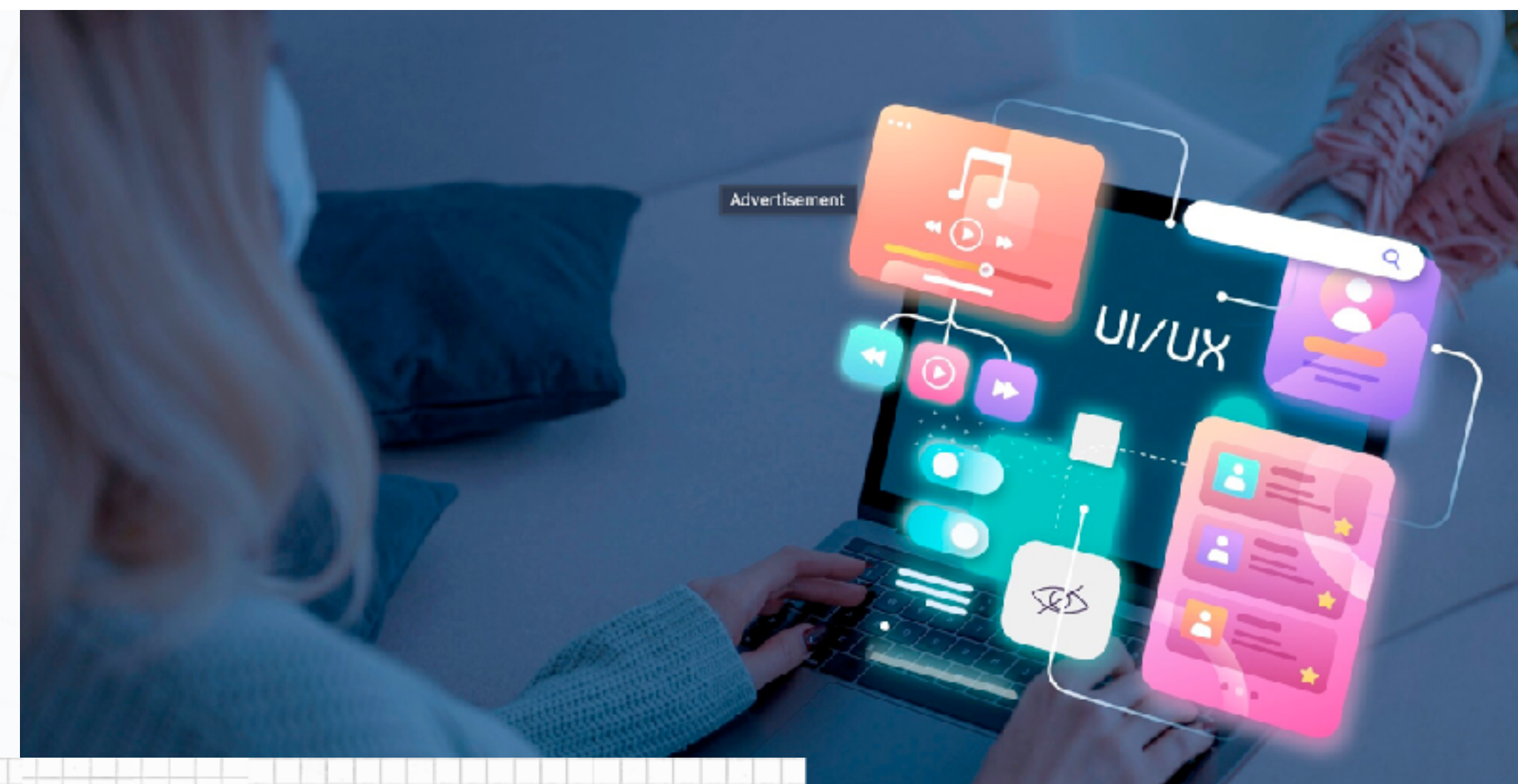


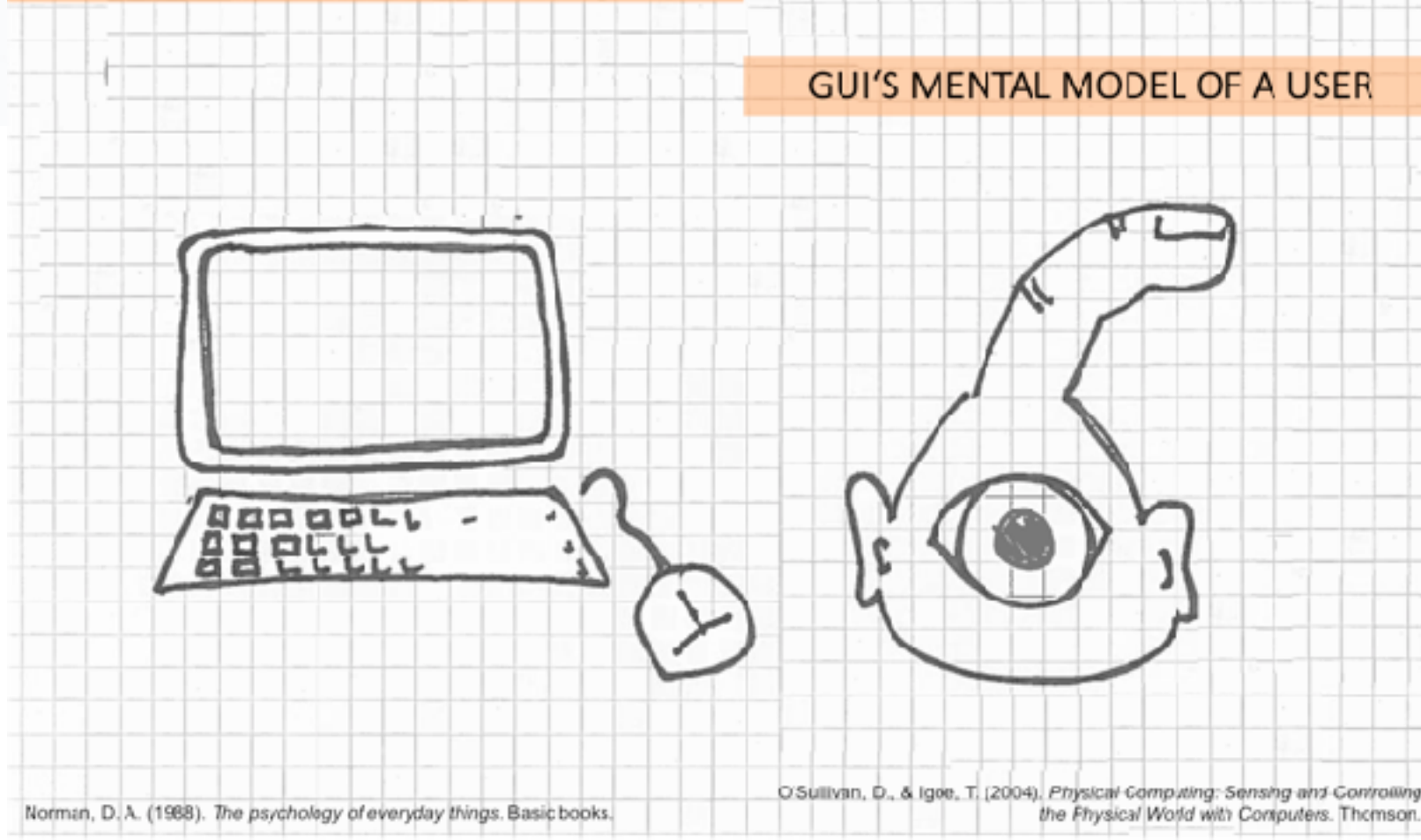
CS190-1: Human-Computer Interaction



Human Computer Interaction



USERS' MENTAL MODEL OF A COMPUTER



Norman, D. A. (1988). *The psychology of everyday things*. Basic books.
O'Sullivan, D., & Igoe, T. (2004). *Physical Computing: Sensing and Controlling the Physical World with Computers*. Thomson.

HCI can be anything!!



