

Deep Tech Ethics

An Approach to Teaching Social Justice in Computer Science

Rodrigo Ferreira[†]
Computer Science
Rice University
Houston, Texas, USA
rf29@rice.edu

Moshe Y. Vardi
Computer Science
Rice University
Houston, Texas, USA
vardi@cs.rice.edu

ABSTRACT

As ethical questions around the development of contemporary computer technologies have become an increasing point of public and political concern, computer science departments in universities around the world have placed renewed emphasis on tech ethics undergraduate classes as a means to educate students on the large-scale social implications of their actions. Committed to the idea that tech ethics is an essential part of the undergraduate computer science educational curriculum, at Rice University this year we piloted a redesigned version of our Ethics and Accountability in Computer Science class. This effort represents our first attempt at implementing a “deep” tech ethics approach to the course. Incorporating elements from philosophy of technology, critical media theory, and science and technology studies, we encouraged students to learn not only ethics in a “shallow” sense, examining abstract principles or values to determine right and wrong, but rather looking at a series of “deeper” questions more closely related to present issues of social justice and relying on a structural understanding of these problems to develop potential sociotechnical solutions. In this article, we report on our implementation of this redesigned approach. We describe in detail the rationale and strategy for implementing this approach, present key elements of the redesigned syllabus, and discuss final student reflections and course evaluations. To conclude, we examine course achievements, limitations, and lessons learned toward the future, particularly in regard to the number escalating social protests and issues involving Covid-19.

CCS CONCEPTS

• Social and professional topics → Computing education

KEYWORDS Computers, Ethics, Social Justice, Criminal Justice, Sharing Platforms, Fake News

[†] Corresponding Author

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Permissions@acm.org.

SIGCSE '21, March 13–20, 2021, Virtual Event, USA.

© 2021 Association of Computing Machinery.

ACM ISBN 978-1-4503-8062-1/21/03...\$15.00.

DOI: <https://doi.org/10.1145/3408877.3432449>

ACM Reference Format:

Rodrigo Ferreira and Moshe Y. Vardi. 2021. Deep Tech Ethics: An Approach to Teaching Social Justice in Computer Science. In *The 52nd ACM Technical Symposium on Computer Science Education (SIGCSE '21)*, March 13–20, 2021, Virtual Event, USA. ACM, New York, NY, USA. 7 pages. <https://doi.org/10.1145/3408877.3432449>

1 Introduction

Following numerous scandals in technological development and corporate management over the last few years, the visibility and public demand of courses in tech ethics in university campuses has markedly increased. Recently, tech ethics courses and initiatives in universities such as Harvard, Stanford, and MIT have been featured in popular media for their efforts in “trying to train technologists to consider the implications of tools before they’re used” [40].

Certainly, the notion of including ethics in computer science curriculum is not new. At SIGCSE, the question has been under discussion at least since 1972, when Norman Nielsen presented a paper on “Social Responsibility and Computer Education” [27]. Since then, the social impact of technology has been a topic included at least as an elective in the ACM Computing Curricula since 1978 [3] and a point of discussion in several ACM forums [22–24], including recent examples of innovative curricular initiatives in SIGCSE [11,30,35]. More broadly, a collective effort was also recently made by scholars around the world teaching tech ethics to increase the visibility of their work following the publication of a *New York Times* op-ed claiming that academics in this area were “asleep at the wheel” [28]. Since the summer of 2018, a crowd-sourced spreadsheet has collected over 230 different tech ethics syllabi from across at least 94 different universities, based in at least 10 different countries [12].

Fully committed to the value of teaching ethics to computer science students, at Rice University this year we piloted a redesigned version of the undergraduate course Ethics and Accountability in Computer Science. This is a 300-level elective course that was first offered in spring 2019 by the Department of Computer Science as part of an initiative on Technology, Culture, and Society. In spring 2020, the course was redesigned and co-taught for the first time by the two authors, a digital media studies scholar and a computer scientist. During this semester, the course met twice weekly for a total of 2.5 hours each week, and hosted 40 students, the majority of which were seniors ($n = 38$) majoring in Computer Science ($n = 36$, including double majors). Though, as

we discuss later in the paper, some of our plans were forced to change due to the Covid-19 pandemic, the course also included guest lectures from specialists across several academic disciplines at Rice University, including history, philosophy, and education.

