Inclusive practices and software project productivity

HPC Best Practices Webinar, October, 2024

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Outline

- Inclusion and bias
- Inclusion and productivity
- Practices for cultivating inclusion
- Some resources

Why inclusion?

Talent is equally distributed across all sociocultural groups…

…access and opportunity are not.

~ Dr. Angela Byars-Winston, Preface, NASEM “The Science of Mentorship”, 2019

What is inclusion?

In the context of open source software projects, inclusion is about creating an environment where all individuals, regardless of _____ (fill in the blank), feel welcomed, respected, valued and encouraged to contribute as their full, authentic selves. This involves ensuring equitable access to project resources as well as reducing barriers to participation.

Inclusion is more than just *allowing* participation; it's about actively cultivating and supporting contributions of all interested individuals.

If diversity means getting invited to the party, inclusion means getting asked to dance.

This talk focuses on Practices. But, its really about People.

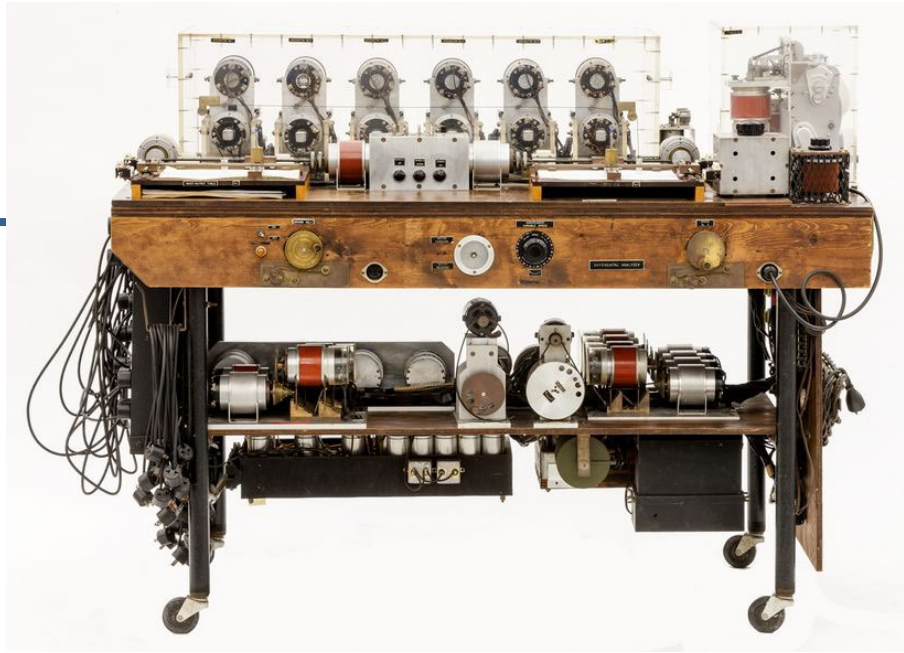
- Broadening participation by historically underrepresented people is ultimate goal
  - Many active programs: NSF, ECP, SHI ( ), ECEP Alliance, MSIPP, many others
  - This is really the most impactful inclusive practice

- This talk will focus on a number of other practices. Why?

- If workplace culture is not inclusive, many people will struggle to stay and succeed

Who wants to stay at a party where no one will dance with them?

What is anti-Inclusion?



Anti-inclusion in the context of open-source software projects is the practice of differential treatment or evaluation of contributors or their contributions based on non-relevant personal attributes such as _____ (fill in the blank).

It is actions, policies, or practices that discourage or disadvantage whole groups of individuals from participating fully and equitably.

Bias is a key enabler of anti-inclusion

Example of an inclusivity bug

- Green indicates “safe” state
- Red indicates “unsafe” state
- About 1 in 12 men and 1 in 200 women cannot see the difference
- What is the bias?
  - That everyone perceives colors the same

Example of an inclusivity bug

f(.or.)tr[an]
mula slator

- `libCoolKids` is a new mixed precision scientific computing library
- Has C, C++, Python and Java interfaces
- A pull request for a Fortran interface is left un-reviewed for “lack of interest”
- What is the bias?
  - That Fortran is obsolete or not relevant

Example of an inclusivity bug

Excerpt from recent activity on the Linux Kernel

```
I'm getting really fed up here.

And before you start whining - again - about how you are fixing bugs, let me remind you. . .

I'm getting the strong feeling that absolutely nothing was learned from the experience. . .

I'm seriously thinking about just stopping pulling from you. . .If you want to have an experimental
tree, you can damn well have one outside the mainline. I've told you before, and nothing seems to
really make you understand.

I feel like I've given you enough hints. You have exactly two choices here:
 (a) play better with others
 (b) take your toy and go home
```

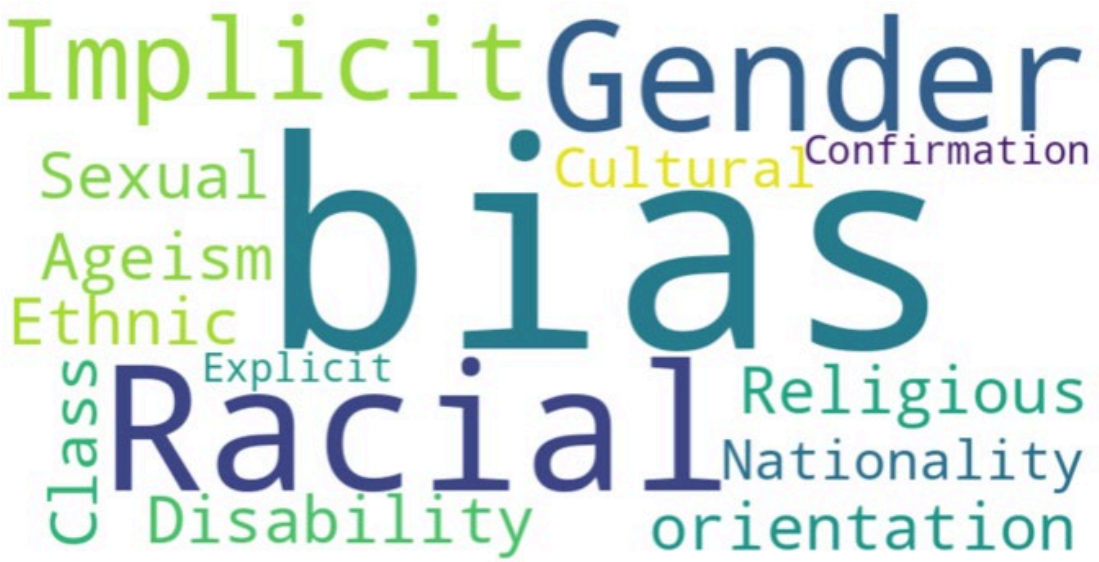
- What is the bias?
  - That everyone is comfortable with this communication style

What can microplastics teach us about unconscious / systemic biases?

