'Anti-Blackness is no glitch':
The need for critical conversations within computer science education

The conversation around and application of computer science often reinforces neoliberal ideals of what pathways students should take. Computer science education is said to be the great equalizer for marginalized youth. We grapple with how this can never be true in an educational system grounded in anti-Blackness.

By Stephanie T. Jones and Natalie Melo

" **A**nti-Blackness is no glitch. The system is accurately rigged, we might say, because, unlike in natural weather forecasts, the weathermen are also the ones who make it rain" [1].

GLITCHES IN THE SYSTEM?
The conversation around and application of computer science often reinforces neoliberal ideals. We see this as technological systems have become intertwined with ideas of "success" in our careers, everyday movement, and personal lives. Facial recognition software, as an example, has been heavily utilized in the past decade for iPhones, Facebook, and security cameras. Many of these systems seem innocuous at first, promoting visions of innovation and security. However, in part because they are largely designed by white males, these same systems are inherently biased. Facial recognition in particular has been shown to be significantly more accurate at detecting white male faces than any other demographic [2]. This gives way to women, people of color, and gender non-conforming people being misidentified, leading to greater opportunities to link them to crimes they did not commit [3]. Even worse, the basis for facial recognition use within systems of power, often publicized for "security," already has a history of harming minoritized communities. Instances of surveillance technologies have existed for many years as evidenced through lantern laws and the origins of the modern passport system [4]. Facial recognition algorithms are one of the many ways computer scientists are not asked to consider the ethical questions that are life or death for some communities [5]. Failing to address and combat systems of power is an intentional part of computer science that must be disrupted.

The same negligence that we see in industry is true within computer science (CS) education, which often

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upholds "The New Jim Code"—wherein and outside of the classroom new technologies are promoted as objective or progressive, but reflect and reproduce existing inequalities and systems of power [1]. We use the expansive term systems of power to highlight western hegemonic forces such as racism, the gender binary, patriarchy, classism, elitism, and more. Within this article, we pay particular attention to the powers upholding anti-Blackness, and how this system "constructs Black subjects, and positions them in and against law, policy, and everyday (civic) life" [6]. Like the facial recognition example, these inequalities also look like the difficulties Black families face in acquiring home loans due to biased data and legal algorithms that disproportionately link Black men to crime [1]. As educators and researchers interrogate systems of power in CS by engaging with critical race theory, there is the potential to help students think through and disrupt the inequalities they may be expected to program into technology.

What will future computer scientists be doing for their and others' communities? What are the tradeoffs, are they really worth it, and who has a say in making that decision? The narrative that access to computer science and CS education reform are the great equalizers for marginalized youth can never be true in an educational system grounded in anti-Blackness. It creates an environment that disproportionately targets Black and brown people to both be subjects that work within and are oppressed by these systems of power [7]. Hence we must ask: Computer science towards what end? We move through this article examining the ways CS education needs to change.

STATE OF THE FIELD
It is easy to forget that computer science is *a tool* that people can use to think with and build with, but it is not the ultimate tool. CS education researchers often position technology as the great equalizer of marginalized communities [8]. This baseline assumption mirrors that of the broader field of education, where the researcher/teacher bestows knowledge to mar-

ginalized communities based on deficit mindsets [8]. Education grounded in a deficit mindset assumes that a person, peoples, or community lack "essential" knowledge, disregarding what other ways of knowing are valued already. This leads to prioritizing the new information researchers and educators want to bestow, rather than valuing the forms of knowledge communities already have. Assimilation into neoliberal ideals perpetuates harm against marginalized communities by reinforcing deficit mindsets and prioritizing corporate and government visions for what a country needs. We see this through the ways access and CS education reform are implemented.

For at least the past decade, efforts to broaden participation in computer science in the United States have been heavily driven by industry, government, and military interests. In 2012, the National Science Foundation (NSF) initiated a push for access to computer science learning for underrepresented groups: particularly women, African Americans, Hispanics, Native Americans and indigenous peoples, and persons with disabilities. The motivation behind this call-to-action was justified by the NSF as a way "to meet projected workforce demands" [9], which perpetuated the idea that equity in computer science is linked to job attainment. When education is commodified, it is clear why the NSF and others see no issue with bright new computer scientists becoming the software engineers and computer science researchers who work to improve government surveillance and automate drones for warfare all in the name of "national security"

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[7]. Gone unquestioned, these technologies end up being used against the citizens they claim to protect, particularly those already minoritized. Many students from minoritized communities are well aware of this negotiation, knowing they may have to "sell out" and sacrifice their values for financial stability [10]. In the meantime, those already in power remain unaffected and continue to profit.

A restricted vision of how and where CS can be applied, combined with unexamined power systems in the field, bleeds into the kinds of research pursued within CS education. An example of CS reform efforts that attempt to but often fail to succeed in addressing the bigger problem is with the integration of culturally relevant pedagogy in computer science curricula. Culturally relevant pedagogy stresses academic success, cultural competence, and critical consciousness [11]. Critical consciousness, as drawn from Brazilian educator Paulo Freire, pertains to "learning to perceive social, political, and economic contradictions, and to take action against the oppressive elements of reality." [12]. The CS research using culturally relevant pedagogies places an overemphasis on academic success and cultural competence, while neglecting the critical consciousness component. In order to create critically conscious pedagogies, educators would need to simultaneously address these systems of power, such as anti-Blackness, which is endemic to everyday life and therefore also endemic to the field of computer science education [6]. Further, while the curriculum attempts to be expansive and inclusive, the assessment methodologies remain standardized, leading to a disconnect between what is learned and what students are graded on. What are the goals of these assessments? Alim and Paris call out how "so-called educational 'integration' has always framed success in terms of a unidirectional assimilation into whiteness," the measures of success in this case still being capitalistic ideals [13]. This kind of computer science education reform overemphasizes ways to increase the number of marginalized populations in the STEM career pipeline. The integration of culturally relevant pedagogy

does not guarantee more inviting and expansive education systems, careers, or life paths.

