AI is changing workload, shifting liability, and altering expectations of competence.

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When AI Becomes Your Brilliant Subcontractor

Competence, Verification, and Responsibility in Engineering Practice

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A Snapshot, Not a Forecast

Professional Duty

- AI is changing too quickly for any talk to stay current for long.
- This presentation is a snapshot of where practice appears to be now.
- The technology is changing rapidly.
- The professional duty is not.

AI is changing workload, shifting liability, and altering expectations of competence.

A Better Way to Think About AI

AI is not magic.

AI is not a colleague.

AI is not a licence holder.

AI is a brilliant subcontractor.

Meet the Brilliant Subcontractor

The Generation Side

- Fast
- Tireless
- Broadly informed
- Cheap to deploy

The Verification Side

- Confident
- Occasionally wrong
- Never liable *

Thought Exercise #1

Suppose you could hire a subcontractor who:

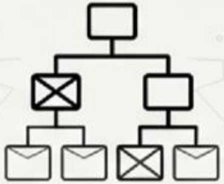
- had read most of the internet,
- worked instantly,
- produced first drafts in seconds,
- sounded authoritative,
- and occasionally made subtle mistakes.

Would you hire that subcontractor?
Under what supervision model?

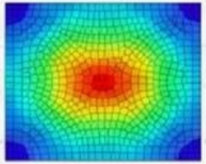
Where AI Is Already Showing Up

Drafting reports and specifications

Writing code and scripts



Generating design alternatives



Assisting with optimization

Summarizing standards and references

Supporting review and troubleshooting

Where Students Are Already Using It

Classroom

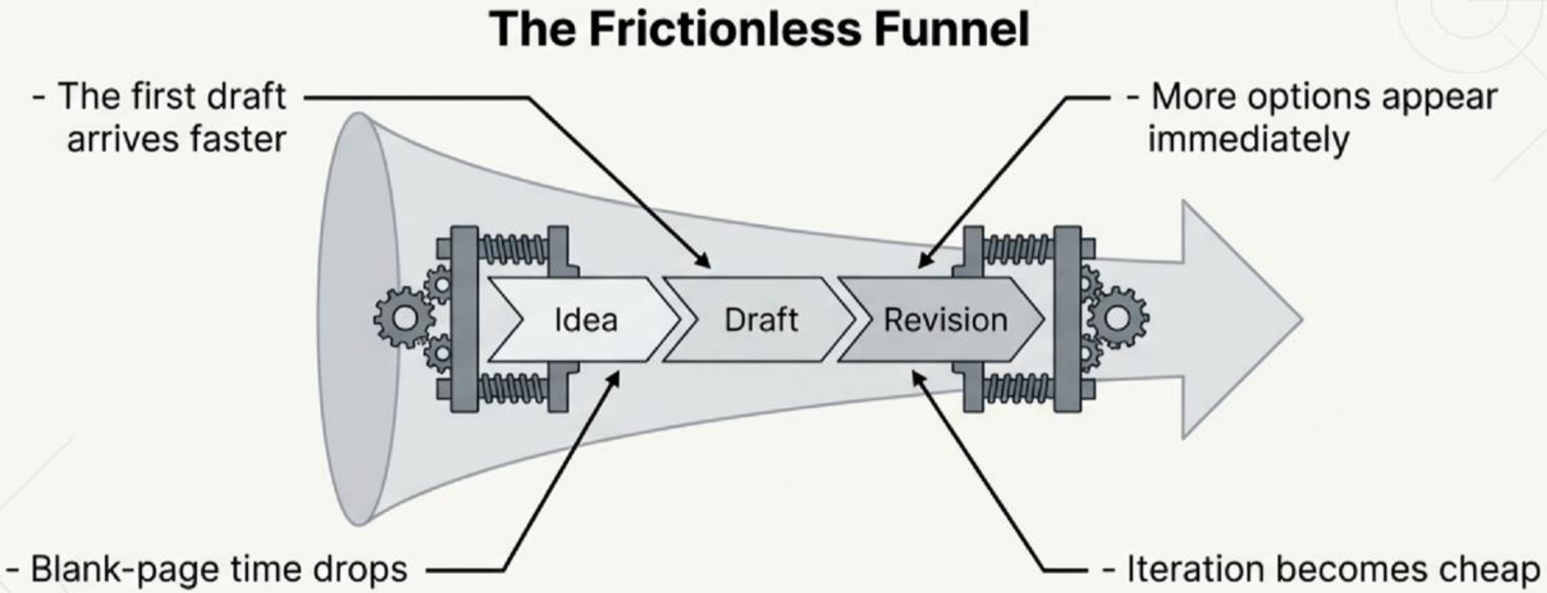
- Reports
- Assignments
- Code generation

