CODED BIAS

THERE IS NO ALGORITHM FOR TRUTH

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USING THIS GUIDE

Americans interact with artificial intelligence (AI) on a daily basis. Without your even knowing it, AI could be determining if you get a loan, a job, or into college. The increasing use of AI over the past decade demands a larger conversation about the ways automated decision-making impacts society.

The film *Coded Bias*, along with this guide, sets out to demystify the algorithms that increasingly govern our lives. The background information and discussion questions in the guide will help viewers initiate meaningful dialogue about issues raised in the film. This guide also includes advice to help organizers host an engaging virtual screening of the film.

Thank you for supporting these goals for *Coded Bias* discussions and film events:

- Create a space where people can learn about the social implications of AI and discuss American civil rights and liberties in the context of technology.
- Educate viewers about the uses of AI for surveillance and automated decision making and discuss options for public oversight.
- Recognize women and people of color working in technology and discuss ways to increase inclusion in the tech industry.
- Provide tools to enable communities to participate in the contemporary discussion about racism and sexism and its effects on American democracy.

ABOUT INDIE LENS POP-UP

Indie Lens Pop-Up is a neighborhood series that brings people together for film screenings and community-driven conversations. Featuring documentaries seen on PBS's *Independent Lens*, Indie Lens Pop-Up draws local residents, leaders, and organizations together to discuss what matters most, from newsworthy topics and social issues to family and community relationships.

During the COVID-19 pandemic, Indie Lens Pop-Up is virtual. Audiences can watch films together from the safety of their homes on OVEE, the Indie Lens Pop-Up virtual theater. Make friends, share stories, and join the conversation at an Indie Lens Pop-Up screening online: **bit.ly/ILPOP-Screenings**.

ABOUT THE FILM

FACE DETECTED

When MIT Media Lab researcher Joy Buolamwini discovers that many facial recognition technologies fail more often on darker-skinned faces or the faces of women than others, she delves into an investigation of widespread bias in artificial intelligence (AI). As it turns out, algorithms, data, and computers are not neutral. From facial scanning used for policing and surveillance to automated HR systems that mirror and magnify workplace prejudices, these technologies are created with fundamentally biased building blocks. Emboldened by these troubling discoveries, Buolamwini goes on to start the Algorithmic Justice League and joins a group of pioneering women to shed a light on the underlying biases in the technology that shape our lives and threaten our democracy.

ABOUT THE FILMMAKER

Shalini Kantayya
Director and producer

Director and producer Shalini Kantayya's feature documentary, *Coded Bias*, premiered at the 2020 Sundance Film Festival. The film was nominated for a Critics' Choice Award for Best Science Documentary. *Coded Bias* will broadcast on Emmy-award winning series *Independent Lens* in March 2021. She directed the season finale episode of the National Geographic television series *Breakthrough* (Ron Howard, executive producer), a series profiling trailblazing scientists transforming the future, broadcast globally in 2017. Her debut feature film, *Catching the Sun* (Leonardo DiCaprio, executive producer), about the race for a clean energy future, premiered at the Los Angeles Film Festival and was named a *New York Times* Critics' Pick. *Catching the Sun* was released globally on Netflix on Earth Day 2016 and was nominated for the Environmental Media Association Award for Best Documentary.

PEOPLE IN THE FILM

Meredith Broussard is a data journalist and assistant professor at the Arthur L. Carter Journalism Institute of New York University. She is the author of *Artificial Unintelligence: How Computers Misunderstand the World.*

Joy Buolamwini is a computer scientist and poet of code who uses art and research to illuminate the social implications of AI. Her MIT thesis, "Gender Shades," forms the basis of the ground-breaking studies featured in the film that exposed racial and gender bias in facial recognition technologies. She also founded the Algorithmic Justice League, an organization leading a movement toward more equitable, accountable, and just AI.

Silkie Carlo, director of Big Brother Watch, is monitoring the trial use of facial recognition technology by police in the United Kingdom. She previously worked for Edward Snowden's official defense fund and whistleblowers at risk.

Virginia Eubanks is an associate professor of political science at the University of Albany – SUNY and the author of *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor.*

Timnit Gebru is co-author of the research paper "Gender Shades" and a research collaborator with the Algorithmic Justice League. A graduate of Stanford, she has worked at Apple and Microsoft and was the technical co-lead of Google's Ethical AI Team. She co-founded Black in AI, a professional group that supports inclusion in the tech industry.

Tranae' Moran is a resin artist, administrative consultant, and merchandising professional. She has been on the frontlines organizing and educating with her neighbors, speaking out against the use of facial recognition technology in the two 24-story apartment buildings in the Brooklyn, New York neighborhood of Ocean Hill-Brownsville. She has made positive strides in pushing back against building management while creating awareness around the realities of facial recognition and the collection of biometric data in residential spaces.

LaTonya Myers is a revolutionary community organizer and activist from Philadelphia. By channeling her lived experience and raising the voices of her neighbors, she offers a passionate and innovative approach to restructuring the criminal justice system.

Ravi Naik, the Law Society's 2018 Human Rights Lawyer of the Year, is at the forefront of data rights and technology—including the first case against Cambridge Analytica for political profiling and claims against Facebook for their data practices.

Safiya Umoja Noble is an associate professor at UCLA in the departments of Information Studies and African American Studies. She is the author of the best-selling book *Algorithms of Oppression: How Search Engines Reinforce Racism.*

Cathy O'Neil is an American mathematician and the author of the blog **mathbabe.org**. Her book *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*, was published in 2016 and long-listed for the National Book Award for Nonfiction.

Inioluwa Deborah Raji is co-author of "Actionable Auditing," the final paper of the Gender Shade Project, and a research collaborator of the Algorithmic Justice League. A University of Toronto graduate, Raji is a Fellow at Mozilla and participated in Google AI's research mentorship cohort, where she worked with the Ethical AI Team.

Daniel Santos is a teacher in Houston. In 2017, a group of Houston teachers, including Santos, and their teacher's union won a settlement against their school district after being fired for receiving a poor score on a value-added assessment.

Zeynep Tufekci is an associate professor at the University of North Carolina School of Information and Library Science and the author of *Twitter and Tear Gas: The Power and Fragility of Networked Protest.*

Amy Webb is the founder of the Future Today Institute and teaches at New York University's Stern School of Business. She wrote the book *The Big Nine: How the Tech Titans and Their Thinking Machines Could Warp Humanity.*

BACKGROUND INFORMATION

Most people are not very familiar with AI, how it works, or how it's used. This background section serves as a beginner's guide to equitable and accountable AI. It introduces viewers to some core themes and questions that may come up in conversations about *Coded Bias.*

Demystifying AI

Artificial intelligence is the quest to equip computers with the ability to complete tasks that have traditionally required human intelligence, such as decision making, visual perception, speech recognition, language translation, and more. AI involves the use of **algorithms**—specific technical instructions—to achieve a task. Algorithms run internet search engines, curate our social media feeds, and determine our credit scores. They control online advertising, answer consumer calls, and recommend our health care. AI is automating all kinds of decision making.