Similar to other existing tech ethics courses, as well as to previous versions of our course, the purpose of this class was to create a bridge across disciplines, providing students with different modes of inquiry and knowledge from across the hard sciences to the humanities to cover a variety of topics, including algorithmic bias, privacy and surveillance, work and automation, government regulation, etc. Yet, in addition to relying on an interdisciplinary perspective to cover these diverse topics, a specific objective of redesigning the course was to push the theoretical boundaries within which these topics are traditionally examined. By pulling together a series of methods and insights from theoretical approaches outside of the mainstream analytic philosophical tradition - including primarily from philosophy of technology, critical media theory, and science and technology studies (STS) - this course represented our first attempt at developing a specific approach to teaching tech ethics in our classroom that focused, rather than on applying abstract values or principles to particular case studies, on historical social justice issues that are today amplified by technology and on imagining potential sociotechnical solutions to these problems. In short, our objective was to push the content of our tech ethics curriculum, from examining the timeless and universal values and principles often discussed in ethics courses, to the cultural and political issues that students today are increasingly concerned with, both inside and outside of academic contexts, and that involve critical reflection on long-established social inequalities and structural mechanisms of material and ideological oppression.

In this article, we report on our experience developing this approach in the classroom. In section 2, we describe the rationale behind our approach and the course objectives that we set for students. In section 3, we outline our strategy for implementing this approach, including key details from our syllabus. In section 4, we discuss the results we obtained from student assignments, reflections, and quantitative evaluations. To conclude, in section 5, we provide a conclusion, outline a series of existing limitations, and briefly discuss a series of opportunities for the future, particularly in regard to escalating social issues around the Covid-19 pandemic.

2 Deep Tech Ethics

Despite multiple efforts by tech ethics educators to introduce a number of diverse ethical perspectives and to cover a wide range of relevant topics, social justice remains a relatively underexamined topic in tech ethics syllabi. Fiesler, Garret, and Beard's analysis of 115 syllabi found in the open spreadsheet described in the previous section [13] reports that out of all topics found across different syllabi, "law and policy," "privacy and surveillance" and "philosophy" are the most common. These topics are followed in fourth place by "inequality, justice, and human rights." This is a topic which, even though it trails the top three

closely and the authors describe as also appearing in relation to the topic of "AI and algorithms" (fifth place on the list), it only appears per se in 59 of 115 syllabi, or slightly more than half of them.

From our point of view, social justice is the single most important issue confronting computer science students today. Throughout the past few decades, and particularly since the 2008 financial crisis, there has been a steep decline in public trust in social institutions, such as government, businesses, and media outlets [42]. This trust crisis has had a number of implications on the role of technology and technology developers in society. On the one hand, it has opened the doors for people to increasingly rely on computing technology as they help shape new modes of social interaction, economic production, and political regulation. On the other hand, in the growing absence of traditional kinds of social institutions and forms of economic and political management, various technology developers and corporations have often betrayed the newfound trust awarded to them, either as a result of ignorance of the large-scale consequences of their actions, or as a result of them prioritizing private economic and political interests over that of society as a whole. This situation has in many ways led to the public disgruntlement against technology developers, popularly referred to as the "techlash" [14].

In our quest to grant students the power to gain concrete understanding of the ethical and social issues emerging in the present historical juncture, we decided to formulate what we refer to as a "deep" ethics approach to our class. Premised by the idea that our present experience of everyday life and normative prejudices supervene on a number of underlying material and ideological structures, the fundamental impetus for this approach was to provide computer science students interested in ethics with the theoretical tools to determine, not only what is "right" or "wrong" in an abstract sense, but also to understand the broader historical, politico-economic, and affective conditions that inform their critical-thinking and decision-making processes. In other words, our focus was to help students understand how their actions, as individually well-intentioned as they might seem, or as justifiable as they might be by any kind of timeless and universal frame, might already be embedded within a number of underlying social structures that - without their knowledge - might actively be helping to perpetuate existing social injustices.

Though we admit that the term "social justice" is no less an ambiguous concept than "ethics" itself, and the conceptual barriers separating justice from injustice are unclear, for us this approach implies a basic commitment to the idea that any sense of justice entails justice *for all*. It has already been suggested by scholars that, given the collective nature of tech ethics problems, more "political philosophy" should be incorporated in computer ethics curricula [20], and already a number of courses exist that focus on the "politics" of technology, such as courses on the "Politics of Algorithms" (Stanford) and "Big Data and Its Politics" (Georgetown) [12]. In our approach, we completely agree and take inspiration from such efforts, for we definitively see value in adding more "politics" into "ethics." At the same time, however,

we are deeply aware that no political sense of social justice as social-justice-for-all can exist without first challenging certain fundamental premises on which contemporary political structures have been built.