Agenda

- Course logistics/intros
- Lecture: What is HCI research?
- Discussion: Discussion norms

Senior seminar goals

- Learn foundations of HCI research (it's kind of a graduate seminar)
 - There will be a lot of reading from non-CS disciplines the first half of the semester
 - After, for individual presentations, you can choose more modern HCI papers
- Improve your speaking skills
- Apply what we've learned to your senior project proposal
- There will be 4 total presentations per person this semester: 1) group, 2) individual, 3) final, and 4) hot take
- TBH: My main goal is to have fun discussions with you all

Presentation weekly flow

- If you are **not** presenting:
 - Submit a reading response on Gradescope by 10:59a Tuesday (before class)
 - Submit presentation feedback for the presenters by 11:59p Tuesday (ideally you can get it done in class)
- If **are** presenting:
 - No reading response due; focus on your presentation!
 - Have a **pre-meeting** with me in OH before your presentation (~10 min)
 - Submit a written reflection of how your presentation went by 11:59p Tuesday
 - I will return feedback (mine + aggregated classmates) to you by 11:59p Friday
 - If your presentation was not “excellent”, you may update your reflection with changes you want to make, and make those changes in the next presentation (grade will be updated with subsequent presentation) or re-record the presentation (for immediate grade update)

The group presentation readings are on the website

Schedule

Week	Date	Topic	Due this week (Mon)
1	Aug 26	Introduction: What is HCI? SLIDES Optional readings: The Three Paradigms of HCI (Harrison et al., 2007), Seven Research Contributions in HCI (Wobbrock, 2012)	Course survey (Thu 11:59 pm)
2	Sep 2	Visioning Readings: As We May Think (Bush, 1945) (plain text version), The Computer for the 21st Century (Weiser, 1991) These two "thinkpieces" are canonical in establishing the field of HCI. Vannevar Bush, founder of the National Science Foundation, wrote a piece in The Atlantic magazine shortly after WWII about why computers should be used for thinking, not just mathematical operations. Mark Weiser, creator of the field of "ubiquitous computing" (which you can thank for your smartphones), put out his vision in Scientific American in the early 90s. How do have you seen their influence play out today? PROF LI'S PERSONAL RATINGS: DIFFICULTY: ★☆☆☆☆ • INTERESTING: ★★☆☆☆ Optional readings: The Psychology of Human-Computer Interaction (Card, Moran, & Newell, 1983)—notably, the human information-processor, keystroke model, and GOMS	

- Our specific website: <https://cs.pomona.edu/classes/cs190/section1/>
- Shared policies: <https://cs.pomona.edu/classes/cs190/>
- Please fill out your preference survey by Thurs EOD

Each class flow

- Hot takes (5 min)
- Presentations (65 min)
- Any closing announcements, life advice, etc (5 min)

“Hot takes” rubric

The goal of the “hot takes” presentation is to practice speaking and communication skills while making a convincing argument. Note that an argument needs to have a *position* or stance; this is not a 3 minute mini lecture (though you should provide some brief background on your topic as necessary). The content of the presentation is less important than the delivery. This is not a debate club: we will not be poking holes in your argument; in fact, some ambiguity and openness lends itself to a good (but brief) discussion. Your hot take can be on any topic of your choice, not necessarily CS related: for example, opinions on food, fandom, music, culture, Pomona College, internet trends... Despite it being a “hot” take, your take does not have to be controversial in any way—just something you believe strongly enough to talk about with the class for a few minutes. Please avoid hot takes that can be viewed as discriminatory to certain groups. You can be a hater, but not a racist. If you’re unsure, you may check your topic with me in office hours.

The secondary goal of the hot takes presentation is to give you the skills to carry on fun conversations at parties. If you end up repeating your hot take in a social setting, I would love to know how it goes!

Grading

- All assignments are bucket graded: excellent, satisfactory, or incomplete
 - For an A in the class: all assignments marked excellent + 24 colloquiums + no more than 2 missed classes
 - You have to Slack/email me *before* you miss class for it to be an excused absence
 - No class on 9/30, everyone does an asynchronous reading response instead
 - You may redo and resubmit excellent/satisfactory assignments (more details on the course webpage)
- You probably won't get detailed feedback on weekly reading responses, but you will get detailed feedback on your presentations

Your paper presentations

- First: pair presentation on foundational HCI papers that I chose (60 min total for 2 papers)
- Second: individual presentation on a modern HCI paper you choose (20-25 min each depending on if 2 or 3 people go that day)
- OK/encouraged to have some kind of activity: this is your classroom; you can make it a lecture, or a studio, or whatever you think
 - 1. Communicates the ideas of the paper best
 - 2. Leads to the most interesting discussion
- Required to have at least 3 discussion questions
- Suggested time breakdown: 10 min about the paper, 10-20 min of discussion/activity. But it's up to you!

Other assignments

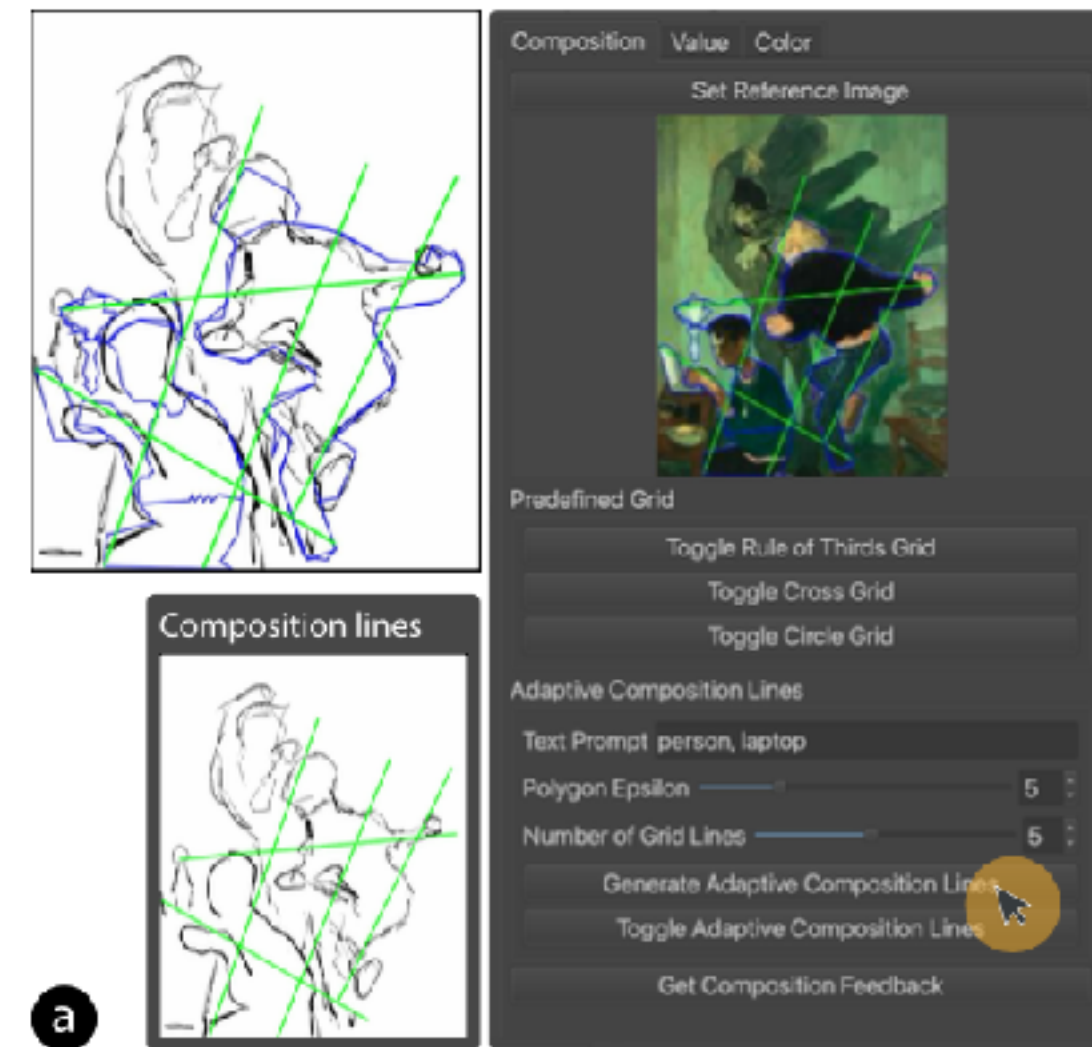
- Hot takes does not require a pre-meeting, but you should still submit a (short) reflection and your slides on Gradescope.
- Written assignments every other week due Mon 11:59pm
 - First assignment is a simple autobiography in Latex, due Sep 8. I recommend just using an Overleaf template so you don't struggle with Latex installs on your computer :)
- Technology: Gradescope for assignments, Slack for communication. That's it!

