Green AI

Roy Schwartz

Hebrew University of Jerusalem

Workshop on AI and Environment, AI for Good Global Summit, Geneva
July 2025

THE HEBREW
UNIVERSITY
OF JERUSALEM

Scaling AI Models

Scaling AI Models

Gemini

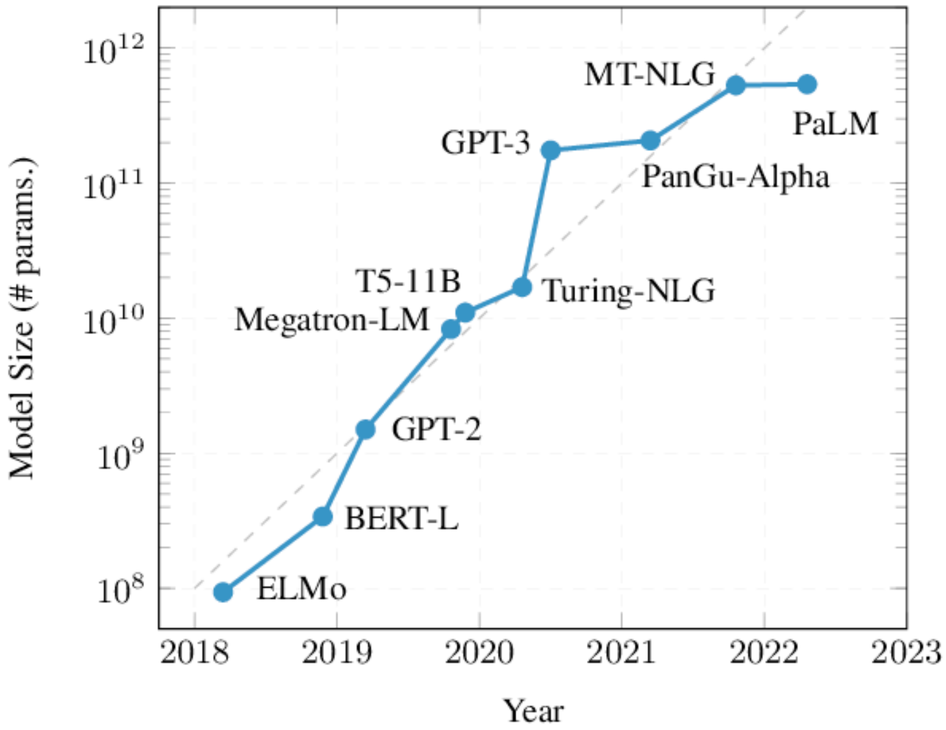
GPT - 4

Meet Claude

A next-generation AI assistant for your tasks, no matter the scale

Jamba

AI21's Hybrid SSM -Transformer Model



Taken from Lakim et al. (2022)

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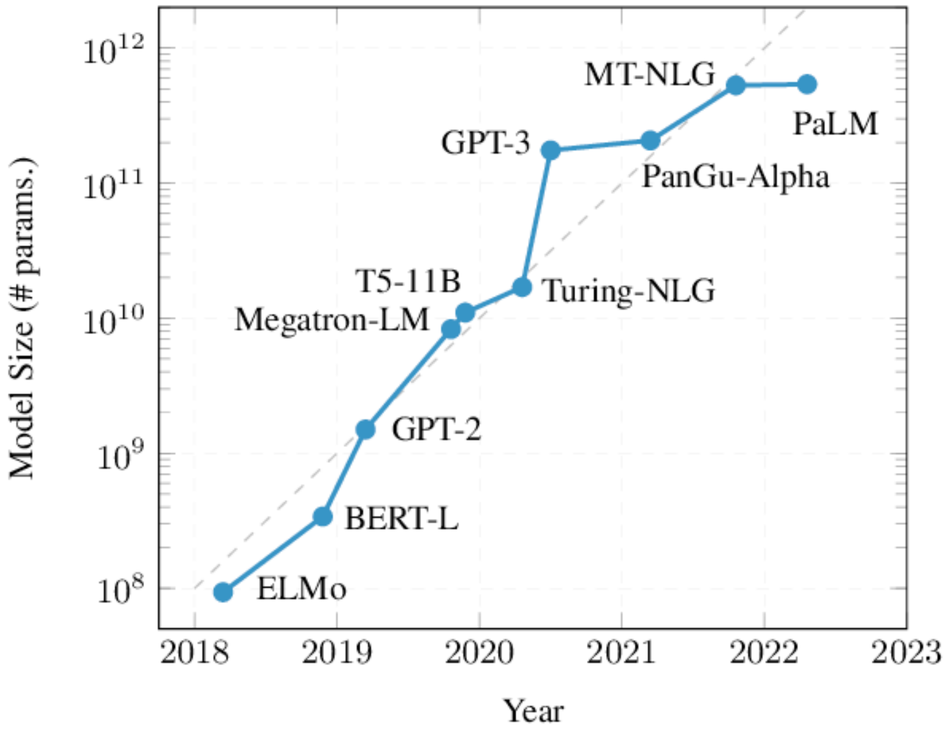
5,000X in 4 years



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Schwartz*, Dodge*, Smith & Etzioni, CACM 2020

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- Red AI
  - Inclusiveness
  - Environment

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Exclusive AI:

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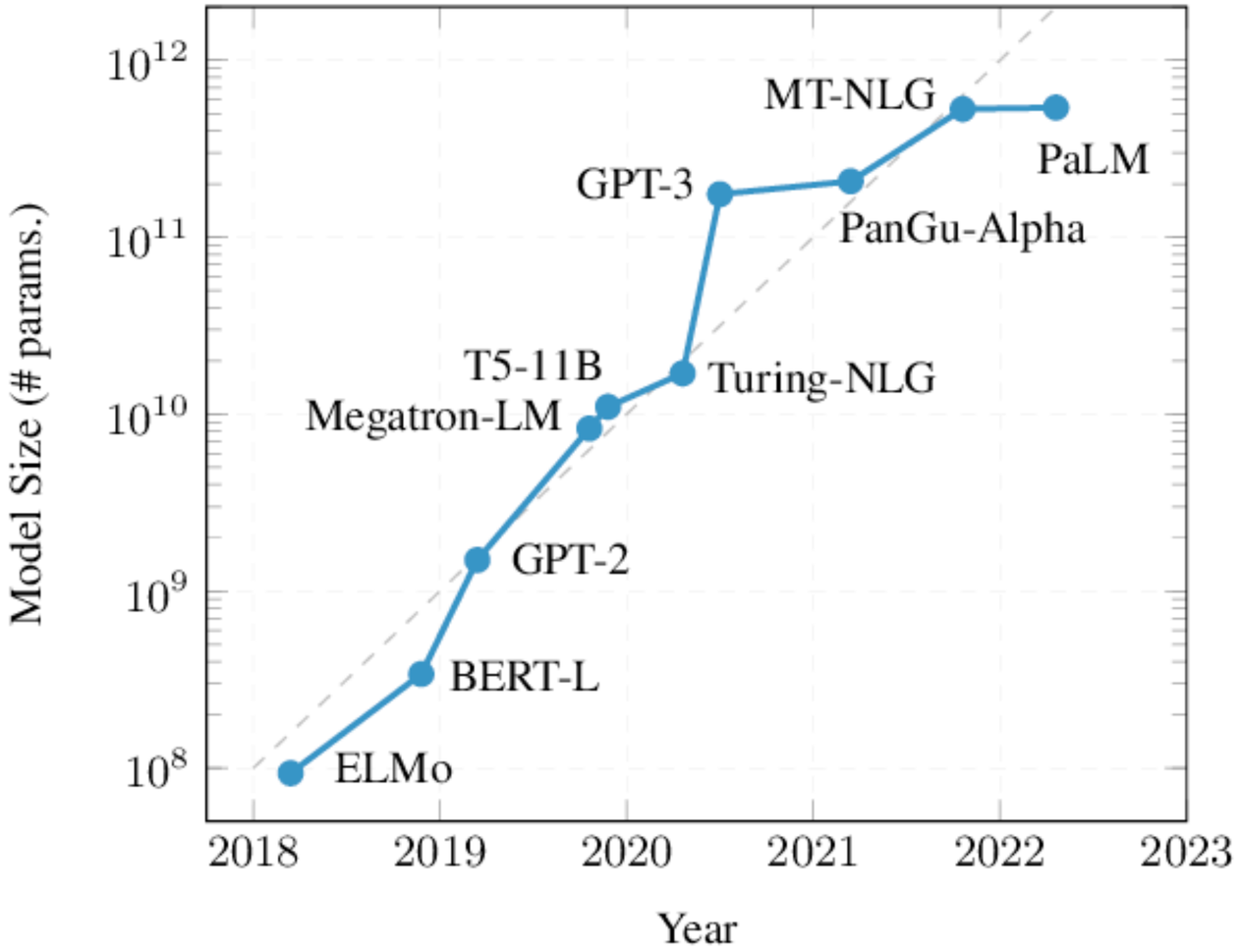
It's a Rich Man's World



