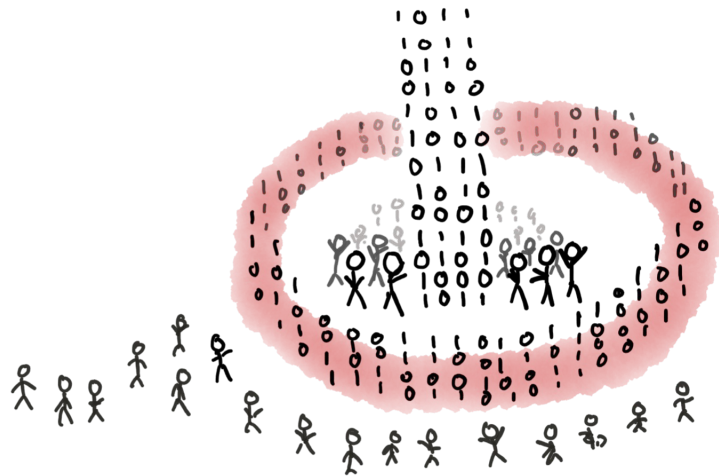# Deconstructing CS Culture

Dr. **Amy J. Ko**, Ph.D.
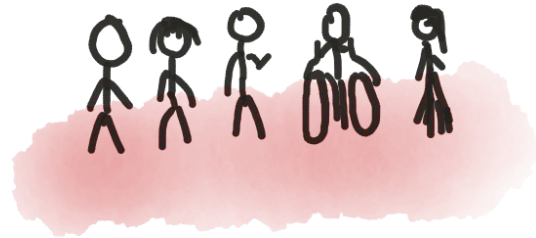
Professor
The Information School
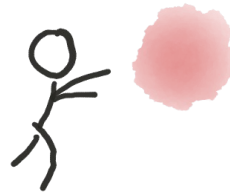*University of Washington, Seattle*

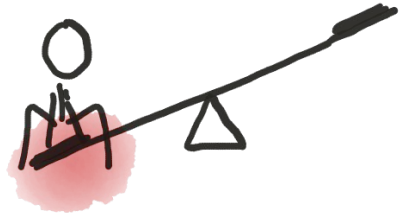**Everyone** in CS deserves respect, support, and agency, no matter who they are.

Respect for their identities, cultures, interests, hopes, dreams, and visions

# **Support**, in the form of encouragement, affirmation, and resources to thrive

Agency to make space in CS for their needs, to shape their learning, and to express their values

As we know, not everyone receives support, respect, or agency from CS. Some get the opposite, because of who they are.

Broadening participation is all about rectifying these inequalities, via equity, inclusion.
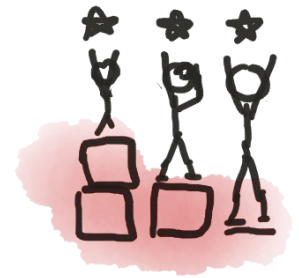
But whether someone is marginalized in CS isn't strictly a function of their *visible* identity. Sometimes, it's a function of what's **hidden**.
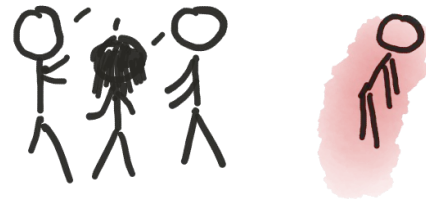
This is true for me. In fact, in CS, I've simultaneously been treated as part of the dominant group, while *also* being erased and marginalized.

I am both White and Asian, the two dominant racial groups in CS…

… but White people in CS don't really see me as White, and Asian people in CS don't really see me as Asian.
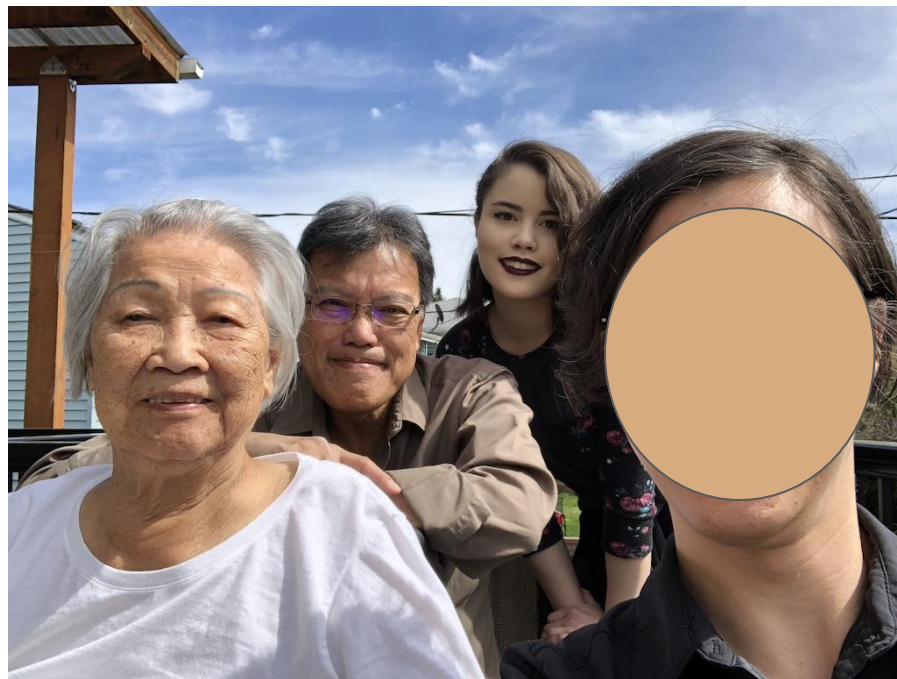
My (Chinese) grandmother, (Chinese) father, my (German, Polish, Danish, and Chinese) daughter, and me.
Credit: Amy J. Ko

