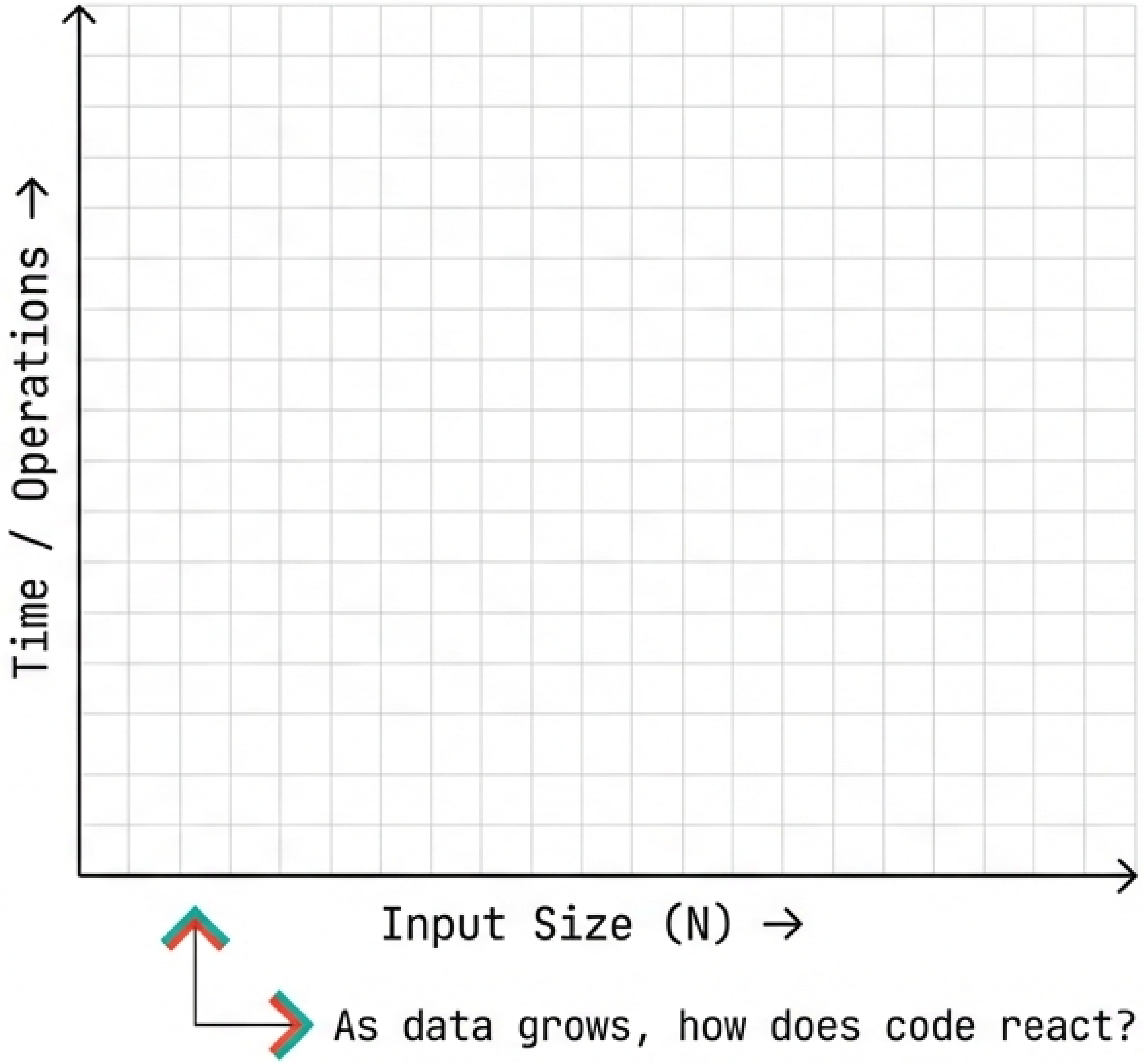
The Speedometer of Scalability

Algorithmic Complexity / Week 01

Definition: Big O notation is a prediction of future performance.