- Microplastics have been found everywhere!
  - found in human tissues in populations all over the world
  - Nobody escapes it. Its systemic and prolific
- Believing you are free of any microplastic contamination maybe because you've never used plastics is naïve
- If this is the first time you are learning about this, it may be uncomfortable or even creepy to hear and its natural to want to avoid/dismiss the idea

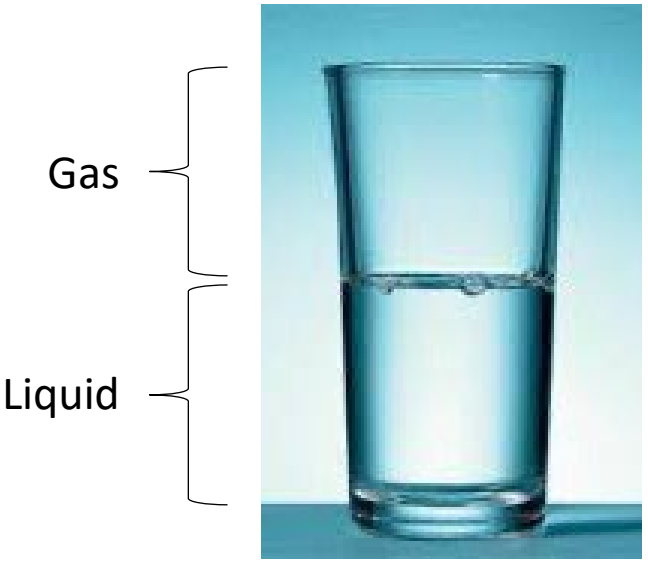
Having to confront our biases can be uncomfortable.
Fear not…we ALL have to work to manage bias.

Bias-free is not realistic (Nor is it equitable)



- Some common refrains…
  - "I treat men and women equally"
  - "focusing on race only divides us"
  - "I don't see color or gender"
- The aim cannot be to be free of bias
- The goal is to be aware of and get control of our biases
- To prevent and undo the negative outcomes our biases contribute to

The experience of holding two truths



- Is the cup half full or half empty?

- The Wave / Particle duality of light
- General Relativity / Quantum Mechanics
- Bubble sort is the worst (time) / Bubble sort is the best (space)
- I think I am a good person / I can perpetuate systemic biases (if I am not careful)

For some, what we discuss here may feel like it isn't nearly enough to meet the moment

For others, it may feel like it is way too much

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- Inclusion and productivity
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Dimensions to inclusion

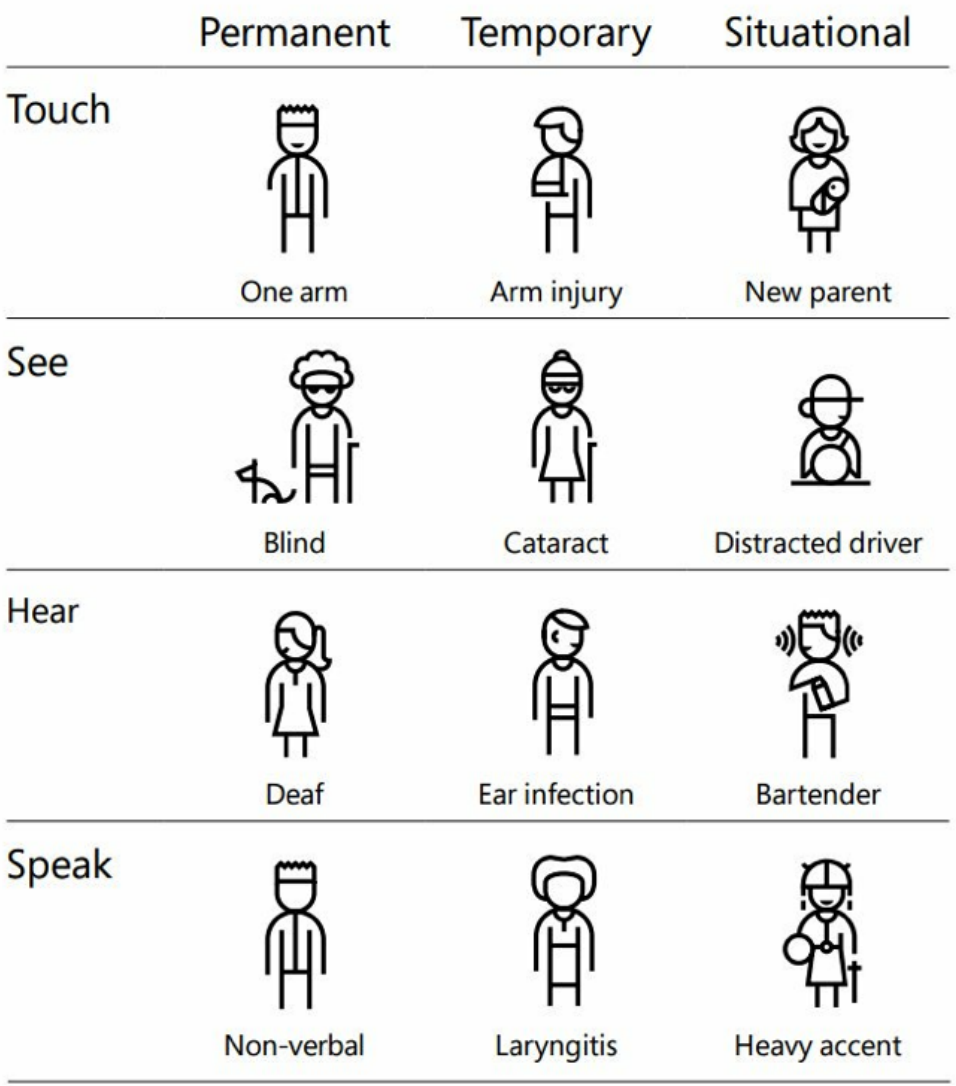
Familiar dimensions…

- Race / ethnicity
- Gender
- Gender identity
- Sexual orientation
- Religion
- Age
- Disability

Other dimensions…

- Neuro-diversity
- Handed-ness (10% lefties)
- Dyslexia / Dyscalculia (3-7%)
- Visual impairments (1% - 40%)
- Hearing impairments (~15%)
- Speaking impairments (3-7%)
- English as a second language
- Immigration status
- Culturally relevant legal holidays
- Self-regulating blood glucose
- Home office situation / time-zone
- More…

When we are inclusive for persons with any kind of disability, there is a good chance we're being inclusive for our future selves



Inclusive
A Microsoft Design Toolkit

Some findings on inclusion and productivity

FIGURE 2 | The case for an inclusive culture

Organizations with inclusive cultures are:

2x
as likely to meet or exceed financial targets

3x
as likely to be high-performing

6x
more likely to be innovative and agile

8x
more likely to achieve better business outcomes

Source: Juliet Bourke, *Which Two Heads Are Better Than One? How Diverse Teams Create Breakthrough Ideas and Make Smarter Decisions* (Australian Institute of Company Directors, 2016).