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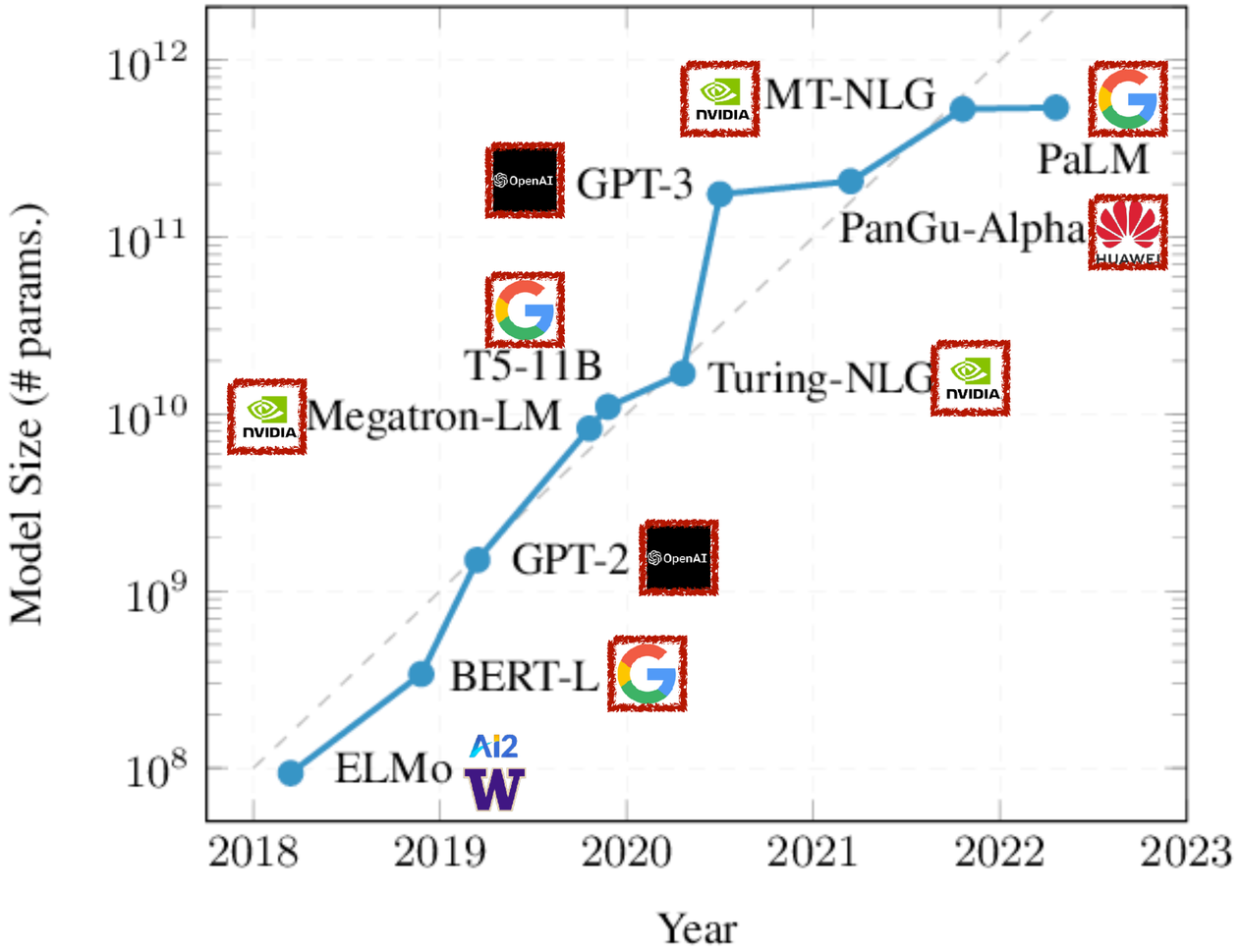

Problems with Scaling

Environment

Consumption	CO_2e (lbs)
Air travel, 1 person, NY↔SF	1984
Human life, avg, 1 year	11,023
American life, avg, 1 year	36,156
Car, avg incl. fuel, 1 lifetime	126,000
Training one model (GPU)	
NLP pipeline (parsing, SRL)	39
w/ tuning & experiments	78,468
Transformer (big)	192
w/ neural arch. search	626,155

Strubell et al. (2019)

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Is AI really creating an environmental problem?

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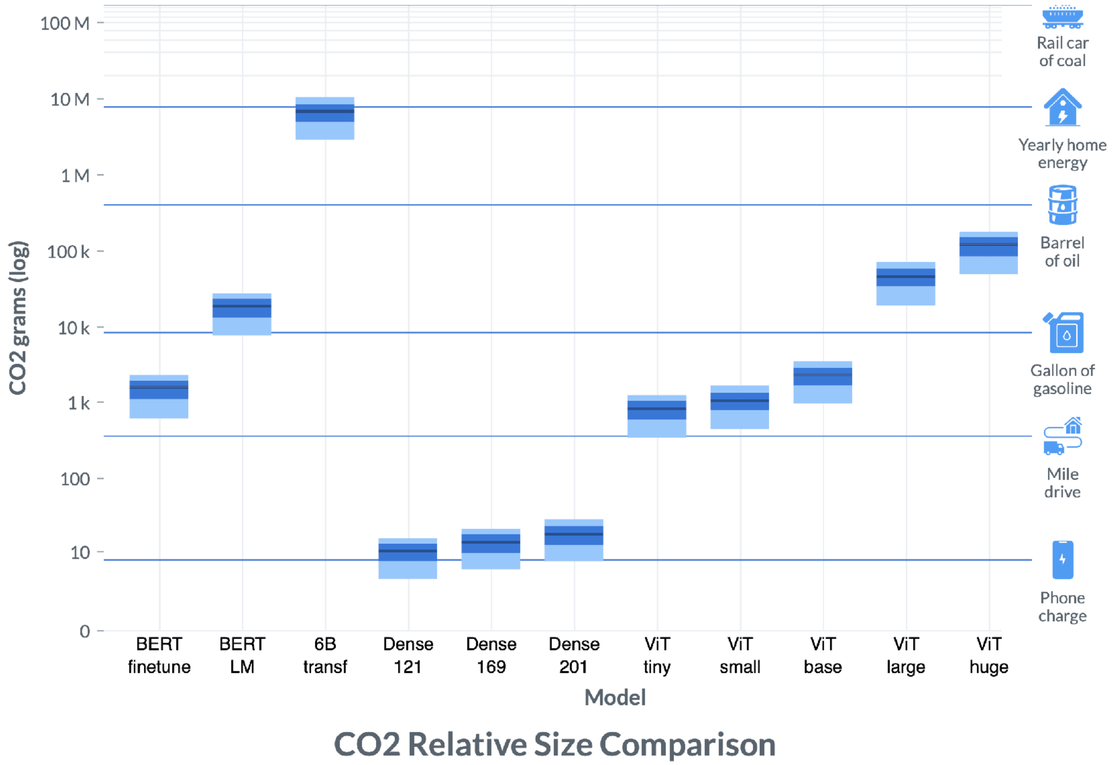
We need better reporting!