Course intros

Prof. Li

they/them • jingyi.li@pomona.edu • Edmunds 111 • jingyi.me

- Teaching CS62 & CS190
OH: Mon/Weds 4-5, Tue 1:30-2:45p, and also before class (10:30a) by request
- Research: **human-computer interaction**, specifically in art creation tools. I run the **Doodle Lab**.
- Things that make me happy:
 - drawing/painting/sewing; talking about art
 - going to concerts, interior design, reading, video games: Pokémon, Silksong!
 - birding, biking, being outside



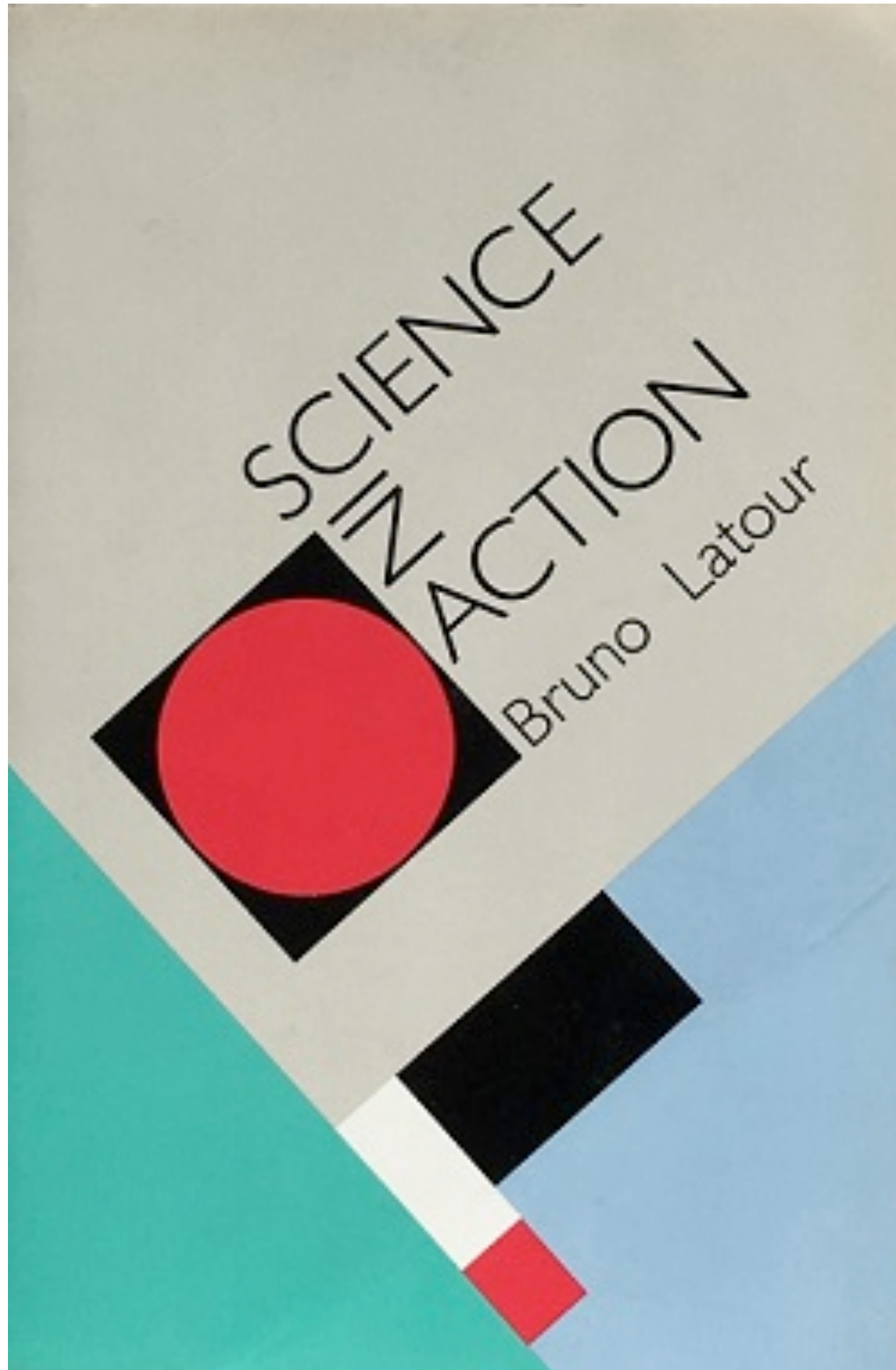
Your turn!

- Name & pronouns (if you'd like)
- Your motivations for being in the HCI section of senior seminar
- 1 senior year bucket list item



(mine was climbing Jacob's Hall)
(and meeting Toro y Moi on the street)

A Latourian perspective on HCI research



- When we read research papers, we often take it as “truth” — e.g., we “trust science”
 - (Aside: the week 9 group presentations - is HCI even a science? What does it mean to do science?)
- Science is fundamentally a social activity. It is done by humans, and requires convincing humans (honestly, in HCI, just 3 other humans) before it becomes published “truth”
- I want to help you “open up the black box” of science to see the people behind it
- Balance enthusiasm of reading cool papers with a healthy skepticism of where it came from/why it was done

What is HCI research?

What is HCI research?

**The relationship between people,
computers, and the world**

Lots of different perspectives and theories: we'll deep dive into them in the first half!

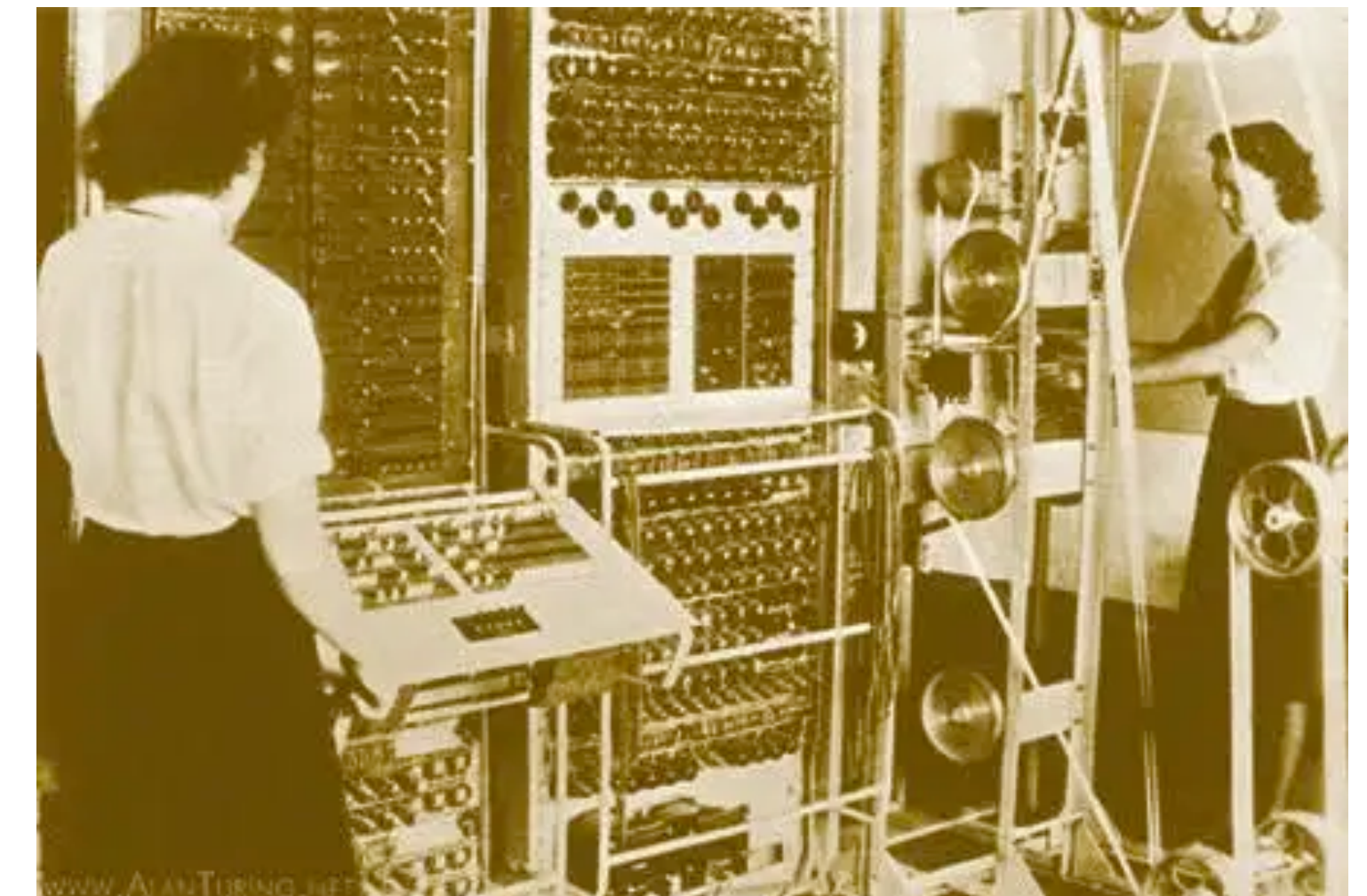
Computers & WWII

- Computers were huge, room sized machines that were good at doing lots of math calculations quickly (e.g., for breaking codes and calculating missile trajectories)
- Shortly after the war, people started to wonder if computers could be used for more than math
 - What if we could get military funding to fund research into computers?
 - What would a compelling vision for the future of how humans use computers be?
 - Vannevar Bush tried to answer these questions with his article, "As We May Think"

next week's
paper!