Deloitte Insights | deloitte.com/insights

Inclusion and productivity

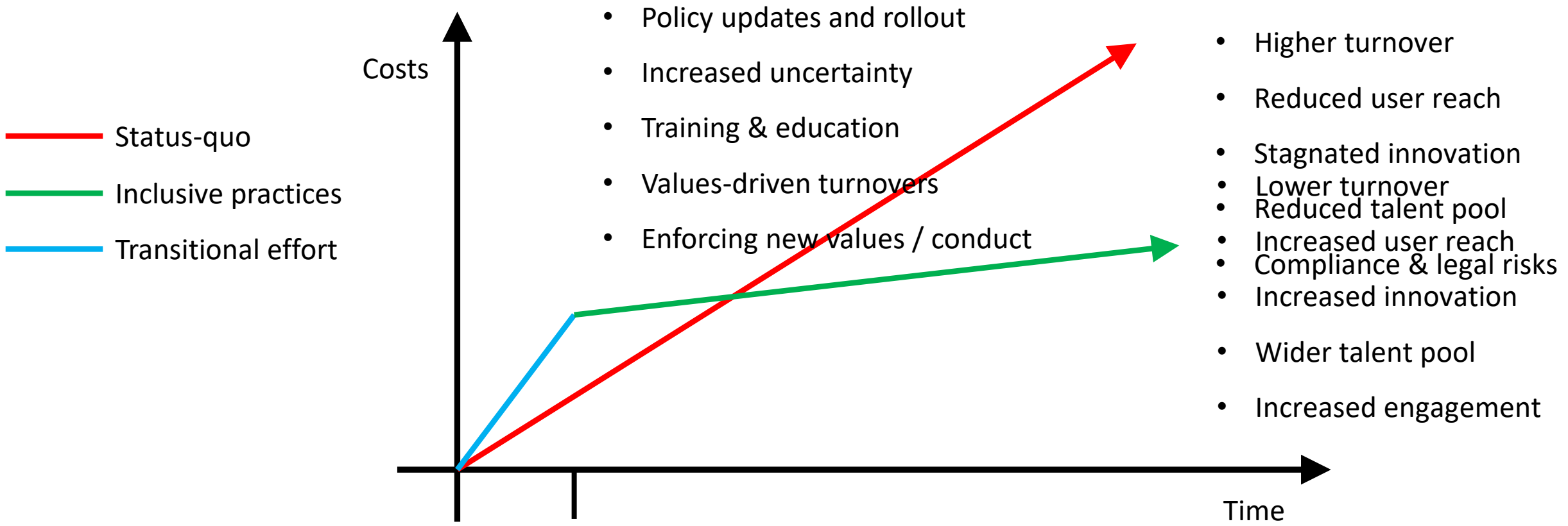
- Diverse perspectives:
  - Leads to more creative and innovative solutions
  - Helps uncover alternative approaches and enhances overall decision-making
- Improved collaboration:
  - More contributors are more likely to contribute their ideas and expertise (won't self-censor)
  - Results in faster problem-solving and better overall project outcomes
- Enhanced problem-solving:
  - More likely to identify (early) and address a broader range of potential issues
  - More adept at identifying and addressing biases or blind spots
- Increased creativity and innovation:
  - Individuals feel safe to express their ideas and take risks…encourages others to do the same
  - Challenge conventional thinking
- Broader user understanding:
  - Consider the needs of a wider user base and design software that accommodates a wider range of users
  - Leads to increased uptake/adoption, better user satisfaction, and ultimately, a more successful product

We already invest very heavily in inclusion... …for other software

- We support GUIs and documentation in multiple human languages
- We value API/ABI compatibility in libraries like MPI, GL, Blas, Lapack, C/C++ stdlib etc.
- We design numerical libraries to handle a variety of precisions (single, double, quad, mixed)
- We want libraries that implement similar functionality (e.g., solvers, meshers, etc.) to **interoperate**
- We want our data analysis tools to read a variety of file formats (VisIt reads 142 file formats)
- We design for a variety of interface bindings (C, C++, Fortran, Java, Python, etc.)…
- …and parallel execution paradigms (AMT, Dataflow, PGAS, MPI+X, etc.)

All of these are expressions of inclusion we already routinely demonstrate in the code we labor to produce and support

Costs and benefits of investing in inclusive practices



Where does inclusion play a role in software development?

- Our communications (emails, chats, tweets, …)
- Our documentation
- Our presentations
- Our Interfaces
- The code we write
- Our collaborations
- Our customer support processes
- Our product's reach and marketability

Inclusive practices have a role to play in all aspects of a software project.

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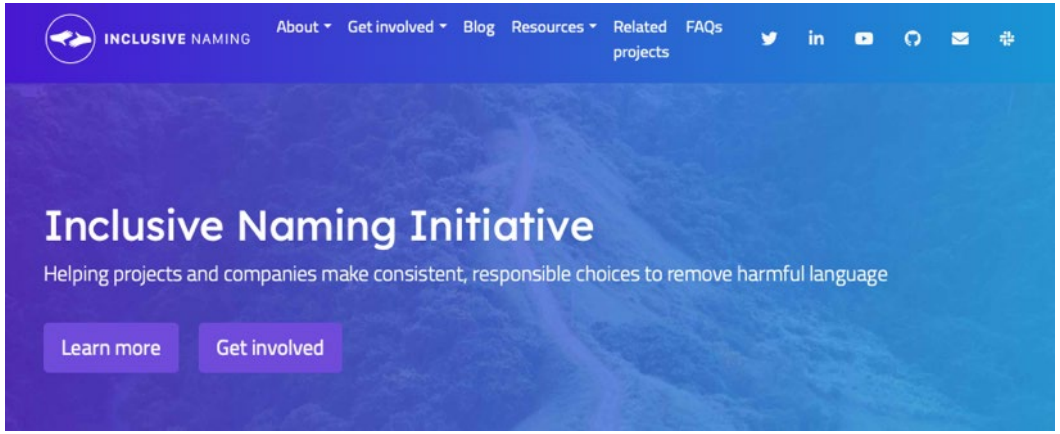
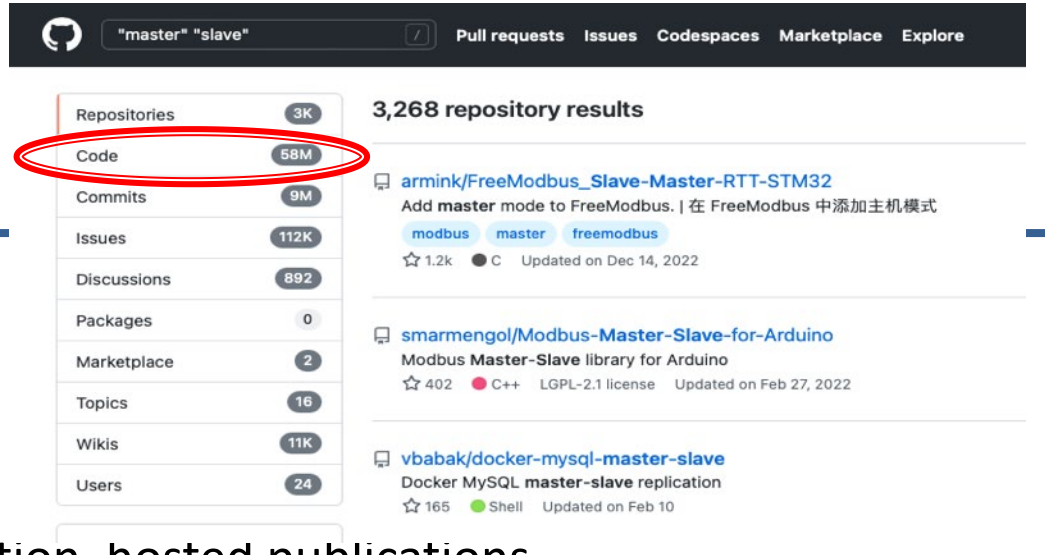
Consider inclusive language practices and standards



- Inclusive Naming Initiative
- Linux Foundation
- Google's Inclusive Documentation
- National Institute of Standards and Technology (NIST)
- Atlassian Design
- US Government Plain Language Standard
- Microsoft's Bias-free Communication

…to promote and facilitate replacing harmful and exclusionary language in information technology

Replace “master/slave” terminology



- Consider all places it may be used
  - Code, data files, data objects, presentations, documentation, hosted publications
  - Diagrams and images too
  - Derived terms and abbreviations
- Engage stakeholders early
  - Propose replacement terminology and seek consensus
- Ensure no bugs are introduced with the changes
  - Might need to create tests to confirm this
- See the article an the Better Scientific Software site (https://bssw.io)

Avoid jargon when communicating with newbies
(credit: Mariah Martinez)

"To mitigate DDoS attacks and enhance QoS, IT must configure ACLs on the routers and switches, ensure SNMP is secured against unauthorized access, and deploy IPSec VPNs."