Is AI Really Creating an Environmental Problem?

Measuring the Carbon Intensity of AI in Cloud Instances

JESSE DODGE, Allen Institute for AI, USA
TAYLOR PREWITT, University of Washington, USA
REMI TACHET DES COMBES, Microsoft Research Montreal, USA
ERIKA ODMARK, Microsoft, USA
ROY SCHWARTZ, Hebrew University of Jerusalem, Israel
EMMA STRUBELL, Carnegie Mellon University, USA
ALEXANDRA SASHA LUCCIONI, Hugging Face, USA
NOAH A. SMITH, Allen Institute for AI and University of Washington, USA
NICOLE DECARIO, Allen Institute for AI, USA
WILL BUCHANAN, Microsoft, USA



CO2 Relative Size Comparison

Measu

JESSE D
TAYLO
REMI T
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ROY SC
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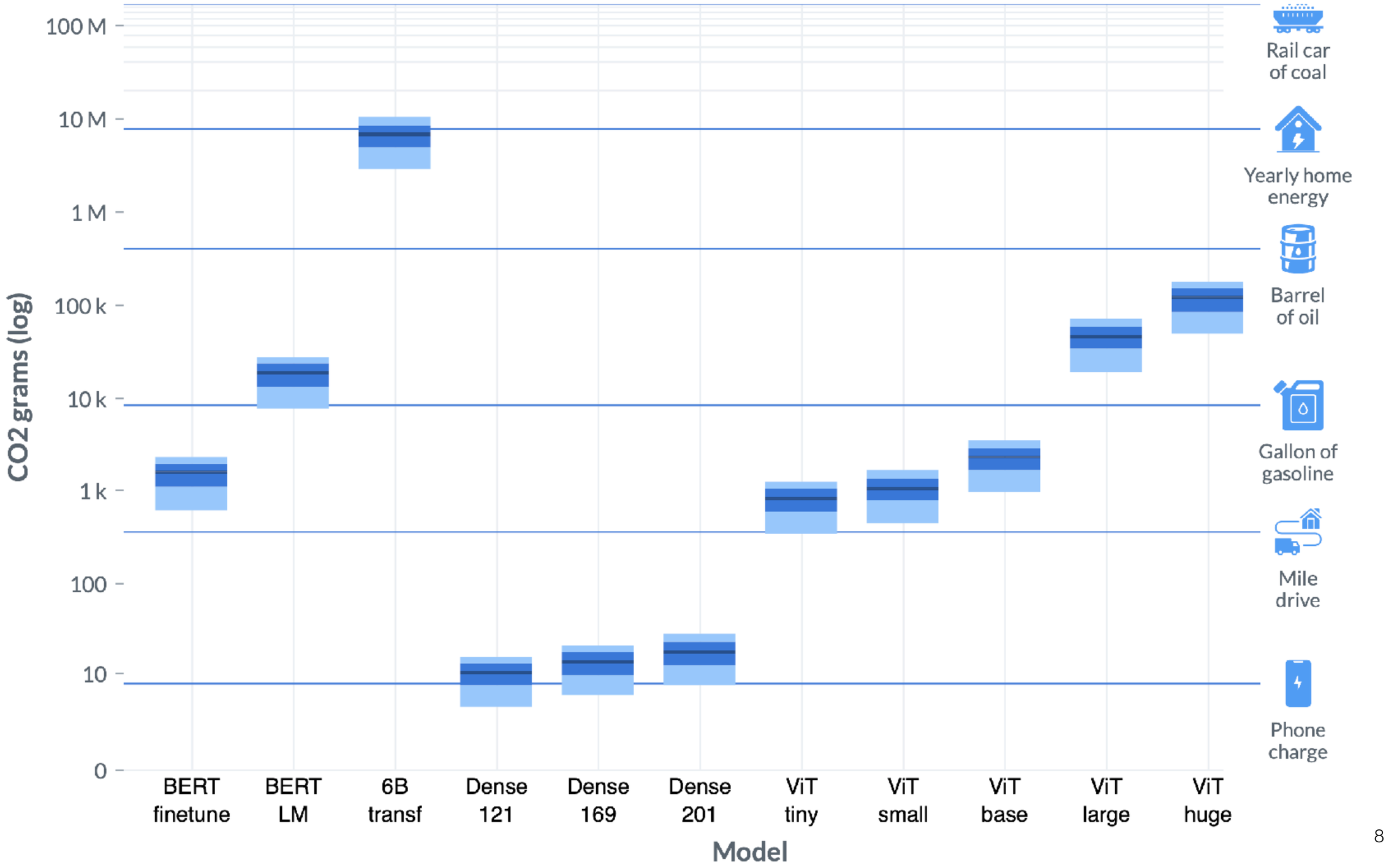

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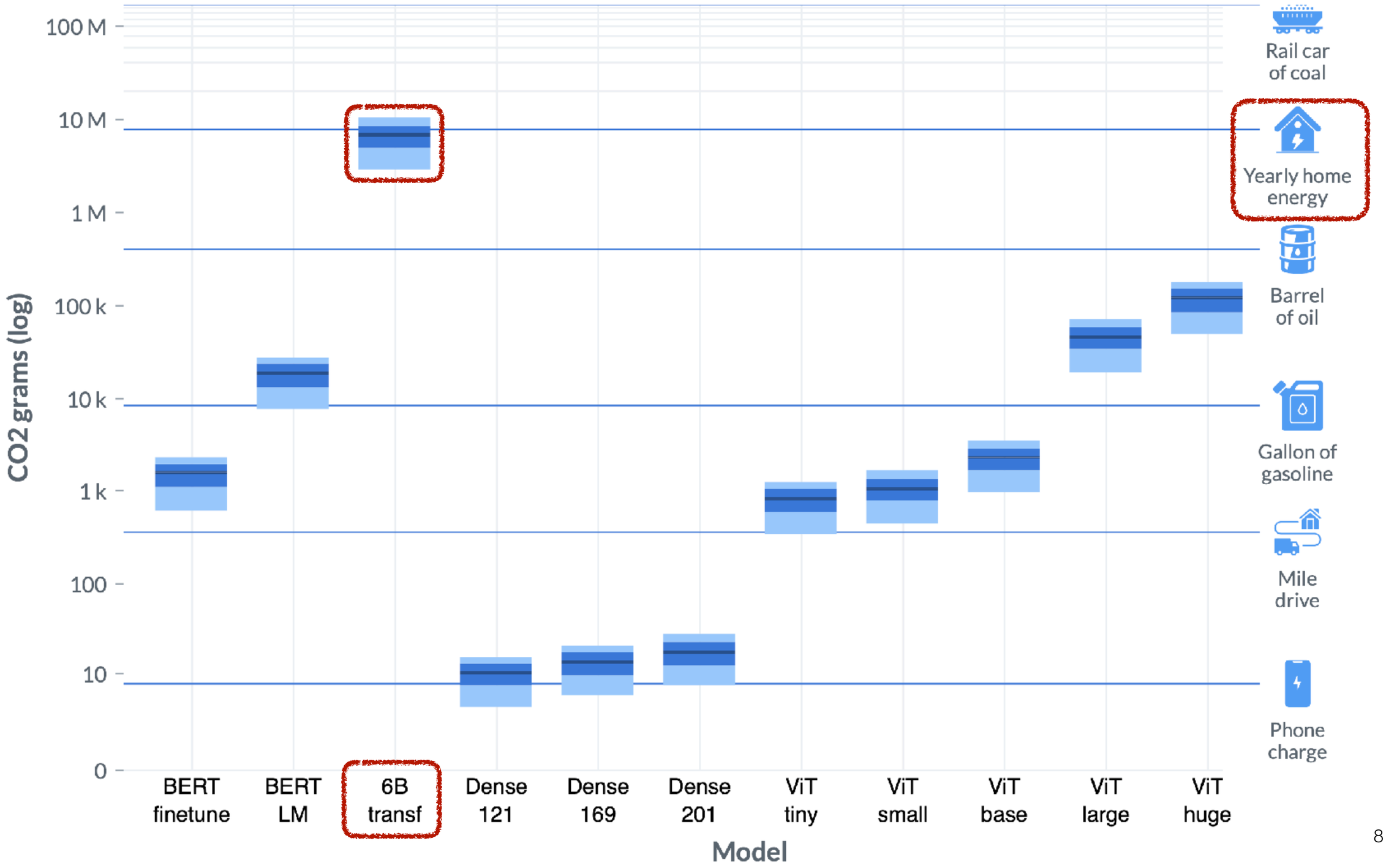