As the Hobbesian myth about “war” as “the state of nature” [21] makes clear, certain fundamental tenets of the western liberal tradition are premised upon an ontology of individual rational agents freely bargaining for their collective well-being. When two individuals stand vulnerable and with equal power over one another, the social contract appears as the clear and rational choice to guarantee their safety. From our perspective, focusing on the present historical juncture entails necessarily recognizing both that for a long time now not everyone has stood in equal relation of vulnerability and power to one another. Since the foundation of modern governments, certain groups of people, either because of their gender, race, class, or physical ability, have been excluded from the decision-making roles of any such social “contract.” Instead, these social groups have been bound to a certain order, not by free and rational decision, but instead by ideological or repressive force, one which has caused a degree of pain and suffering that cannot be simply washed away by any thought experiment or hidden behind any kind of “veil of ignorance” [29], no matter how forward-looking and conceptually productive these theoretical constructs might be.

Following this commitment to expanding our syllabus beyond traditional ethics to recognize these historical asymmetries and oppression, our course had three objectives.

First, for students to develop an understanding of the aforementioned power dynamics, specifically focusing on the social and political context in which contemporary technologies have historically emerged, and how these factors have at times helped reinforce and normalize existing social inequalities.

Second, for students to consider critically the kinds of “solutions” that are present today. As technology critics have for a long time suggested, the “Californian ideology” in which many technologies have developed in the United States, has been often oblivious to social and political inequalities and concerns [4]. This historical phenomenon is often embodied today by the mantra “there’s an app for that!” or the term “solutionism”, which refers to the application of a “technical” solutions to issues that are of social complexity [26]. One example that has been widely discussed in the media (and which we also addressed in class and discuss in section 3 below) is that of fact-checking mechanisms for “fake news”. As critics have argued, imposing any kind of filter to “fake news” cannot offer a definite solution, since it does not refer to the social circumstances in which “fake news” are consumed and produced [8]. Fake news are a problem not only in the sense that they are “fake” or untrue, but also in that they are presented by nefarious or incompetent actors and are received by naive or ignorant readers as “news” when they in fact do not meet simple journalistic standards [25].

Our third objective was to invite students to reflect on the existing “solutionist” mentality and imagine potential sociotechnical

changes. Borrowing this term from STS, what we hope is to teach students that technical solutions should either be accompanied by or immediately encourage a more structural social change. In other words, rather than attempting to momentarily bandage or “cover up” a social problem, technical solutions should help to either strengthen or challenge existing social relations in such a way that help create more effective and sustainable changes for the future.

3 Social Justice in The Tech Ethics Syllabus

We developed our “deep” ethics approach in our course in two fundamental ways. First, in a series of introductory lectures, providing an overview to students of contemporary ethical approaches, including our view on the significance of social justice. Second, in analyzing specific topics, by embedding a series of theories and insights that helped us take the topic to a “deeper” level, leading both to material and ideological analysis as well as to discussion on potential sociotechnical solutions.

3.1 Technology and Social Justice

We dedicated several sessions during our first course unit to exploring multiple ethical approaches to contemporary tech-related problems and questions. To this purpose, in addition to introducing students to main ethical positions in “analytic” philosophy, such as utilitarianism, deontology, and virtue ethics, and fundamental ideas in political philosophy, such as Rawls’ version of “justice is fairness,” we were also inspired by philosophy of technology, critical media theory, and STS, to further encourage students to examine the current situation from a broader historical, politico-economic, and affective perspective.

In specific terms, this meant introducing a fundamental idea that any technology or technology-mediated practice is never politically neutral but is always already embedded within a particular social context and guided by the power asymmetries that exist therein. To illustrate this point, we introduced a series of examples famously articulated by French philosopher Michel Foucault in his career-long examination of historical techniques and technologies of power [15]. From the Middle Ages, or the time that Foucault refers to as “sovereign societies,” kings used guillotines and public executions to manage their sovereign authority. Later on, after the Enlightenment and the rise of industrial technologies, at the times of “disciplinary societies,” such hierarchical forms of management were superseded, but only to give way to new ones: social institutions such as factories, hospitals, and prisons, used assembly lines and panopticon-like surveillance mechanisms to exercise a decentralized, bureaucratic form of management. Today, as “new” technologies such as computers and information networks have seemingly helped free people from such hierarchical and institutional control, Foucault’s historical periodization opens the door for a crucial provocation: how is power managed and enforced today? And what technologies and techniques accompany it?

Following this provocation, we prompted students to reflect on existing techno-utopian tendencies in the media and the tech industry, particularly focusing on the many ways in which the network affordances of computer technology tend to obfuscate existing power structures behind a screen of increased mobility, freedom, and horizontal communication. Today, even as computer technologies have opened the possibility of new forms of “peer-to-peer” cooperation, Alexander R. Galloway warns of “believing in the power of distributed networks to free people from the enforcement of power as such [18]. This “reticular fallacy” as he calls it, “does not consider the fact that ... the distributed network is simply a different form of organization, one with its own special brand of management and control” [18]. As technology structures have changed, power-management structures have also “mutated” to employ new, less conspicuous forms of “soft control” [9]. Users today are encouraged by technical and ideological mechanisms to increasingly “datify” themselves, creating the resources that, on the one hand, will allow them to better manage themselves, but, on the other hand, will also leave the door open for them to be exploited in new and more violent ways for economic and political purposes.