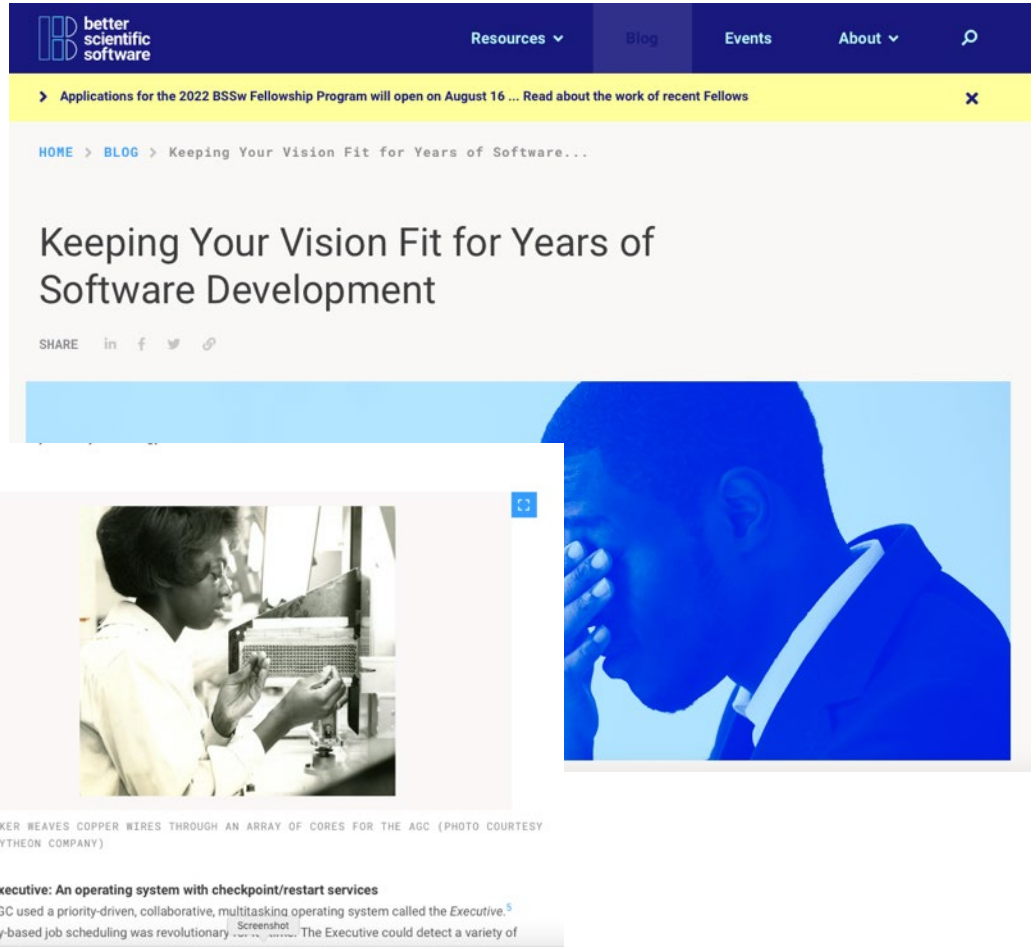
- Unnecessary complexity introduced by a lot of jargon
  - Meeting interruptions
  - Miscommunication
  - Loss of legacy knowledge
- Information overload and knowledge gaps are top onboarding challenges
- When participants are provided with recruitment messages that are more difficult to read the participants show less interest in joining the group.[1]

[1]Hales, Andrew H., Kipling D. Williams, and Joel Rector. "Alienating the audience: How abbreviations hamper scientific communication." *APS Observer* 30 (2017).

Gender neutralize your project's documentation

- https://techwhirl.com/gender-neutral-technical-writing/
  - — ***Gender-specific:*** *Each user has **his** own login name and password.*
  - — ***Gender-agnostic:*** *Each user has **their** own login name and password.*
  - ✓ ***Gender-neutral:*** *Each user has **a personal** login name and password.*

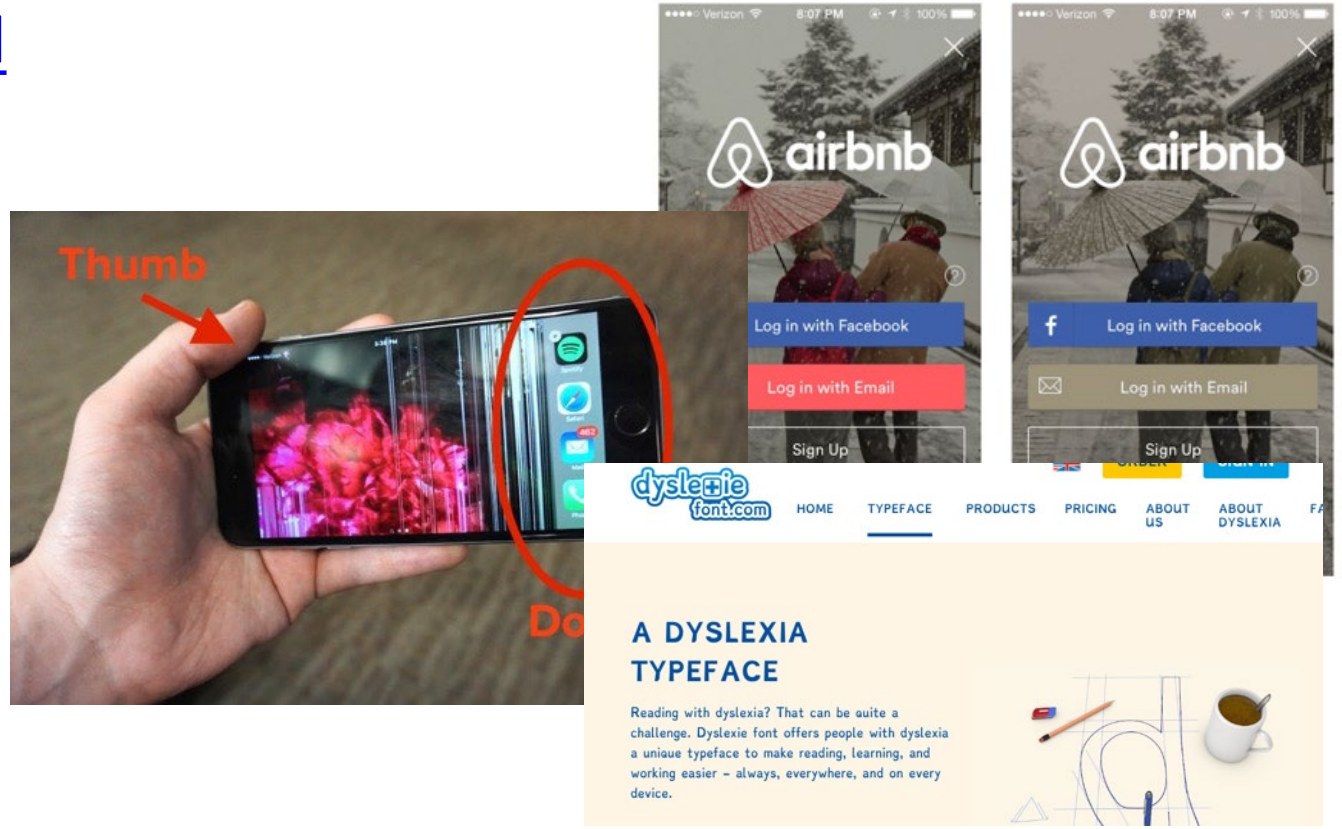
Be inclusive in imagery whenever it is possible