Workplace

- Debugging
- Design exploration
- Summaries and study support

Bottom line: Students are entering the profession AI-native.

Why AI Feels Like Free Productivity



Bottom line: AI makes technical generation feel almost frictionless.

But What Actually Changes?

AI may not reduce engineering work. It may change the kind of work.

From:
~~drafting~~
~~searching~~
~~formatting~~

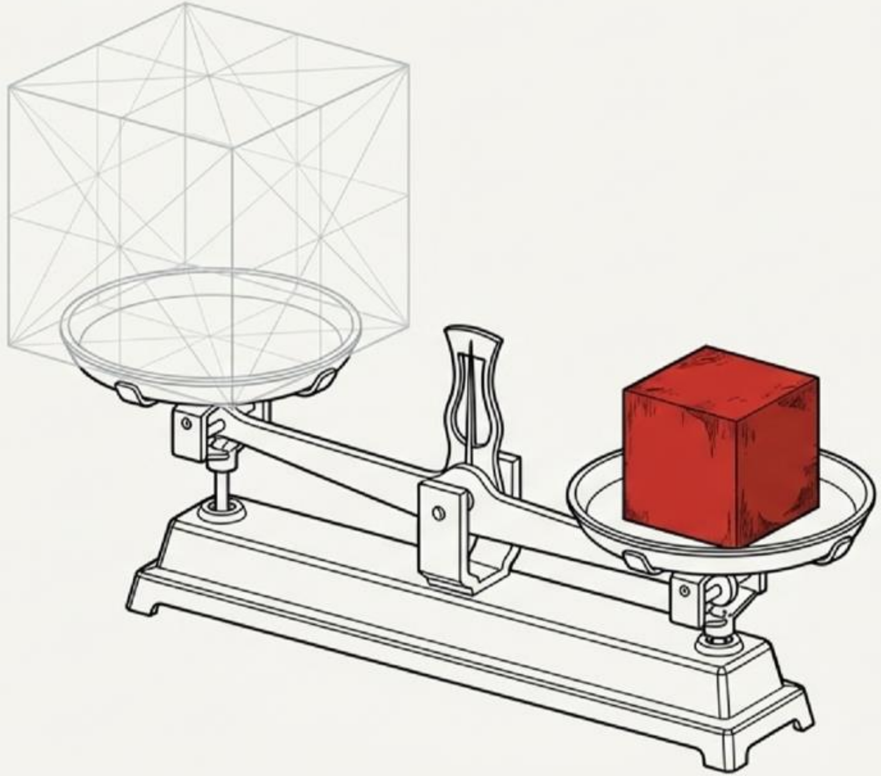
To:
checking
interrogating
validating
documenting

The first draft is getting cheaper.

Judgment is getting more expensive.