Thinking along these critical lines, we formalized a series of questions to pose to students in different ways throughout each course unit in order to help them think about the particular power dynamics related to specific technologies and technical practices.

1. History and Context. When examining a specific technology, what are the historical and cultural circumstances in which it emerged? When was it developed? For what purpose? How has its usage and function changed from then to today?
2. Power Dynamics and Hegemony. Who benefits from this technology? At the expense of whose labor? How is this technology sold and marketed? What are potential economic and political interests for the proliferation of this technology?
3. Developing Effective Long-Term Solutions. What solutions are currently being implemented to address this labor/benefit asymmetry? In what ways do they reinforce or challenge the status quo? What are the long- and short-term implications of these solutions and who will benefit from them?

Following the formulation of these questions, we sought to implement our “deep” tech ethics approach to each of the topics discussed in class. In the rest of this section, we discuss three examples, including in each case: (i) a brief overview of the topic; (ii) an analysis of the topic both from a “shallow” tech ethics approach and a “deep” tech ethics approach; and (iii) a list of readings that we discussed in class and that helped shape our discussion and student’s response.

3.2 Criminal Justice

Topic: Emerging risk assessment technologies such as COMPAS and PredPol have been recently deployed in the US to help assist with criminal sentencing and police resource management. Even though these proprietary tools have been marketed as helping to make distinct elements of the criminal justice system more

efficient, they have at same time been shown to help perpetuate pre-existing social and racial biases and to lead to inadequate or wrongful convictions [2,19,31].

Tech Ethics Approach: Even though these mechanisms did not use “race” as a variable, other proxies were used that corresponded with race, such as subject residential location. An ethical solution to this problem would encourage developers to pay further attention to data sample populations, clarifying the relationship between different variables, and establishing greater norms for transparency and accountability in usage of these algorithms.

“Deep” Tech Ethics Approach: Beyond analyzing the issues with data collection and representation, we should examine the historical role of the criminal justice system in the United States. The disproportionate incarceration of people of color in this country is not only the product of racial bias, but also of private economic and political interests that benefit from the implementation of proprietary software and mass incarceration in private prisons [39]. A “deep” ethical approach would suggest, not only looking to develop more accurate algorithms, but also looking at structural reforms of existing economic incentives around the criminal justice system and of the overall transformation of prisons from sites of punishment to rehabilitation.

Recommended readings: Louis Althusser’s *“Ideology and Ideological State Apparatuses”* [1]; Jackie Wang’s *“This Is a Story About Nerds and Cops: PredPol and Algorithmic Policing”* [38]; Alex Vitale’s *The End of Policing* [36].

3.3 “Sharing” Economies

Topic: Borrowing some of the language and collective spirit that first arose from free and collaborative crowd-sourced projects such as Wikipedia during the time of Web 2.0, a new set of “sharing” platforms have since emerged, such as Uber, that seemingly allow for easier, more economic, and more socially-responsible exchange between consumers and producers. However, these “sharing” economies have shown to circumvent existing government regulation and to undermine labor rights.

Tech Ethics Approach: While “sharing” platforms such as Uber may pose a short-term benefit for consumers, Uber’s strategy constitutes an instance of “wiki-washing” [17]: representing an action as “sharing” when it is in fact renting people’s services. As independent contractors, Uber drivers are not eligible for social benefits, nor are able to make demands through collective mechanisms such as unions. An ethical solution would suggest either greater accountability on behalf of Uber, raising commission rates or, on behalf of the government, either banning Uber or implementing regulatory measures to protect workers.

“Deep” Tech Ethics Approach: Uber’s marketing lingo inviting drivers to “be their own boss” echoes the creative and entrepreneurial spirit that was once oppositional to large corporations [6], but is now predominant strategy used by “start-ups” to hyper-outsource expenses and profit from unpaid affective driver labor, all while implementing “nudging” mechanisms that help maintain driver behavior under corporate guidelines [32]. A

“deep” ethical solution would suggest not only a change to working terms and conditions, but a reoriented application of open-source technology toward developing alternative economic systems, more along the lines of cooperative economies [34].

Recommended Readings: Alex Rosenblat and Luke Stark’s *“Algorithmic Labor and Information Asymmetries: A Case Study of Uber’s Drivers”* [32]; Trebor Scholz’s *“Platform Cooperativism vs. the Sharing Economy”* [33]; Christian Fuchs’s *“AirBnB and Uber: The Political Economy of Online Sharing Platforms”* [16]

3.4 Fake News

Topic: While at first social media seemed to open the doors to “free speech,” particularly in social settings ruled by political censorships and/or where minority viewpoints have traditionally not had an opportunity to express their discontents through mass media, social media has now become a significant source of “fake news” and other modes of public disinformation around the world. The negative implications of this transformation affect informed dialogue, political participation, and democratic governance.