- Unsplash
- U. of Chicago
- Pexels
- Nappy
- Asking permission too

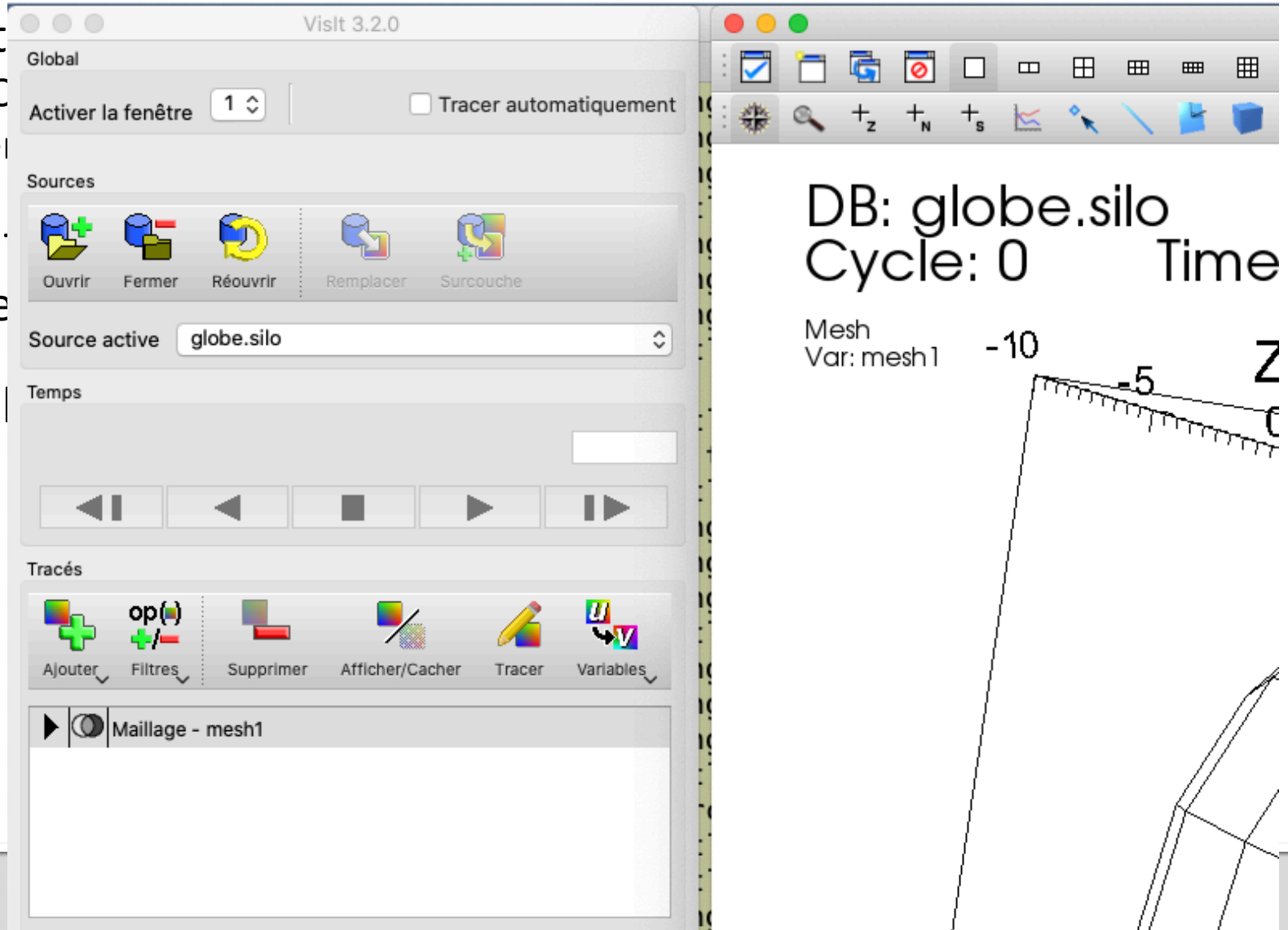
UX: Check your GUIs, docs and presentations for…

- Color vision friendliness
  - —https://colororacle.org/usage.html
- Left/Right friendliness
- Dyslexia friendliness
  - —https://opendyslexic.org

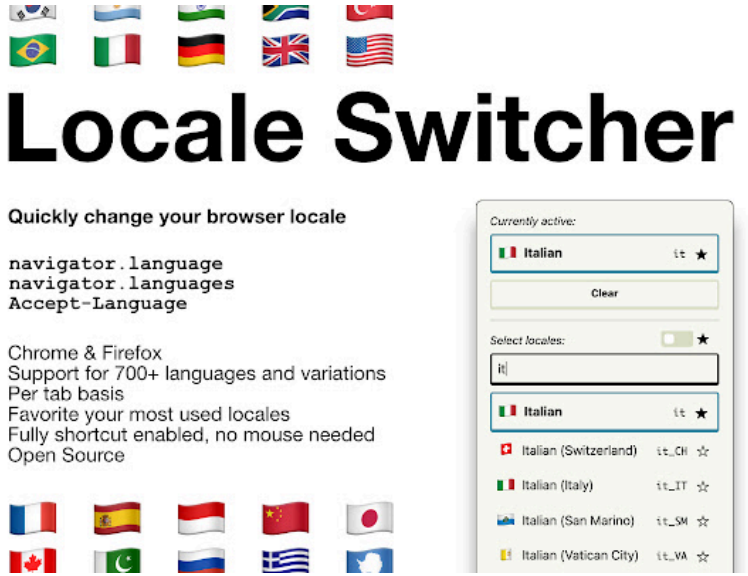


Internationalization of interfaces, data files and documentation

- Connect wit
  - VisIt uses C
    French, Ge
- Automated
  for interface
- Enlist a local
- Data object



Use “locale” whenever possible
region-specific handling of string data



- `atoi()` vs `atoi_l()`, `strtol()` vs `strtol_l()`
  - The “locale” versions (_l) are more inclusive and do not require more effort to use
- Numbers: Europeans use dot instead of comma for separating triples of digits
  - US: 1,234,567.89 / EUROPE: 1.234.567,89 or 1 234 567,89 (spaces)
- Dates and Times
  - Month/Day/Year vs. Day/Month/Year
- Character Encodings
  - Which character set is used / how strings are processed and displayed.
- Locales handle things like capitalization rules, currency symbols, and unique language characters.

