

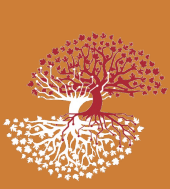
Anti-positivist science? Precedents and (im)possibilities of critical quantitative methods

Momin M. Malik, PhD

4S Annual Meeting 2026 Toronto

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<https://www.mominmalik.com/4S2026.pdf>



Outline

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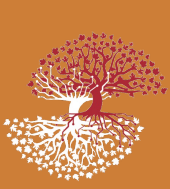
Actor-analyst hybridity?

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- The background: Actor-analyst hybridity?
- The phenomenon: Critical technical awakenings, need for “mythologies” by which to construct productive new identities and encourage community
- Progress so far on write such a mythology, while also creating surface area for interactions with STS



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Background: Actor-analyst hybridity?



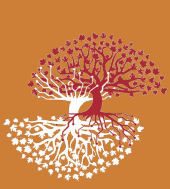
Background of this project

- I went *from* science studies into *science*, an unusual direction
 - Typically, once you've seen "behind the curtain" it's hard to go back to working in a positivist register
 - STS has many who were trained as scientists, but I don't I ever see the opposite
- My goal was to use my analyst knowledge to intervene as an actor
- I acknowledge that redeeming theory against quantification "from the inside" is a naïve fantasy and not the point, but that was one motivation/curiosity



Carnegie Mellon University
School of Computer Science





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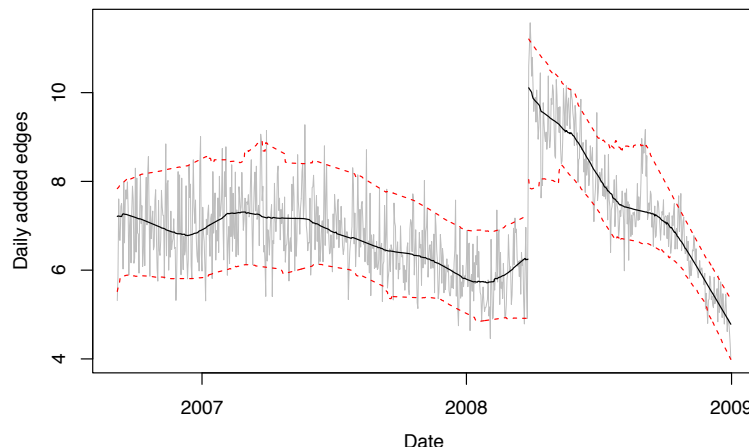
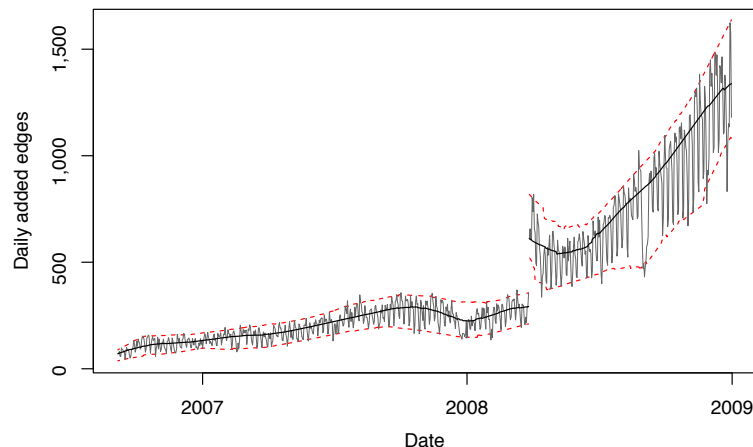
Some of my attempts at “anti-positivist” quantitative methods...

(Not what this talk is about, but this is just in case
you came to see the goods)



“People You May Know” changed the network (Malik & Pfeffer, 2016)

- Facebook links: +300 new edges per day (x2)
- Triangles: +3.8 triangles per edge (x1.62)



A quantitative, causal inference demonstration of (weak) performativity (Healy, 2017). At least one success: at IC2S2 in 2016, a BuzzFeed product manager told me she forwarded this paper to the engineers on her team