ENIAC (artillery firing tables)



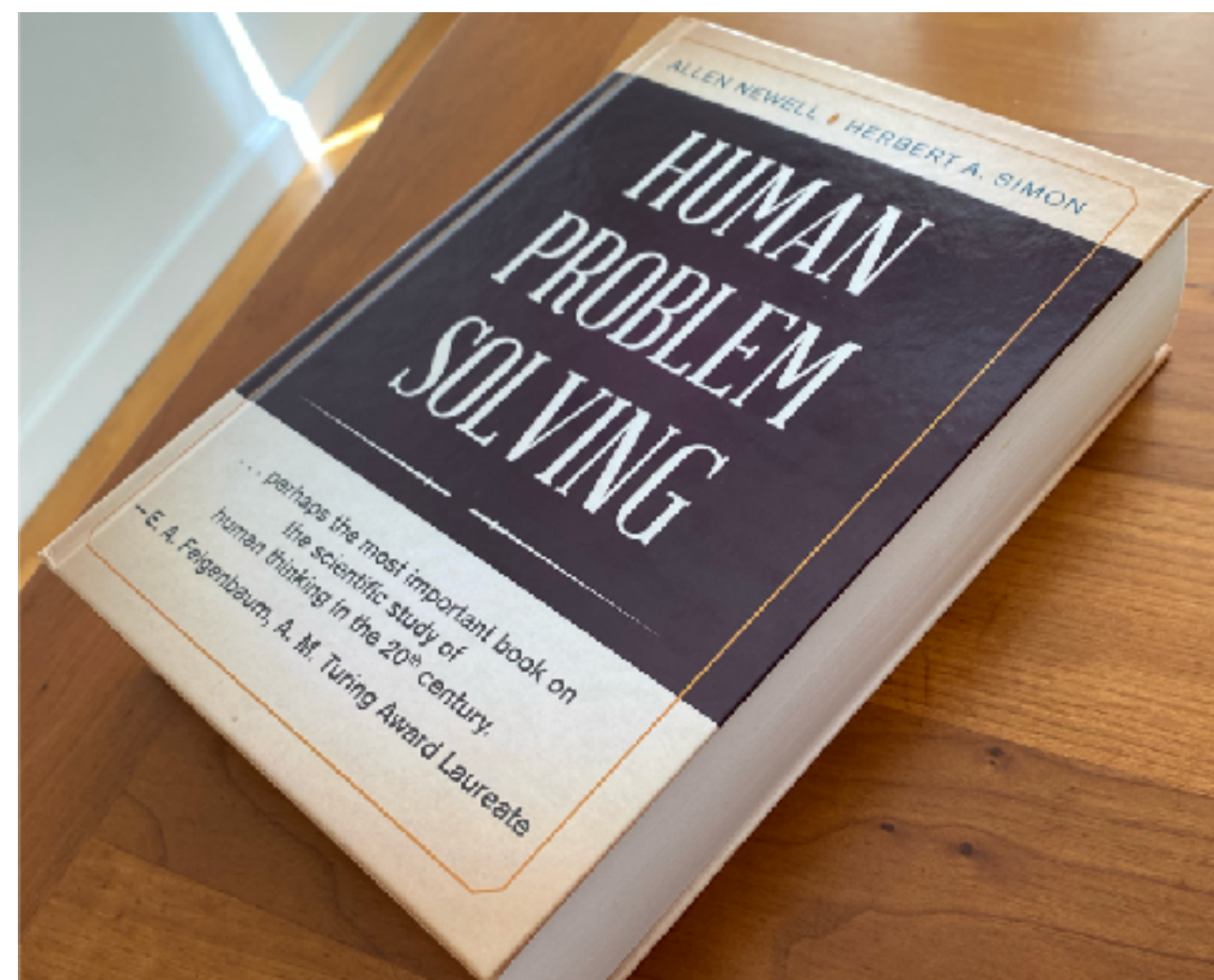
Colossus (code breaking)

Computers for **thinking**

- 25 years later (1970s), computers became smaller, commonplace in the workplace, and in the homes of the wealthy: the personal computer
- Work tasks involved more than mathematical calculations. The concern now was, How can computers help humans think better?



Apple II (1977)



Herbert Simon & Allen Newell (CMU) tried to answer this question in their 1972 tome, Human Problem Solving. Pioneers in AI, they built programs capable of “logical reasoning”.



Xerox Star (1981)

Representing problem solving as plans

P-1584
12-30-58
-21-

- They called their method a “general problem solver” which formally encoded a plan into a flowchart that a computer could chain reason about: if my goal is to get my son to school, and I have a car with a dead battery, I should go fix the battery first, to change the state of the car to working, so then I can drive my son, etc...
- Through creating this computational representation, they implicitly argued that **this is also how humans think**: we can not only represent the world in a computational way, but also the activity of a human mind—human cognition—computationally.