By high school, I had the privilege of having my own computer...

.. but I was bullied for liking computers. My calculators were smashed, I was shoved into lockers, I was mocked, even by teachers.

I work on my Breakout remake in BASIC while my brother plays with a balloon. *Credit*: Judy Jensen.

I was privileged to have amazing public schools and nationally renowned K-12 teachers…

… but I had no CS in school. I took the AP CS A exam alone in a literal broom closet, unsupervised, unsupported. I got a 3, because I didn't know what objects were. (The used textbook I found at a local bookstore didn't teach them).

Woebke, Scott Gollierman, Jamie LeVeque, Nikki Hudson, Bart Valentine. Sitting: Tom Ogan, Cappy Mack. Not Pictured Nick Kintz. Below left: **The ERC** :Standing : Ann Dunlap, Kathy Smith, Susan Harrel, Sherri Ingram, Laurie Angel. Sitting: Steve Penne, Judy Belk.

My high school math teachers.
Credit: Amy J. Ko.

My parents went to college, and encouraged me to go…

… but I didn't know of Berkeley, Stanford, MIT, or Carnegie Mellon. The University of Washington offered me a $500 loan to cover $10,000 out of state tuition, so I went to my state university.

My college friends and I talking about politics in my dorm room. *Credit: Unknown.*

I enjoyed programming. It made me feel creative and in control. Majoring in CS seemed like a good fit.

But I primarily did CS for stability: I was tired of being poor. CS was my path to economic security.

I graduate from Oregon State University in 1998.
Credit: Unknown.

Thanks to an amazing undergraduate research mentor, Margaret Burnett, I earned my Ph.D. at an elite, private university, granting me an network of power and influence in CS…

… but I pursued a Ph.D. primarily to avoid a male-dominated, toxic software industry.

My advisor Brad Myers next to me at my graduation from Carnegie Mellon University in 2002. *Credit: Unknown.*

I earned tenure in 2014 without learning much of anything about diversity, equity, and inclusion, or contributing much to it.

... but my motivation for tenure wasn't curiosity, but employment protection. I saw tenure as the safest way to be trans and not lose my job.

February 13, 2014

Professor ▮▮▮▮▮ ensen Ko
The Information School

Dear Professor Ko:

I am pleased to approve your promotion from Assistant Professor to Associate Professor (with tenure) in the Information School, effective September 16, 2014.

No decision in a university is more important to a faculty member or the institution than a tenure decision. Your colleagues have reviewed your professional credentials with great care, and you can take considerable pride in their decisions. Please accept my congratulations and my best wishes for your continued success.

Sincerely yours,

Michael K. Young
President

I receive tenure knowing next to nothing about diversity, equity, and inclusion. *Credit: Amy J. Ko.*

I co-founded a startup and raised millions in venture capital, saving enterprise businesses money and destroying tens of thousands of jobs, embracing a toxic work/life balance for profit.

But I absorbed myself in startup life mostly to run away from my transness.

My team of 14 at AnswerDash, replacing tens of thousands of customer support workers.
Credit: Amy J. Ko.

I did all of this while being seen as a man in CS.

... but I wasn't a man, I was a woman, and had to do a lot of painful masking in CS spaces to pretend to be.

Greg and I accept a best paper award at ICER 2018. At this point I was out to myself and plotting coming out. *Credit: Amy J. Ko.*

Despite all of this erasure, CS was still my **refuge**.

For whom else is CS a refuge? And how do we change it from a refuge to a culture that offers support, respect, and agency to everyone, including both marginalized groups, but also the dominant groups, who are often marginalized in their own ways *outside* of CS?