When engineers write algorithms to analyze large amounts of data and make predictions based on the patterns found in **data sets**, this is called **machine learning.** One way to have a computer make predictions is to train it to recognize patterns using a lot of data. The more quality data that are fed into the system, the more material the system has to learn from and the more accurate its predictions will be. For example, if you use Facebook for a month,

the algorithm that runs the platform may be able to learn a few things about what you like. But if you use Facebook every day for five years, the algorithm will have way more information it can use to accurately predict your interests, your political leanings, and religious affiliations.[1]

Facial recognition technology can be powered by AI and is intended to identify or verify the identity of an individual. For example, a police officer might use facial recognition software to try to identify someone in security camera footage, and a landlord might scan a tenant's face to verify their identity at the entrance of a housing unit—which was the case for the Brooklyn tenants featured in the film. It is even becoming a standard feature on smartphones. Beyond its reference to identification and verification, sometimes the term facial recognition is used

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as a catchall phrase to include tasks like estimating demographic attributes, such as age, gender, and race, and guessing emotions.[2]

Facial recognition analyzes an image or video footage for **biometric data**, which is a term used to describe information about an individual's unique physical characteristics or behaviors. Your fingerprint is your personal biometric data. So is your faceprint. A **faceprint** maps your face based on its unique features derived from the relationship of characteristics like the distances between your eyes and nose. For identification, algorithms are used on the biometric data in an image to try to match the person pictured to their identity so it can pull up information about them—much like a human would if they met you on the street.

Voice recognition—the kind that runs personal assistant devices like Amazon's Alexa and Apple's Siri—is another application of AI. In addition to interpreting and carrying out spoken commands, voice recognition technology analyzes audio to try to identify an individual based on their speech patterns.

What is AI?

Coded Bias offers more ways to understand AI and describe it to others:

"A lot of our ideas about AI come from science fiction. Welcome to everything in Hollywood. It's the *Terminator*. It's Commander Data from *Star Trek*…It is the robots that take over the world and start to think like human beings. And it's all totally imaginary. What we actually have is…narrow AI, and narrow AI is just math. We've imbued computers with all of this magical thinking."
—**Meredith Broussard**, author of *Artificial Unintelligence*

"Machine learning. It's a scoring system that scores the probability of what you're about to do. Are you going to pay back this loan? Are you going to get fired from this job? What worries me the most about AI or whatever you want to call it, algorithms, is power because it's really all about who owns the f*****g code. The people who own the code then deploy it on other people, and there is no symmetry there."
—**Cathy O'Neil**, author of *Weapons of Math Destruction*

"There are two ways in which you can program computers. One of them is more like a recipe. You tell the computer to do this, do this, do this, do this. That's been the way we've programmed computers almost from the beginning. Now there's another way. That way is feeding the computer lots of data and then the computer learns to classify by digesting this data."
—**Zeynep Tufekci**, author of *Twitter and Tear Gas*

"If you're thinking about data and artificial intelligence, in many ways data is destiny. Data is what we're using to teach machines how to learn different kinds of patterns. So if you have largely skewed data sets that are being used to train these systems, you can also have skewed results. So this is when you think of AI, it's forward looking, but AI is based on data, and data is a reflection of our history. The past dwells within our algorithms."
—**Joy Buolamwini**, founder of the Algorithmic Justice League

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Early Influences on AI

From the early days of AI to the big tech companies of today, the development of artificial intelligence has been dominated by a small subset of the population: mainly white male academics and tech executives in the United States.[3] They have determined the scope and purpose of AI as well as its design, development, and deployment. The decisions of these early influencers have created systems that impose the ideas of a few on the rest of the population via technology.

How did AI start?

AI got its start at a Dartmouth College math conference in 1956, at which a group of mathematicians gathered to determine if artificial intelligence was indeed possible. They agreed that it was and decided that intelligence could be measured by a computer's ability to play games, such as chess, among other tasks. At the time, AI still required several more decades of advancement in computer memory and processing power before systems could process the data necessary to learn strategic decision making.[4]

Film and television also played a key role in the early development of AI. In 1968, there was one of the first and most influential popular depictions of AI: HAL9000 in Stanley Kubrick's film *2001: A Space Odyssey*. The sentient computer character was depicted as a pulsing red dot on a black screen.

In the 1980s, *Star Trek's* Data and Arnold Schwarzenegger's character in *Terminator* came onto the scene. Both depicted AI in a human form, but with the mind and body of a machine—and the ability to save or destroy humanity in the case of the *Terminator* character. As in academia, the early depictions of AI in film and television were envisioned through the eyes of a small group of male directors, which reinforced the narrow scope of the field.[5]

By the 1990s, the tech industry was set to take off. IBM, Microsoft, and Apple were already well-known computer companies at this point. In 1997, the AI program IBM's Deep Blue defeated world champion Garry Kasparov in chess for the first time, achieving the original vision established by the Dartmouth mathematicians.[6]

The advent of social media sites, such as Facebook in 2004,[7] and smartphones, such as the Apple iPhone in 2007,[8] helped usher in a new era of big data that has taken AI to the next level of evolution. **Big data** refers to the practice of collecting massive amounts of seemingly trivial information about individuals who use technology. Companies now have a huge storehouse of largely unregulated data they can use to create algorithms for all kinds of purposes.

AI and Big Tech

Currently, the research and development of AI is primarily in the hands of big technology corporations—which have made astonishing profits off the technology. The U.S. government has taken a mostly hands-off approach to influencing or regulating AI development. However, with the increasing use of commercial AI applications in the areas of health care, law enforcement, employment, and elections, there is a growing public awareness of the potential risks of leaving the use of AI technology unmonitored.[9]

How did AI start?

Nine big tech companies are shaping the future of AI, according to *The Big Nine* author Amy Webb, who is interviewed in the film. Six of the companies are based in the United States: Google (Alphabet), Microsoft, Amazon, Facebook, Apple, and IBM. Three are in China: Alibaba, Baidu, and Tencent.[10]

These big tech companies hold the lion share of AI patents [11] and an enormous amount of cash to invest in AI research and development. The five biggest tech companies—Apple, Amazon, Google (Alphabet), Microsoft, and Facebook—have a combined worth of more than $5 trillion.[12] And during the COVID-19 pandemic, when more people are spending more time online, their wealth is skyrocketing.[13]

In addition to money, big tech also has access to a lot of data. Every Google search, Facebook post, or Amazon order logs data on a user's behaviors. In the big-data economy, companies offer a free service, such as an email account or a social media profile, in exchange for access to your data. The companies then use that data to, for example, sell advertisements targeted directly to your interests[14] and possibly to exploit your insecurities, as is the case with predatory advertisers described in the film.

American tech companies are beholden to investors and shareholders, who expect them to make a profit. Therefore,

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decisions about AI are driven by what will make the most money in the shortest amount of time. Facebook, for example, has come under repeated criticism for its platform's role in spreading conspiracy theories and hate speech on the internet,[15] as well as the Cambridge Analytica scandal, in which leaked Facebook user data was used to influence elections in the United States and the United Kingdom.[16] Since then, the role that technology companies play in democracy has come under greater scrutiny by Congress and others.