Goal type #1: Transform object $\underline{a}$ into object $\underline{b}$

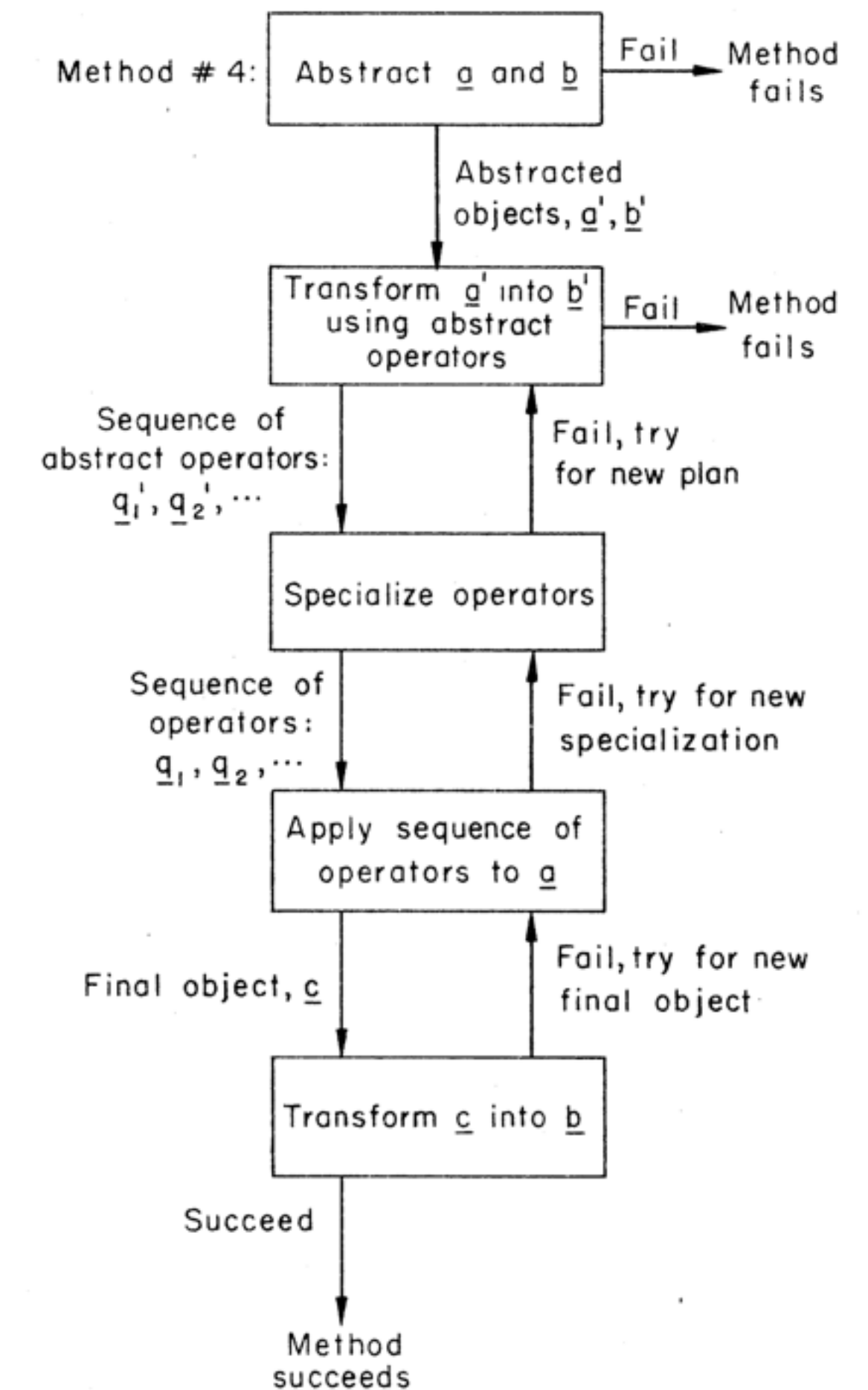


Fig. 7—Planning method

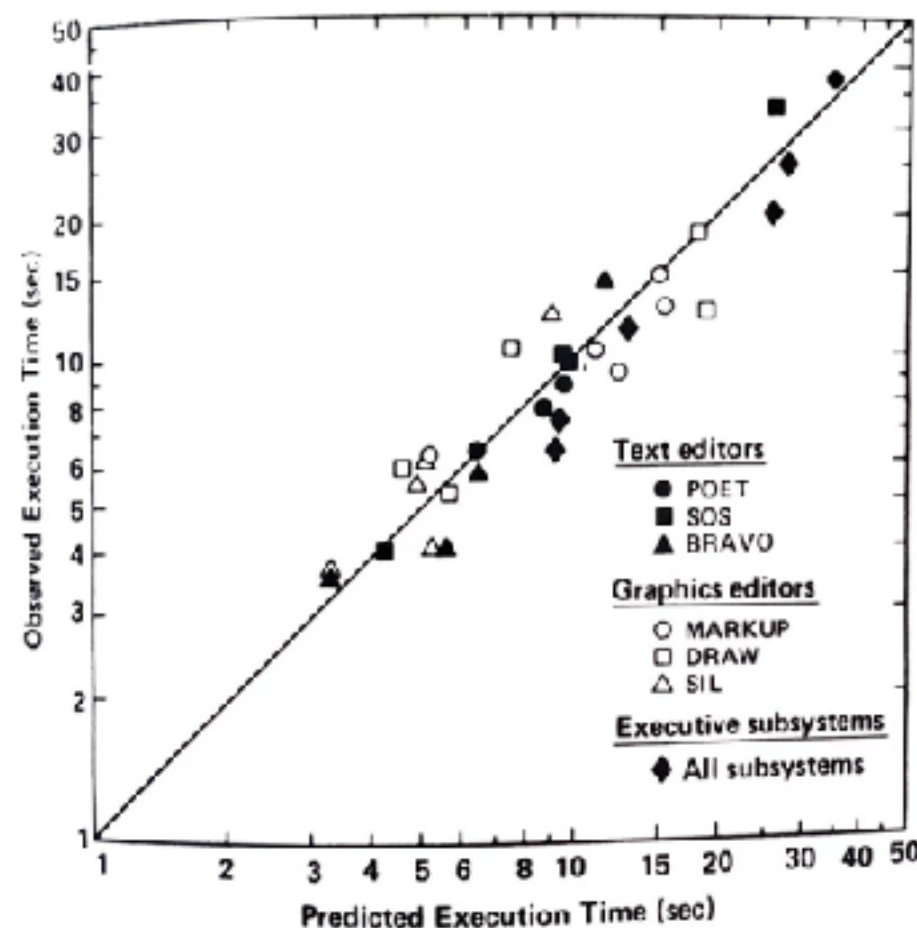
Academic lineage

- Card and Newell's PhD students, Stuart Card and Tom Moran, went to work at XEROX PARC after graduation

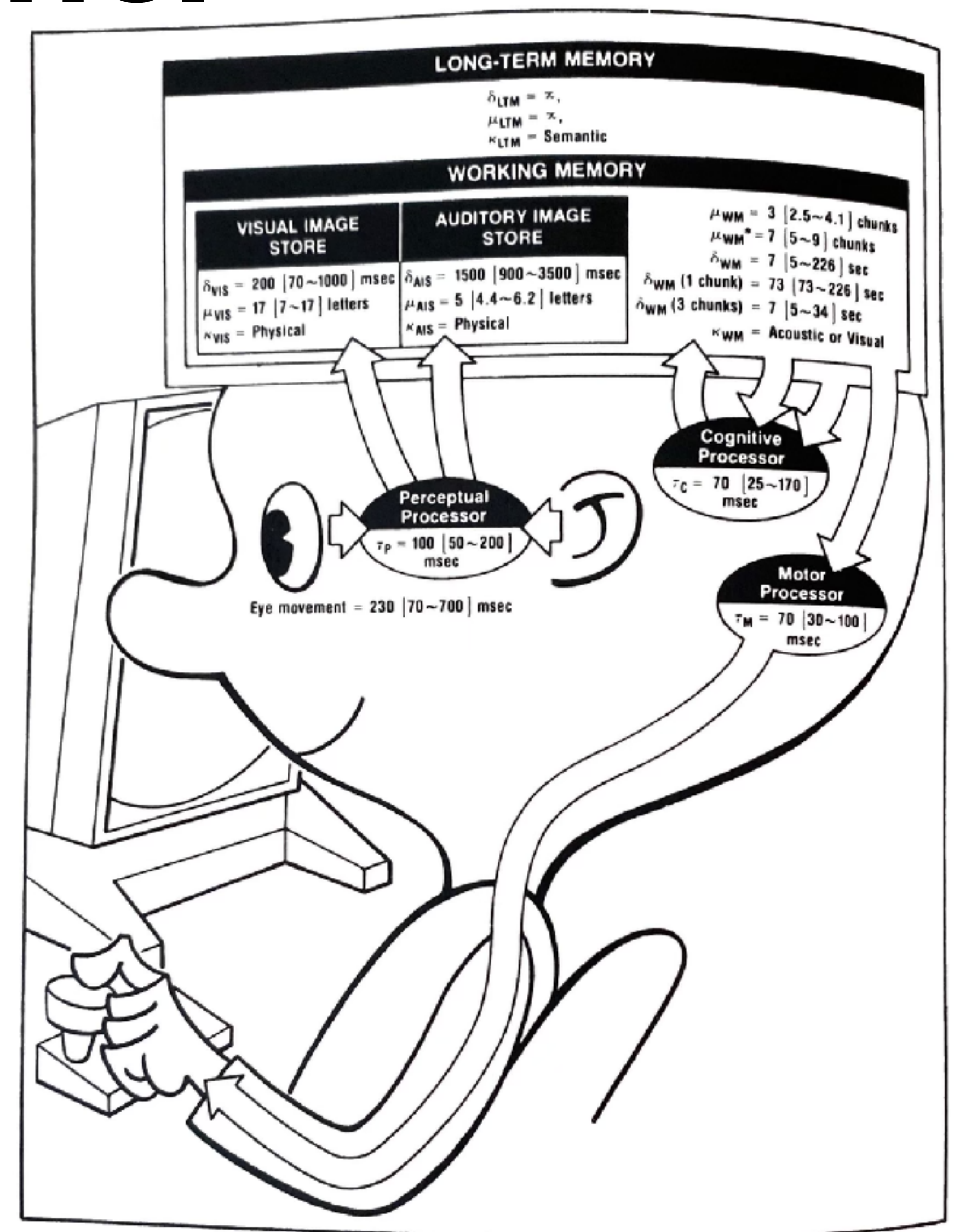


Human factors influence in HCI

- There, they took computationally modeling human behavior to the next level. They argued humans also had a processor, sensors, memory caches, etc.
- They conducted experiments on how long it took people to recall information they recently saw versus long term memory, how many milliseconds it takes for your brain to send a signal to your hand to move a mouse...