An answer in three parts...
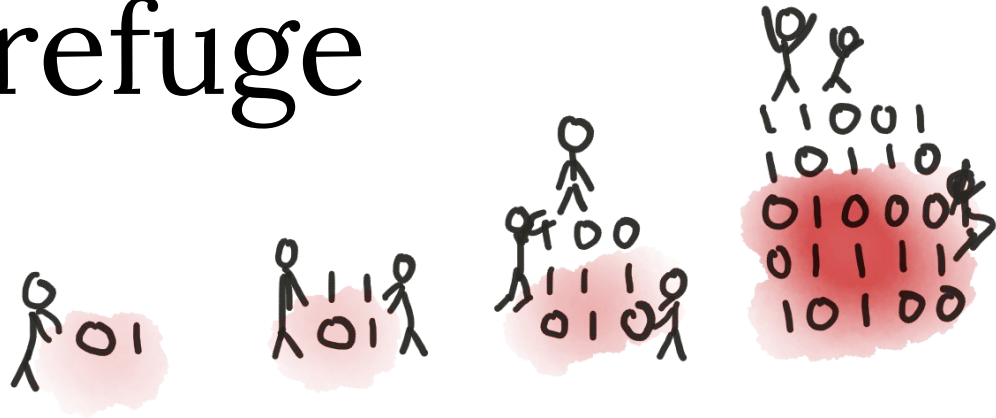
A (Western)
history of CS
as a refuge

Deconstructing
computing culture

Reimagining CS
culture

# 1. A (Western) history of CS as a refuge

CS in the **1940's**

Alan Turing laid the foundations of modern computing. Turing was also a closested gay man, and might have been an Autistic person: his schools described him as anti-social and aloof; he was obsessed with codes and ciphers; he avoided eye contact. **He found his refuge studying CS at Princeton.**
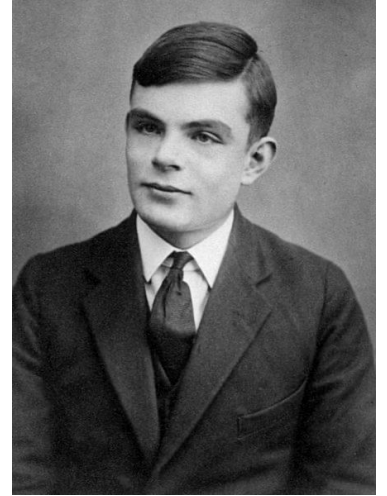
Alan Turing, 16.
Credit: Unknown
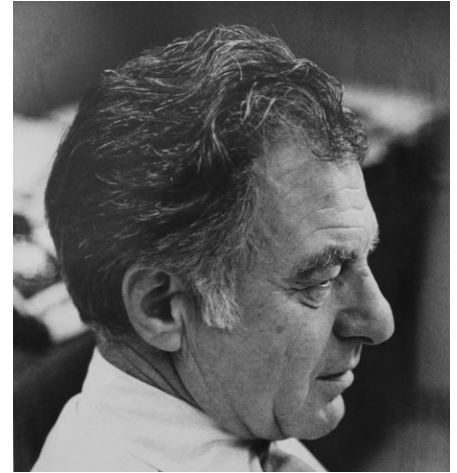
CS in the **1950's**

After Turing, Shannon, and von Neumann, the digital computer arrived. Programming labor was feminized, and therefore underpaid and undervalued. Computers served war, which financed the first computers. **CS became a refuge for women in mathematics** who began to lose jobs as human computers.
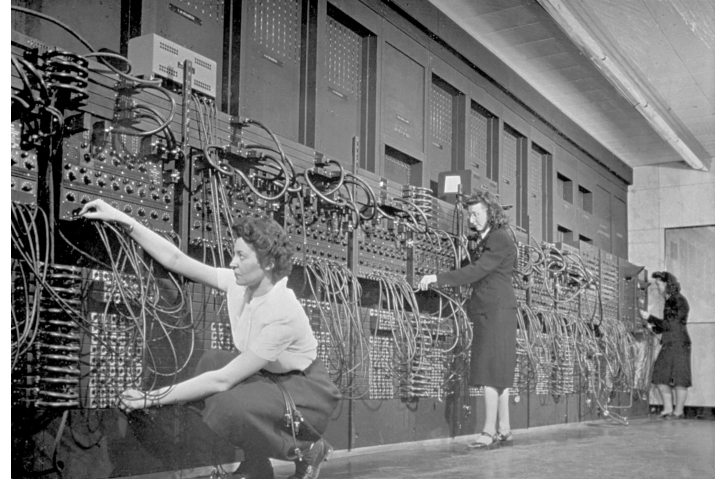
Women operating the ENIAC. *Credit*: Corbis
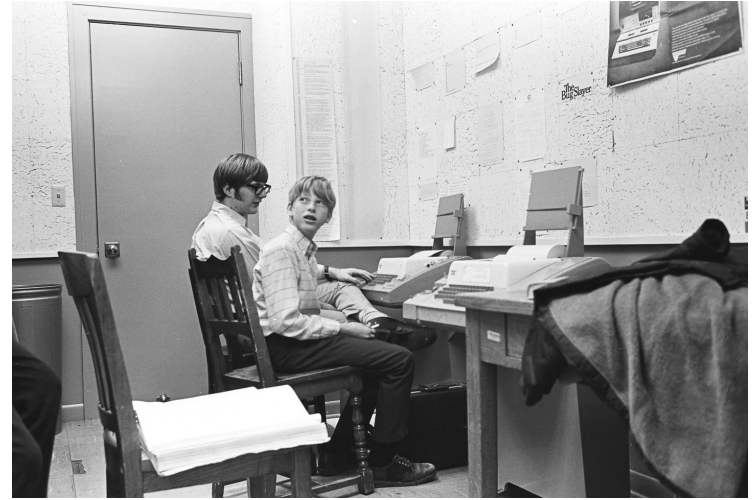
CS in the **1960's**