Compared with the United States, China has a very proactive, hands-on approach to AI. The government works with Chinese technology companies to develop systems like the **social credit score**, which tracks and analyzes data on an individual's behaviors to reward them for behaviors deemed favorable by the government—or punish them for unfavorable behaviors. Human rights activists have criticized the Chinese government for using AI to suppress dissent and ethnic minorities in the country.[17]

The Myth of Neutrality

"The progress that was made in the Civil Rights era could be rolled back under the guise of machine neutrality."

—**Joy Buolamwini**

Technology is often regarded as a neutral decision maker, which can make decisions as well as, good as, or even better than, humans because AI makes decisions based solely on relevant data. *Coded Bias* reminds us that technology is made by humans, and it relies on code written by and data collected by humans. As more AI products enter the marketplace, more researchers are revealing ways human bias has corrupted the technology.

How are facial recognition technologies biased?

The problem that researcher Joy Buolamwini amplified in her MIT thesis—which later became the basis of "Gender Shades Project," a series of studies co-authored with Timnit Gebru and Inioluwa Deborah Raji—is that the data used to evaluate how well facial recognition technologies work and the data to train them are loaded with human bias. The term *bias* describes the assumptions, explicit or implicit, that people have in favor of or against a person or groups of people. Buolamwini coined the term *coded gaze* to describe the preferences, priorities, and at times prejudices of those who have the power to shape the technology that shapes our lives.[18]

The first study found that commercial AI systems from Microsoft, IBM, and Face++, made by the Chinese company Megvii, misgendered the faces of darker-skinned women more often—with an error rate of up to 37.7 percent. Lighter-skinned men, by comparison, had error rates of no more than 1 percent.[19] The second study found that Amazon also had gender and racial bias, misgendering women overall 19 percent of the time and dark-skinned women 31 percent of the time, with zero errors on lighter-skinned men.[20]

When the researchers analyzed key data sets used to test the facial recognition algorithms, they found a significant lack of diversity. The data sets consisted of more lighter-skinned people than any other demographic, as much as 80 percent of the images. Datasets were also largely male. Because the systems evaluated were not as well trained on women, people with darker skin, and especially women with darker skin, they misclassified them more often.[21]

Following the Gender Shades Project, which focused on gender classification, the National Institute of Standards and Technology released a report analyzing 189 facial recognition algorithms from 99 companies. The independent government study reveals: "For one-to-one matching, the team saw higher rates of false positives for Asian and African American faces relative to images of Caucasians. The differentials often ranged from a factor of 10 to 100 times, depending on the individual algorithm…For one-to-many matching, the team saw higher rates of false positives for African American females."[22] Put another way, depending on the algorithm, the number of errors for African-American and Asian faces were 10 to 100 times higher than the number of errors for white faces. And African-American women's faces were most likely to be misidentified, which can lead to false accusations.

Inaccurate results can have serious consequences. Facial recognition technology is used by police departments in investigations to try to identify suspects captured on security or body camera footage. Officers run image searches against their database of mugshots to see if they can find a match. At least half of U.S. states also allow police to search their database of driver's license photos for matches.[23]

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BACKGROUND INFORMATION

A few police departments, such as Detroit, are now experimenting with real-time video facial recognition,[24] the kind used by the U.K. police surveillance van featured in the film.

In 2020, the Detroit Police Department arrested an innocent Black man in Michigan in front of his two young daughters and detained him for 30 hours in a high-profile false arrest caused by facial recognition misidentification.[25] A study by Big Brother Watch indicates that the mistake was not uncommon based on similar technology used by U.K. police, which found inaccurate results more than 90 percent of the time.[26] In the film, we see a 14-year-old boy stopped and searched by police due to a false match. We are also seeing concerns of bias with the use of proctoring services that scan student faces through a video camera.

How are healthcare algorithms biased?

In 2019, a study into a UnitedHealth algorithm widely used by hospitals found racial bias in how it recommended care to patients. The research, led by UC Berkeley's Ziad Obermeyer, found that the algorithm underestimated the needs of sicker Black patients compared with healthier white patients—even though developers had not used race data as an input.

Instead, the algorithm's developers used data collected from billing departments to predict how much a patient would spend on health care in their lifetime. They assumed that the sicker a patient was the more they spend on health care. The algorithm did not account, however, for the fact that Black communities have historically spent less on health care for a variety of factors, including lack of health insurance or mistrust of the healthcare system.[27] New York regulators demanded the Minnesota-based company Optum fix the algorithm, and the researchers recommended changes that would reduce bias, but they warned that additional flawed algorithms may exist in the healthcare system.[28]

Just a few months after the study was published, the COVID-19 pandemic hit the United States, straining the national healthcare system. Data from early in the pandemic indicate that COVID-19 has hit Black communities especially hard. Of the states reporting racial/ethnic information, Black Americans accounted for one in three COVID-19 deaths[29]—raising concerns that COVID-19 data could be used to justify increased surveillance on communities of color during the pandemic. Advocates from Data 4 Black Lives have issued a call for inclusion of Black community members in the decision making for COVID-19 data applications. [30]

AI has been used in pandemic tracking since the first handful of cases in China alerted an algorithm developed by Boston Children's Hospital of an outbreak. The algorithm scans the internet for social media posts and news stories that indicate a public health outbreak. Taiwan, South Korea, and Italy have all used cell phone location tracking to monitor how well their

populations are adhering to stay-at-home guidelines and physical distancing. And in Moscow, the Russian government is using facial recognition technology to identify those leaving their homes during quarantine.[31]

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What are recidivism risk assessments?

Recidivism risk assessment is automated decision making that aims to predict the likelihood of an individual's future criminal behavior. Judges in almost every state use recidivism risk assessments to inform their decisions about who gets released at pretrial or how long to keep someone on probation,[32] as was the case with LaTonya Myers, who was interviewed in the film. Some states, including Arizona, Colorado, Delaware, Kentucky, Louisiana, Oklahoma, Virginia, Washington, and Wisconsin, share scores with judges for criminal sentencing and sometimes even in conviction decisions.

A 2016 ProPublica study found that a recidivism risk algorithm called COMPAS was almost twice as likely to rate a Black defendant as high risk for reoffending. White defendants, by contrast, were more likely to be mislabeled as low risk. The study found that two years after the predictions were made, they were accurate in predicting violent crime only 20 percent of the time. When nonviolent misdemeanors were added, the predictions fared slightly better than a coin flip, at 61 percent accuracy.[33]

The process uses data collected from inmate questionnaires that ask things like where you live, if your friends and family have criminal records, and if you have a job. Race data are never used in the algorithms; however, an inmate's age and sex are. The algorithm compares the inmate's data with the data of other people with similar profiles to classify the inmate as either high or low risk of committing a future crime. The algorithms assume that people with similar data will commit similar crimes.[34]

At least one defendant in Wisconsin sued the state for using a recidivism risk assessment in determining his sentence; however, the Wisconsin Supreme Court ruled in favor of using algorithms.[35] And criminal justice reforms passed in 2018, in legislation known as the First Step Act, are set to expand use of recidivism risk algorithms to all states.[36]

"Algorithmic justice—making sure there's oversight in the age of automation—is one of the largest civil rights concerns we have."