Show your pronouns in your profiles

- Zoom
- WebEx
- Teams
- Slack
- GitHub
- Email signature
- More…

Mark (he/his) C. Miller
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Scientific data & software interoperability, HPC software quality engineering, Scalable I/O, Scientific Vis. (HDF5, Silo, VisIt, MACSio, Spark, IDEAS-ECP)

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Achievements

Highlights

PRO

✓ 30 discussions answered

Organizations

Adopt a code of conduct

- How a project's business is conducted and how the people doing it are expected to behave
- Behavior that is wholly unacceptable…
  - Harassment, violence, etc.
- Statements about "things we value"
  - We value inclusive, safe spaces…
- How issues are addressed and resolved

Code of Conduct	#Google Results (out of 108)
Ubuntu	20
Contributor Covenant	20
Django	13
Python	9
Citizen	9
Open Code of Conduct	7
Geek Feminism	7
Mozilla	6
Twitter	5
Rust	5
Ada Initiative	4
KDE	4
SpeakUP	3
Apache	2
Thoughtbot	3
Openstack	3
Debian	2
Puppet	2
PyCon	2

Parastou Tourani; Bram Adams; Alexander Serebrenik, "Code of Conduct for Open Source Projects", 2017 IEEE 24th International Conference on Software Analysis, Evolution and Reengineering (SANER)

Connect with employee resource groups (ERG)

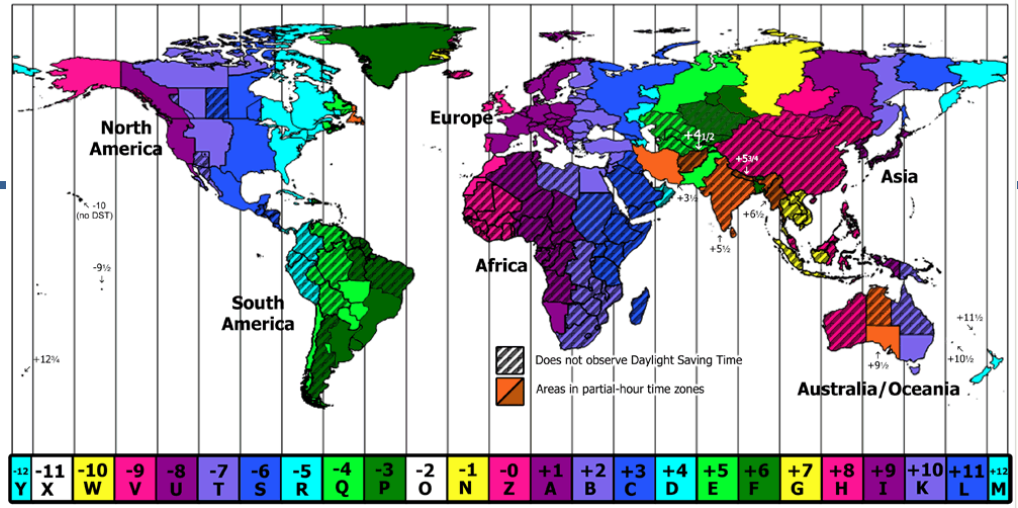
- DOE labs have many ERGs
  - LLNL has ten
- ERG members likely have special expertise relevant to inclusive practices in software projects

Honoring special days

Whether or not they are “official” organization holidays

- We dress up, we share slogans/greetings, we decorate, we cook special foods, we take time to acknowledge and celebrate
  - Dia de los Muertos, Halloween
  - Hanukkah, Kwanzaa, Christmas
  - Passover, Easter, Ramadan (2022 was a rare occurrence)
  - Juneteenth, July 4th
  - Equal Pay Day
- Different DOE sites may have different official holidays
  - Examples: Spring holiday at LLNL (Monday after Easter), Good Friday at ORNL
- Caution: possible appropriation risk
  - Be sure to engage with leading voices of relevant communities (ERGs)

Be cognizant of your collaborator's time zone(s)



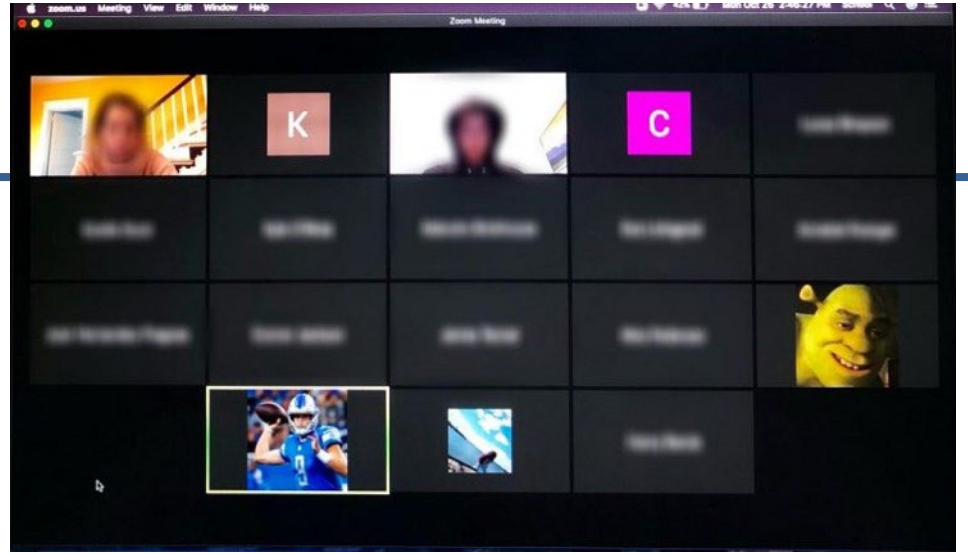
- Making deadlines
- Scheduling meetings
  - Alternate meeting days/times to accommodate wider time-zone disparity
- Planning on-line events / conferences

Add inclusive messages to your email signature quotes

- “It is harder to crack prejudice than an atom.” - Albert Einstein
- “Justice will not be served until those who are unaffected are as outraged as those who are.” -- Unknown
- “If one is accustomed to privilege, equality can feel like oppression” – Unknown
- "You learn more about a person by what they say about others than by what others say about them.”- AH
- "In the end, we will remember not the words of our enemies but the silence of our friends" – MLK

Caution: Internet is full of quotation / attribution misinformation

Be present for others in virtual meetings



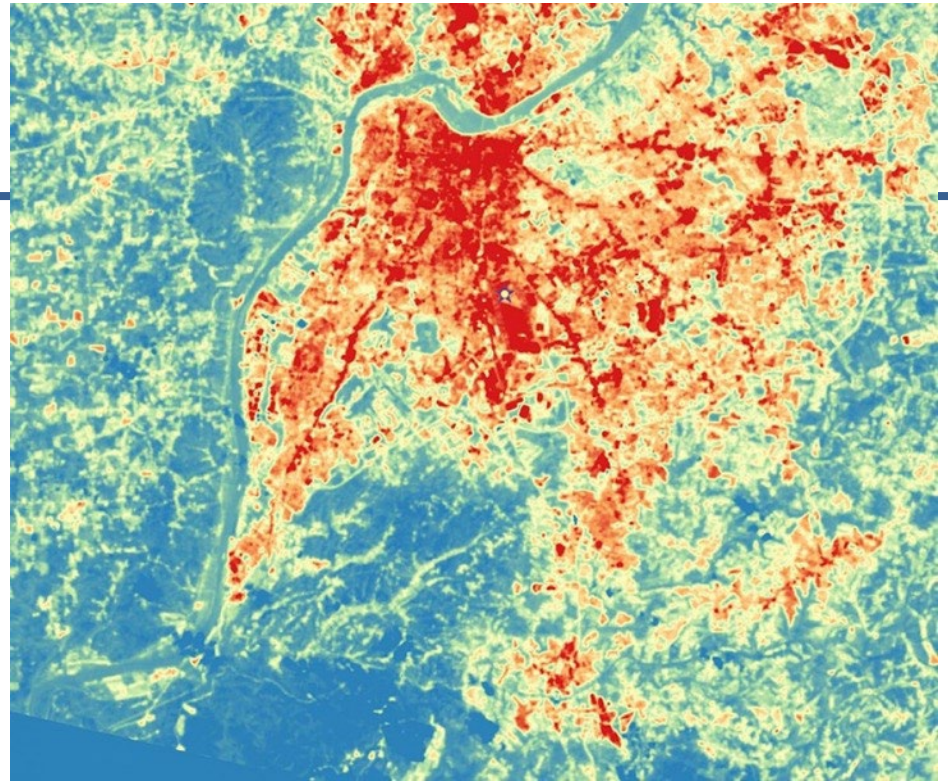
- Have your camera on
- Mute your mic when not speaking
- Give speaker's feedback/reactions
- Don't multi-task
- Use backgrounds to commemorate different themes / topics