IBM monopolized the burgeoning computer industry, dominating business, shifting power to White businessmen. The White men of mathematics branched off to found CS departments. At Purdue, the first CS department in 1962, all new faculty hires were men. **CS became a refuge for male mathematicians interested in computation, spurned by mathematics**; women were excluded.

Samuel Conte, first chair of the first CS department at Purdue. *Credit*: Purdue.

CS in the **1970's**

CS departments in higher education proliferated, formalizing pathways between universities and industry. Admissions focused on students with preparatory CS privilege (e.g., Bill Gates and Paul Allen). As Allen described it, **CS was a refuge for wealthy "young geeks," looking for a place to play without being bullied for their interests.**

Paul Allen and Bill Gates at Lakeside School, an elite private university in Seattle. *Credit*: Allen.

CS in the **1980's**

Marketers decided computers and video games were for boys. Departments establish undergrad curriculum. Industry and enrollment booms. Faculty responded by restricting enrollment, increasing class sizes, pushing out women and students of color. **CS became a refuge for White boys captivated by the emergence of video games.**

How to talk your parents into parting with $1300.

A 1984 Apple Computer ad, speaking directly to young White boys. *Credit*: Apple.

CS in the **1990's**

The public internet arrives, Silicon Valley booms bigger than ever, but CS enrollment plateaus. Most interested in CS are White boys who grew up with computers in their homes. **CS becomes a refuge for those seeking social mobility, especially White and Asian immigrant men whose parents valued mathematics and engineering**.

Larry Page and Sergei Brin in their garage in 1998. *Credit*: Google.

This brings us to my entry into CS in 1998

I was a Freshman at Oregon State University (OSU), in Corvallis, Oregon, a 90 minute drive from home in Portland, and in the heart of the rural Willamette Valley, surrounded by cows, hay, hops, grapes, cherries, potatoes, onions, corn, watermelon, and trees.
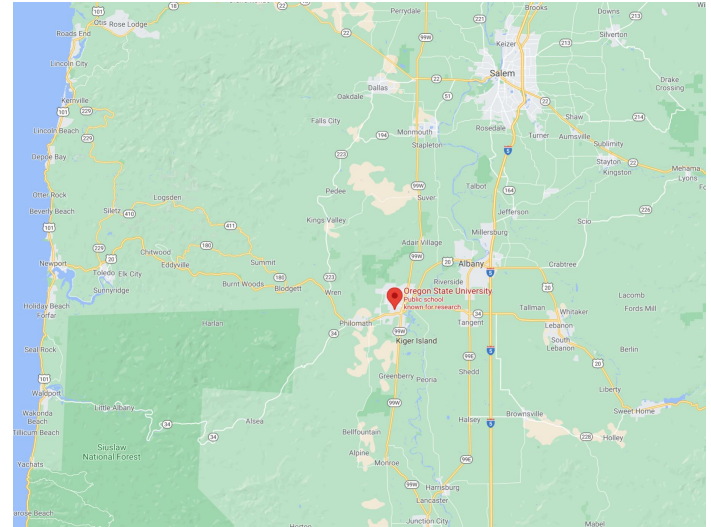
Corvallis, Oregon, home to Oregon State University. *Credit*: Google.

A refuge for a **deeply closeted trans girl**

The gendered world was painful, complex, and hard to understand. Code was comparatively rewarding, simple, knowable, and genderless.

1990's CS culture at OSU offered me:

- Freedom from gender anxiety since everyone was a man.
- Minimal social interaction, sparing me from having to be me.
- Affirmation of my mind.
- Encouragement to ignore my body.

But these same features made it safe for others I met in CS...

A refuge for **bullied boys**

I had many peers who adored puzzles and games, did not conform to rigid stereotypes of masculinity, and were ruthlessly bullied for it in primary and secondary school.

1990's CS culture at OSU offered them:

- A place to find peers who'd suffered the same traumas, but where they didn't have to talk about their traumas.
- A career that promised empowerment, rather than abuse.
- A community of people with shared interests.

A refuge for **queer youth escaping the farm**

Many of my White queer peers had grown up in rural Oregon and sought an escape from family and farming, and a pathway into queer-friendly urban life.

1990's CS culture at OSU offered them:

- A promise of economic security in case they lost their families after coming out.
- A direct pathway to jobs in Seattle, Portland, and San Francisco, which many viewed as a queer refuges.

A refuge for **parent-pleasing immigrant boys**

I had many second generation Chinese and Indian peers who didn't choose CS because of interest, but because their family valued mathematics, engineering, and social mobility.