—Joy Buolamwini

Civil and Human Rights Concerns

There is a lot at stake when it comes to AI bias. In policing, sentencing, and health care, AI bias threatens the lives and liberties in Black and brown communities. In employment, housing, and education, AI bias can limit and deny opportunities for women and people of color. Even if bias in AI systems is reduced, more accurate systems can be weaponized and used for surveillance. When we think about the impact of technology, bias is important to highlight, but there are many ways to cause harm even with more accurate systems. The film *Coded Bias* views technology through a civil and human rights framework.

How does AI bias threaten civil rights?

Civil rights refers to a broad set of protections designed to prevent unfair treatment or discrimination in areas such as education, employment, housing, banking, and more. Black civil rights leaders in the 1960s, women's rights activists in the 1970s, and disability rights advocates in the 1980s fought for victories that secured protections under the law. The Civil Rights Act, the Fair Housing Act, and the Americans with Disabilities Act are just a few examples. All of these civil rights laws were written prior to the advent of the internet.

Now, bias in algorithms used in hiring, for example, threatens an individual's right of equal opportunity to employment, protected by the Civil Rights Act. The law prevents employers from advertising jobs based on race, gender, or other discriminatory criteria. However, algorithms, not humans, are increasingly influencing who sees job announcements advertised online, whose résumé is selected for an interview, and whether you have the right personality traits for the job. Amazon's now-scrapped AI recruiting tool that disproportionately rejected women is a cautionary tale of what technology can do when left unsupervised.[37]

Due process is an American civil right that protects an individual from being deprived of life, liberty, or property without proper legal proceedings. It is referenced in the Fifth and Fourteenth Amendments. Algorithms threaten due process rights because their precise decision-making process is unknown, even to the developers. An algorithm is a **black box**, meaning it can be viewed only through its inputs and outputs, not its internal process. In addition, many for-profit companies refuse to share information about their products for proprietary reasons, making it difficult to appeal the decision.

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In 2017, a group of Houston teachers, including Daniel Santos, who was interviewed in the film, and their teacher's union won a settlement against their school district after being fired for receiving a poor score on a **value-added assessment**. The assessment used an algorithm to determine teacher performance based on student data. The ruling found that the teachers' rights to due process were violated because the algorithm was incomprehensible and there was no way to legally mount an appeal over the decision or how it was made. The settlement effectively prohibited the use of value-added assessments in Houston and elsewhere.[38]

Students are also subject to grading by algorithm-based predictions, which can determine their eligibility to get into college. In 2020, bias was found in the results of an algorithm used by the International Baccalaureate, a widely used educational testing program that allows high-school students to obtain college credit. Initial reports show that high-performing students from low-income backgrounds received disproportionately low scores, causing many parents and students to demand the company explain the algorithm.[39]

What about AI surveillance?

Journalists and activists have uncovered several cases of AI surveillance technology used by local and federal law enforcement against immigrants and Black Lives Matter protesters in the United States. The actions raise human rights concerns regarding privacy and the abuse of technology to target political protestors and ethnic minorities.

In 2020, the U.S. Customs and Border Patrol (CPB) rerouted a drone from where it was surveilling the Canadian border to fly over Minneapolis during protests of the police killing of George Floyd. The CPB also tracked the social media accounts of organizers of the protests that followed the police killing of Michael Brown in Ferguson in 2014. And Baltimore police used aerial surveillance during the protests of the police killing of Freddie Gray in 2015.[40]

In 2017, the Department of Homeland Security (DHS)—the federal law enforcement agency that oversees the CPB and Immigration and Customs Enforcement (ICE)—began experimenting with facial recognition. Using technology purchased from tech companies Palantir and Amazon, the DHS builds profiles on immigrants and their families to track their whereabouts and identify targets for deportation raids. The DHS spends 10 percent of its $44 billion budget on data services,[41] which it uses to store biometric information on some 250 million Americans.[42]

Who is harmed by AI bias?

Biased algorithms and data have the ability to automate discrimination at a scale never seen before in human history, raising concerns that that AI will accelerate social problems of sexism, racism, and other injustices. **Sexism** and **racism** are forms of systematic discrimination that harm women and people of color—especially Black and Indigenous people of color. Multiple systems of discrimination can affect someone's life at the same time—for example, sexism and racism compound harmful effects in the lives of women and girls of color.[43]

In her book, *Algorithms of Oppression*, Safiya Noble, who is interviewed in the film, describes the role that popular search engine algorithms play in promoting sexism and racism toward women and girls of color. For example, up until a few years ago, a Google search for "Black girls," "Latina girls," and "Asian girls" produced pornographic results.[44] In another example, a 2013 study by Harvard researcher Latanya Sweeney found that Black names searched on Google brought up ads for criminal record search sites, associating Black people with criminality.[45] In 2016, Microsoft's chatter bot Tay had to be taken down for posting racist and sexist comments after only 16 hours of machine learning from the internet.[46]

Misrepresentations online can contribute to real-life harms by fueling violence against women and girls and overpolicing in communities of color; they also inform commercial algorithms that profile consumers online. Companies use consumer-profiling AI to make predictions about who might buy their products or who can be trusted with a loan, for example. Based on online data about us and people like us, an algorithm could decide to offer a higher insurance rate or a credit card with a lower limit, which was the case for the Apple Credit Card mentioned in the film. In her book, Noble calls this practice **"technological redlining,"** which refers to the practice of using online data to categorize entire groups of people as unworthy of investment.[47]

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BACKGROUND INFORMATION

The Great Recession demonstrated the widespread harm that commercial algorithms can enable. In her book *Weapons of Math Destruction,* Cathy O'Neil, who is interviewed in the film, explains how unregulated algorithms played a role in almost every step that led to the subprime mortgage scandal in 2008. Banks used them to determine the credit scores of people targeted for subprime loans, to calculate the high mortgage rates that borrowers eventually couldn't afford to pay, and to bundle the mortgages into investment portfolios that ended up collapsing the stock market.[48] Black people and their communities experienced some of the worst harms from the Great Recession. During the crisis, home foreclosures amounted to the largest loss of Black wealth in U.S. history.[49]

"The machine was simply replicating the world as it exists, and they are not making decisions that are ethical. They are making decisions that are mathematical. If we use machine learning models to replicate the world as it is today, we are not going to actually make social progress."

—**Meredith Broussard**

Laws and Oversight

What are data rights?

So far, the European Union (EU) has taken the strongest stance on **data rights**,[50] which is the human right to privacy, confidentiality, and ethical use of personal information collected by governments or corporations through technology.

In 2016, the EU passed the General Data Protection Regulation (GDPR), creating the first human rights framework for technology companies to follow. It protects a user's right to know who is collecting their data and for what purpose and the right to correct or erase data collected on them. If a user chooses not to opt-in to data collection, the law protects their decision from being used to discriminate against them or deny them access to services. The GDPR also prohibits the sale of data to third-party data brokers. The GDPR took effect in 2018 and applies to any company doing business online with European customers no matter where the company is located. Companies that violate the GDPR face steep fines.[51]

In 2018, California became the first and so far only U.S. state to pass a broad data rights law. Unlike the GDPR, however, the

California law allows the sale of user data.[52] In Illinois, Facebook users filed a class action lawsuit against the company for its use of unauthorized facial recognition technology in its photo tagging feature. In 2020, Facebook settled for $650 million.[53]

Does my police department use facial recognition technology?