The Workload Shift

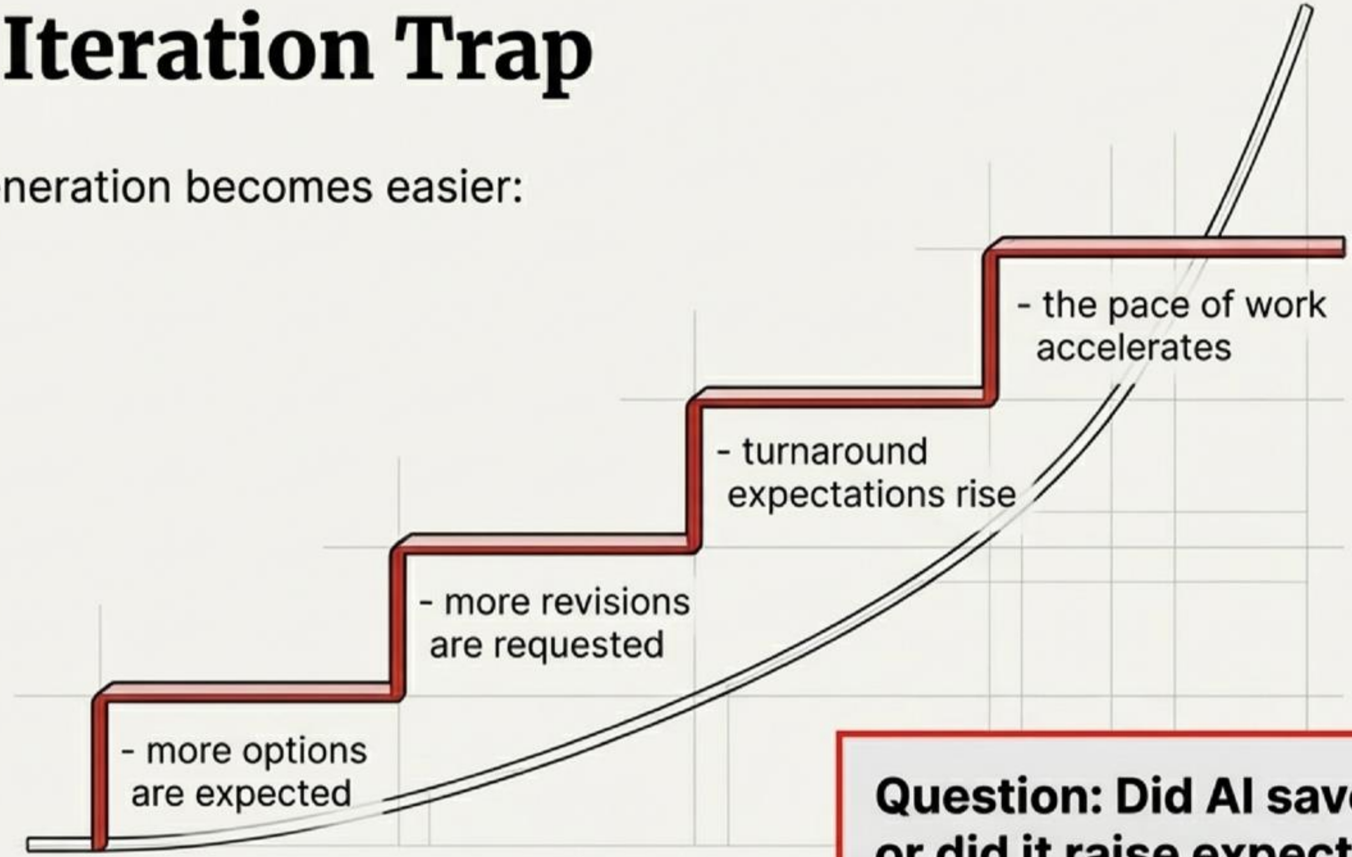
Less time spent on:
- drafting
- boilerplate
- formatting
- routine coding



More time spent on:
- verification
- edge cases
- assumption checking
- provenance
- review sign-off

The Iteration Trap

When generation becomes easier:



Question: Did AI save time, or did it raise expectations?

Thought Exercise #2

If AI helps you produce 5 design options instead of 2, have you have you reduce workload, or increased the number of decisions you must now defend?