Classic argument for CV

$$\begin{aligned}\text{Err}(\hat{\mu}) &= \frac{1}{n} \mathbb{E}_f \|Y^* - \hat{Y}\|_2^2 \\&= \frac{1}{n} \left[\mathbb{E}_f \|Y^*\|_2^2 + \mathbb{E}_f \|\hat{Y}\|_2^2 - 2\mathbb{E}_f(Y^{*T} \hat{Y}) \right] \\&= \frac{1}{n} \left[\mathbb{E}_f \|Y^*\|_2^2 + \mathbb{E}_f \|\hat{Y}\|_2^2 - 2\text{tr} \mathbb{E}_f(Y^* \hat{Y}^T) \right] \\&\quad + \frac{1}{n} \left[\mu^T \mu + \mathbb{E}_f(\hat{Y})^T \mathbb{E}_f(\hat{Y}) + 2\text{tr} \mu \mathbb{E}_f(\hat{Y})^T \right] \\&\quad + \frac{1}{n} \left[-\mu^T \mu - \mathbb{E}_f(\hat{Y}) \mathbb{E}_f(\hat{Y})^T - 2\mu^T \mathbb{E}_f(\hat{Y}) \right] \\&= \frac{1}{n} \left[\text{tr} \Sigma + \|\mu - \mathbb{E}(\hat{Y})\|_2^2 + \text{tr} \text{Var}_f(\hat{Y}) - 2\text{tr} \text{Cov}_f(Y^*, \hat{Y}) \right] \\&= \text{irreducible error} + \text{bias}^2 + \text{variance} - \text{optimism}\end{aligned}$$

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Apply this to *dependent* data (Malik, 2020)

- Imagine we have, for $\Sigma_{ii} = \sigma^2$ and $\Sigma_{ij} = \rho\sigma^2, \quad i \neq j$

$$\begin{bmatrix} Y_1 \\ Y_2 \end{bmatrix} \sim \mathcal{N} \left(\begin{bmatrix} \mathbf{X} \\ \mathbf{X} \end{bmatrix} \beta, \begin{bmatrix} \Sigma & \rho\sigma^2 \mathbf{1}\mathbf{1}^T \\ \rho\sigma^2 \mathbf{1}\mathbf{1}^T & \Sigma \end{bmatrix} \right)$$

- Then, optimism in the training set is:

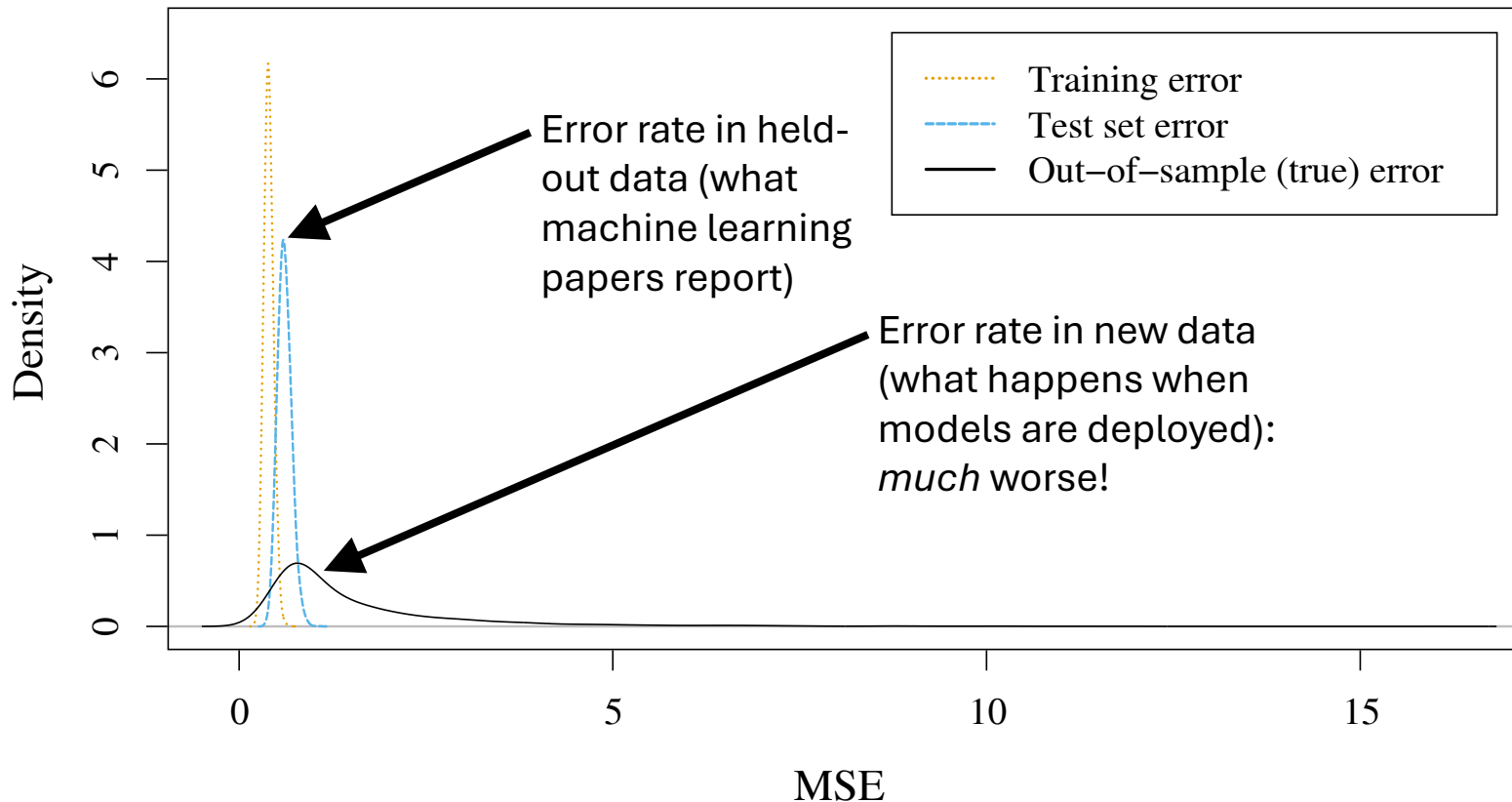
$$\frac{2}{n} \text{tr Cov}_f(Y_1, \hat{Y}_1) = \frac{2}{n} \text{tr Cov}_f(Y_1, \mathbf{H}Y_1) = \frac{2}{n} \text{tr } \mathbf{H} \text{Var}_f(Y_1) = \frac{2}{n} \text{tr } \mathbf{H}\Sigma$$