In 2019, San Francisco became the first city to ban the use of facial recognition technology by any city official or police officer.[54] Oakland and Berkeley followed.[55] California also passed a three-year ban on police use of facial recognition, which started in January 2020, joining New Hampshire and Oregon in imposing limits on the technology.[56] More than half of all states have considered some form of regulation on police use of facial recognition; see if your state is included in this map from the Electronic Privacy Information Center: **https://epic.org/state-policy/facialrecognition/**.

In Massachusetts, where Buolamwini conducted her work out of the MIT Media Lab, the cities of Boston, Springfield, Somerville, Brookline, Northampton, and Cambridge have all passed ordinances banning police use of facial recognition.[57] Portland, Oregon, also joined the list in 2020,[58] and New York City passed the Public Oversight of Surveillance Technology (POST) Act requiring public disclosure before the New York City police department can acquire surveillance technology.[59] The state of New York placed a two-year ban on facial recognition in public schools.[60]

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During the mass Black Lives Matter protests in 2020, IBM and Microsoft agreed to stop selling facial recognition technology to law enforcement. And in June 2020, Amazon put a one-year moratorium on police use of Rekognition, buying time for Congress to establish oversight for its use by government entities.[61] Immediately after the announcement, a group of lawmakers introduced the Facial Recognition and Biometric Technology Moratorium Act in Congress, which is the most comprehensive bill so far that would ban use of the technology by federal law enforcement and local police forces that receive federal funding.[62] Another bill on the use of biometric technology in public housing was introduced by the representative of the Brooklyn tenants featured in the film.[63]

Tech Ethics and Algorithmic Justice

"For algorithms that have the potential to ruin people's lives…we need an 'FDA for algorithms' that says, 'Show me evidence that it's going to work, not just to make you money, but for society.'"

—Cathy O'Neil

In the absence of regulations, companies have adopted tech ethics in an effort to decrease harms caused by their products. **Tech ethics** is a set of principles that guide product development in the technology industry. The Algorithmic Justice League points out, however, that even when developed with the best of intentions, AI can still cause unintended harms when it is deployed in the real world. They call for a more robust process of algorithmic justice.

What is algorithmic justice?

Algorithmic justice exposes bias in algorithms in order to develop equitable and accountable design and implementation of coded systems. The Algorithmic Justice League outlines the following framework for promoting equitable and accountable AI:

- People should have agency and control over how they interact with an AI system, which requires knowing how systems are used and what their potential harms might be.
- An AI system should secure affirmative consent from people, such as with an opt-in request, on how or whether they interact with the AI system. No one should be penalized for opting out.
- To respect human life, dignity, and rights, AI requires centering justice by prohibiting certain corporate and government uses.

- An AI system should demonstrate meaningful transparency by providing an explanation of how the system works, how it was designed, the specific purpose for which it was designed, and its known limitations.
- Because it is constantly evolving, AI should be subject to continuous oversight by independent third parties and laws that require companies and government agencies deploying AI to meet minimum reporting requirements.
- AI systems should provide people who have been harmed by it with access to remedy; there should be a working pathway through which people can contest and correct a harmful decision made by artificial intelligence.[64]

The Algorithmic Justice League has also called for a new federal office to oversee the development and deployment of AI. The proposal is modeled on the Food and Drug Administration (FDA), which regulates medicine and medical devices in the United States. Similar to how the FDA operates, a federal office for AI would create standards and datasets to make sure AI development serves the public interest and would review algorithms before they are used on people. According to the Algorithmic Justice League proposal, the FDA would also monitor AI throughout its use to make sure it is being used as originally intended.[65]

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BACKGROUND INFORMATION

Timeline

1956
The field of AI starts at a Dartmouth college math conference.

1968
The AI character HAL9000 appears in *2001: A Space Odyssey*.[66]

1994
Jeff Bezos founds the e-commerce company Amazon.[67]

1997
The AI program IBM's Deep Blue beats world champion Garry Kasparov in chess.[68]

1998
Larry Page and Sergey Brin launch the internet search engine Google.[69]

2004
Mark Zuckerberg launches the social networking site Facebook.[70]

2014
China pilots social credit score systems.[71]

2016
Amazon begins selling its Rekognition software to police departments.[72]

A ProPublica report exposes bias against Blacks in recidivism risk assessment algorithms.[73]

2017
Amazon scraps its AI recruiting tool for bias against women candidates.[74]

Houston teachers win a suit to end the use of value-added assessments.[75]

2018
Cambridge Analytica is sued over the use of Facebook data to influence elections.[76]

The EU's General Data Protection Regulation goes into effect.[77]

The study "Gender Shades," by Joy Buolamwini and Timnit Gebru, is published, exposing racial and gender bias in commercial face-based AI products from IBM, Microsoft, and Face++.[78]

2019
San Francisco becomes the first U.S. city to ban the use of facial recognition technology by police officers and city officials.[79]

The study "Actionable Auditing," by Inioluwa Deborah Raji and Joy Buolamwini, is published, exposing racial and gender bias in commercial face-based AI products from Amazon.[80]

Berkeley and Oakland, California, and Somerville, Brookline, Northampton, and Cambridge, Massachusetts, ban police use of facial recognition technology. [81] [82]

California passes a three-year ban on police use of facial recognition technology, which goes into effect in January 2020.[83]

Congress holds hearings on facial recognition regarding its commercial use, police use, and use in public housing.[84]

The Apple Credit Card algorithm is investigated for bias against women applicants.[85]

A study by Ziad Obermeyer finds bias against Black patients in a UnitedHealth algorithm.[86]

2020
The California Consumer Privacy Act goes into effect.[87]

Facebook settles for $650 million in a class action lawsuit over facial recognition.[88]

Boston and Springfield, Massachusetts, and Portland, Oregon, ban police use of facial recognition technology.[89] [90]

New York City passes the Public Oversight of Surveillance Technology (POST) Act, and New York State passes a two-year ban on facial recognition in schools.[91] [92]

IBM and Microsoft announce they will no longer sell facial recognition technology to police.

In June, Amazon announces a one-year pause on police use of its facial recognition technology.[93]

Lawmakers in Congress introduce the Facial Recognition and Biometric Technology Moratorium Act to ban use of the technology by law enforcement agencies.[94]

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Inclusion in the Tech Industry

When IBM improved their facial recognition software *"...the laws of physics didn't change. What did change was making it a priority and acknowledging what our differences are so that you could make a system that was more inclusive."* —**Joy Buolamwini**

Throughout AI's history, women and people of color have been systematically excluded from the academic halls and executive suites where decisions about technology were made. And recent reports show technology companies and STEM education programs still do not include equal representation of women and people of color. Complaints about sexual harassment and cultural incompetency plague the industry. And yet research shows that companies with diverse teams attract better talent and are more profitable—making inclusion both just and good for business.[95]

So how inclusive is big tech?