The Verification Bottleneck

- Plausible output is not validated output

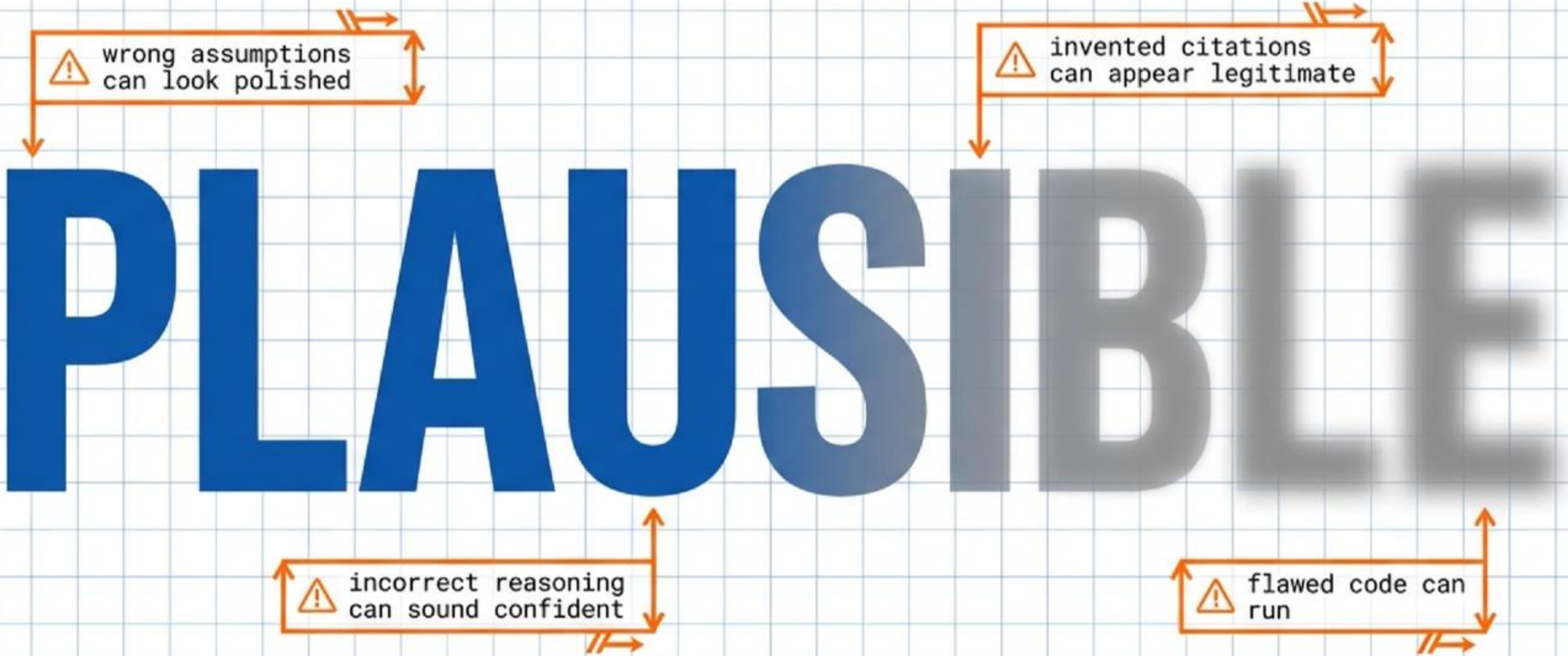
- Confidence is not correctness

- Speed does not reduce duty of care

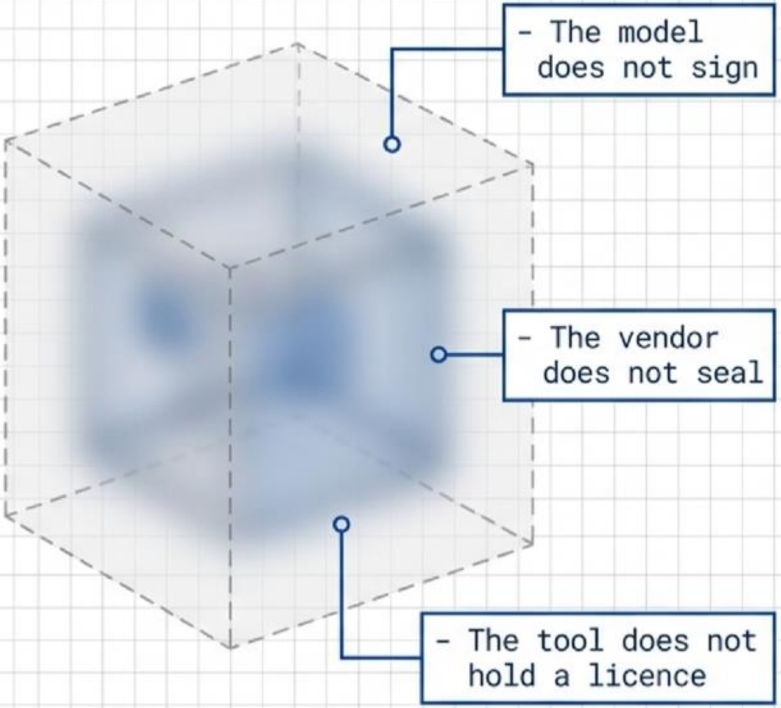
The Real Risk Is Plausibility

The danger is not that AI is obviously foolish.