Tech Ethics Approach: The proliferation of “fake news” and of corporate filter bubbles represent a problem insofar as they bypass traditional editorial functions and reinforce existing biases and social prejudices underlying political partisanship. At the threat of public and political pressures, platforms are already making numerous attempts to address these issues. Existing solutions refer to increased corporate ethical standards, including fact-checking and other forms of content moderation, such as trust indicators, and modifying proprietary algorithmic mechanisms.

“Deep” Tech Ethics Approach: Even though these solutions help filter the spread of false information on social media platforms, promoting self-driven corporate ethical action over government regulation opens the door to deceptive corporate-marketing strategies, a phenomenon popularly known as “ethics washing” [37]. Even in a most generous interpretation of self-driven corporate action, the problem persists in that socio-economic class and race appear as factors in “fake news” consumption [7], thereby creating a potential difference in how “fake news” may negatively affect certain social populations over others. “Deep” solutions would refer toward creating a more educational media environment, offering not only “facts” but also contextual cues needed to understand the meaning and significance of presented information and that can help establish a degree of journalistic editorial authority over private commercial interests.

Recommended Readings: Nicholas Diakopoulos’s *Automating the News: How Algorithms Are Rewriting the Media* [10]; Shoshana Zuboff’s *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* [41]; W.L. Bennett and Steven Livingston’s *The Disinformation Order: Disruptive Communication and The Decline Of Democratic Institutions* [5]

4 Discussion

Student response to each topic was collected throughout the semester via a series of online posts and assignments.

Simultaneously, student feedback on the course was collected through a mid-term survey, a series of final reflections, and a quantitative course evaluation survey. In this section we analyze results obtained regarding our class objectives, and final evaluative scores in comparison to previous versions of the course.

4.1 Objectives

As mentioned in section 1, our objectives in the course were (i) to introduce students to existing tech-related issues and questions in regard to social justice (ii) to provide them with critical tools to examine the status quo and/or existing technical solutions, and (iii) to invite them to develop or redesign existing solutions tending more toward structural social issues.

4.1.1 Social Justice. Students were surprised to find an intrinsic nature to the relation between technology and politics. Several students admitted to thinking, prior to the course, that there was no intuitive relation between the two. “Technology,” one student said, was “objective and ‘right’ (they’re just bytes of code, after all).” Despite this initial position, students were enthused to discover the contextual depth within which contemporary technologies have developed. “No technology exists in a vacuum,” one student said. Above all, students displayed having understood that the historical changes brought forth by specific technologies have had widespread ethical and political implications that did not always benefit all members of society. As one student strikingly put it: “Those creating technology just need to be more cautious about *whose* lives they speak of improving... Every arrow forward is usually accompanied by one static and another backward.”

4.1.2 Critical Perspective on Existing Solutions. In addition to understanding the ethical and political implications of technology, students also demonstrated a change in their attitude towards the kind of solutions that technology per se might be able to offer. For example, one student wrote: “I believed that there was no problem that couldn’t be solved by the all-powerful technology; it was only a matter of time before scientists devised the correct algorithms to solve all the problems of the world. Looking back, I realize how naive I was.” Students were also often critical of existing technologies that seem to offer a solution to social problems, when this solution does not create any kind of long-term fix and instead serves private economic or political gain. Certain students were highly critical of the Big Tech’s “disruptive” attitude: “Disruptive technologies are just that – disruptive in a way that can affect society.” Other students focused on critiquing technology developers’ prioritization of efficiency and speed over social interest. One student said: “the old ‘move fast and break things’ model is not acceptable. When the only thing that can ‘break’ is an app or website, this tradeoff is acceptable. When democracy and industries that people rely on for their wellbeing begin falling apart due to negligence, that is when you know how dangerous a philosophy can be.”

4.1.3. Developing sociotechnical solutions. In addition to discussing a number of social justice issues in class, we planned to ask students to design a conceptual prototype that would address one of these issues as a final project. This meant imagining not only a

technological change or innovation, but also reflecting on the social circumstances in that this technological intervention would take place and considering its long-term future effects. Due to the disruption caused by the Covid-19 pandemic, however, at the end we decided to slightly re-orient this assignment to address topics discussed in class that overlapped with emerging social issues related to the pandemic. In this regard, most student groups decided to focus their final project on either contact tracing and surveillance or on fake news. In both cases, students came up with inventive designs that represented this sociotechnical spirit. For example, as it refers to contact tracing and surveillance, one group discussed creating a database to keep record of all access points to user information, while at the same time developing a regulatory body that could implement a privacy-protection law similar to “right to be forgotten” currently existing in Europe. Regarding fake news, one group built on significant elements from our class conversation on the need for further context in social media news and foreshadowed many changes to social media platform design that have since taken place. This group encouraged social media corporations to incorporate banners of the sort that would highlight Covid-19-related issues, beyond any profit-driven algorithmic decision implemented by the newsfeed. This kind of “priority banner” system, they argued, could be carried forth beyond the pandemic to be implemented across other social and political issues and would allow social-media moderators to take more the role of traditional editors, contextualizing news by giving them significance through visible editorial order and refereed links.