1990's CS culture at OSU offered them:

- A place to be affirmed for their mathematics skills.
- A place to build community around shared ethnicity.
- A place to earn economic security.
- A way to earn the love and support of their parents.

A refuge for **Autistic youth**

Some Autistic people often have strong interests, some have a close attention to detail, some have a need for routines, some have difficulty understanding social rules and making social inferences.

1990's CS culture at OSU offered them:

- A place where attention to detail was prized and valued.
- An intellectual space that concerned rules and routines.
- Little need for social interaction or reflection on society.

2000's - present

Google, Amazon, Facebook, Microsoft, and Apple dominate global markets. A gold rush ensues. The same faculty that founded the CS departments in 1960's and 70's are at the height of their powers, shaping curriculum, admissions, culture. The immense force of markets leads to cultural lock-in, ossifying the culture set in the 1980's. **CS becomes a magnet for power**.

Zuckerberg builds thefacebook.
Credit: Harvard.

2. Deconstructing computing culture
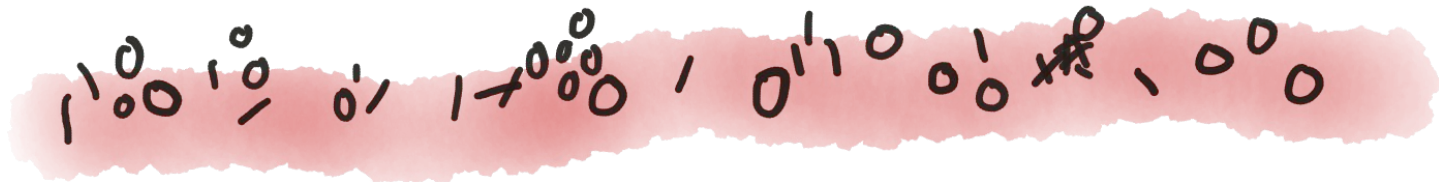
When I reflect on this history, and my participation in it, this is what I see...

The world

society, emotions, nuance, politics
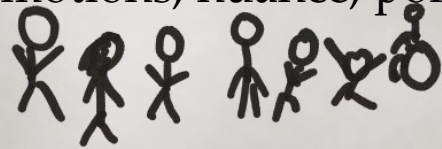
This is the world as we know it, full of wonderfully diverse people and ideas.

CS

abstraction,
structure, logic

The world

society, emotions, nuance, politics
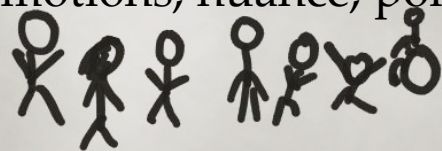
We all know that CS is part of the world, part of that wonderful diversity and complexity.

The world

society, emotions, nuance, politics
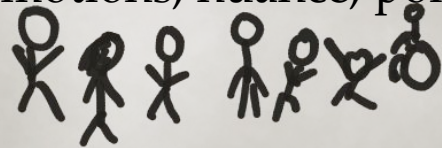
segregation

CS

abstraction, structure, logic

But CS culture sees itself as separate from the world.

CS culture is *defined* as a **refuge from the social world**: it protects bullied less masculine boys, queer youth, White and Asian immigrants, Autistic youth—and yes, deeply closeted trans girls—from the oppression of the social world. It *is* a place of *respect, support,* and *agency*—but just for these groups, and likely others we haven't examined.

CS
abstraction, structure, logic
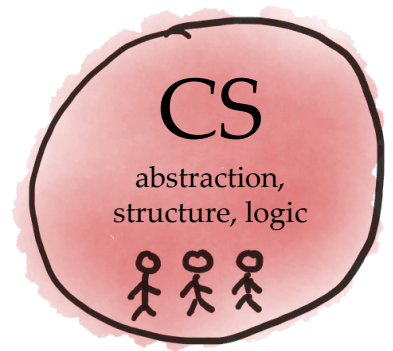
And it's not just social segregation, but intellectual segregation.

- CS **abstracts**, removing *messy social context*
- CS **neutralizes**, removing *nuanced values and politics*
- CS **normalizes**, erasing *diversity and exceptions*
- CS **automates**, removing *people and their unpredictable decisions*

These foundational CS concepts and values benefit the dominant groups in CS, reducing the burden of understand the complex social world, isolating them from its complexities.

Of course, the social and intellectual segregation of CS from the world has consequences...

CS is an *un*safe space for many groups

Students who are Black, Brown, Native, disabled, gender non-conforming, non-binary, women, may all find the decontextualized, anti-social nature of CS psychologically *unsafe*, posing:

- Stereotype threats.
- Imposter syndrome.
- Culturally *un*responsive pedagogy.
- Racism, sexism, ableism.
- Resistance to advocacy and social conflict.