In 2019, Facebook and Google on average employed slightly more than 20 percent women in technical positions, such as coders, engineers, and data scientists. When it came to race/ethnicity, Apple posted the highest diversity in technical positions at 6 percent Black and 8 percent Latinx, with the rest of the companies achieving a fraction of that. Meanwhile, Amazon does not separate its demographic information by job title, so although its numbers show 42 percent women and roughly the same for Black and Latinx workers, many may be working in distribution centers rather than developing AI.[96]

A 2018 study conducted by the Center for Gender Equity in Science and Technology at Arizona State University and the Oakland-based Kapor Center helps fill the gaps in tech company reports. The study found that among all women employed in computer and information science occupations, 12 percent are Black or Latinx. In Silicon Valley tech companies, however, the numbers are far worse—less than 2 percent of all workers are Black, Latinx, or Native American/Alaskan Native women. When it comes to leadership positions in Silicon Valley, the report found that less than 1 percent are held by Latinx women, and less than 0.5 percent are held by Black women.[97]

What about STEM education?

Studies show that women and people of color, especially Black professors, are chronically underrepresented and underpaid across the disciplines of science, technology, engineering, and mathematics (STEM), signaling a lack of role models and culturally competent mentors for students of color in the fields.[98]

In 2018, young women comprised about 23 percent of advanced computer science courses in high school. Among female students that took advanced placement computer science college qualifying exams, 2 percent identified as Black, and 4 percent identified as Latinx. Less than 1 percent were Native American/Alaskan Native.

Once young women make it to college, the trend of underrepresentation continues. Women of all races/ethnicities earn 18 percent of computer science bachelor degrees. Within that group, women of color combined make up less than 10 percent—with 3 percent identifying as Black, 2 percent Latinx, and 2 percent Asian.[99]

Coding groups for young women, such as Black Girls Code, aim to mentor more of them into computer science fields.[100] And tech companies, including Google, have made some modest investments in programs at historically Black colleges and universities and in other STEM education programs.[101]

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RECOGNIZING TECH TALENT

Coded Bias celebrates the change-makers leading the ethical revolution in technology. The experts interviewed in the film join a long tradition of pioneering women who have used data and technology to advance justice and increase opportunity in the tech industry. The film's broadcast and community events are a chance to share the names and accomplishments of women and gender-nonconforming people changing tech. Here are just a few suggestions.

Rediet Abebe is a computer scientist and co-founder of Black in AI. She was the first Black woman to receive a Ph.D. in computer science from Cornell University.[102]

Ruha Benjamin is a professor at Princeton University. She founded the IDA B. WELLS Just Data Lab and authored the book *Race After Technology*.[103]

Anita Borg co-founded the online network Systers in 1987 and the Institute for Women and Technology in 1997 to support and increase the inclusion of women in the tech industry.[104]

Kimberly Bryant is an electrical engineer. In 2011, she founded Black Girls Code to teach basic programming concepts to young Black women, a group that is underrepresented in technology careers.[105]

Stephanie Castillo is the executive director of Latina Girls Code. In addition to teaching young women how to code, she is also an immigration advisor to assist undocumented students in her organization.[106]

Sasha Costanza-Chock is an associate professor of Civic Media at MIT, the author of *Design Justice: Community-Led Practices to Build the Worlds We Need*,[107] and a member of the Algorithmic Justice League.[108]

RECOGNIZING TECH TALENT

Kate Crawford and Meredith Whittaker co-founded the AI Now Institute at New York University, a leader in tech ethics and algorithmic justice research run by a team of mostly women.[109]

Adji Bousso Dieng became the first Black woman on the faculty of Princeton's School of Engineering, and in 2020, she became the first Black faculty member in Princeton's computer science department.[110]

Kathryn A. Finney is the founder and CEO of digitalundivided, a social enterprise that leads Black and Latinx women through the process of founding their own organization, from startup pipeline to idea to exit.[111]

Clare Garvie, who testified to Congress in 2019, alongside Joy Buolamwini,[112] is the lead author of *The Perpetual Line-Up: Unregulated Police Face Recognition in America* and is engaged in groundbreaking facial recognition research out of the Center on Privacy & Technology at Georgetown Law.[113]

Laura I. Gómez founded Atipica, a recruiting software startup that uses AI to help companies make bias-free hiring decisions. She previously worked at YouTube, and she led Twitter en Español.[114]

Evelyn Boyd Granville was the second Black woman to earn a Ph.D. in mathematics from Yale University, in 1949. She worked as a computer scientist for IBM and the Space Technologies Laboratories.[115]

Grace Murray Hopper was a computer scientist and rear admiral in the U.S. Navy during World War II, where she served as one of the first programmers of the Harvard Mark I computer.[116]

Katherine G. Johnson calculated the flight path for the first NASA mission to space. When NASA opened the position to women mathematicians in 1953, she was one of the first hired.[117]

Yeshimabeit Milner is the founder and executive director of Data for Black Lives, which uses data for social change, and worked at the racial justice organization Color of Change.[118]

Kimberly Scott leads the Center for Gender Equity in Science and Technology at Arizona State University. Scott is a professor of women and gender studies.[119]

Latanya Arvette Sweeney is a professor of the Practice of Government and Technology at the Harvard Kennedy School and the director of the Data Privacy Lab.[120]

Rachel Thomas is a computer scientist. She founded the Center for Applied Data Ethics at the University of San Francisco.[121]

Ida B. Wells was a data journalist and an anti-lynching advocate. In 1895, Wells published *The Red Record: Tabulated Statistics and Alleged Causes of Lynching in the United States, 1892–1894.* Her data analysis provided proof of the underlying racism of lynch mobs.

Maya Wiley and Greta Byrum are co-directors of The New School's Digital Equity Laboratory, which Wiley founded.

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DISCUSSING THE FILM

Framing the Conversation

The film *Coded Bias* covers a range of topics about AI, surveillance, and data rights that affect every American. However, women and people of color tend to disproportionately bear the harms of racist and sexist technology. Your events are an opportunity to amplify the voices of women and people of color who have largely been excluded from the tech industry. Event hosts planning screenings of the film should strive to invite a majority of women of color speakers for the post-screening panel discussions.

DISCUSSING THE FILM

Discussion Questions

The following discussion questions are written with event hosts and viewers in mind. Event hosts can use these conversation prompts to facilitate post-screening discussions online. Viewers can also use these to generate dialogue with others who have seen the film. Join the conversation online at #CodedBiasPBS.

1. *Coded Bias* interviews a dynamic group of scholars and advocates—mostly women of color—on the subject of artificial intelligence. What information or interviews stood out to you while watching the film? Why do you think they resonated?

2. What are some popular cultural depictions of artificial intelligence you have seen in film or on television? How do you think popular culture has influenced American perceptions of AI?

3. Have you ever talked about algorithms with friends, family, or co-workers? How would you describe an algorithm to someone who is unfamiliar with the technology?

4. Describe examples of AI discussed in the film. Have you ever encountered one of the algorithms described in *Coded Bias*? If so, which one?

5. How do algorithms influence the news we see online and the perspectives we see on social media? How does AI shape the way we all think?

6. Early AI developers measured the intelligence of the technology by its ability to play games, such as chess. Why might this definition of intelligence be limiting? What other forms of intelligence are important measures for technology?

7. Joy Buolamwini's research challenged the idea that technology is a neutral decision maker and immune to human bias. What is bias? How did Buolamwini's work help to expose AI bias?