The Goal: Solving for the answer before the universe ends.

The Variable: N = Input Size.



As data grows, how does code react?

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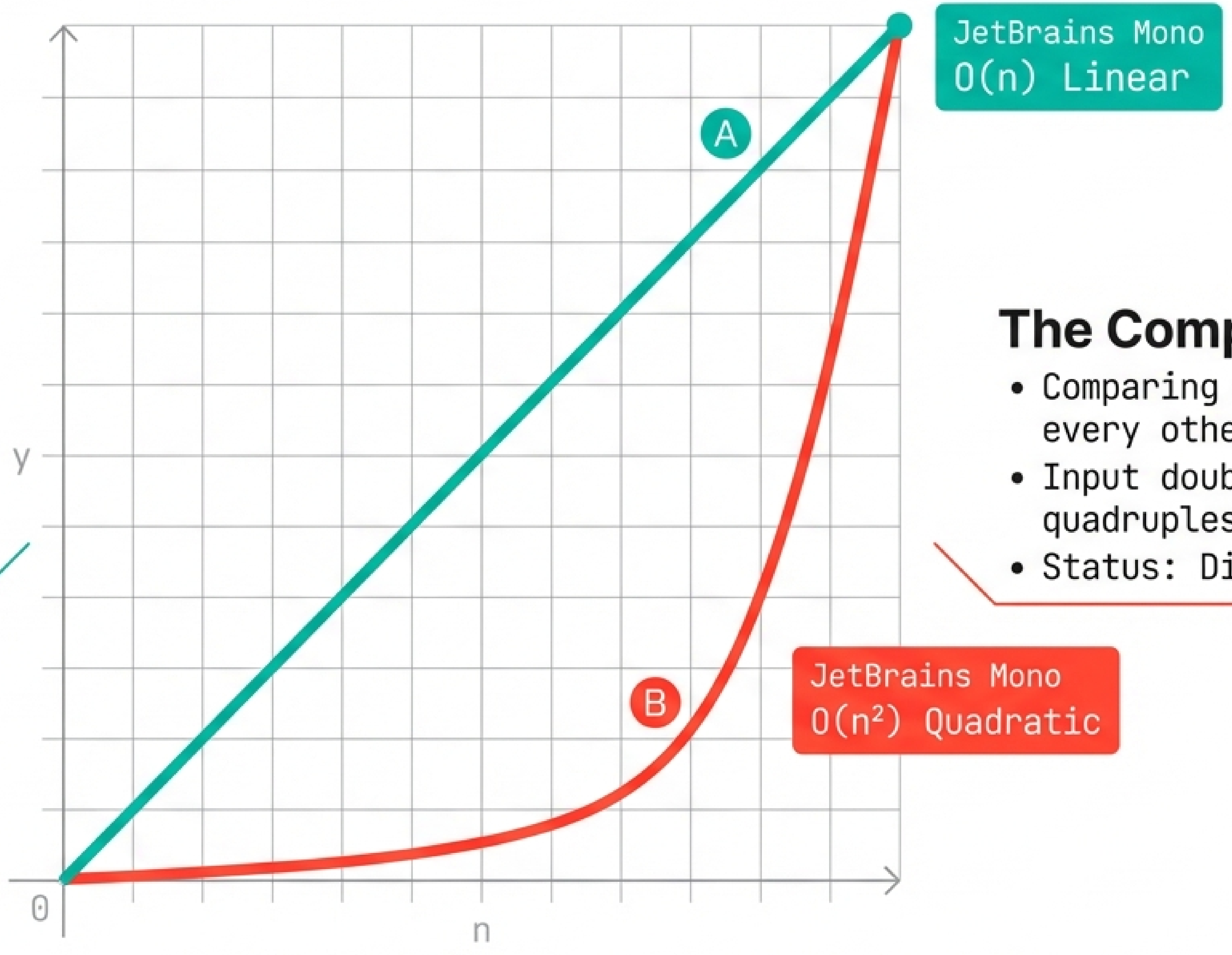
The Duel: Linear vs. Quadratic

