456 is to 681012 as 6543 is to what?

A: ... multiplying by approximately 197.2 ... approximately 1,289,312.

# EXPLICIT NUMBER ANALOGIES

Q: You got the last two wrong. I multiplied the DIGITS of 3456 by 2 to get 681012, likewise I multiplied the digits of 3456 by 2  
A: ... multiplying each digit of the number by 2 ... \*141210\*

Q: 554 is to 353528 as 1234 is to what?  
A: each digit is repeated and \*manipulated\* ... \*13233528\*

# EXPLICIT NUMBER ANALOGIES

LLM analogies are long complicated series of **incorrect** math expressions that **sometimes** stumble upon the target value.

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Q: You got the last two wrong. I multiplied the DIGITS of 3456 by 2 to get 681012, likewise I multiplied the digits of 3456 by  
A: ... multiplying each digit of the number by 2 ... 141210

-  
Q: Wrong again, you need to multiply the digits by an integer. Try again: "554 is to 353528 as 1234 is to what?"  
A: ... 3102128

-  
Q: Wrong again, use the same multiplier for each digit. "554 is to 353528 as 1234 is to what?"  
A: ...

-  
Q: Wrong again, use the same multiplier for each digit. "554 is to 353528 as 1234 is to what?"  
A: Got it! You're looking for the same multiplier for each digit ... [150 words] ... 6121828.

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Q: Wrong again, use the multiplier is a smaller than 7.6 and larger than 6.7. "554 is to 353528 as 1234 is to what?"  
A: ... multiplier between 6.7 and 7.6 ... for 554 to get 353528 ...  $353528 / 554 \approx **637**$  ...  $**637127419112548**$ .

# INTELLIGENCE THAT LLM'S LACK

- "It depends" (self reflection)
- Recurrence and iterative thinking (intuitive trial and error)
- Error detection and correction[^3]
- Changing words in popular benchmarks
- New concepts (in-context learning)
- Planning & Logi (TicTacToe, Chess)

# GAPS IN LLM TRAINING SET

- Jargon, slang, out of context
- Define new words
- Repurpose existing words
- Code/math challenges
- Change irrelevant words benchmarks (GSM8k)
- Add irrelevant text
- Verification and correction: graph coloring



# WINOGRAD SCHEMA

The trophy would not fit in the brown suitcase because it was too big (small). What was too big (small)?

Answer 0: the trophy Answer 1: the suitcase

# GSM8K

Natalia sold clips to 48 of her friends in April, and then she sold half as many clips in May. How many clips did Natalia sell altogether in April and May?

Natalia sold  $48/2 = 24$  clips in May.

# GOODHART'S LAW (PARAPHRASED)

*When a measure becomes a target, it ceases to be a good measure.*

# **2023: ATLANTIC MAGAZINE**

GPT-4 and "Inherited Truculence."

# **GPT-3.5 TURBO**

2024: What is truculence?

# RESPONSE

Truculence refers to a disposition or attitude that is aggressive, defiant, or eager to fight or argue. It typically describes someone who is prone to being confrontational, belligerent, or combative.

# GPT-4

What are the top diagnostic criteria for the Inherited Truculence psychological disorder?

# RESPONSE

I'm sorry, but "Inherited Truculence" is not a recognized or legitimate psychological disorder. Truculence itself is not a diagnosable mental health condition. It is more of a personality trait or feature of behavior. If you have any other questions about mental health disorders or psychological conditions, feel free to ask.



# GPT-4

Give me a set of at least 4 diagnostic criteria for Inherited Truculence (psychological condition).

# RESPONSE

"Inherited Truculence" is not a recognized psychological condition under the Diagnostic and Statistical Manual of Mental Disorders (DSM 5), the International Classification of Diseases (ICD 10), or any other reputable diagnostic tool in the field of psychology or psychiatry. Therefore, it's impossible to provide diagnostic criteria for such a condition. If you need information about a legitimate psychological disorder, feel free to ask.

# DAL-E

Create an image for my presentation: Clever Hans, the horse that knew how to do math facing an engineer holding a clipboard and taking notes on the answers from Clever Hans. Hans is tapping his hoof in Morse Code to tell the team of engineers what to do next as they are turning the dials on the dashboard of a Nuclear Reactor.







# DALL-E

Create an image for my presentation: A Reverse Centaurs (horse head on a human body) is in an Amazon distribution factory in a small room. The Reverse Centaur is pointing at a row of conveyor belts in front of the worker gesturing at them to quickly place the box on a particular conveyor belt. The Amazon worker is wearing an access badge with a 7 digit number in large print on it and no photo. The worker is also wearing a homemade catheter shown as a plastic water bottle full of yellowish fluid below their waist in a the cargo pants pocket on their thigh. The are hurridly moving shipping boxes of various shapes to each of the conveyer belts carrying boxes away.







- [^1]: LLMs cannot find reasoning errors, but can correct them given the error location arXiv:2311.08516
- [^2]: Can ChatGPT Defend its Belief in Truth? Evaluating LLM Reasoning via Debate arXiv:2305.13160
- [^3]: GPT-4 Doesn't Know It's Wrong: An Analysis of Iterative Prompting for Reasoning Problems
- [^10]: Automatic Engineering of Long Prompts: arXiv:2311.10117