4.2 Overall Quantitative Results

In addition to meeting the objectives in several ways, the course also improved from its two previous iterations in quantitative terms. The course ranked higher than the average score of the two first iterations of the class along several significant student course evaluation metrics. As the table below demonstrates, the course ranked significantly higher in terms of organization and assignments, oscillating closer to “outstanding” than to “good” in both categories. Most importantly, the course also received a significantly higher overall score than previous versions.

Item	S19 & F20	S20	Change
Assignments	1.96	1.46	0.50
Organization	1.80	1.32	0.48
Challenge	1.92	1.5	1.69
Overall	1.71	1.29	0.42

S = Spring, F = Fall. Score range 1 to 5. 1 = Outstanding, 2 = Good, 3 = Average, 4 = Fair, 5 = Poor. “Challenge” = “I was challenged to extend my capabilities: 1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree. N = 38.

In specific regard to the set of scores included in the final quantitative survey around the level of “challenge” presented by the class, one important point to note is that despite a relative unfamiliarity with many of the theoretical positions described in the course, students did not find the course to excessively challenging. A survey conducted halfway through the term, revealed that students were not all too familiar with the topics discussed in class. However, throughout the course, students

demonstrated large success in grasping central concepts and developing arguments of their own. As one student put it: “the class helped to formalize some of the language around technology issues. Terms like technocracy, cyberlibertarianism, and cyberpunk represent ideas that I could formulate, but not formalize into language.” At the end, students found the course to be more challenging than previous iterations of the course, but only slightly so than other courses in the university.

5 Conclusion

As mentioned in the introduction, the redesigned version of our computer ethics course was aimed at encouraging students to focus more deeply on issues associated with social justice. In more concrete terms, this meant encouraging students to think from a material and affective perspective, examining questions of power, to examine and identify problems with current technical solutions, and to develop sociotechnical solutions of their own. According to feedback obtained from students, our course succeeded in many respects in achieving its objectives. From a quantitative standpoint, the class also significantly improved from its previous versions, as it obtained a higher score in terms of all three content-oriented metrics: organization, assignments, and overall score. Despite this success, being the first time that we taught this redesigned version of the class, there were still a few challenges we experienced and opportunities we found to make future changes to the course.

A primary challenge that we faced this semester, just like many educators across the world, was navigating around the Covid-19 pandemic. This situation disrupted our plans for the semester by forcing us to compress our schedule, cancel guest lectures, and reorient certain activities. Yet, despite these obstacles, it also reinvigorated our efforts by highlighting the importance of certain social justice issues we had already planned to discuss in class. For example, noticing how government response seemed to affect more positively certain social groups over others, we debated whether Uber drivers should receive the same relief package as full-time employees. After the class was finished, instances of police brutality during the time of lockdown also emphasized several racial prejudices in the criminal justice system that we had previously discussed in class.

In future iterations of this course we hope to learn from these challenges and continue to find ways to develop our “deep” ethics approach. As we see it, these reflections on public health and politics only help underline the importance of addressing social justice issues throughout our computer ethics syllabus. By continuing to develop and refine the notion of a “deep” ethics approach we express our commitment to helping computer students break through with those historical structures, to challenge power dynamics, and create positive large-scale changes in society.

ACKNOWLEDGMENTS

The work of the first author is supported by the Rice Academy of Fellows and the Initiative on Technology, Culture, and Society at Rice University.