The Reader

- Reading a book page by page.
- Input doubles = Time doubles.
- Status: Efficient



The Comparator

- Comparing every word to every other word.
- Input doubles = Work quadruples.
- Status: Disastrous

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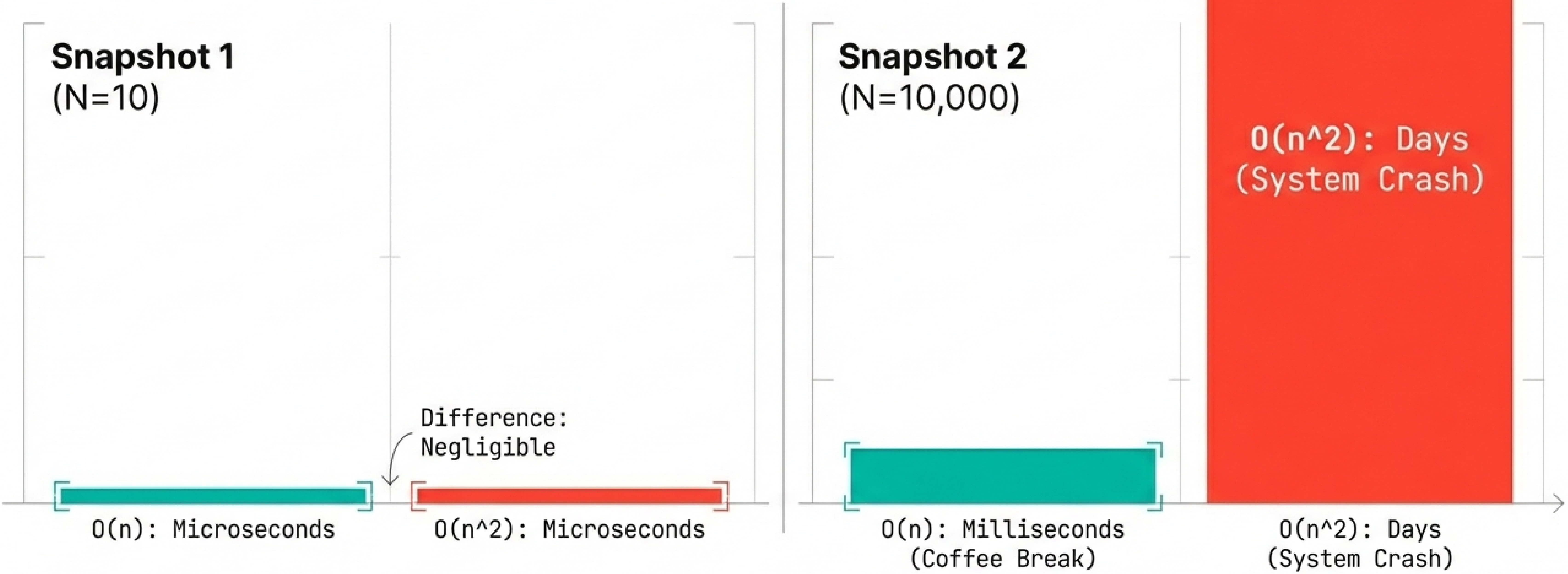
The Explosion of Scale