The danger is that it is often plausible.



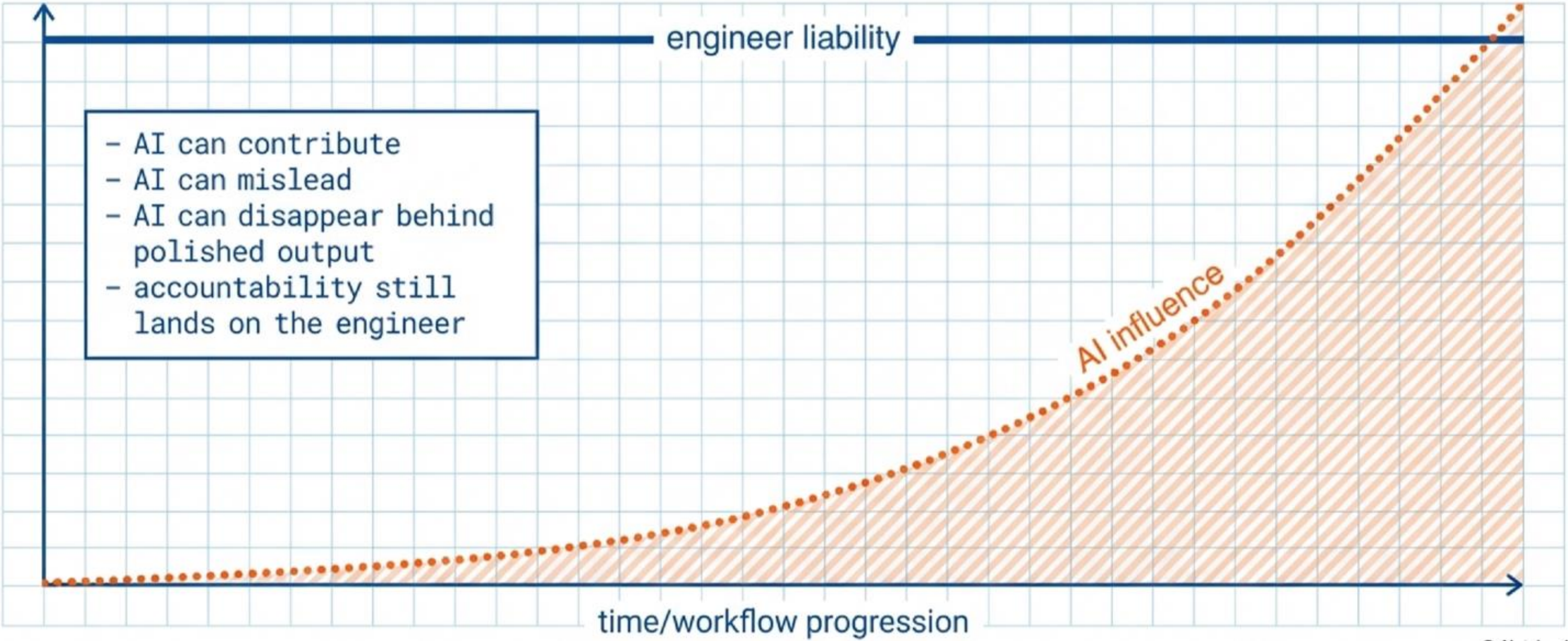
So Who Owns the Mistake?



- The engineer remains responsible

Liability Asymmetry

As AI influence increases, professional liability does not move.



Scenario #1: Analysis Script

A junior engineer uses AI to generate a thermal or structural analysis script.

↓

It runs.