- But test set also has nonzero optimism!

$$\frac{2}{n} \text{tr Cov}_f(Y_2, \hat{Y}_1) = \frac{2}{n} \text{tr Cov}_f(Y_2, \mathbf{H}Y_1) = \frac{2\rho\sigma^2}{n} \text{tr } \mathbf{H}\mathbf{1}\mathbf{1}^T = 2\rho\sigma^2$$



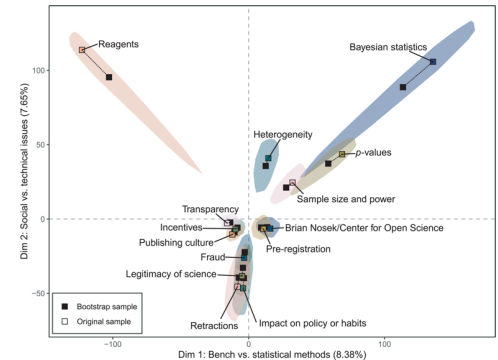
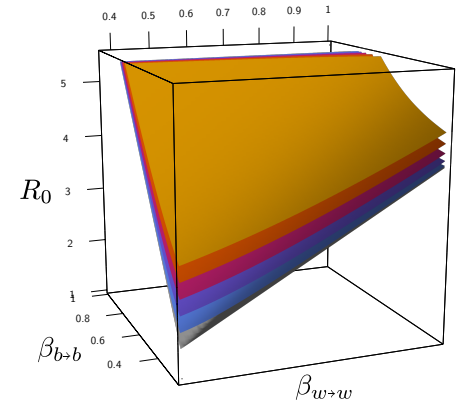
Out-of-sample MSE: *much* worse!

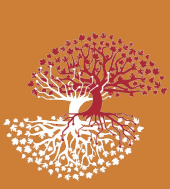




Other works

- A hodge-podge of bivariate regressions on different datasets, analytic derivations, and an argument weaving them together to argue that **reparations would improve public health** (Richardson, Malik, Darity, Mullen, Morse, Malik, Maybank, Bassett, Farmer, et al., 2021)
- Work with Nicole Nelson using **Correspondence Analysis** for a mixed-methods interpretive analysis of the discourse around the “reproducibility crisis” (Nelson et al., 2021; 2022)





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The phenomenon: Critical technical awakenings



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- “Socio-technical integrations” (Fisher et al. 2015; Downey & Zuiderent-Jerak 2017)
 - Data science specifically (Neff et al. 2017; Moats & Seaver 2019; Bates et al. 2020)
 - Roles of STS for data science? (Selbst et al. 2019: Articulate “traps”?)
- Downey & Zuiderent-Jerak 2017: **others [actors] can “benefit from STS sensibilities,” but are “usually not expected to become agents of STS knowledge.”**
- Also: emic/ethic (Jardine, 2004), actor-analyst divide (Collins, 2008), unquestioned (or at least I found nothing normatively justifying it, or even explaining where it came from). Surprising for a field that investigates boundaries and genealogies elsewhere else (last night, Traweek: “Even as we study it, we continue to perform it”, and epistemic avoidance)
- For what question is quantification the right tool?