- These empirical experiments about how human bodies behave are called **human factors**, another important perspective in how people interact with computers



The Model Human Processor (1988)

Situatedness in HCI

week 4's papers!

- At the same time at Xerox PARC, Anthropologist Lucy Suchman was observing how her colleagues struggled with using their copiers. Her detailed analysis of their interactions led her to believe “plans” would not capture these nuances
- In contrast to the formal models of cognition or human behavior, Suchman argued you needed to consider the complex interpersonal, social, and cultural situations to understand how people use technology
- This perspective is supplemented by feminist technoscience scholar Donna Haraway, whose Situated Knowledge essay begins by explicitly calling out the “late-industrial, militarized, racist, and male-dominant societies” in the US in the 1980s



Situated Actions video (1983)



Lucy Suchman at the first CSCW (1986)

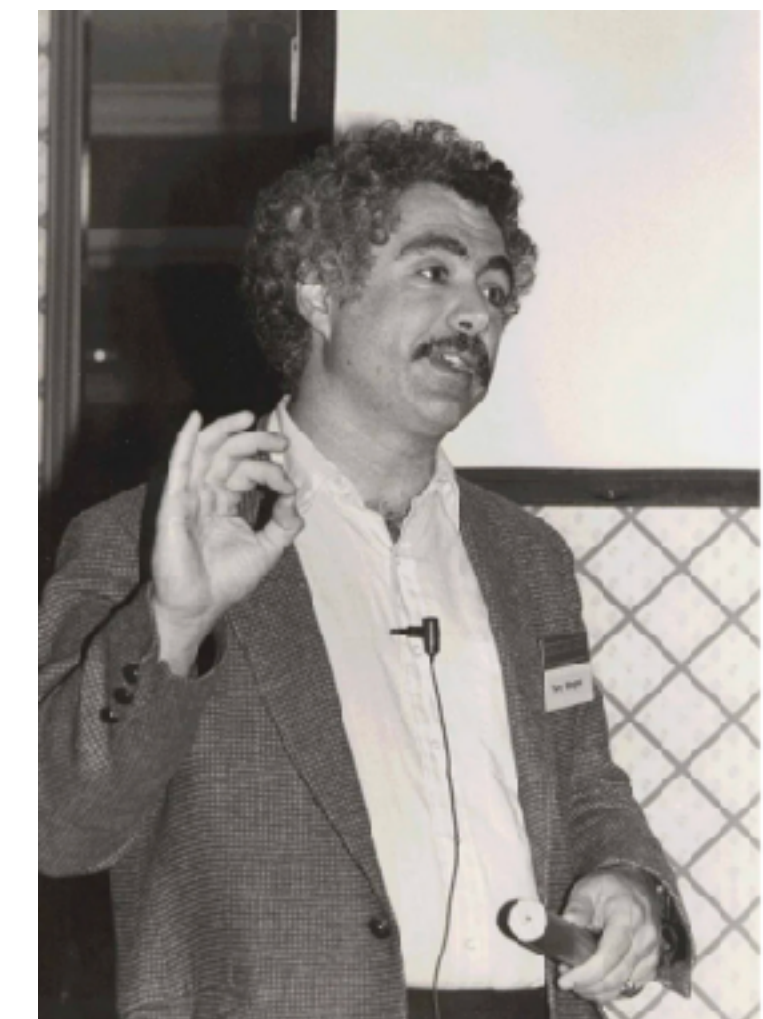
Phenomenology in HCI

- Suchman would engage in public academic debates with her colleague, Terry Winograd around the validity of formal models (speech act theory - language is the foundation of thought).
- Winograd & Flores are credited with bringing the ideas of phenomenologist Martin Heidegger into HCI via their 1986 book Understanding Computers & Cognition (week 3's reading)
- You should understand the concepts of “ready-to-hand” vs “present-at-hand”; they pop up often in your readings (esp. week 7) (even in next week's Computer for the 21st Century!)

Ready-to-hand: the car disappears to the background of your mind, you focus on the beautiful scenery



Present-at-hand: you think about driving the car, how to steer, how your foot is on the gas/brake



Terry Winograd at the first CSCW (1986)

Aside: positivism vs interpretivism

- This class focuses on “epistemic pluralism” - the idea that there are many ways of creating knowledge, and all can be valid
- The previous slides showed you some human faces to differing opinions on how knowledge is created about HCI
- In sociology, this is the positivism vs interpretivism debate: does society have objective social facts, or is it always through the situated realities of individuals and their backgrounds?
- Both viewpoints are found in HCI research today
- Positivism often gets more grant funding/prestige since it seems more “useful” and “objective” (week 9’s readings)

POSITIVISM	INTERPRETIVISM
• Assumes that society has objective social facts • Society exerts influence on its members	• Reality is constructed through the meanings created by individuals • Our actions are the result of our own meanings not external forces
• Quantitative Data	• Qualitative Data
• Objectivity	• Subjective meaning
• Macro Approach	• Micro Approach
• Researchers should remain detached, research should be value free	• Researcher should develop rapport and empathy (Verstehen)
• Reliability	• Validity
• Questionnaires, Structured interviews, Experiments	• Unstructured interviews, Ethnography, Participant observation

Participatory Design in HCI

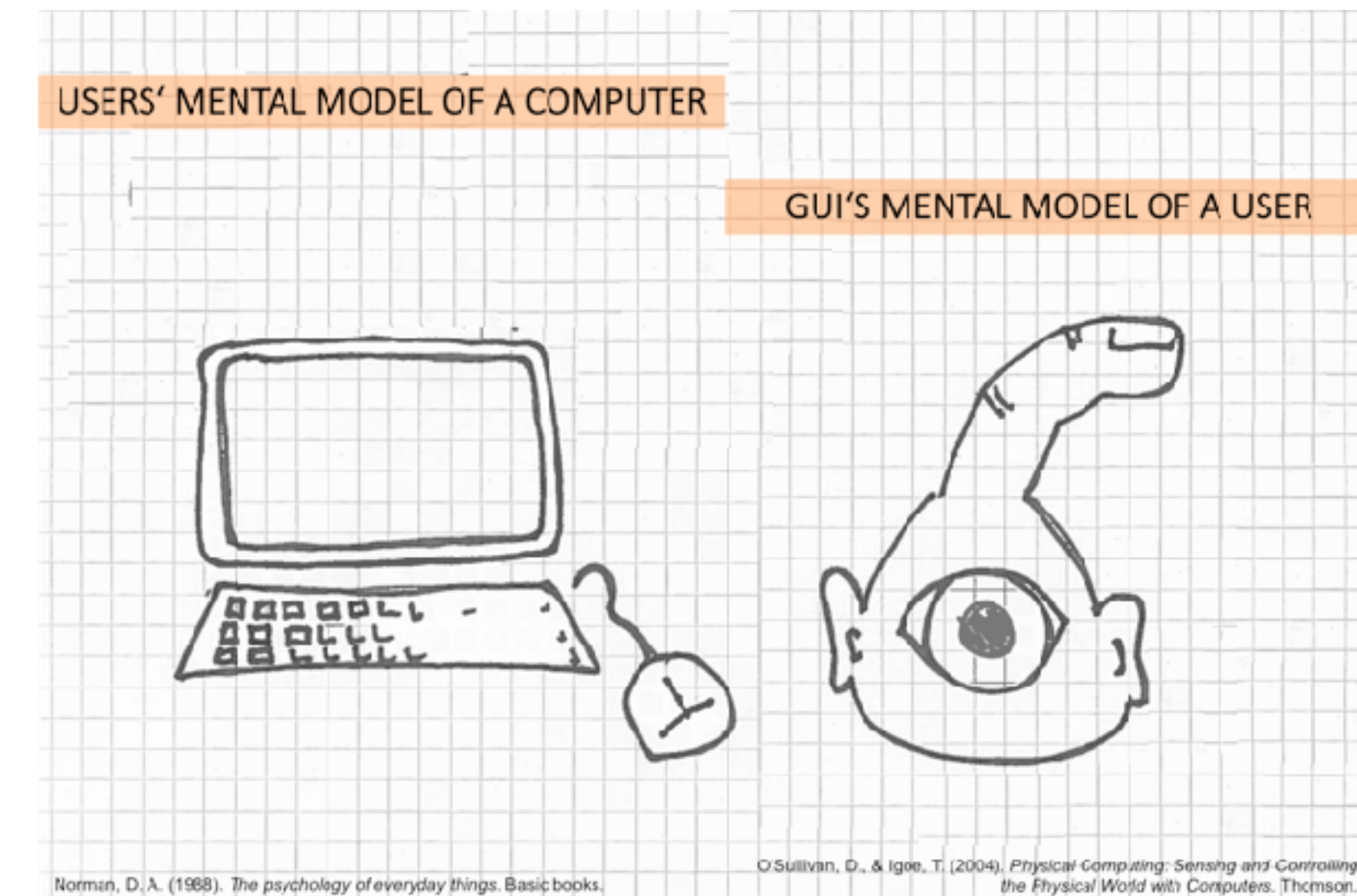
- Also against the purely cognitive approach to HCI, over in Scandinavia, Susanne Bødker ran the UTOPIA project
- Simplified graphic design tools were replacing skilled manual newspaper layout workers
- The PD perspective:
 - Computers are a part of a larger economic and political world in which they are tools
 - The relationship between people and computers is one of worker power erosion and expert augmentation
- Suchman & Winograd were very influenced by this perspective, invited the UTOPIA team to Xerox PARC, and sent their own employees to Aarhus to learn
- We still see this happening today in creative fields with generative AI!