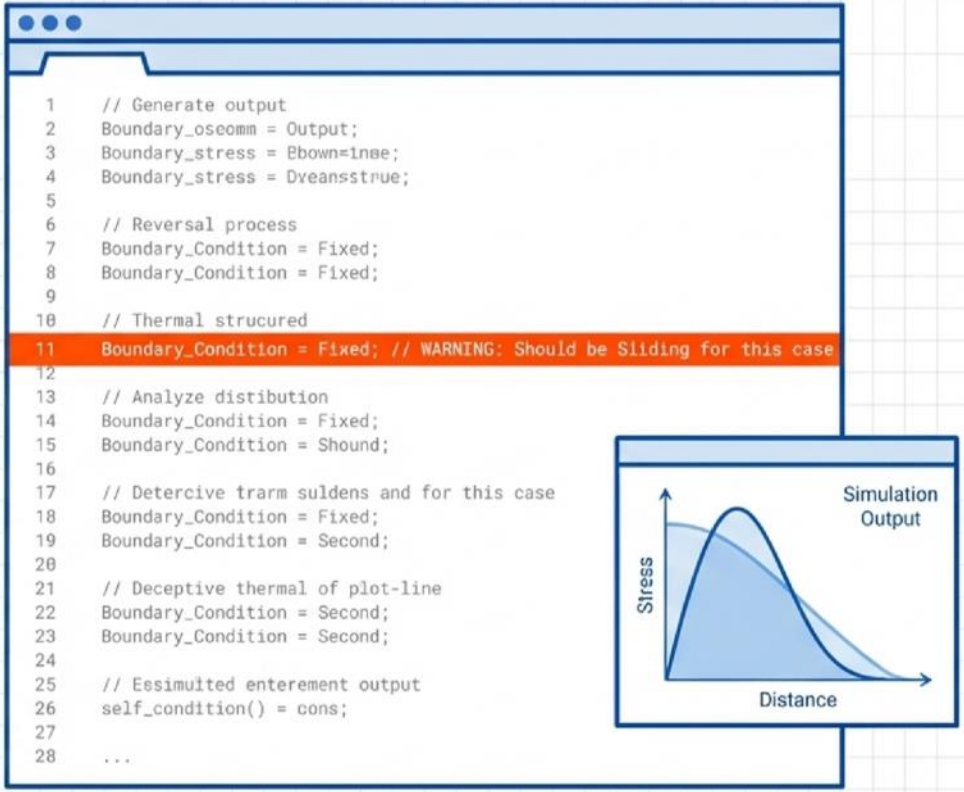
↓

The plots look reasonable.

↓

A boundary condition is wrong.

Question:
Who should have caught it?