The phenomenon: Critical consciousness in technical practitioners

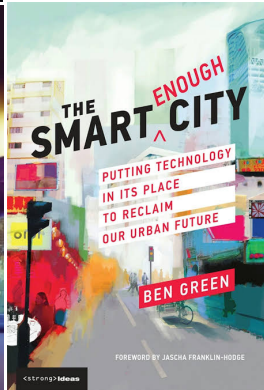
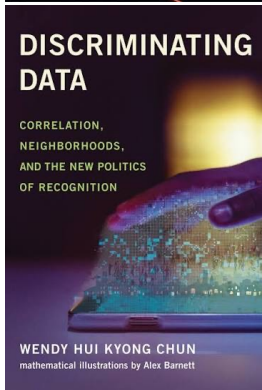
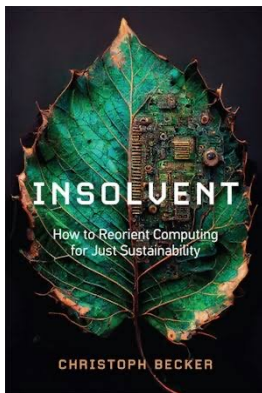
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- “I still remember the **vertigo** I felt during this period; I was speaking these strange disciplinary languages, in a wobbly fashion at first, without knowing what they meant — without knowing what sort of meaning they had...
- “In retrospect, this was the period during which **I began to ‘wake up’, breaking out of a technical cognitive style that I now regard as extremely constricting.**” (Agre, 1997)



Narratives gesturing to “moments of radicalization”

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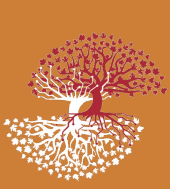
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- Toyama (2015): “**These revelations were hard to take.** I was a computer scientist, a Microsoft employee, and the head of a group that aimed to find digital solutions for the developing world. I wanted nothing more than to see innovation triumph, just as it always did in the engineering papers I was immersed in. But exactly where the need was greatest, technology seemed unable to make a difference.”
- Rogaway (2015): “If cryptography’s most basic aim is to enable secure communications, how could it not be a colossal failure of our field when ordinary people lack even a modicum of communication privacy when interacting electronically? Yet **I soon realized that most cryptographers didn’t see it this way.** Most seemed to feel that the disclosures didn’t even implicate us cryptographers.”
- Chun (2021): “I first heard about the [1989 École Polytechnique] massacre the next morning as I was sitting down to write my Physical Systems exam. The boys behind me asked me if I had heard about the women who were killed in an engineering classroom in Montreal. Thinking it was yet another sick and misogynist engineering joke—engineering was filled with them—I told them to shut up and write the exam. Later that day, when I found out that the massacre had actually happened, I was in shock. I had turned to engineering as a first- generation immigrant in Canada to escape from discrimination and politics. **Disoriented, I turned to the humanities**—to English literature and critical theory—to help me acknowledge the violence and discrimination around me.”
- Gebru (2026): “I would go to academic conferences, and you’d have about 5,000-6,000 people in those conferences, and only a couple of, one or two, you know, a handful of Black people. And at the same time, we had some of these systems, some of the kinds of systems that [the previous guest] was talking about.”



Context of this

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- Malik & Malik (2022): We theorize this genre of autobiographical narratives and experiences in terms of *perspective transformation* (Mezirow, 1978) from adult education, and Freire's *critical consciousness*
- Perspective transformation is disorienting and isolating; codifying new communities and identities can help avoid collapse
 - **Theory of change:** guide those who want to do anti-positivist quant with ideas for new roles, models, and identities
 - Moments of radicalization are not inherently anti-positivist, but we would like them to be
 - E.g., Science for the People (Schmalzer et al., 2018) did not seem to be inherently anti-positivist
 - Many (most?) who become anti-positivist leave scientific practice; shouldn't be only option
- The current, follow-up work: consciously and contentiously create a "mythology" to support developing those identities and conclusions. What communities, people, roles, and work can serve as models and exemplars?