AI and the Environment

- Evidence around the **most expensive experiments**
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Overview

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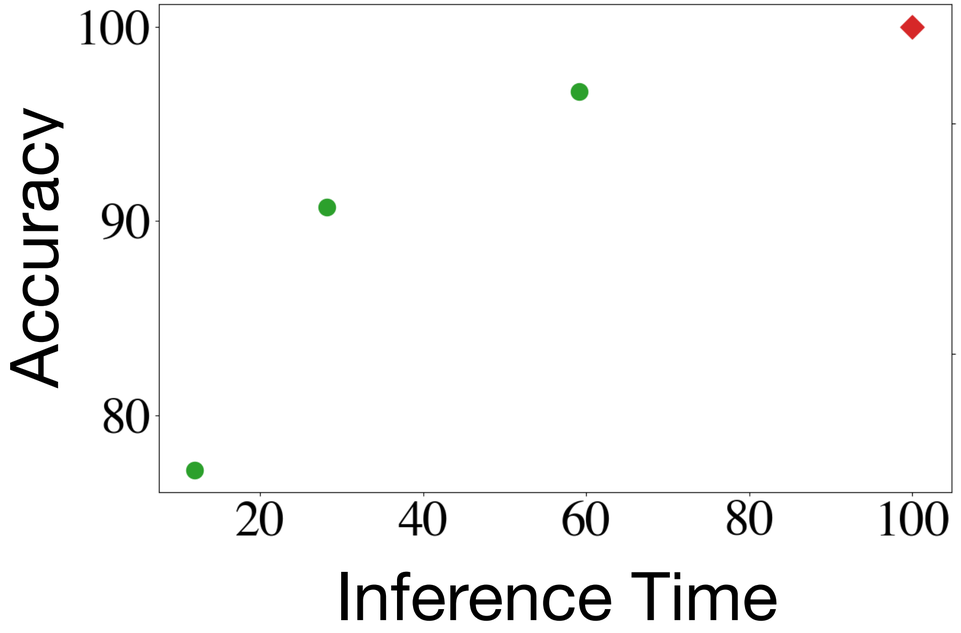
Matching Model and Instance Complexity

S. et al. (2020)



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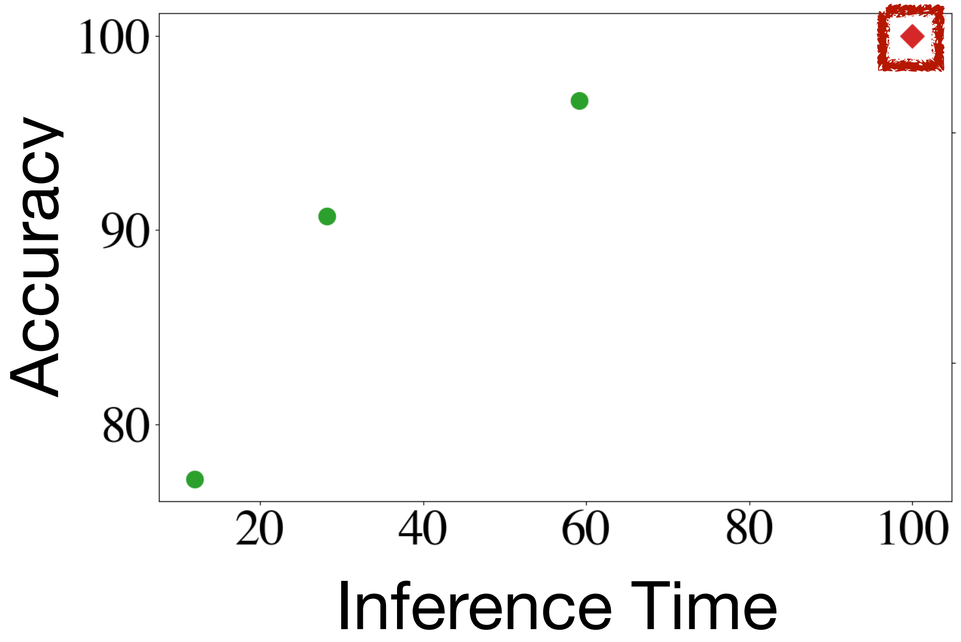

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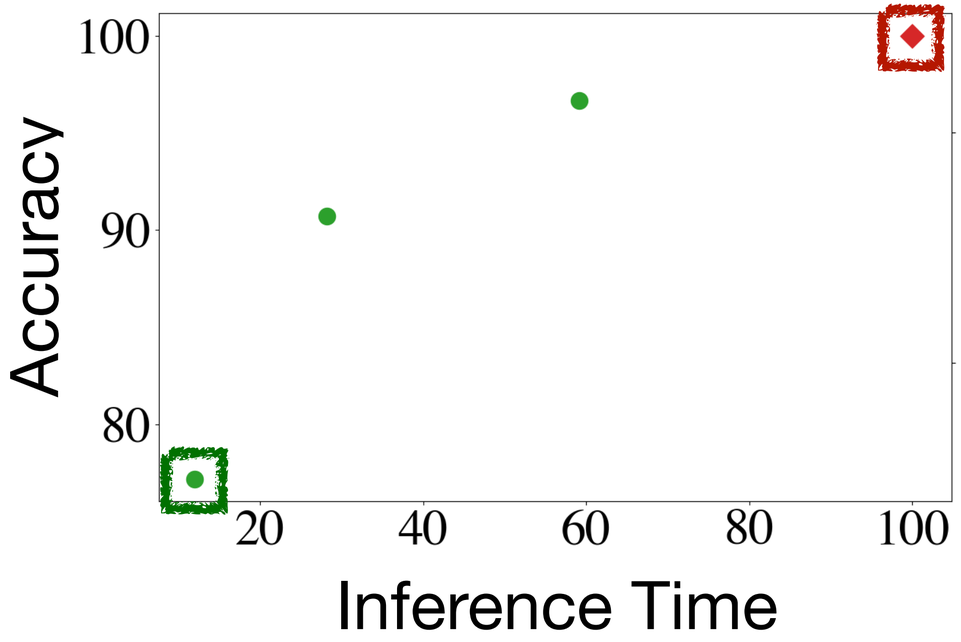

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Run an efficient model on "easy" instances,

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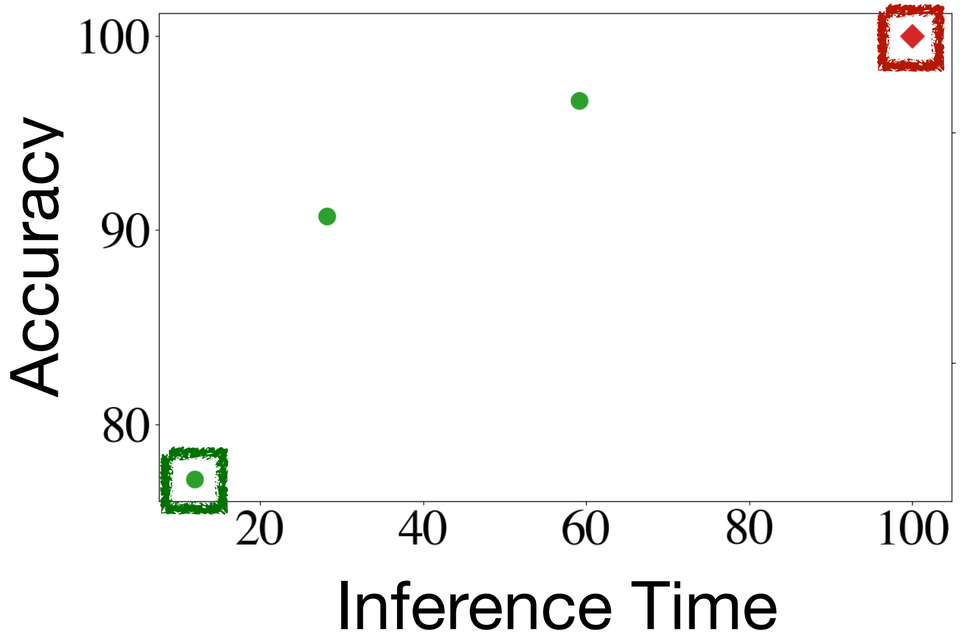