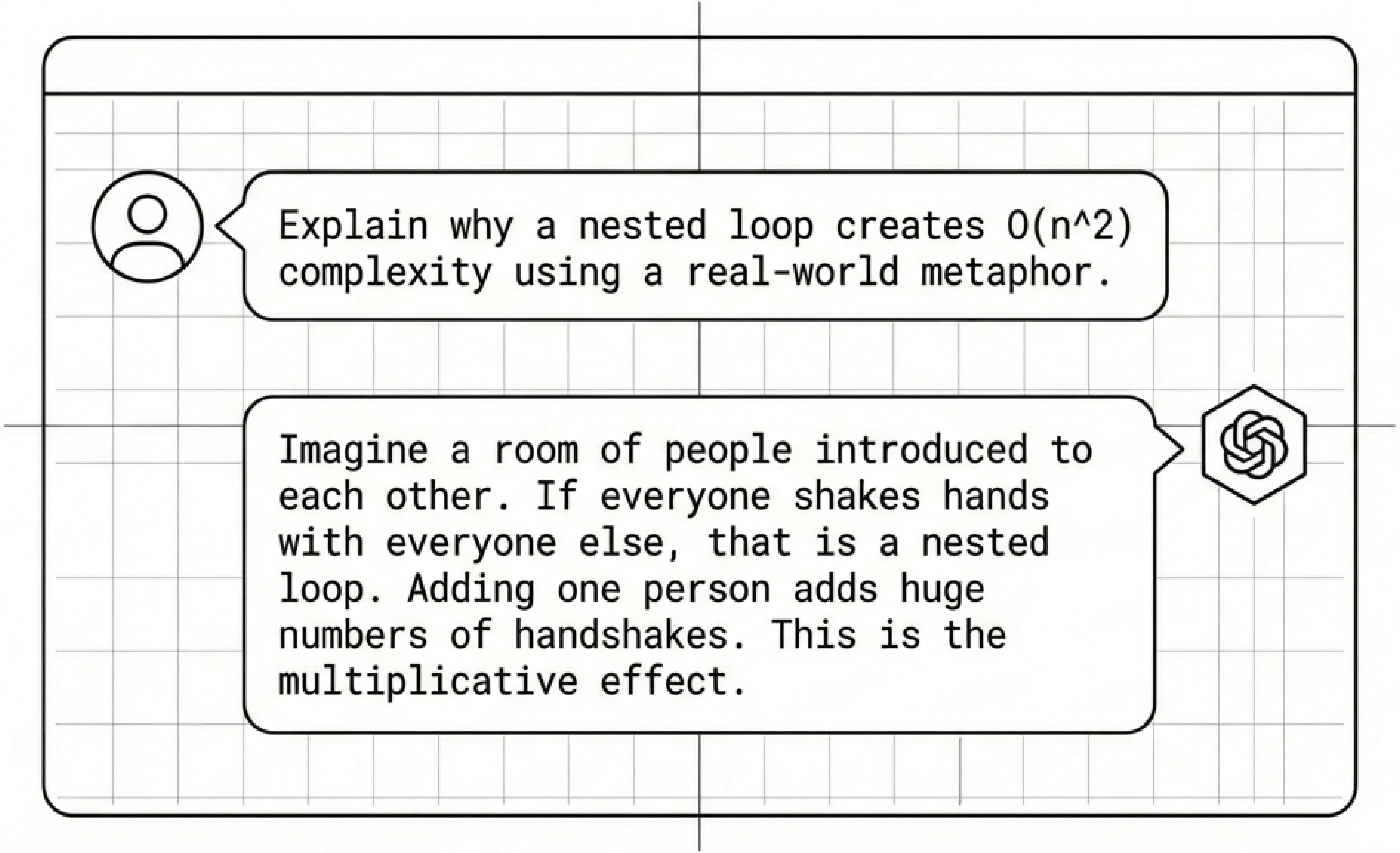
Why N matters.



At small scales, inefficiency hides. At large scales, it destroys performance.
Task: Identify the Explosion Point.

Your AI Study Buddy

Week 1 Focus: Conceptual Explanation



Explain why a nested loop creates O(n^2) complexity using a real-world metaphor.

Imagine a room of people introduced to each other. If everyone shakes hands with everyone else, that is a nested loop. Adding one person adds huge numbers of handshakes. This is the multiplicative effect.

Strategy

- ✓ Don’t stare at the math.
- ✓ Ask AI to visualize the concept.
- ✓ Ask AI to trace the loop.
- ✓ Goal: Scaffolding & Understanding.