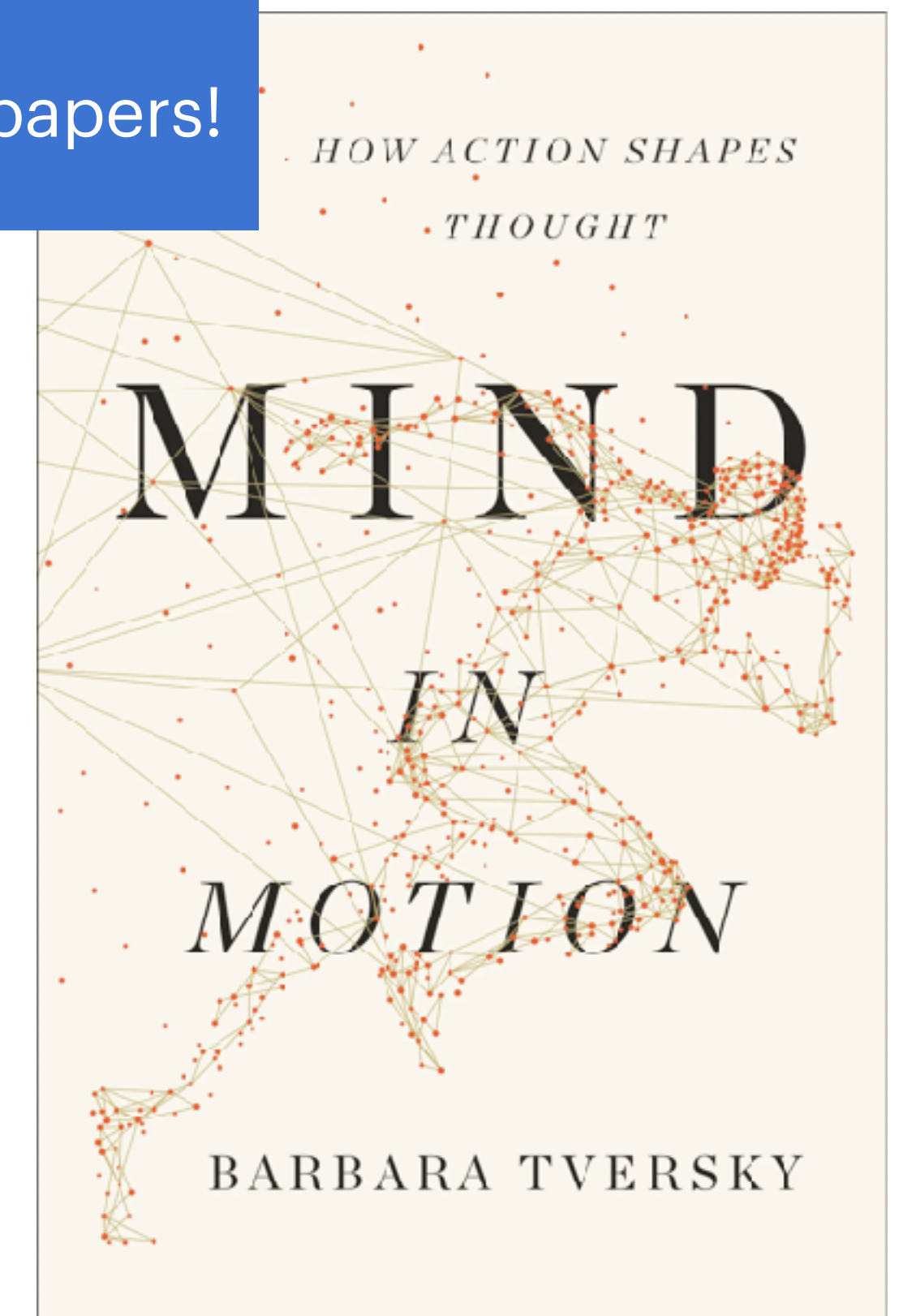
Susanne Bødker talking about the Utopia project (1980s)

Embodiment in HCI

- Last perspective for today: when designing systems, why do we only care about a user's brain (processor), eyes (input), and fingers (output)?
- For Barbara Tversky, language is not the foundation of thought, but physical motion
- For Paul Dourish, embodiment means meaning making: understanding through your whole body and whole self how to purposefully exist in a world with/through technology
- New “paradigm” of HCI which focuses on construction of **meaning** rather than making computers more efficient. How can computers make us more human?



week 7's papers!



Discussion

- We've seen a brief overview of the cognitive, human factors, situated, phenomenological, participatory design, and embodied perspectives in HCI.
- Think about a recent time you had an encounter with a computer. Which of these perspectives could be applied to analyzing how your *interaction* was shaped by the *design* of the technology? How does applying different theories change how you reflect on the situation?
- Think about a recent frustrating experience you had with technology. How did it turn from ready-to-hand to present-at-hand? How did you resolve the situation? Did anything positive or unexpected result from the frustration?

Modern day HCI

- One critique of modern day HCI is that it lacks *theory*, an explicit position or tie-in to its genealogy and roots
- HCI can be anything as long as it deals with computation. Random examples:
 - Building new interfaces to augment human thought
 - Designing better ways to get people to participate in group chats
 - Running experiments to collect or analyze large-scale sleep datasets
 - Thinking about how different identity groups experience computers differently
- As we transition to the second half of the course, keep the foundations in mind!

UPCOMING EVENT • JUN 02, 2025 Kasper Hornbæk (U of Copenhagen)- The Theory Crisis in Human-Computer Interaction

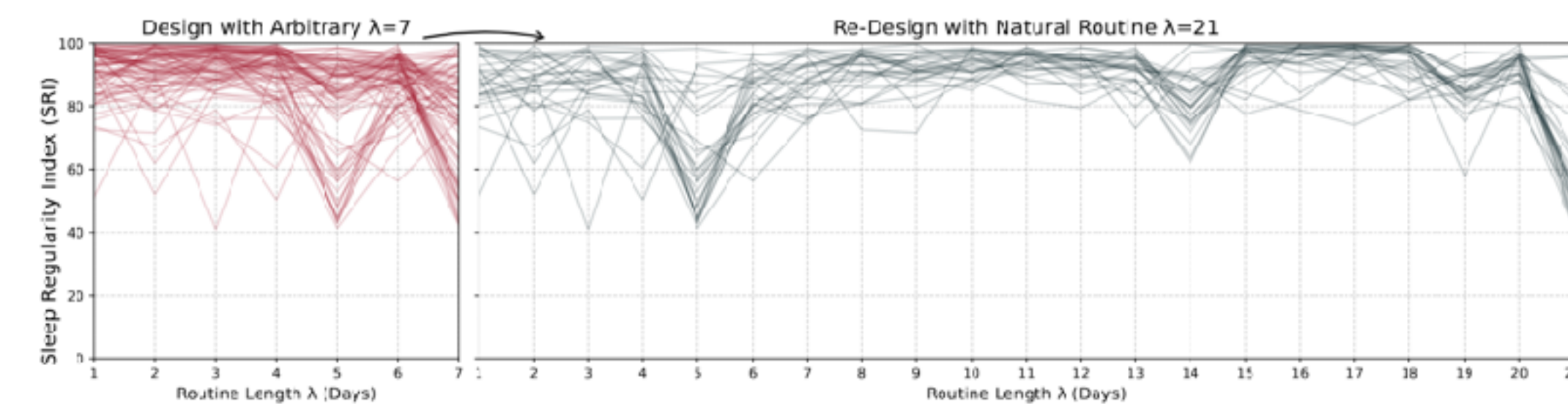
Date & Time: June 2, 2025 11:00 am – 12:00 pm