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Progress so far: Write a mythology to codify a field/idea, encourage a community



Groundwork: Quantification as a specific form of abstraction

- Other abstractions
 - Critiques of language (Nietzsche [1873]; Wittgenstein; Zhuangzi)
 - Writing was at first a technology of oppression, and a majority of Mesopotamian city-states rejected it (Lamberg-Karlovsky, 2003)
 - Plato's critique of writing
- The goal in all cases: *conclusions made with/about the abstractions apply to the thing they are abstractions of* (cf. Wigner, 1960)
 - Map is not the territory (Korzybski, 1933); all models are wrong but some are useful (Box, 1979)
 - Performativity (see Healy, 2017): the abstraction creates the reality it purports to describe. Weaker form is maybe akin to Hacking's dynamic nominalism

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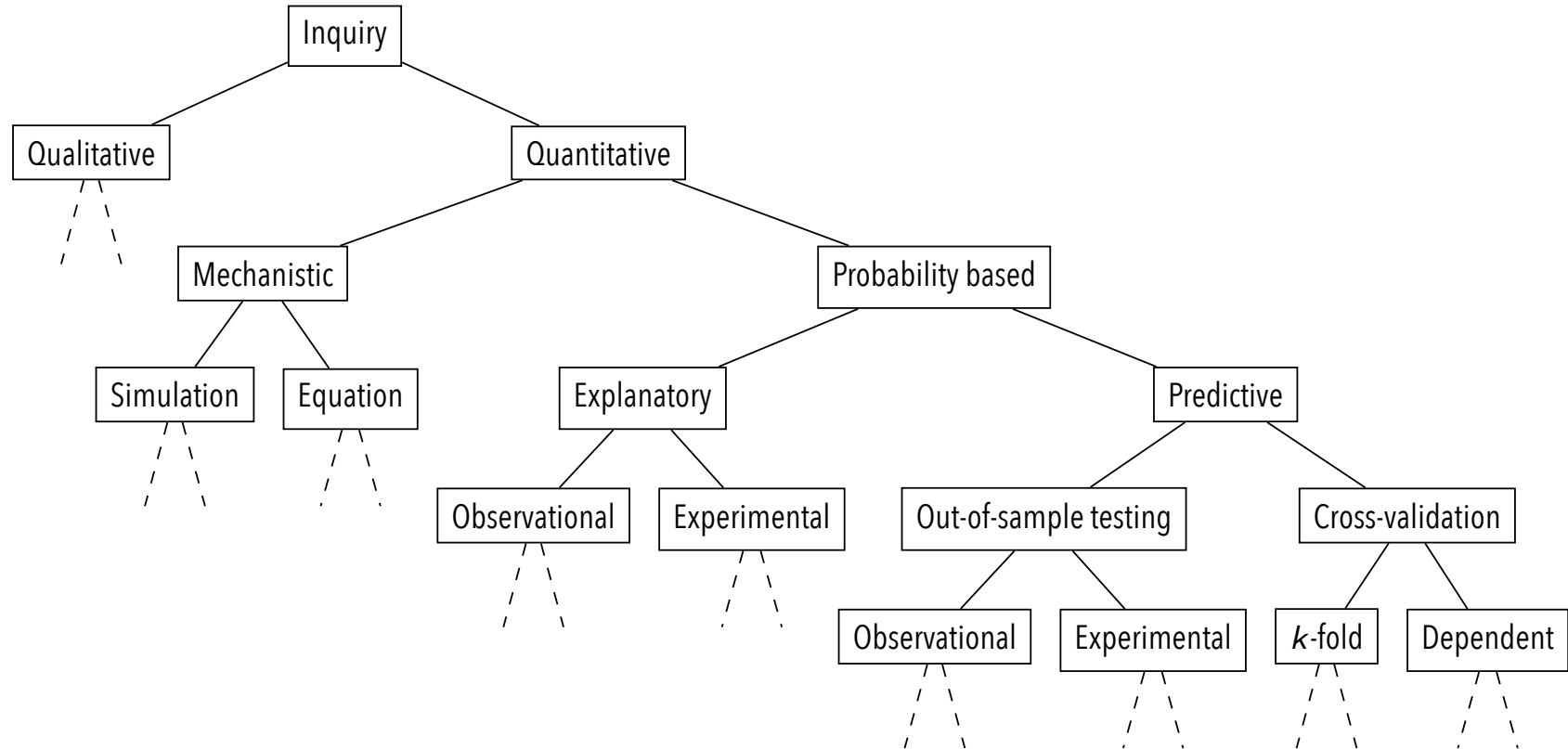
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(Prior work [Malik, 2020]: Varieties of quantification)