CS as a space of *unsafe ideas*

Social segregation leads:

- Algorithms that **abstract**, ignoring diversity, exceptions, context.
- **Automation** that ignores humanity and its complexities, its beauty, and its need for community.
- **Systems** that disrupt, centralize, privatize, and standardize in service of order and parsimony.
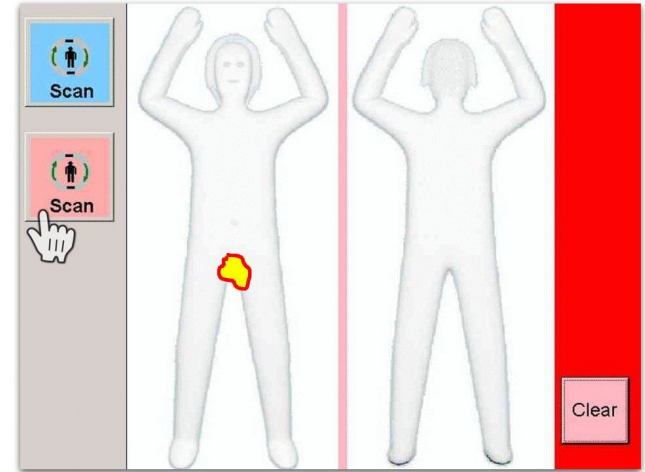
A TSA body scanner "anomaly". *Credit*: Unknown.

CS
abstraction, structure, logic

The world
society, emotions, nuance, politics
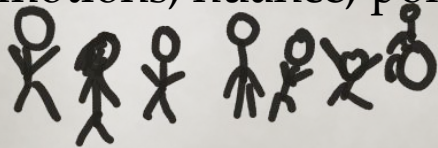
The result is a culture more resilient to social complexity and social change, than ever, since CS *works* for its dominant groups.

It's not clear that CS wants the power it has

Dominant groups in CS didn't flock to CS for power, they came for *respect*, *support*, and *agency*.

Most are still unsure what to do with it (e.g., Mark Zuckerberg, Jack Dorsey, Elon Musk). Pressure is mounting, but few are equipped to respond inclusively. Many respond with defensiveness, ignorance.

Zuckerberg speaks to the U.S. congress.
Credit: NY Times.

All of this leads to two major barriers to making change...

1. Broadening participation is a psychological threat

Asking CS to let in the rest of the world is asking dominant groups in CS to let in the very things they've been running from.

- It asks bullied boys to let in their bullies.
- It asks Asian boys to compete more for their parents' love.
- It asks Autistic youth to face a social world they struggle to parse.
- It asks closeted trans youth to face their gender identities.

1. Broadening participation is a psychological threat, *continued*

This challenge raises new questions:

- What kind of CS culture would make space for everyone, but also bullied boys, immigrants, and Autistic people?
- How we do reconcile the toxic masculinity, Asian cultures, and neurodiversity of CS with the rest of humanity?
- What might groups marginalized in CS need to learn about bullying, Asian parenting, Autism, and trans shame to create a truly inclusive CS culture?

2. Diversity is an intellectual threat

The foundations of CS aren't built to accommodate *variation*, *exceptions*, *nuance*.

- Conditional statements work with Boolean logic, not the fuzzy temporal indecision of human judgements.
- Loops have no social awareness of their amplifying forces.
- Machine learning is incapable of being humane to outliers.

2. Diversity is an intellectual threat, *continued*

These challenges raise new questions:

- What kinds of foundations would better account for diversity?
- Are new definitions of data and algorithms that account for the margins possible?
- Who will develop these foundations, if not the dominant groups in CS, and how might we adopt them without dismantling the entirety of 70 years of technical infrastructure?

None of these threats are excuses

The White and Asian men who dominate tech—despite many of them being marginalized in their own ways in broader society—still need to own their privilege, recognize their power, stop being sexist, racist, and ableist, and start using their power for equity and justice.

3. Reimagining CS culture
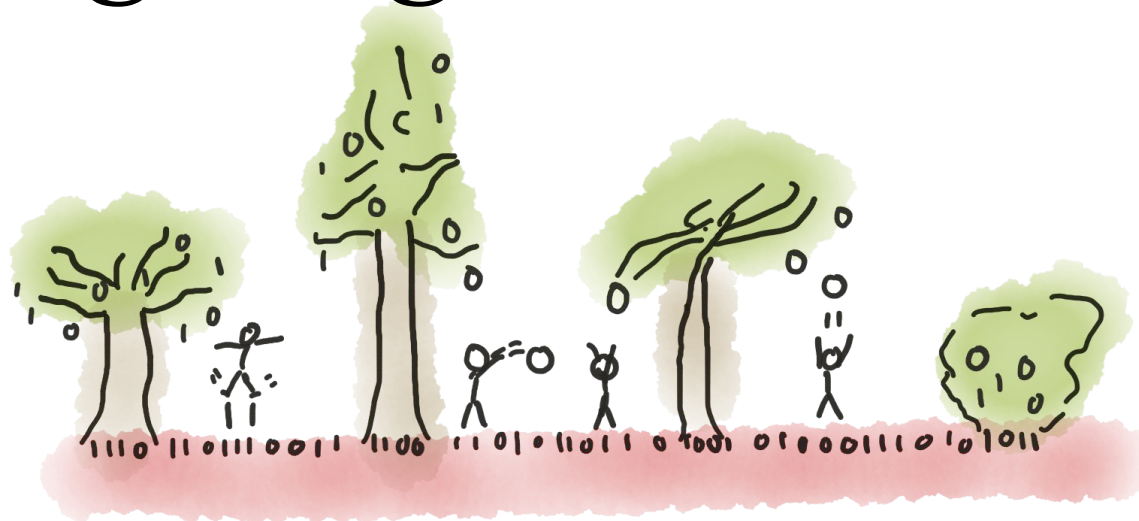
Respect. We need a CS culture that is respectful for all identities, cultures, values, and dreams.
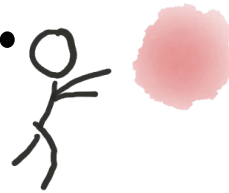
Cultural tensions around **respect**