Onboarding experience

- Institutional on boarding…
  - Computing equipment and peripherals ready
  - Network and machine access set up
  - Ergonomic evaluation available
  - Added to all relevant communication platforms, groups, lists…org. chart
  - Tour of the office building, site (restrooms, coffee, cafeteria, fitness rooms)
  - Introductions on site and/or in meetings…pointing out mentors available
- Software project on boarding…
  - Added to all resources (e.g. GitHub, ReadTheDocs, Azure, Slack, AWS, etc.)
  - Computer accounts, groups and permissions
  - Coding standards and development documentation
  - Code of conduct and communication norms
  - Overview of source code organization
  - Engage in some pair programming for first PR

Cultivate use cases with a social justice impact

- The application of our software to address topics with a social justice impact is a meaningful way to attract contributors from underrepresented populations
- Biases in AI
- Urban heat islands
- Climate change and its impacts
- Algorithmic Justice



Be an active ally in meetings

- If you notice a colleague is frequently interrupted in meetings, use your opportunity to speak to circle the conversation back to them to give them the floor
- If you notice some contributors haven't been heard from, maybe notice this out loud and ask if they have anything they would like to share

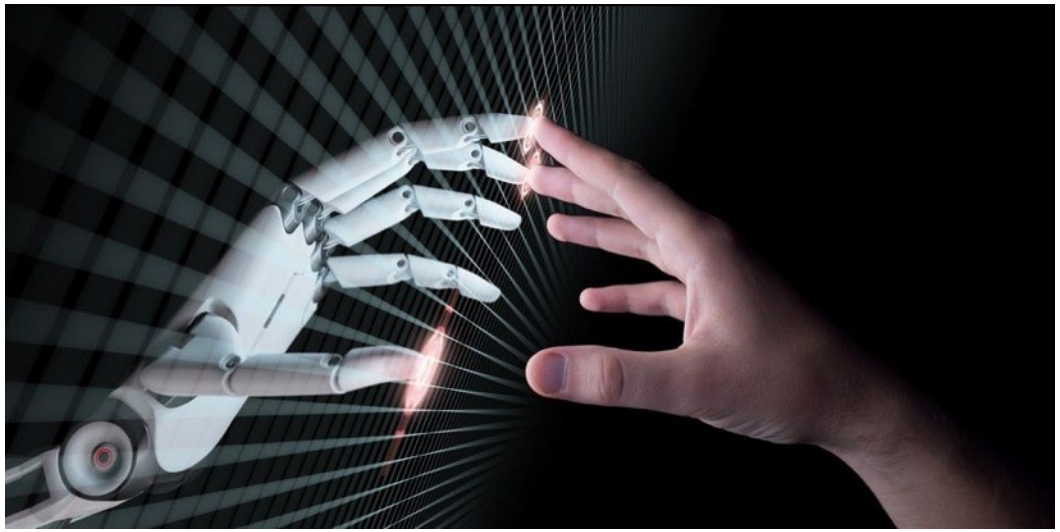
Advocate for “inclusive moment” exercises in routine meetings

- A Factoid, Resource, Event, Experience, etc.
  - Short introduction and dialog so that it can be part of regular meeting agendas
  - In software projects, it’s best to select topics that relate to software, science or technology
- Goals:
  - Small exercise to fit into most ”regular” agendas…raises awareness, seed deeper thinking
- Examples
  - A quick review of the film “Coded Bias” or “Imitation Game”
  - Highlighting a pioneering individual (e.g., Lynn Ann Conway)
  - Pointing out online inclusive design resources
- Read more about this exercise on HPC-WDR

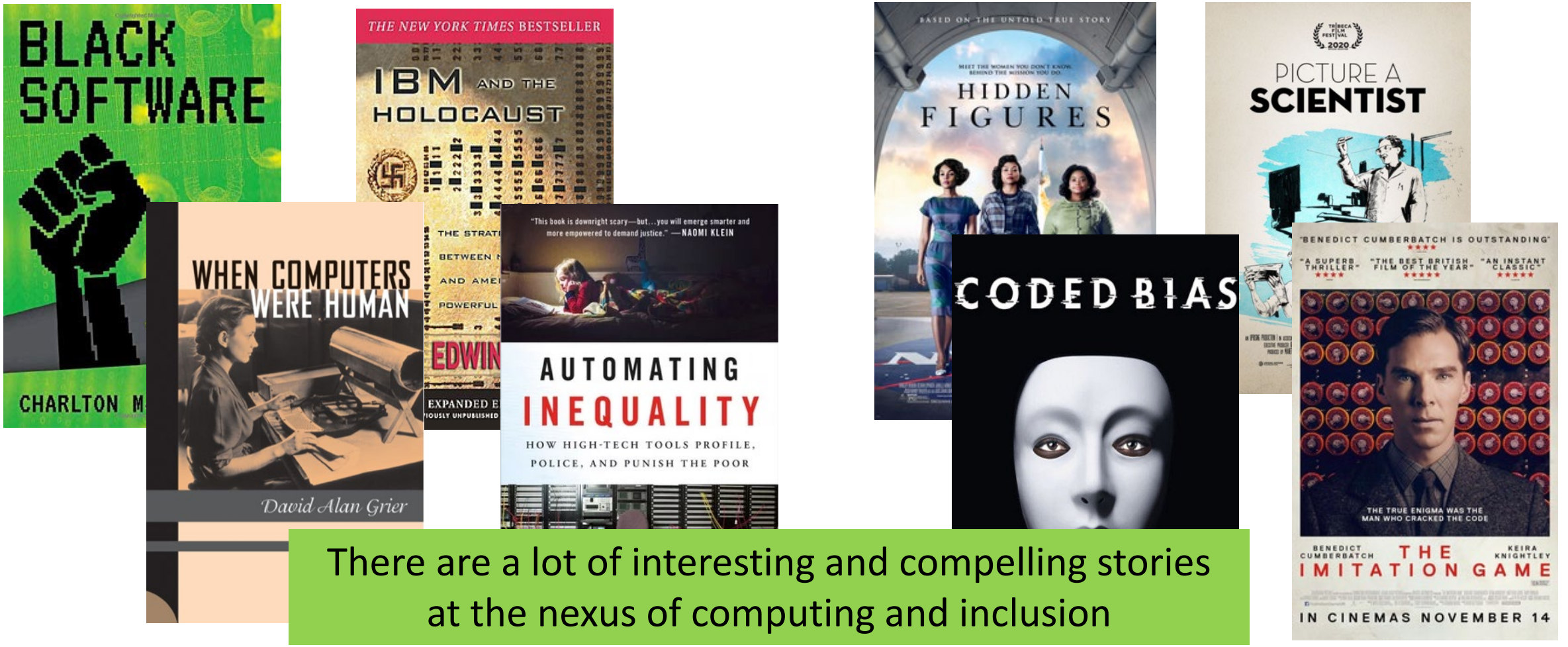
This is now practiced in many teams and organizations

Join/follow an online group or hack-a-thon

- Algorithmic Justice League
- Computational Culture
- Association for Women in Computing
- Sisterhood of Native American Coders
- Girls who Code / Black Girls CODE / Black Men Code
- Queer Code / QWER Hacks
- Software Carpentries (training)
- Hack for Humanity
- AbilityHacks
- Code for America
- Black in AI