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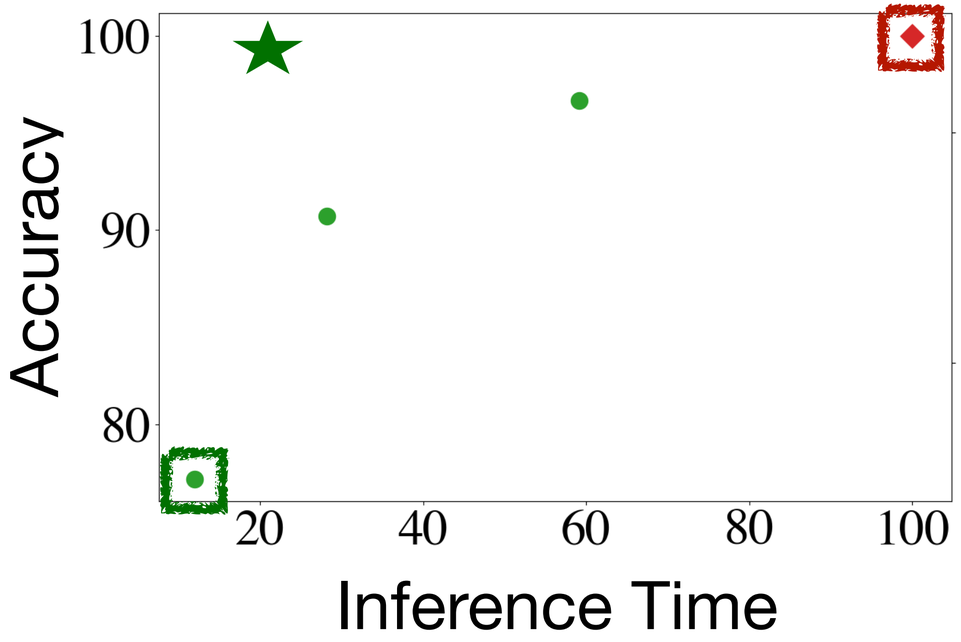

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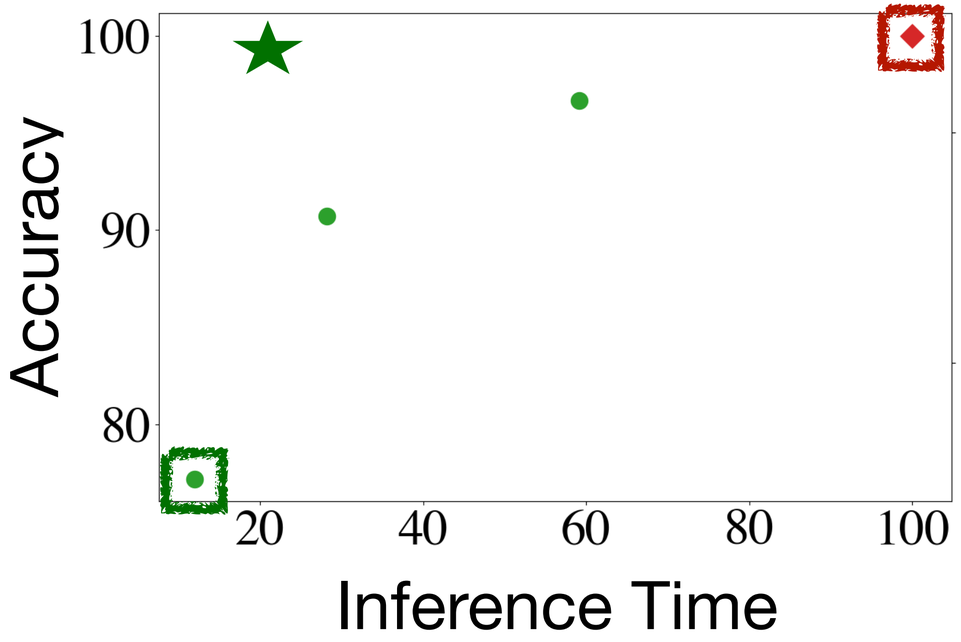

Improved Budget Allocation

Hassid et al. (2024)

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x1
Model Size

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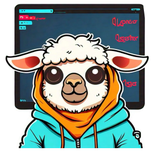
x10
Model Size

x1
Model Size



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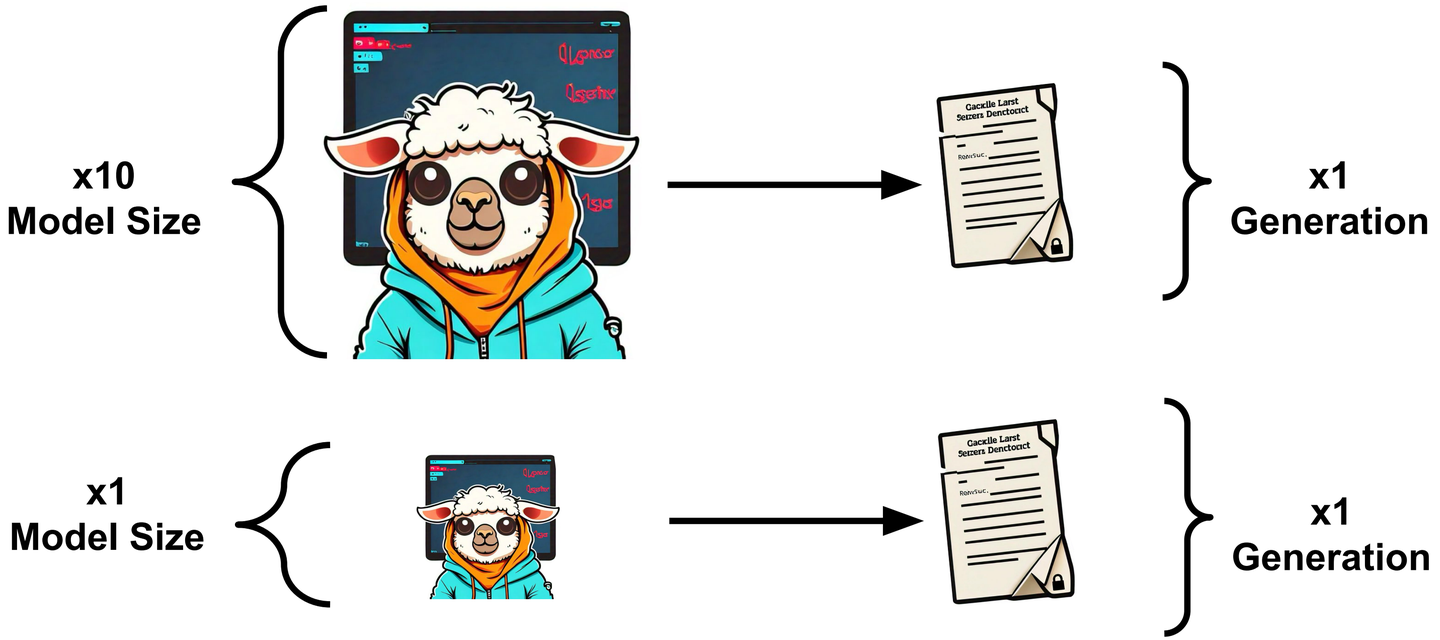