8. What civil rights are at stake when it comes to automated decision making? What protections do we need to safeguard as AI continues to develop?

9. Who is harmed by AI bias? How does power factor into who is harmed and who benefits from AI products?

10. Have you ever had the experience of being surveilled? If so, how did it make you feel?

11. In the film, Amy Webb says: "I would prefer to see our Western democratic ideals baked into our AI systems of the future." What ideals or values, if any, would you like to see incorporated into AI development?

12. Do you think police or immigration enforcers should be allowed to search databases that store your driver's license photo or passport photo? Why or why not?

13. Joy Buolamwini says in the film "Because of the power of these tools, left unregulated there's really no kind of recourse if they're abused. We need laws." Do you agree that AI should be regulated? Why or why not?

14. Joy Buolamwini describes Amazon's response to her research on bias in its products as "a continuation of the experiences I've had as a woman of color in tech. Expect to be discredited. Expect your research to be dismissed." Is this an experience you can relate to in your work? Why or why not?

15. Studies found racial bias in algorithms used in the courts for sentencing and used in hospitals for healthcare recommendations even though the AI did not factor in race data. How does this happen? What is causing biased results?

16. How is AI being used during the COVID-19 pandemic? What human rights concerns related to pandemic data and surveillance should health officials be taking into consideration?

17. During the COVID-19 pandemic, big tech companies are seeing record profits while many American workers are suffering from the economic slowdown. What role, if any, do you think these companies should play in the economic recovery from the pandemic?

18. How is the tech industry doing when it comes to promoting inclusion in the workforce? What more needs to be done to ensure that everyone has a fair opportunity to work in tech?

19. What effect do you think a more inclusive workforce would have on the tech industry? Do you think tech products would be less biased? Why or why not?

20. What promising practices have you seen in tech ethics education? In efforts to increase student inclusion in computer science programs?

21. What is your vision for AI development in the future? How would you like to see the technology evolve?

POTENTIAL PARTNERS

To help event organizers connect to subject matter experts who can discuss the film with participants, below is a list of potential partners.

Civil rights and civil liberties groups: For example, the ACLU has a widespread effort to increase community oversight of surveillance technology and policing. Groups participating in Black Lives Matter and the immigrant rights movement may also be working on issues of surveillance and systemic racism against Black and immigrant communities.

- Join the Algorithmic Justice League: **ajl.org**
- See if there is an ACLU affiliate near you: **aclu.org/about/affiliates**
- Connect with Black Lives Matter: **blacklivesmatter.com**
- Find a chapter of Black Youth Project 100: **byp100.org/chapters**
- Connect with Data for Black Lives: **d4bl.org/about.html**

Professional tech groups can speak to their experiences in the industry and efforts to support tech talent who identify as women, Black, or Latinx.

- Contact the Black in AI group to find talent near you: **blackinai.github.io/#/**
- Connect to members in the Latinx in AI group: **lxai.app/public-directory**
- Reach out to Women in Machine Learning: **wimlworkshop.org/senior-advisory-council**
- Search the directory for Women Tech Founders: **womentechfounders.com/directory/?wpbdp_view=search**
- See if there is a local meeting of the Tech Workers Coalition: **techworkerscoalition.org**

STEM students and tech ethics educators from local organizations, student groups, and higher education institutions. They could share their experiences in the field as part of panel discussion or potentially lead audience members in a short educational activity.

- See if there is a Girls Who Code location near you: **girlswhocode.com/locations**
- See if there is a Google Tech Exchange program near you: **blog.google/outreach-initiatives/diversity/tech-exchange-brings-black-and-latinx-students-google**.
- Browse the winners from the Responsible Computer Science Challenge hosted by the Mozilla Foundation: **foundation.mozilla.org/en/initiatives/responsible-cs/winners**
- Review this database of tech ethics courses to see if there is one near you: **link.medium.com/3iTniC91T7**

Local elected leaders, such as city council members and school board members, who make decisions about the use of surveillance technology. Reach out to local elected officials to see what work they have done to address concerns about government use of surveillance technology. You could also consider framing the event as a public listening session or town hall to discuss surveillance issues relevant to your community.

- See this map from Fight for the Future for an overview of facial recognition technology: **banfacialrecognition.com/map**
- See where surveillance technology is being used in the map on Electronic Frontier Foundation's Atlas of Surveillance: **atlasofsurveillance.org**

ENGAGEMENT ACTIVITY IDEAS
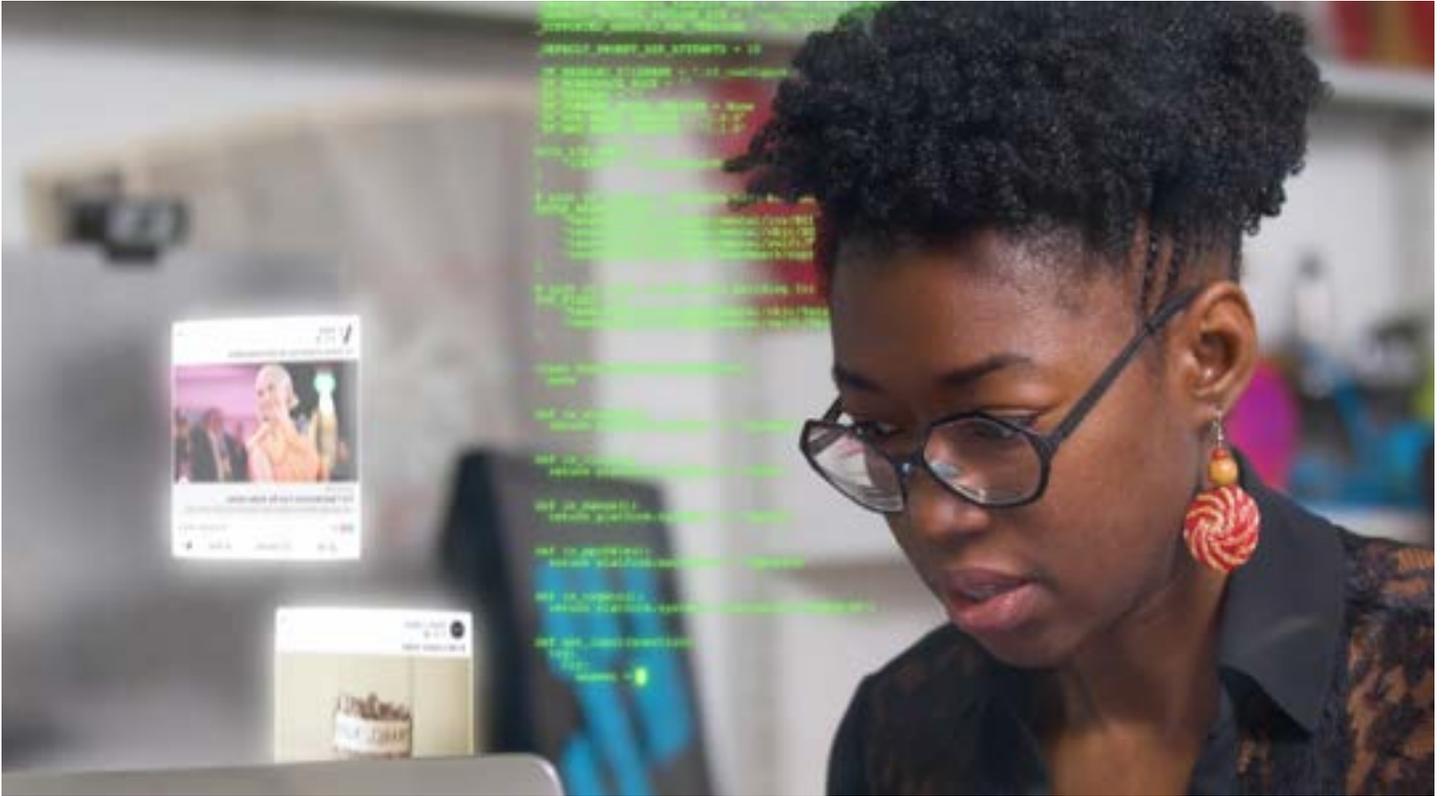
There are other ways to engage with the film beyond a discussion. These activities invite people to get involved with the issues in creative ways.