We want you to consider an alternative vision of computer science education that pushes students toward joy and liberation, thereby creating learning environments that are attentive to student interests, values, and multiple ways of knowing and being [14]. Going beyond this, these environments would also provide students with the skills to question not only what they learned in the program, but around technology's role in society as well as our own role as stewards of this technology. Imagining more liberatory futures, where individuals are no longer restricted by systems of power and can only be reached through intergenerational collective thinking, making particular room for community voices, knowledges, and experiences. Toward this end we propose a closer engagement with critical race theory as a way to disrupt patterns of oppression that have been programmed into our educational system.

CRITICAL RACE THEORY IN COMPUTER SCIENCE EDUCATION

Technology is a political artifact [15], and computer science education must address the systems of power these artifacts are created and used under. Scholars have incorporated the beliefs of social sciences and humanities to stress the importance of addressing structural inequities and the ways in which technologies—as political artifacts—have amplified the oppression of marginalized communities. Critical race theory provides an avenue to discuss anti-Blackness, as well as other western hegemonic systems of power that oppress marginalized people. Within the field of human-computer interaction, recent scholarship has argued for the integration of critical race theory, stressing that racism is ordinary, and thus is ordinary in our technologies; calling out deficit narratives of communities of color; and cautioning on capitalism's exploitative tendencies [16]. Anti-Blackness in particular benefits non-black people through policy level redirection of resources and disciplinary practices that position Black children as prime examples

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of disobedience [6]. When students are sent to remedial courses, based on their assumed disobedience, they are deprived of opportunities such as CS education. CS4ALL initiatives begin to address this, but focus on workforce development rather than student enjoyment and learning. In order to move beyond this, the specificities of anti-Blackness must be emphasized in discussions of computer science education, while attending to racism and harm perpetrated against communities of color [6]. Scholars, therefore, must do the private and public work to address the functions of these systems of power in CS education.

Here within are examples of scholarship that give youth a language and framework for investigating the systems of power that shape technology. These two projects have begun to do the work of reimagining beyond the principles of access and reform and toward critical consciousness. These are a starting, not ending, point for your investigation of these ideas.

Case I: The Young People's Race, Power, and Technology Project. Engaging with critical race theory opens doors to interrogate systems of power. The Young People's Race, Power, and Technology (YPRPT) project provides an example of this within computer science education. This initiative hosts an afterschool program "that brings together Northwestern University undergraduate students with youth and community members to jointly investigate the ethical and social dimensions of specific law enforcement technologies" [17]. The weekly after-school

discussions in the YPRPT program prompted students to investigate the history and impact of surveillance on their own community. It gave way for students to utilize their own lived experiences as a source of knowledge and allowed for them to make an impact in their community by sharing what they learned. YPRPT culminates with a final screening of documentaries created by the students themselves, which discuss the impact of a specific technology within the lives of the students. "Racial Recognition," one student film, highlights how lack of questions of these systems of power in curriculum leads to profiling and injustice for marginalized peoples [3]. In future iterations, we hope to hear the ways students take up computer science learning within these discussions and what ways this learning is carried forward.

Case II: Data in Motion. Hand-in-hand with examining systems of power, there must be a discussion within computer science education research that addresses the reasons for which students are learning CS. Jones et. al disrupt the focus on STEM career pipelines, maintaining their stance that "with adequate pedagogical support, computing can be a tool that youth use to investigate what they know now and what they want to know in the future" [18]. Data in Motion is an initiative that intentionally supports critique and questioning of technology within sports contexts. It aims to move students from being avid consumers of sports and technology, to becoming designers of technology that can answer the questions they have about their own sports performance. Over the course of a week they test and critique commercial wearables, participate in physical computing, and design what kind of wearables they would want to use. This work aims to empower students with the tools to assess technology they use in and outside of the classrooms, and to improve in an area they are passionate about. Moving forward we look forward to more explicit discussion that questions systems of power and anti-Blackness with students within their work, such as analyzing the athletic industrial complex [19]. Ideally this would empower stu-

dents to ask more questions about and find means to address societal issues.

FUTURE DIRECTIONS

Integrating critical race theory within computer science education is a step toward fighting against algorithmic levels of oppression. Critical race theory allows us to examine the ways in which systems of power affect us. It can also be utilized to challenge deficit narratives from an anti-Black system. We push for moving beyond access and reform toward the incorporation of critical consciousness. In order to expose and disrupt systems of power we must discuss them openly. In addition, CS researchers need to interrogate their own inner selves, asking the questions that critical race theory opens up and seeing how we all can be complicit in upholding systems of oppression. This article serves as an introductory point for the thinking and learning we will continue to do around this topic.

We propose the following questions for those in CS education to consider, and hope readers will continue to expand this list, asking themselves:

▶ How is my work complicit in upholding anti-Blackness? How is my work actively fighting anti-Blackness?

▶ Who is funding my work and how are they benefitting from it?

▶ Where is the central location of my work? Is it solely extractive or are there material and learning benefits being sustainably given to others in the community?

▶ What would a computer science education program look like if it fully embraced who a student is and who they want to be?

▶ What would a computer science education program look like if it were geared toward liberation, joy, and consciousness?

As we participate in research in the academy, we are not able to escape questions about the ways in which we, knowingly and unknowingly, perpetuate systems of power. It is up to us as a field to continue dreaming and envisioning outside these walls so that action can be taken toward justice.

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