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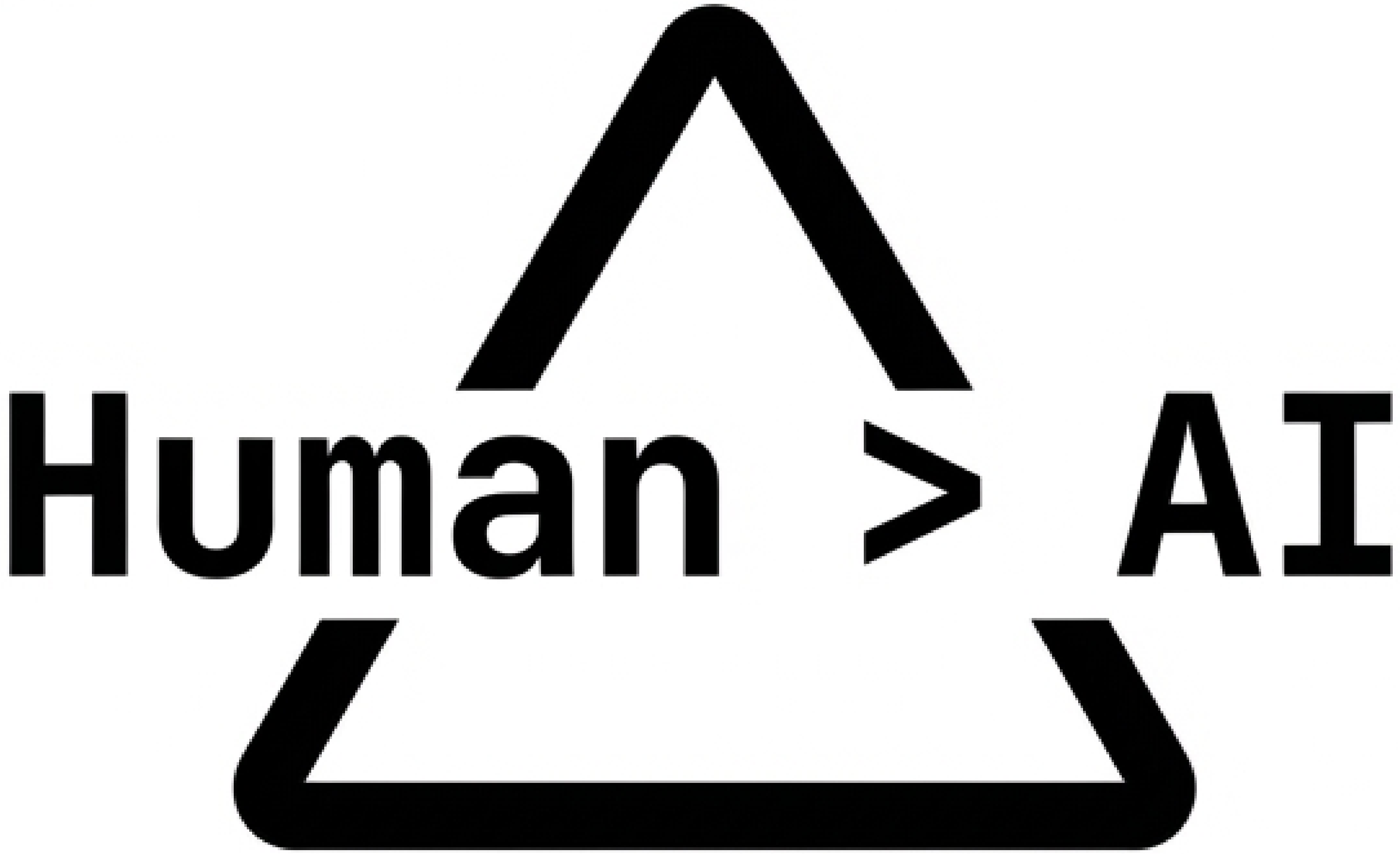
The Augmented Engineer



Human > AI

The Philosophy

- AI is a sophisticated but fallible intern.
- It lacks accountability. You do not.

The Risk

- Hallucination is real.
- AI will confidently generate inefficient code.
- “The AI told me so” is not a defense.

The EYC Rule

- Explain Your Code.
- If you cannot explain the logic during a check, the grade is zero.

To use the tool, you must master the tool.

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