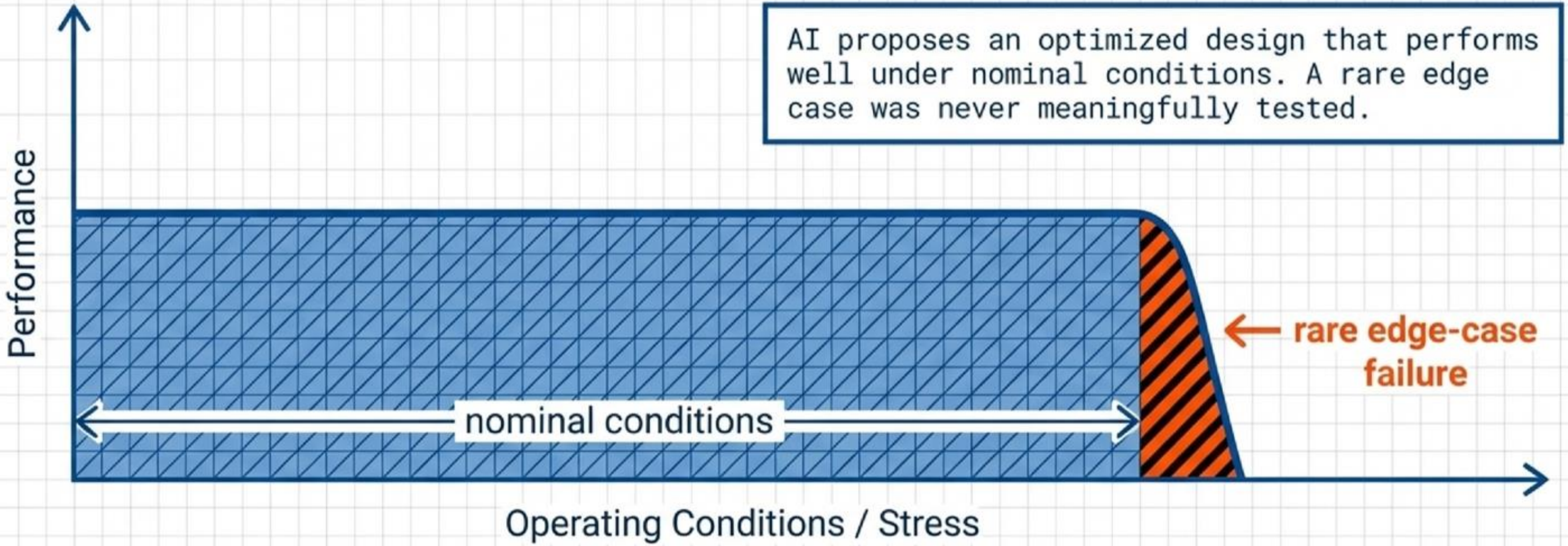


Scenario #2: Specification Language

- AI drafts a compliance summary or specification section.
- The language is polished.
- A requirement is misstated.
- The project team relies on it.

Question:
At what point did "drafting assistance" become professional reliance?

Scenario #3: Design Optimization



Question: Does optimization reduce engineering effort, or make the hidden failure more expensive?

What Competence Looks Like Now

A competent engineer must be able to:

- interrogate outputs
- detect hidden assumptions
- recognize scope limits
- verify independently
- resist polished nonsense
- know when not to trust the tool

What Responsible Use Looks Like

Practical elements of responsible AI-assisted practice:

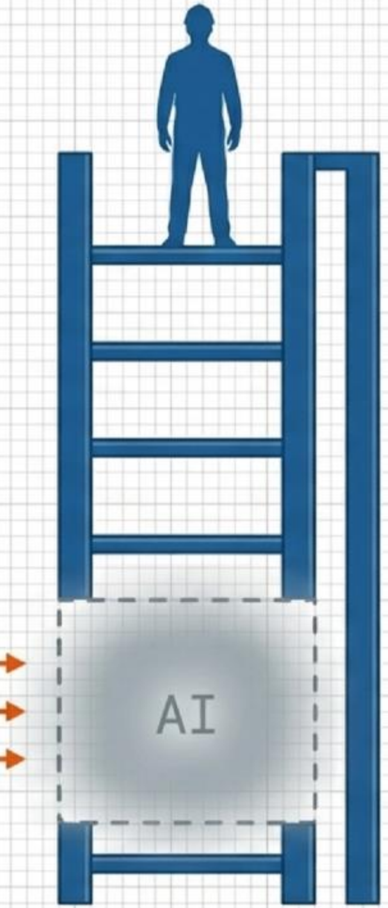
- documented checking
- direct supervision
- retention of key records
- independent review where warranted
- use within one's competence

Illustrative themes drawn from current engineering practice guidance. Verify wording before delivery.