- Incorporate **spoken word poetry** and other forms of art into your event. You could invite spoken word poets, visual artists, and other artists to share artistic work related to technology. Reach out to your local youth art programs and high school writing classes to offer the opportunity for a poet to write and record a spoken word piece on video to play after your screening of the film. For inspiration, see Buolamwini's spoken word video "AI, Ain't I a Woman?" **youtu.be/QxuyfWoVV98** or the Algorithmic Justice League's "Voicing Erasure" piece: **ajl.org/voicing-erasure**. And for more information about spoken word, check out area organizations like the San Francisco–based Youth Speaks: **youthspeaks.org**.

- You can host a **Drag vs AI virtual workshop** created by the Algorithmic Justice League. Participants learn about the basic workings of facial recognition technologies and then, with the assistance of drag performers, use makeup, accessories, and other props to drag the machines and confront the coded gaze in a runway show. Learn more at: **ajl.org/drag-vs-ai**.

- You can organize a **hackathon**, where coders, mathematicians, and data scientists come together to develop tech solutions that address problems identified by the community. For example, you could ask participants to analyze crime data from your local police department to identify patterns of bias in local policing. It may be helpful to partner with a local organization or degree program that has experience hosting hackathon-type events. For more inspiration, see how Black Girls Code hosts a hackathon: **blackgirlscode.com/bgc-hackathons.html**.

- Host an **innovator fair** and ask local designers, inventors, and startups to share work that contributes to the social good. For example, a student science group could present a prototype for an application of AI designed to serve community members in need. This activity can be adapted for virtual events by recording short video interviews with local innovators. Reach out to your local universities to see if they honor any award winners. For more inspiration, check out the Anita Borg Abie Award winners: **anitab.org/awards-grants/abie-awards**.

ENGAGEMENT ACTIVITY IDEAS

- Invite your audience members to try an **accuracy test** of facial recognition technology. Those who would like to participate can submit their photo in advance, and you could reveal the results at your event. If you are doing the activity on behalf of an organization, it is a good idea to check with your legal team to create a permission form for participants explaining exactly how their data will be used as part of the activity. Alternatively, you could perform a test on a group of local elected officials, whose images are publicly available on the internet. **aclu.org/blog/privacy-technology/surveillance-technologies/amazons-face-recognition-falsely-matched-28**.

- You can ask your audience to help create a **community-generated map** identifying where surveillance cameras exist in your community. Ask audience members to submit the locations where they see security cameras in your community. Consider doing this before a screening of *Coded Bias* so that you can reveal results to your viewers at the event. You can create a digital map using a free tool such as Google Maps: **google.com/maps/about/mymaps**. For an example, see the map of Project Green Light cameras: **freep.com/story/news/local/michigan/detroit/2019/06/27/detroit-project-green-light-cameras/1561014001**

- Submit a **Freedom of Information Act (FOIA)** request to your local government regarding the use of surveillance. Anyone has the right to make a FOIA request to a government entity as a way to ensure transparency. Mijente offers some suggestions about how to file an FOIA request: **mijente.net/wp-content/uploads/2019/07/Tech-Policy-Report_v4LNX.pdf**. The government entity should reply within about two weeks. The results of the FOIA could be revealed at an event or you could create content regarding your findings as promotion for your event.

- Host a **book club reading** of one of the authors featured in the film. You could also ask your library to create a display featuring women in tech authors. Book club events can also be hosted virtually using video conferencing. Books relevant to the film include:
  - *The Big Nine: How the Tech Titans and Their Thinking Machines Could Warp Humanity*, by Amy Webb
  - *Algorithms of Oppression: How Search Engines Reinforce Racism*, by Safiya Umoja Noble
  - *Artificial Unintelligence: How Computers Misunderstand the World*, by Meredith Broussard
  - *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor*, by Virginia Eubanks
  - *Twitter and Tear Gas: The Power and Fragility of Networked Protest*, by Zeynep Tufekci
  - *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*, by Cathy O'Neil
  - *1984*, by George Orwell

- Start a **STEM club** for youth underrepresented in the field to provide more opportunities to explore computer science. You can reach out to schools, libraries, and youth centers to see if something already exists in your area. If not, partner with community groups to recruit young women of all backgrounds to join. You can also consider raising money for scholarships so that youth from all income backgrounds can participate. See how to start a Girls Who Code club: **girlswhocode.com/get-involved/start-a-club**.

INDEPENDENT LENS

ADDITIONAL RESOURCES

- **pbs.org/codedbias** – This is the web page for the *Independent Lens* premiere of *Coded Bias* on PBS.

- **codedbias.com** – The website for *Coded Bias* was created by filmmaker Shalini Kantayya.

- **aclu.org/issues/privacy-technology** – The American Civil Liberties Union works on the issue of privacy and technology to ensure that civil liberties are enhanced rather than compromised by technological innovation.

- **ajl.org** – The Algorithmic Justice League, founded by Joy Buolamwini, combines art and research to illuminate the social implications of AI.

- **amnesty.org/en** - Amnesty International is a global movement of more than 10 million people who take injustice personally. They are campaigning for a world where human rights are enjoyed by all.

- **ainowinstitute.org** – The AI Now Institute at New York University is a research center dedicated to understanding the social implications of AI.

- **www.fightforthefuture.org** – Fight for the Future is a group of artists, activists, engineers, and technologists advocating for the use of technology as a liberating force.

- **bigbrotherwatch.org.uk** – Big Brother Watch is an independent civil liberties group fighting to reclaim privacy and defend freedoms during a time of technological change.

- **colorofchange.org** – Color of Change is an online racial justice organization that helps people respond effectively to injustice in the world, including online hate speech.

- **d4bl.org** – Data for Black Lives is a movement of activists and mathematicians using data science to create change in the lives of Black people.

- **datasociety.net** – Data & Society is a nonprofit research group that looks at the impact of AI and automation on labor, health, and online disinformation.

- **eff.org** – The Electronic Frontier Foundation is a nonprofit organization defending civil liberties in the digital world.

- **mijente.net** – Mijente is a Latinx and Chicanx organization fighting for racial, economic, gender, and climate justice and fighting against high-tech immigration enforcement.

Credits