REFERENCES

- [1] Louis Althusser. 2008. *On Ideology*. Verso, London; New York.
- [2] Julia Angwin, Jeff Larson, Surya Mattu, and Lauren Kirchner. 2016. Machine Bias. *ProPublica* (May 2016). Retrieved November 2, 2020 from https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing?token=H5XUYhBoyN_v2qMTsijRtLcJOEweQC5e
- [3] Richard H. Austing, Bruce H. Barnes, Della T. Bonnette, Gerald L. Engel, and Gordon Stokes. 1979. Curriculum '78: recommendations for the undergraduate program in computer science. *Commun. ACM* 22, 3 (March 1979), 147–166. DOI:<https://doi.org/10.1145/359080.359083>
- [4] Cameron Barbrook. 1995. The Californian Ideology. *Mute*. Retrieved August 11, 2020 from <https://www.metamute.org/editorial/articles/californian-ideology>
- [5] W Lance Bennett and Steven Livingston. 2018. The disinformation order: Disruptive communication and the decline of democratic institutions. *Eur. J. Commun.* 33, 2 (April 2018), 122–139. DOI:<https://doi.org/10.1177/0267323118760317>
- [6] Luc Boltanski and Eve Chiapello. 2005. *The New Spirit of Capitalism*. Verso.
- [7] Joel Breakstone, Mark Smith, Sam Wineburg, Amie Rapaport, Jill Carle, Marshall Garland, Anna Saavedra, and Gibson Consulting. 2019. *Students' Civic Online Reasoning: A National Portrait*. Stanford History Education Group. Retrieved from <https://stacks.stanford.edu/file/gf151tb4868/Civic%20Online%20Reasoning%20National%20Portrait.pdf>
- [8] danah boyd. 2017. Google and Facebook Can't Just Make Fake News Disappear. *Wired*. Retrieved August 6, 2020 from <https://www.wired.com/2017/03/google-and-facebook-cant-just-make-fake-news-disappear/>
- [9] Gilles Deleuze. 1992. Postscript on the Societies of Control. *October* 59, (1992), 3–7. Retrieved March 13, 2020 from <https://www.jstor.org/stable/778828>
- [10] Nicholas Diakopoulos. 2019. *Automating the News: How Algorithms Are Rewriting the Media*. Harvard University Press, Cambridge, Massachusetts.
- [11] Stacy A. Doore, Casey Fiesler, Michael S. Kirkpatrick, Evan Peck, and Mehran Sahami. 2020. Assignments that Blend Ethics and Technology. In *Proceedings of the 51st ACM Technical Symposium on Computer Science Education (SIGCSE '20)*, Association for Computing Machinery, New York, NY, USA, 475–476. DOI:<https://doi.org/10.1145/3328778.3366994>
- [12] Casey Fiesler. 2019. Tech Ethics Curricula: A Collection of Syllabi. *Medium*. Retrieved August 11, 2020 from <https://medium.com/@cfiesler/tech-ethics-curricula-a-collection-of-syllabi-3eedfb76be18>
- [13] Casey Fiesler, Natalie Garrett, and Nathan Beard. 2020. What Do We Teach When We Teach Tech Ethics?: A Syllabi Analysis. In *Proceedings of the 51st ACM Technical Symposium on Computer Science Education*, ACM, Portland OR USA, 289–295. DOI:<https://doi.org/10.1145/3328778.3366825>
- [14] Rana Foroohar. 2018. Year in a Word: Techlash. *Financial Times*. Retrieved August 11, 2020 from <https://www.ft.com/content/76578fba-fca1-11e8-ac00-57a2a826423e>
- [15] Michel Foucault. 1995. *Discipline & Punish: The Birth of the Prison*. Vintage Books, New York.
- [16] Christian Fuchs. 2017. AirBnB and Uber: The Political Economy of Online Sharing Platforms. In *Social Media: A Critical Introduction* (2 edition). SAGE Publications Ltd, Thousand Oaks, CA.
- [17] Mayo Fuster Morell. 2011. *The Unethics of Sharing: Wikiwashing*. Social Science Research Network, Rochester, NY. Retrieved May 13, 2019 from <https://papers.ssrn.com/abstract=2842693>
- [18] Alexander R. Galloway. 2014. The Reticular Fallacy. *Culture and Communication*. Retrieved August 6, 2020 from <http://cultureandcommunication.org/galloway/the-reticular-fallacy>
- [19] Will Douglas Heaven. 2020. Predictive policing algorithms are racist. They need to be dismantled. *MIT Technology Review*. Retrieved November 2, 2020 from <https://www.technologyreview.com/2020/07/17/1005396/predictive-policing-algorithms-racist-dismantled-machine-learning-bias-criminal-justice/>
- [20] Johannes Himmelreich. 2019. Ethics of technology needs more political philosophy. *Commun. ACM* 63, 1 (December 2019), 33–35. DOI:<https://doi.org/10.1145/3339905>
- [21] Thomas Hobbes. 2017. *Leviathan* (First Edition edition ed.). Penguin Classics, Harmondsworth, Middlesex.