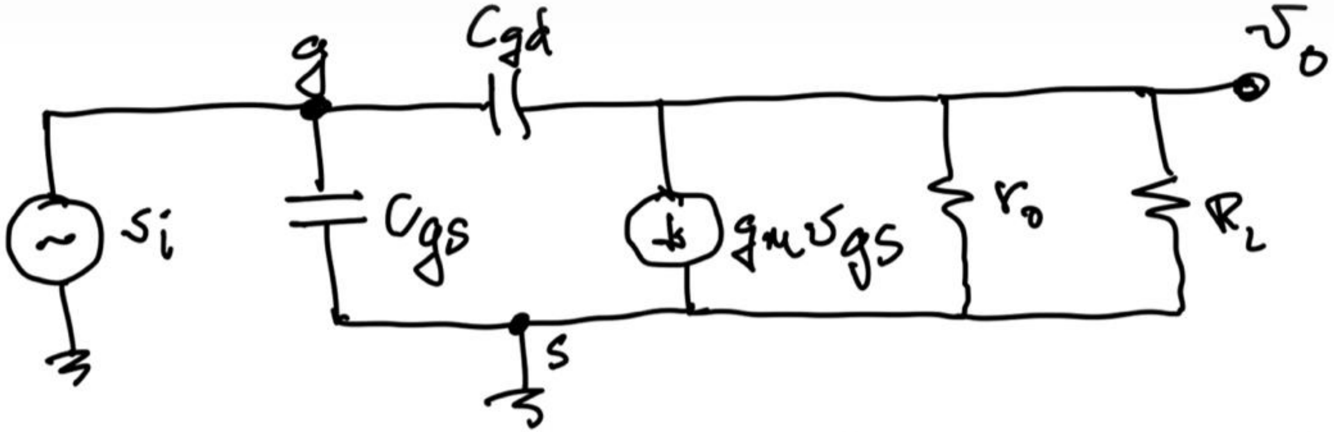
The Apprenticeship Problem

If AI writes the first draft, how do young engineers develop judgment?

- less struggle with first principles
- less manual debugging
- less exposure to the anatomy of mistakes
- greater need for supervised formation



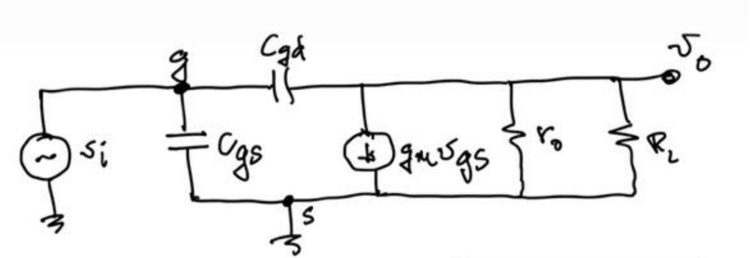
The Impatient Student/Engineer



solve for the gain vo/vi

Interpret the circuit as a common-source MOS stage with:

- Source grounded
- v_i directly applied to the gate
- Output at the drain
- r_o and R_L both to ground
- C_{gd} between gate and drain
- C_{gs} to ground (but it does not affect gain since the input source is ideal)



solve for the gain vo/vi

Define $v_{gs} = v_i$.

KCL at the output node v_o

Currents leaving the drain node:

- Through r_o: $\frac{v_o}{r_o}$
- Through R_L: $\frac{v_o}{R_L}$
- Through C_{gd}: $sC_{gd}(v_o - v_i)$
- Controlled source: $g_m v_{gs} = g_m v_i$

KCL (sum of currents leaving = 0):

$$\frac{v_o}{r_o} + \frac{v_o}{R_L} + sC_{gd}(v_o - v_i) + g_m v_i = 0$$

Rearranging

Group v_o and v_i:

$$v_o\left(\frac{1}{r_o} + \frac{1}{R_L} + sC_{gd}\right) + v_i\left(g_m - sC_{gd}\right) = 0$$

Gain $\frac{v_o}{v_i}$

$$\frac{v_o}{v_i} = -\frac{g_m - sC_{gd}}{\frac{1}{r_o} + \frac{1}{R_L} + sC_{gd}}$$

Clean form using $R_{out} = r_o \parallel R_L$

$$\frac{v_o}{v_i} = -\frac{g_m - sC_{gd}}{\frac{1}{R_{out}} + sC_{gd}}$$

Observations

- Low frequency ($s \to 0$):

$$\frac{v_o}{v_i} \approx -g_m(r_o \parallel R_L)$$

- C_{gd} introduces:
  - A zero at $s = \frac{g_m}{C_{gd}}$
  - A pole at $s = -\frac{1}{R_{out}C_{gd}}$
- C_{gs} does not appear because the input source is ideal (zero source impedance)

What Industry Should Expect, and What PEO May Need to Clarify

Graduates may arrive:

- faster at first drafts
- more tool fluent
- less reliable if depth is weak
- in greater need of mentoring on verification

Possible areas for professional guidance:

- competence
- documentation
- supervision
- responsible reliance on AI-assisted work

You can outsource your thinking, but not your understanding.

And because you cannot outsource your understanding, you cannot outsource your responsibility.