Key works: Mismatch between social science theory and quantitative methods

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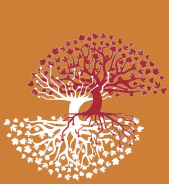
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- Porter (2012): Cultural theorists vs economists in a “thick world”
- Freedman (1997): a statistician who is somewhere between “regression is not suitable for routine use” and “regression might work, but hasn’t yet”
- Abbott (1998): “it is striking how absolutely these assumptions [of statistical models] contradict those of the major theoretical traditions of sociology.”
- Goodhart’s/Campbell’s Law (Goodhart, 1975; Campbell, 1975); Lucas critique (1976); performativity
- Quantitative intersectionality can maybe only ever be “intercategorical”. Is that really intersectionality? (McCall, 2005; Hancock, 2007; Bowleg, 2008; Marecek, 2014; Bowleg & Bauer, 2014; Bauer & Scheim, 2019; Bauer et al., 2021)



Strategic positivism and critiques

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- In geography, Wyly (2009) gives the term “strategic positivism”, after strategic essentialism. But:
 - Sylvia Wynter (1994): “narratively condemned status”
 - Toni Morrison (1970): “there will always be something else”
 - Ruha Benjamin (2018): Does quantification achieve anything, versus “narrative technologies”?
- Quantitative demonstrations of injustice are not sufficient, nor necessary; when are they useful, to what extent?
- *White Logic, White Methods* (2012): selective acceptance/rejection of quantitative legitimacy (I suggest “modeler’s regress”, after Collins)
- Agre (1997): “fallacy of alternatives”. His colleagues always challenged him to build systems that overcame his critiques, which he calls a fallacy



Alternative imaginaries

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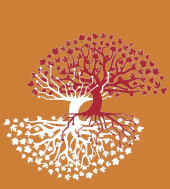
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- Du Bois; Ida Wells-Barnett (Kofi Bright, 2022); Black Radical Republications
 - Du Bois: observing the murdered body of Sam Hose, questioned what his work was worth
 - Robin D. G. Kelley (2003): imaginations around reparations
- Amílcar Cabral's pre-revolutionary agricultural survey work and imaginations (Saraiva, 2022)
- David Blackwell? No written work, but biographical information: denied a position at Princeton after IAS postdoc, went on to head Howard's math department, giving a position to William Claytor, and supporting CAARMS
- "Weird math" (Ochigame, 2019), including Cuban informatics, paraconsistent logics in Brazil, non-binary Turing machines. At least the Cuban informatics, Ochigame notes ultimately did not break out of existing logics
- Leftist French econometric tradition with correspondence analysis? (Desrosières, 2012)



Disciplinary traditions, old and emerging

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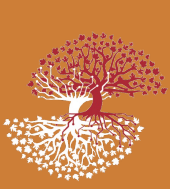
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- Statistics: Not codified, but in people like Freeman (but not anti-positivist)
- Computer science: Weizenbaum, Agre
- Economics: John Stuart Mills (Spiegler, 2015). Core Econ, small leftist traditions (UMass Amherst)
- Sociology: Abbott, Campbell, Bonilla-Silva, Zuberi...
- Political science? Psychology?
- New traditions: Lots within computer science. Starting in mathematics (Carrie Diaz Eaton, Omyra Orteaga, Chad Topaz)
- Engineering: Christoph Becker



Roles for STS?

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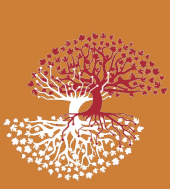
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- Can/should we have hybridity? What would it look like, given that quantitative methods' thinning is hard to justify through anything other than positivism/realism?
- When do certain forms of quantitative demonstration become useful for the project of STS?
- Encouraging critical technical awakenings
- Can technical practitioners become producers of STS knowledge?



Requests

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1. I am not in STS, so can use guidance for the point of the paper (avoiding being Sartonian)
2. Are there *primary* things I've missed? (E.g., I didn't find things around Science for the People that work for this)
3. Is there *secondary* literature on this that I've missed? (Are there sources for the idea of separating out transportable methodologies from substantive claims?)



References (1/3)

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Outline

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Writing a mythology

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