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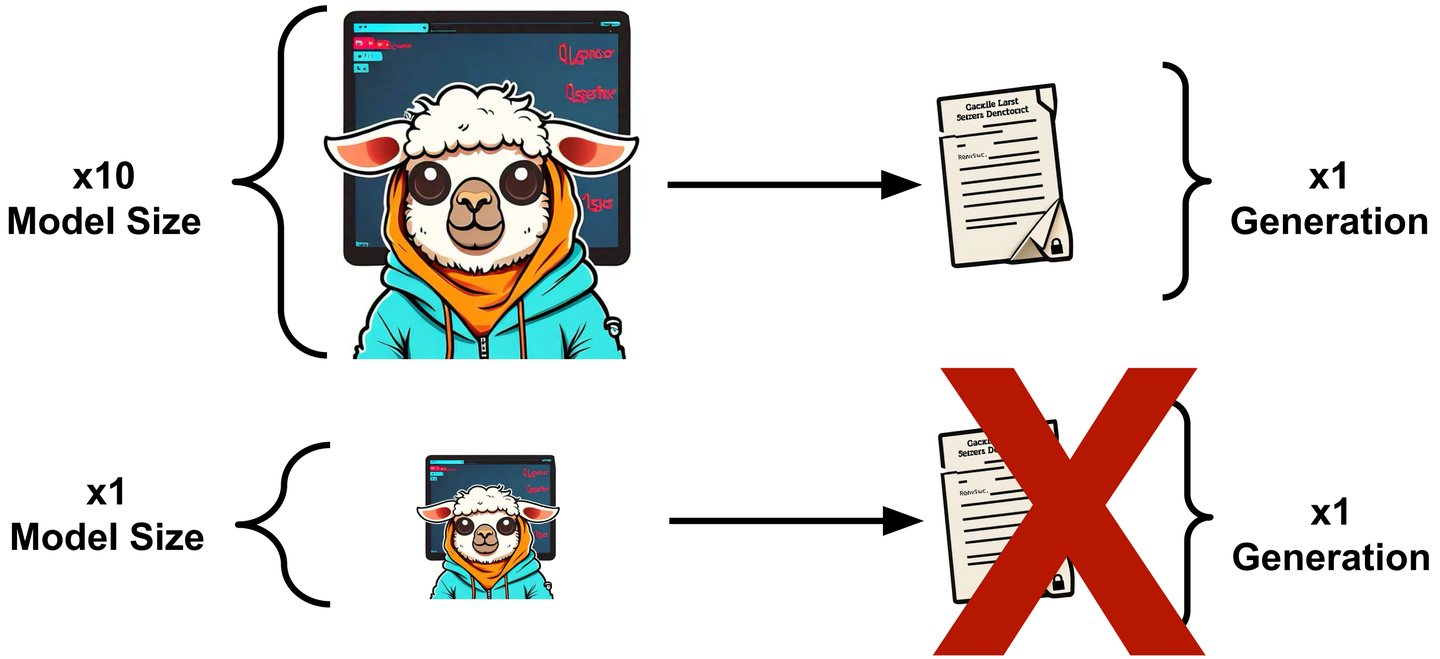

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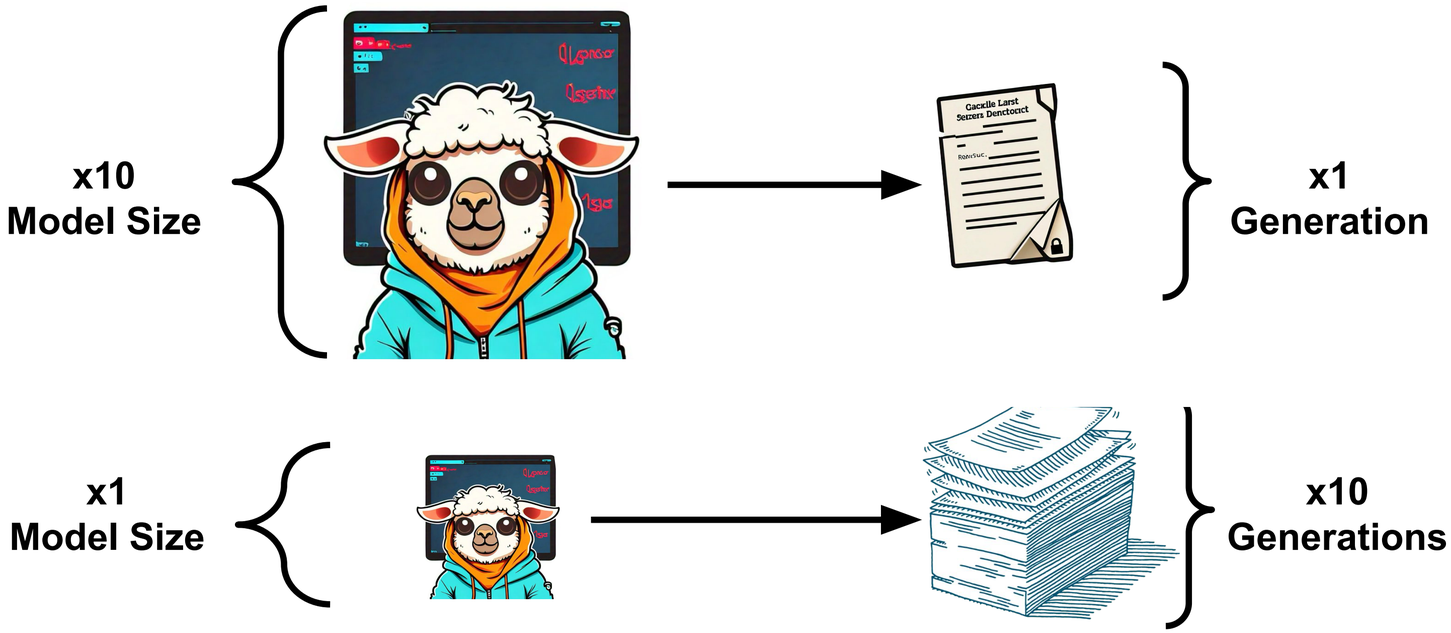

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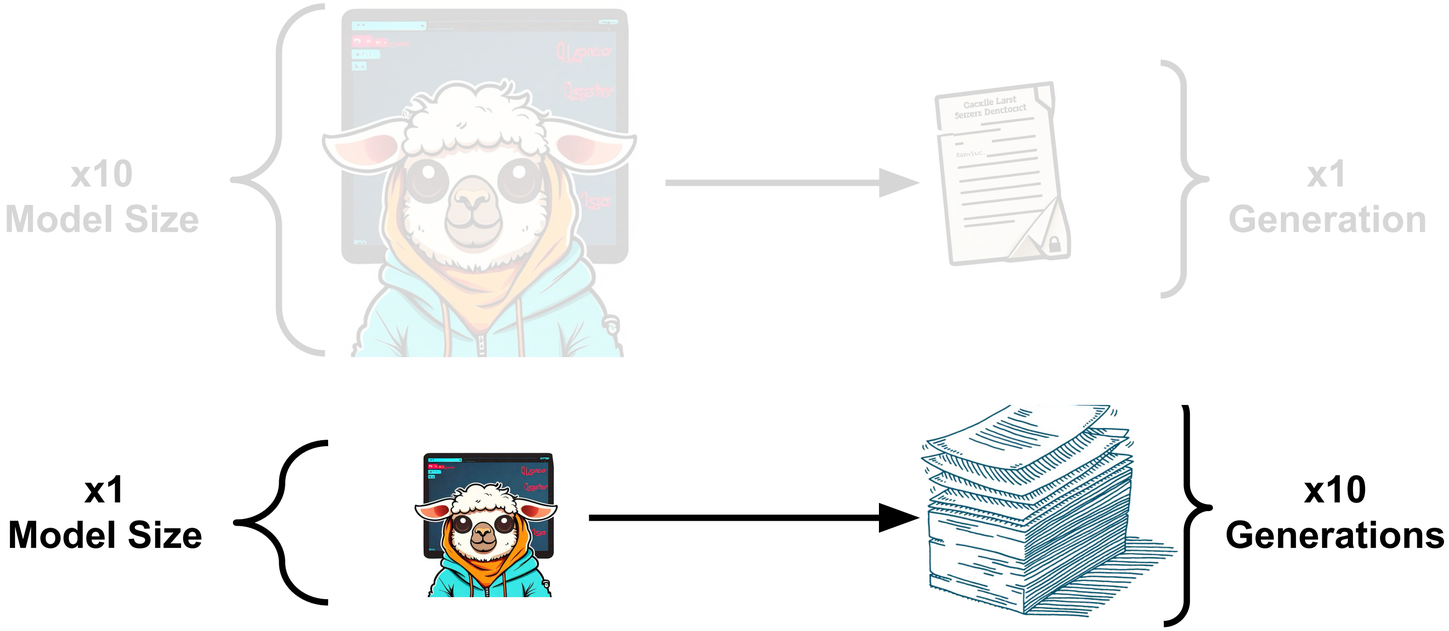

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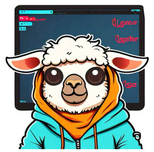
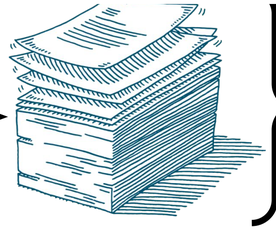
x10
Model Size

x1
Generation

x1
Model Size





x10
Generations

Don’t Overthink it!