I often hear people in our community talking about dominant groups in CS needing to **read the room** in the context of diversity, equity, inclusion, and justice. That's a fine sentiment that's centered in a desire to account for social context in communication, decisions, and action.

*But it's also a very **exclusionary** idea: one characteristic of Autism is precisely the inability to do this; people who immigrate to other countries often lack historical context. How do we create a CS culture that accounts for neurodiversity and gaps in cultural knowledge?*

Support. We need a CS culture that offers encouragement, affirmation, and resources.
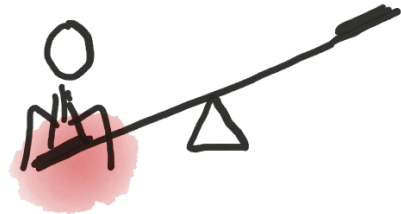
Cultural tensions around **support**

We regularly discuss broadening participation in terms of minoritized racial and gender groups, and we absolutely need to offer these supports, robustly, sustainably, and inclusively.

*But even **dominant** groups in CS need support that they're not getting. Where are the student organizations for Southeast Asian students who need solidarity about the sometimes toxic family expectations that motivate their learning? Where are the student organizations for Autistic students to celebrate the assets their neurodiversity brings to how we see and understand the world?*

Agency. We need to offer space for people in CS to shape their learning and to express their values.

Cultural tensions around agency

We need to engage culturally responsive and sustaining pedagogy, and teach the intersections between social justice and computing.

But what if a student's values or minds center order, rules, and homogeneity (or the political conservatism that often stems from these views)? Do we offer agency to everyone except these students, since their values might be directly counter to embracing diversity? And how do we reconcile that offering them agency might mean taking away agency from others?

It's these tensions that make reimagining CS culture so hard: there is likely no single culture or set of cultures that reconciles them.

Five approaches to reimagining CS culture.

The status quo

We let CS continue to **oppress**, enriching and empowering its dominant groups with responsibility they do not want.

This transfer of power may simply continue despite our efforts to prevent it, due to inertia.

A Jeff Bezos-as-action-hero meme.
Credit: C-SPAN.

Regulate CS culture

We layer **policy** on top of the status quo, regulating business and education. In the process, we obstruct some harm, trying to mold CS into what the world needs it to be.

This may be muted by capitalism's amplification of private action, and the limits of democracy in changing culture.

The CEOs of Facebook, Google, Apple, and Amazon testify. *Credit*: C-SPAN.

Change CS culture

We **broaden participation**, embracing culturally sustaining pedagogy, improving cultural humility, removing barriers, and diversifying power.

Such "desegregation" efforts, might be slow and fractured, much like racial desegregation in schools in the U.S. They also need to begin attending to dominant groups' ethnic and neurodiversity.

Kimberly Bryant, Black Girls Code founder, takes a selfie. *Credit*: Black Girls Code.

CS splinter cultures

We can just make new CS cultures:

1. The *Informatics* degree at my university teaches CS, but situated.
2. K–12 CS has its own distinct pedagogies and values.
3. Industry != academia.

Multiple cultures requires bridges. Who will build them? Will the bridges create their own inequities?

The WINFO *Hackathon*, which draws diverse students into our *Informatics* degree. *Credit*: UW Information School.

A vibrant multiplicity of CS cultures

Everyone makes with CS: scientists, artists, writers, parents, engineers, teachers, children, and more, all with different values, goals, and tools.

Should we support people in creating, finding, engaging, and sustaining new CS cultures? Can they ever escape the hegemonic ideas from higher education?

Alexandra Cardenas live coding music at the Geiger Festival in Gothenburg, Sweden, 2014. *Credit*: Ruud Gielens.

We're not choosing from these approaches. They're all happening, simultaneously.

Even if there are a multiplicity of cultures, *some* CS cultures — higher education, big tech, programming language designers — will still hold most of the power, and will still use it to oppress, even if unintentionally.