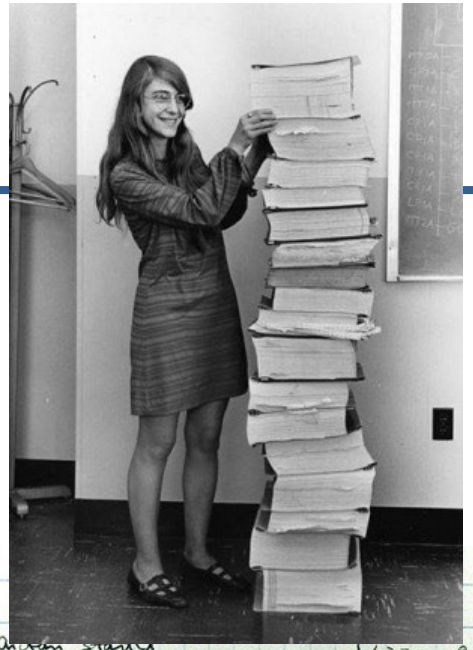
Participate in or host a book/movie club…
…at the nexus of computing and inclusion

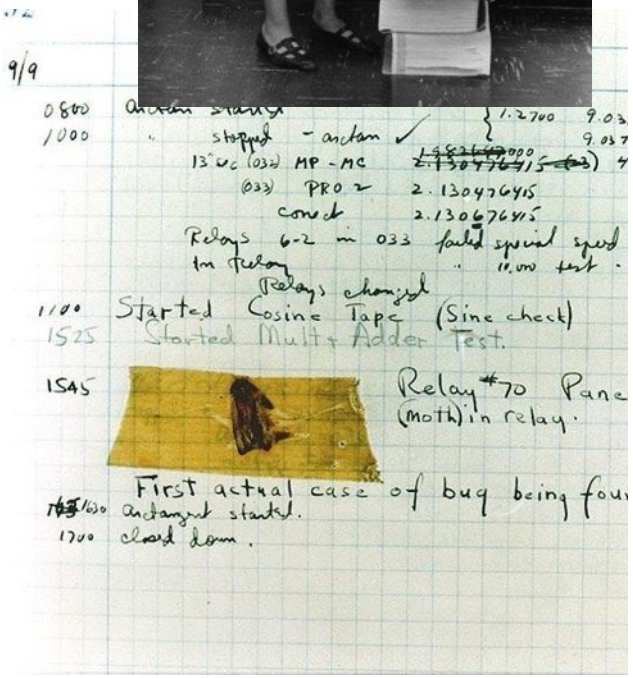


There are a lot of interesting and compelling stories at the nexus of computing and inclusion

Be curious about history relevant to your community

- The word “Computer” has referred to a machine only relatively recently in human history (~70 years)
- Where does the word “bug” come from? Who likely introduced the term?
- Where does the term “software engineering” come from? Who introduced it?
- What were some ways the Manhattan project manifested inclusive principles?
- What are LGUs and how do they impact STEM education?





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Artifacts of the practice of inclusion

- Getting comfortable with being UNcomfortable
- Having regular conversations about privilege, race, gender, sexual identity/orientation
- Taking trainings and participating in on-going dialog with co-workers (and friends, family, …)
- Reading and keeping up to date with current body of knowledge
- Routinely (1-2x/week) having cause to question common assumptions or practices
  - Is responding to an enhancement request with “no can do” a problem? Where did that phrase come from?
  - Why do we call it “Haley’s comet?”
  - Is there a gender-neutral way I can say or write this?
- How often do you intentionally interact with “others,” step outside your comfort zone?
- How often do you call out microaggressions or speak up for the less privileged?

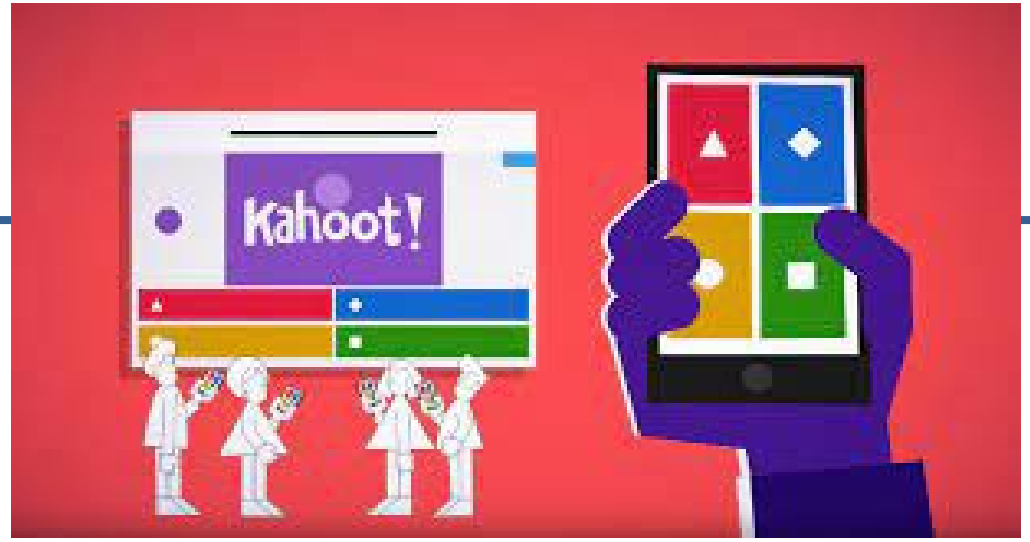
Some resources at intersection of software and inclusion

- Articles/research
  - EEE Software (Apr/May 2021)
  - Ignored Potential
  - Delivering Through Diversity
  - Diversity and Inclusion Through Leadership During Challenging Times
  - Twitter Gone Wrong: How Constructive Dialog and Collaboration Enable Innovation
  - Diversity and Inclusion in the Workplace: Benefits and Challenges
  - Experiences Replacing Master/Slave Terminology in ALE3D and Sierra
  - Inclusivity Bugs and the Language We Use
- Websites
  - Algorithmic Justice League
  - Harvard Implicit Bias Test
  - The Diversity Gap
  - Trip Report: 2020 Software Developer Diversity and Inclusion Workshop
- Books
  - Weapons of Math Destruction
  - Black Software
  - When Computers were Human
  - Automating Inequality
  - Algorithms of Oppression
- Documentaries/dialogs
  - 55 years in HPC: One woman's experiences and perspectives
  - Racism and HPC
  - CODE: Debugging the Gender Gap
  - she++ The Documentary: Good Girl Gone Geek
  - Picture a Scientist
  - Coded Bias
  - Underwater Dreams
  - Experiences replacing master/slave in ALE3D and Sierra
- Movies
  - Hidden Figures
  - The Man who knew Infinity
  - Imitation Game
  - Top Secret Rosies: The Female Computers of World War II
  - Calculating Ada: The Countess Of Computing
  - The Computers: The Remarkable Story of the ENIAC Programmers
  - The Theory of Everything

Recent research and resources

- Google's Equity, Diversity and Inclusion in Software Engineering, Sept, 2024
- Microsoft's Inclusion is Innovation (ongoing)
- NSF's Diversity and STEM: Women, Minorities, and Persons with Disabilities (2023)
- Inclusive-policy.org: Cost benefit vs cost effectiveness (2021)
- HBR: Why diversity programs fail (2020)
- Linux Foundation: CHAOSS (metrics & models for open source community health)
- More resources: SIAM, IEEE, ACM

A fun Kahoot game



- Play from browser on your computer
  - Go to www.kahoot.it
  - Enter game pin
  - Or, follow QR code

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