Location: Crerar 296, 5730 S. Ellis Ave., Chicago, IL

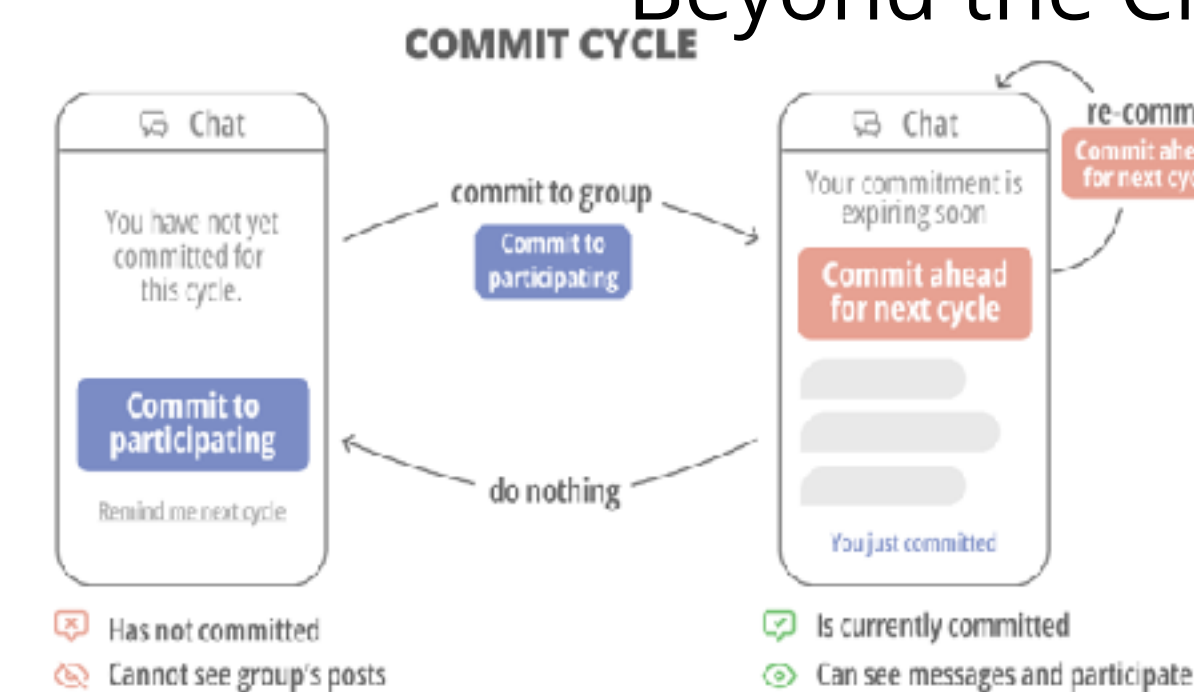
[Add to Calendar >](#)

Abstract: Theory is supposed to be invaluable in HCI research. However, the actual role of theory remains underwhelming, to the extent that I argue there is a crisis of theory in HCI. In this talk, I will first present data suggesting that HCI researchers rarely build theory, actively use it in papers, or raise implications for it. I will then discuss how to resolve the tension between the perceived importance of theory and its actual role. Ways to improve the use and construction of theory will be discussed, as well as some tools for thinking about theory that might help HCI researchers.

CHARLOTTE CORNELL (CHI 23)



Beyond the Circadian Rhythm (CHI 25)



Commit (CSCW 24)

CHI 2020 Paper

CHI 2020, April 25–30, 2020, Honolulu, HI, USA

Critical Race Theory for HCI

Ihudiya Finda Ogbonnaya-Ogburu^{*1}, Angela D. R. Smith^{*2}, Alexandra To^{*3}, Kentaro Toyama¹

¹University of Michigan, Ann Arbor, MI USA
²Northwestern University, Evanston, IL USA
³Carnegie Mellon University, Pittsburgh, PA USA
{iogburu,toyama}@umich.edu, angela.smith@u.northwestern.edu, aato@cs.cmu.edu

ABSTRACT

The human-computer interaction community has made some efforts toward racial diversity, but the outcomes remain meager. We introduce *critical race theory* and adapt it for HCI to lay a theoretical basis for race-conscious efforts, both in research and within our community. Building on the theory's original tenets, we argue that racism is pervasive in everyday socio-technical systems; that the HCI community is prone to "interest convergence," where concessions to inclusion require benefits to those in power; and that the neoliberal underpinnings of the technology industry itself propagate racism. Critical race theory uses storytelling as a means to upend deep papers highlighting race. For example, in a 2016 paper, "Does Technology Have Race?" Hankerson and colleagues enumerate a number of digital technologies that have different consequences for people of different races [63]. In 2018, Schlesinger, O'Hara, and Taylor consider the complexities of avoiding racism in chatbots, with conclusions that have broader scope [110]. Even more recently, O'Leary et al. explore how "conventional design practices may perpetuate forms of institutional racism," and suggest an alternative that emphasizes pre-existing forms of creativity [92].

It is not that racism has reappeared, as much as that ongoing racism – that never went away – is currently receiving more

HCI's novelty bias

- The definition of research is **novel knowledge**. A research project tells us something we didn't know before.
- Unlike systems, where you have to meet specific benchmarks, or theory, where you have to convince your peers via formal proofs, in HCI, a paper gets accepted if
 - The problem is interesting enough
 - The solution is novel enough
- I personally think approaching research problems in this way, without situating them in a larger conversation grounded in theory—*why* you've chosen to do this research—is a disservice to the field

Discussion norms discussion

3.1 Discussion

We will set our in-class discussion policy together on the first day of class! When we do so, a non-exhaustive list of things to consider when we do this include

- constructing an inclusive environment in which participants are encouraged to take risks;
- ensuring participants come to the discussion prepared;
- initiating discussion with engaging, relevant topics or challenges;
- encouraging active listening;
- helping participants digest what they are hearing;
- managing and facilitating the flow of the session;
- making clear the statements open for further discussion;
- acknowledging that we will not agree on everything;
- helping the group reach a satisfactory closure point, and
- mechanisms for ensuring participation.

These points were adapted from [the Sheridan Center at Brown University](#).

- **To discuss: tenants we hold true, norms to create/open questions**
- Proposed tenants:
 - It is the presenter's classroom; they have agency to structure their discussion however they want and should be treated with as much respect as the professor
- Potential norms/questions:
 - Do we want built-in breaks?
 - Can you use an LLM to ask to summarize the paper for you to facilitate your comprehension? It's a lot to read multiple papers on top of a midterm week!
 - How can we disagree with our peers without offending them? How can we speak equitably?
 - How should the professor participate in discussions?
 - Prof Li's intuition is I will be a student, but a passive one to not dominate the discussion: I will largely sit back and let the presenters guide the discussion (another good skill to build), but I can occasionally jump in to contribute my voice (or reframe the discussion if it's going really astray)

Lecture 1 wrap up

- TODOs:
 - Fill out the intro survey (on Gradescope) by **11:59p Thurs** (ideally earlier)
 - The 2 people presenting next week's papers will be contacted Friday morning (the easiest papers are first because of the tight turn around!)
- Latex exercise due in 2 weeks (Sep 8)
- Take a look at the resources section on the website for how to read/skim papers, how to give good talks, etc! <https://cs.pomona.edu/classes/cs190/section1/#resources>
- If I find/add more as the semester goes on, I'll also post on Slack

Resources

- Applying theory in human centered design: <https://theoryfamily.wordpress.com/>
- Jofish Kaye's slides on the history of ethnomethodology (and how it's evolved into technomethodology) - <https://www.slideshare.net/slideshow/steps-towards-a-history-of-ethnomethodology-in-hci/3859861#2>
- See the course website's suggested readings
- Some slides adapted from Eric Rawn. Thanks!