Hassid et al. (2025)

Q: Find the sum of all positive integers n such that n+2 divides the product 3(n+3)(n2+9)

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majority@k

<think> ..... </think> So the answer is **52**

<think> ..... </think> So the answer is **49**

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Final answer:
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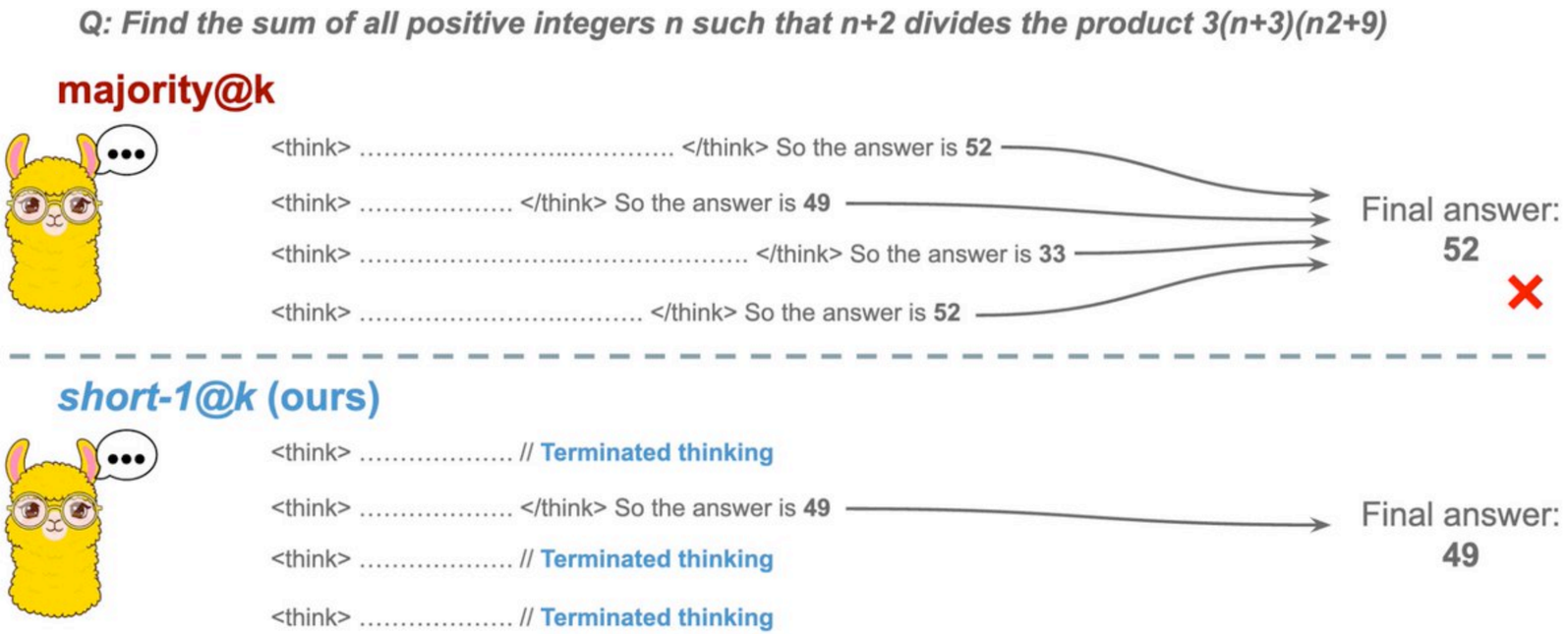

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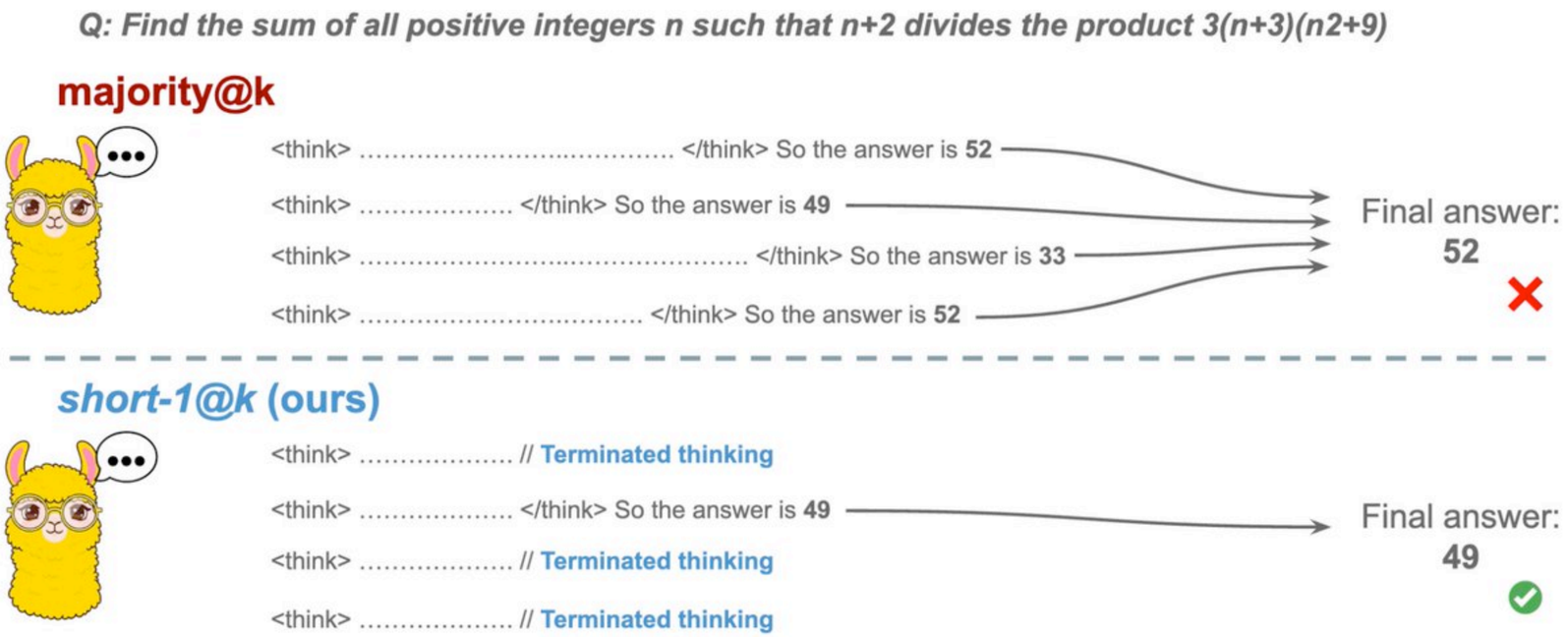