- [22] Chuck Huff and C. Dianne Martin. 1995. Computing consequences: a framework for teaching ethical computing. *Commun. ACM* 38, 12 (December 1995), 75–84. DOI:<https://doi.org/10.1145/219663.219687>
- [23] Dianne C. Martin and David H. Martin. 1990. Professional codes of conduct and computer ethics education. *ACM SIGCAS Comput. Soc.* 20, 2 (July 1990), 18–29. DOI:<https://doi.org/10.1145/95554.95560>
- [24] Dianne Martin, Chuck Huff, Donald Gotterbarn, and Keith Miller. 1996. Curriculum guidelines for teaching the consequences of computing. In *Proceedings of the symposium on Computers and the quality of life (CQL '96)*, Association for Computing Machinery, New York, NY, USA, 73–85. DOI:<https://doi.org/10.1145/238339.238376>
- [25] Eliot Michaelson, Rachel Sterken, and Jessica Pepp. 2019. What's New About Fake News? *J. Ethics Soc. Philos.* 16, 2 (July 2019). DOI:<https://doi.org/10.26556/jesp.v16i2.629>
- [26] Evgeny Morozov. 2014. *To Save Everything, Click Here: The Folly of Technological Solutionism*. PublicAffairs, New York, NY.
- [27] Norman R. Nielsen. 1972. Social responsibility and computer education. In *Proceedings of the second SIGCSE technical symposium on Education in computer science (SIGCSE '72)*, Association for Computing Machinery, New York, NY, USA, 90–96. DOI:<https://doi.org/10.1145/800155.805011>
- [28] Cathy O'Neil. 2017. Opinion | The Ivory Tower Can't Keep Ignoring Tech. *The New York Times*. Retrieved July 15, 2020 from <https://www.nytimes.com/2017/11/14/opinion/academia-tech-algorithms.html>
- [29] John Rawls. 1999. *A Theory of Justice* (Second ed.). Belknap Press: An Imprint of Harvard University Press, Cambridge, Mass.
- [30] Rob Reich, Mehran Sahami, Jeremy M. Weinstein, and Hilary Cohen. 2020. Teaching Computer Ethics: A Deeply Multidisciplinary Approach. In *Proceedings of the 51st ACM Technical Symposium on Computer Science Education (SIGCSE '20)*, Association for Computing Machinery, New York, NY, USA, 296–302. DOI:<https://doi.org/10.1145/3328778.3366951>
- [31] Rashida Richardson, Jason Schultz, and Kate Crawford. 2019. *Dirty Data, Bad Predictions: How Civil Rights Violations Impact Police Data, Predictive Policing Systems, and Justice*. Social Science Research Network, Rochester, NY. Retrieved November 2, 2020 from <https://papers.ssrn.com/abstract=3333423>
- [32] Alex Rosenblat and Luke Stark. 2016. Algorithmic Labor and Information Asymmetries: A Case Study of Uber's Drivers. *Int. J. Commun.* 10, (2016), 3758–3784.
- [33] Trebor Scholz. 2015. Platform Cooperativism vs. the Sharing Economy. *Medium*. Retrieved August 6, 2020 from <https://medium.com/@trebors/platform-cooperativism-vs-the-sharing-economy-2ea737f1b5ad>
- [34] Trebor Scholz. 2016. *Overworked and Underpaid: How Workers Are Disrupting the Digital Economy* (1 edition ed.). Polity, Cambridge, UK; Malden, MA.
- [35] Michael Skirpan, Nathan Beard, Srinjita Bhaduri, Casey Fiesler, and Tom Yeh. 2018. Ethics Education in Context: A Case Study of Novel Ethics Activities for the CS Classroom. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education (SIGCSE '18)*, Association for Computing Machinery, New York, NY, USA, 940–945. DOI:<https://doi.org/10.1145/3159450.3159573>
- [36] Alex S. Vitale. 2017. *The End of Policing*. Verso, London; New York.
- [37] Ben Wagner. 2019. Ethics As An Escape From Regulation. From "Ethics-Washing" To Ethics-Shopping? In *Being Profiled*. 84–89. DOI:<https://doi.org/10.1515/9789048550180-016>
- [38] Jackie Wang. 2017. "This Is a Story About Nerds and Cops": PredPol and Algorithmic Policing. *E-Flux* 87, (December 2017). Retrieved August 6, 2020 from <https://www.e-flux.com/journal/87/169043/this-is-a-story-about-nerds-and-cops-predpol-and-algorithmic-policing/>
- [39] Jackie Wang. 2018. *Carceral Capitalism*. Semiotext, South Pasadena, CA.
- [40] Stephanie Wykstra. 2019. Fixing Tech's Ethics Problem Starts in the Classroom. Retrieved August 6, 2020 from <https://www.thenation.com/article/archive/teaching-technology-ethics-big-data-algorithms-artificial-intelligence/>
- [41] Shoshana Zuboff. 2019. *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* (1 edition ed.). PublicAffairs, New York.
- [42] 2017 Edelman Trust Barometer. *Edelman*. Retrieved August 6, 2020 from <https://www.edelman.com/research/2017-edelman-trust-barometer>