GENERATIVE AI AND MEANINGFUL WORK

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WHO AM I?

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- **Research**: moral and social philosophy
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DEVELOPING ETHICAL SKILLS

What kinds of skills do you need to be a good engineer?

- Programming, problem-solving, technical knowledge, creativity, precision, teamwork…

Like engineering, **ethics involves skills**.

Today, we're going to practice **critically evaluating *tools*** that can have downstream ethical impacts, using **generative AI** as a case study.

GOALS FOR TODAY

1. **Identify** five kinds of **critical questions** to ask about the tools we use in engineering and elsewhere
2. **Recognize** downstream **ethical dimensions** of tool use
3. **Evaluate** **generative AI** using these questions
4. **Reflect** on personal experiences with **meaningful work**

ARE LLMS GOOD TOOLS?

Exercise: Take the lecture notes on IMP: a simple imperative language (lecture 5), and use an LLM to create an implementation following the large/big-step semantics. The implementation language can be OCaml or something else.

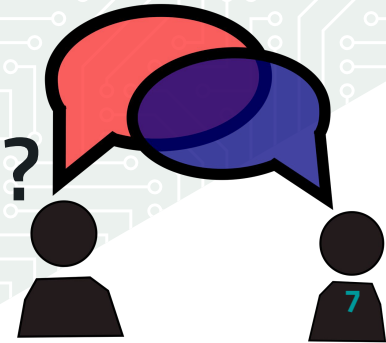
You may use the sandbox posted on the forum if you want.

> Reflect on your experience just now.

Where was the LLM a good tool?

Were there pitfalls?

How did you feel while working?



ASKING CRITICAL QUESTIONS PT 1: EVALUATING TOOLS FROM THE OUTSIDE

Imagine you work for a medical device company. Your job involves verifying that software meets specifications.

What would you look for in tools to do this verification?

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The ethical question: how does this impact others?

1. WHAT MAKES THIS TOOL GOOD?

For example:

- Efficiency
- Reliability
- Correctness
- Quality
- Speed
- Versatility
- Usability
- …

2. WHERE ARE THERE TRADE-OFFS?

Because tools have value along **different dimensions**, it may be difficult or impossible to realize all those dimensions at once.

- Quality ↔ quantity
- Correctness ↔ speed
- Versatility ↔ efficiency

What is one trade-off with using GenAI in the medical device example? Are there trade-offs to avoiding it?

3. WHERE IS THIS DESIGN NORMATIVE?

Tools can **constrain** as well as enable solutions. (“If all you have is a hammer…”)

- Duct tape → home repairs
- Python → mobile apps
- Tweets → communication
- Algorithms → social problems

What is one way widespread use of GenAI enables technological innovation? One way it constrains?

ASKING CRITICAL QUESTIONS PT 2: EVALUATING TOOLS FROM THE INSIDE

Tools don't exist in isolation; someone **uses** them.

- Who is able to use them?
- How do they impact users?
- What is it like to use them?

The ethical question: who has access to valuable things?

Is access distributed fairly?

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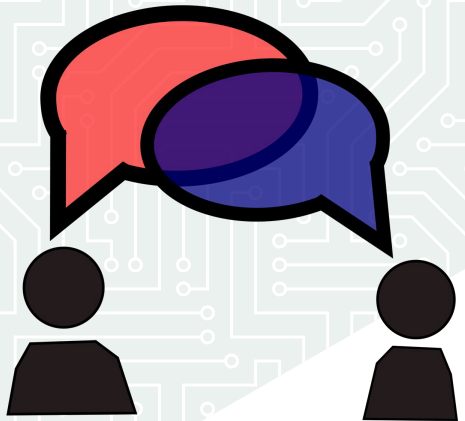
Why do people work?

Why have you chosen to work in computer science?



WHAT IS THE POINT OF WORK?

Among other things…

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- Making a social contribution
- Experiencing community
- Gaining social recognition
- Developing the self

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Research consistently shows that **meaningful work** significantly impacts quality of life.

4. WHO CAN USE THIS TOOL?

Some tools can be useful in theory, but have **limited usability** in practice.

- Standard scissors → left-handed people
- Mechanical harvesters → small farms
- Standard power tools → females
- Most programming languages → non-English speakers

What is one way widespread use of GenAI might impact who can succeed in CS, for better or worse?

WHAT IS THE POINT OF WORK?

- Acquiring resources
- Making a social contribution
- Experiencing community
- Gaining social recognition
- **Developing the self**
  - Attaining excellence
  - Mastering skills
  - Confronting challenges
  - Acting with purpose
  - Feeling ownership over your work

5. IS USING THIS TOOL MEANINGFUL?

Artificial Intelligence, Scientific Discovery, and Product Innovation*

Aidan Toner-Rodgers†
MIT

December 25, 2024

study based on randomized introduction of AI tool to 1,000+ materials scientists

5. IS USING THIS TOOL MEANINGFUL?

Changes in Productivity

- 44% more materials discovered
- 39% increase in patent filings
- 17% rise in innovation
- Boost is concentrated in top decile (based on initial productivity).

Changes in Satisfaction

- 82% report reduced satisfaction with their work
- 73% feel their skills are underutilized
- 53% feel tasks are becoming less creative and more repetitive

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Why? AI automates 57% of idea-generation tasks, turning researchers into evaluators.

"Top scientists leverage their domain knowledge to prioritize promising AI suggestions, while others waste significant resources testing false positives."

"Instead [of automating tedious tasks], the tool automates precisely the tasks that scientists find most interesting—creating ideas for new materials."

5. IS USING THIS TOOL MEANINGFUL?

"If the Machine Is As Good As Me, Then What Use Am I?" – How the Use of ChatGPT Changes Young Professionals' Perception of Productivity and Accomplishment

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5. IS USING THIS TOOL MEANINGFUL?

Sense of Productivity

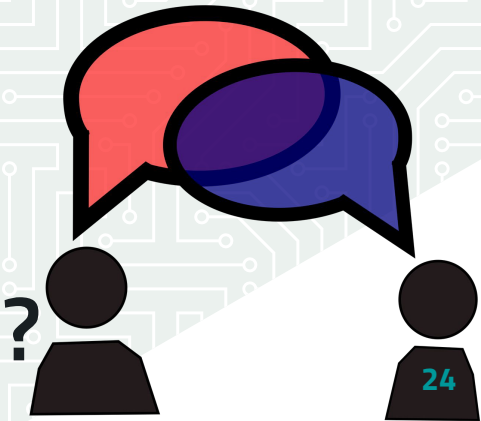
✅ Time efficiency
✅ Increased output
✅ Outsourcing labor
✅ Easier information gathering
⛔ Limited reliability
⛔ Low-quality output
⛔ Generic output

Sense of Accomplishment

✅ Sense of ownership
✅ Smart use of ChatGPT
✅ Task completion
⛔ Lack of challenge
⛔ Difficulties with prompting
⛔ Quality dissatisfaction
⛔ Diminished sense of ownership
⛔ Inferiority

“Which of these feelings of productivity and accomplishment resonated with your earlier experience with the activity?

With other work you’ve done?



WHAT NEXT?

It matters which tools we have. They shape **what** we can do, **how well** we do it, **who** can participate, and whether **doing** it is meaningful.

GenAI can do a lot, but that doesn't mean it's a good tool for every problem.

As computer scientists, you have the opportunity—and responsibility—to **build better tools.**

THANK YOU!

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