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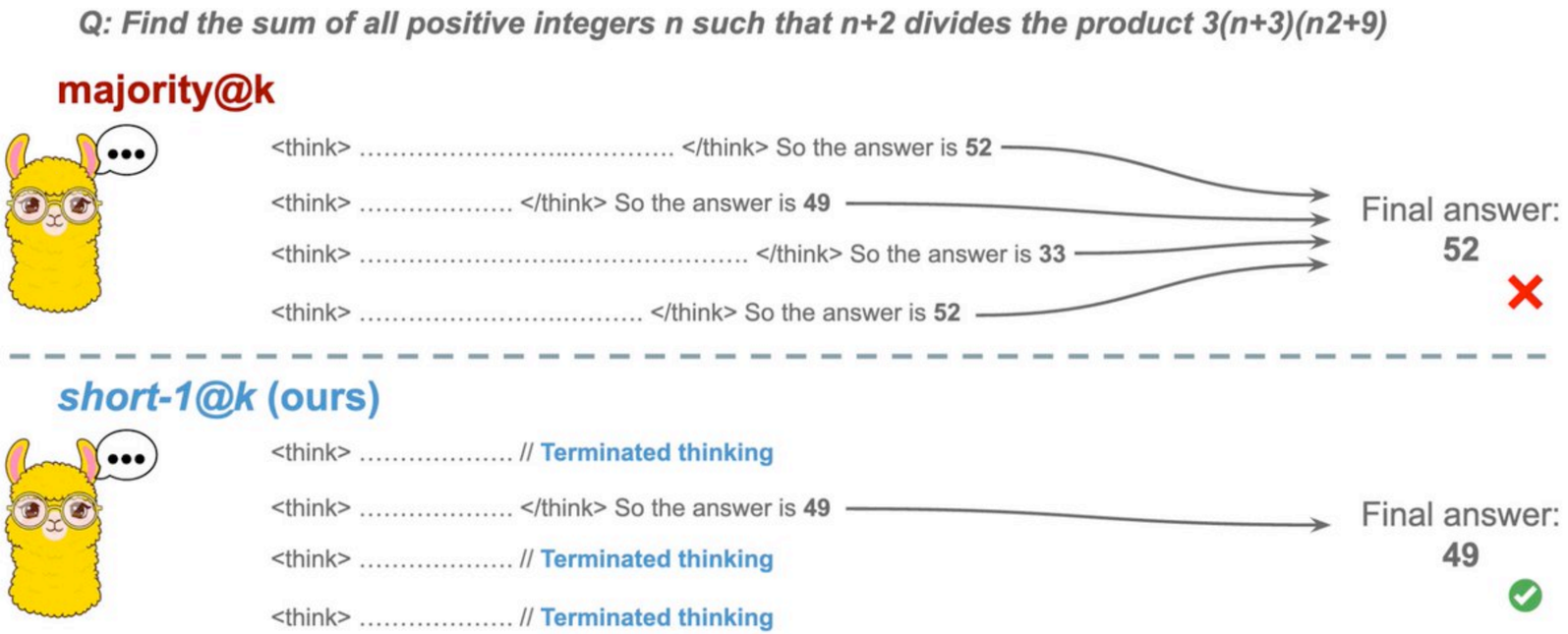

Which Words do we Store in Memory?

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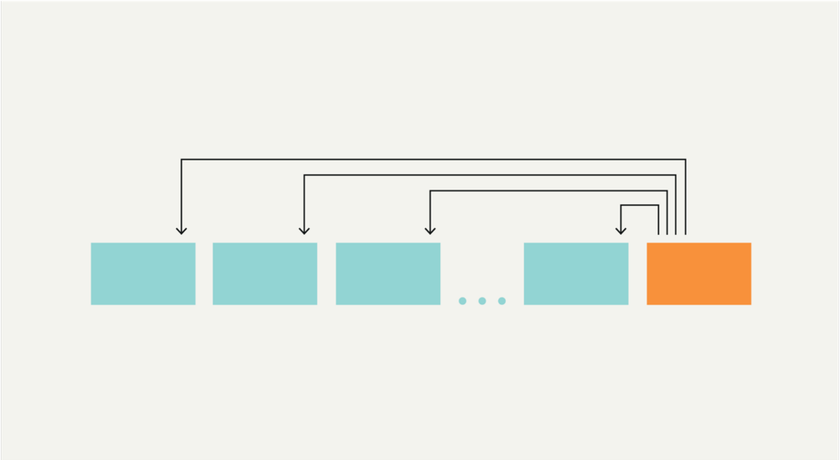

Transformer-based LLMs

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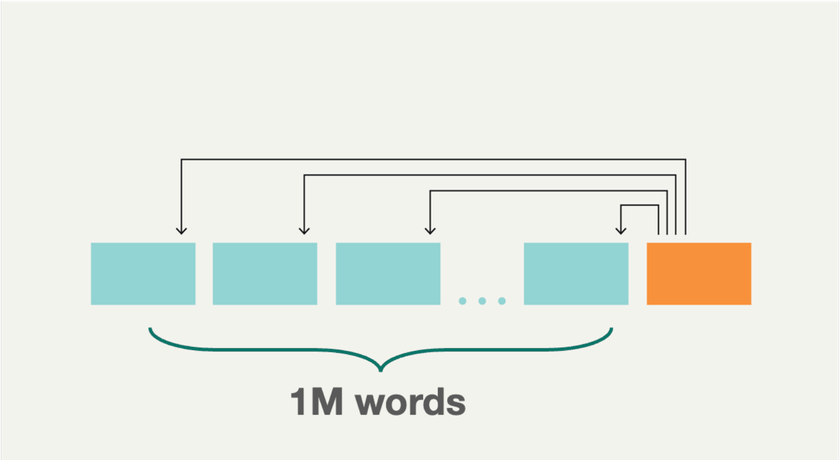

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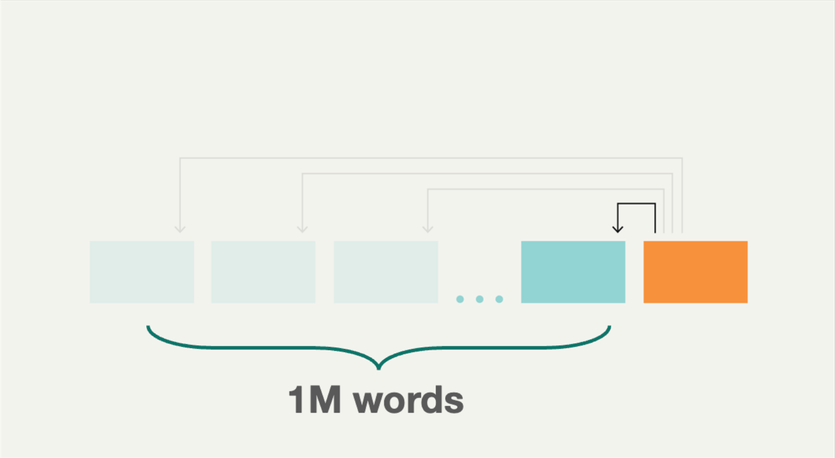

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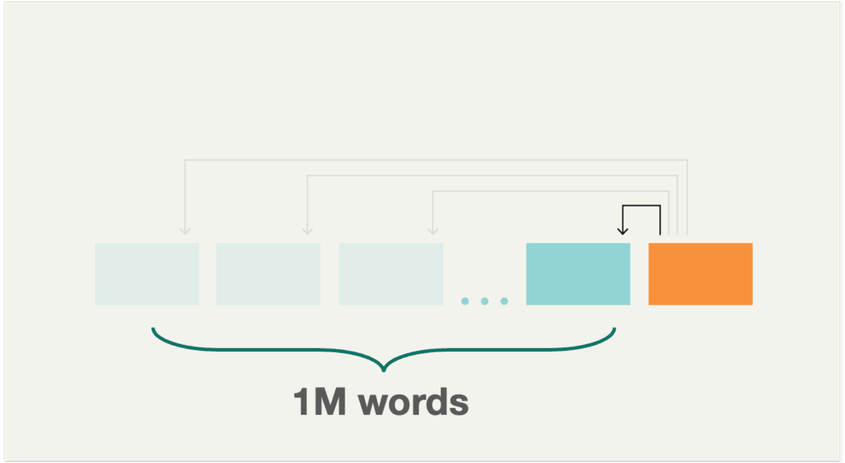

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