The real question is how we connect these many cultures, while also transforming the CS cultures that hold the power to shape them through empathetic partnership with its (often) oppressive leadership.

What might *empathetic partnership* be?

We seriously engage the **marginalization** of Autistic, immigrant, and bullied boys who dominate CS power centers.
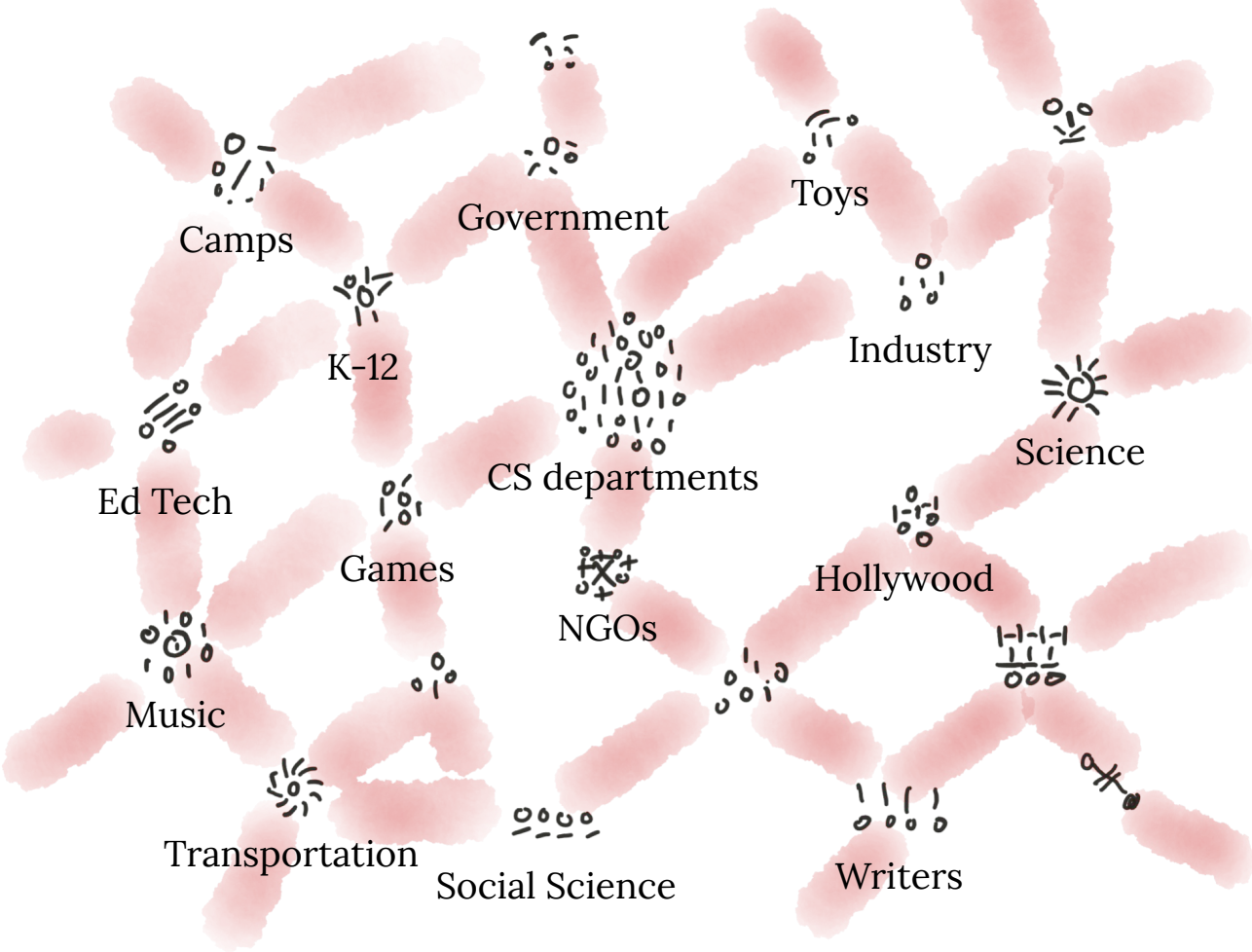
We partner with these dominant groups to imagine a CS culture that keeps both them and everyone else **safe** in CS, through respect, support, and agency.

We reinvent with them the intellectual **foundations** of CS, creatively replacing them with technical infrastructure that centers respect, support, and agency.

Camps
Government
Toys
K-12
Industry
Ed Tech
CS departments
Science
Games
Hollywood
NGOs
Music
Transportation
Social Science
Writers

Perhaps we can create a rich and diverse constellation of CS cultures.

I hope we can continue this dialog—in research, in conversation, and in community!

Key points

- CS has long been a refuge for groups marginalized in invisible ways.
- This has caused CS has become defined by its social segregation
- Efforts to change CS culture need to empathetically partner with dominant groups to create a CS culture that works for everyone.

A painting I commissioned from my brother, depicting the tensions between people and technology. *Credit*: Bryan Ko