NEWS FROM THE EIPC

EIPC Technical Snapshot Webinar – June 16, 2021

WEDNESDAY 16th JUNE @ 15.00 hrs CET

Please join us for our 9th Technical snapshot Webinar.

We will have four speakers:

William Bowerman from MacDermid Enthone will give an insight on Cleaning of Microvia Target Pads. From Atotech Ltd. we will hear from Sebastian Zarwell who will talk about Cu Recrystallization and the Formation of Epitaxial and Non-Epitaxial Cu/Cu/Cu Interfaces in Stacked Blind Micro Via Structures. Maarten Cauwe from IMEC will look at the Challenges in microvia design, modeling and testing. And finally, it will be down to Jason Furlong from PWB Interconnect Solutions who will inform us on IPC/IMEC/ESA testing.

Moderator: Tarja Rapala-Virtanen

15:00 CET

'Cleaning of Microvia Target Pads'
Speaker: William Bowerman, MacDermid Enthone

15:15 CET

'Cu Recrystallization and the Formation of Epitaxial and Non-Epitaxial Cu/Cu/Cu Interfaces in Stacked Blind Micro Via Structures'
Speaker: Sebastian Zarwell, Atotech Ltd.

15:30 CET

'Challenges in microvia design, modeling and testing'
Speaker: Maarten Cauwe, IMEC Belgium

15:45 CET

'IPC/IMEC/ESA testing'
Speaker: Jason Furlong, PWB Interconnect Solutions

16:00 Q&A All Speakers

Each speaker will speak for 15 minutes and we will end again with a Q&A.

To ensure your place on this topically important Webinar, please contact us NOW at eipc@eipc.org

For EIPC members the webinar is free of charge; for non-members the fee is € 50,-.

NEWS FROM ISRAEL

PCB Technologies Ltd.. from Israel was awarded with a large production contract of the Printed Circuit Boards for the world's leading anti-missiles systems "Iron Dome", recently purchased by the US DoD.

Company officials say that "this contract is an expression of the confidence our customers have in the quality and superior performance of our PCBs and another milestone in our strategy of expanding our business to the US market. With decades of experience in producing PCBs and PCBAs for high-end applications such as airborne, radars, maritime and other systems, we poses today a large portfolio of technologies and solutions that we believe can be of a great value to more US customers."

The award is for two years of production and should be followed by more contracts.

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EIPC SPEeDNEWS

The Weekly On-Line Newsletter from the European Institute of Printed Circuits.
Issue 19 - June 2021

ELECTRONIC INDUSTRY NEWS

Can China still lead the world in tech without a new Jack Ma?

Analysis by Laura He and Jill Disis, CNN Business
Updated 0746 GMT (1546 HKT) June 8, 2021

China has cut its global tech champions down to size, cracking down on antitrust abuses and undue risk taking. But the heavy-handed approach could backfire on Beijing by stifling an entrepreneurial spirit that has proven vital to the country's rapid economic rise.

Several tech companies have been investigated in the past few months over alleged monopolistic behaviour or other breaches of consumer rights. The ongoing probe — which President Xi Jinping has personally endorsed as necessary to maintain "social stability" — has led to record fines for some tech titans and massive overhauls for others. More than $600 billion has been wiped off the value of the biggest tech stocks in recent months.

A couple of China's most successful entrepreneurs have quit high-level positions amid the turmoil. Zhang Yiming, the founder of TikTok owner ByteDance, recently announced he would step down as CEO at just 38 years old to take a less prominent role in the company. And Colin Huang, 41, said in March that he would resign as chairman of Pinduoduo (PDD), an upstart e-commerce company that competes with the likes of Alibaba. Meanwhile, Alibaba (BABA) co-founder Jack Ma — China's most famous tech entrepreneur — has largely dropped out of public view.

<u>The young CEO who helped make TikTok a global hit is latest Chinese tech entrepreneur to quit</u>

Zhang and Huang both said they were departing to try new things, and neither referenced the government's focus on the tech sector in their announcements. Zhang's decision to step down was not related to regulatory moves in China, a ByteDance spokesperson said. Pinduoduo referred CNN Business to Huang's public comments.

But it's hard to separate their exits from the widening government clampdown on technology.

"The atmosphere hovering over China's tech landscape has grown increasingly toxic," said Alex Capri, a research fellow at Hinrich Foundation and a visiting senior fellow at National University of Singapore. He cited Zhang's move as "proof that fear trumps ambition if the threat of public humiliation or some worse form of punishment awaits those who challenge the system."

But challenging the system is essential to the private enterprise that played a key role in China's transition from a poor country to one of the worlds greatest economic and tech forces over the past few decades. Losing that dynamic would not only risk undermining some of those achievements, it could also make it much harder for China to meet its ambitious goals to lead the world in the technologies of the future.

A state-driven economy

Wary tech executives need look no further than Beijing's public humiliation of Ma. The flamboyant and outspoken entrepreneur all but disappeared after he criticized China's state-controlled banking system last fall for having a "pawn shop mentality," and accused the government of using stodgy and outdated means to regulate a modern financial system.

It's not just Ma's private reputation on the line. The businesses he built have suffered too. Beijing prevented Ant Group, Alibaba's financial affiliate, from going public, before forcing it to restructure and placing it under heavy regulation. Alibaba was slapped with a record fine in April over antitrust issues. Ma's legacy is under attack elsewhere — he has reportedly been forced to retreat from <u>an elite business school that he founded</u>.

"Part of the crackdown on internet tech companies is motivated by the desire to reduce financial risk, as in curtailing the lending activities of Ant," said Nicholas Lardy, a senior fellow at the Peterson Institute for International Economics (PIIE) who studies China's economy. Ant held about 2.15 trillion yuan ($333 billion) worth of consumer and small business loans this time last year.

<u>What an ancient poem says about China's fearful tech tycoons</u>

But another reason "may be due to Xi's desire to cut down alternative sources of power that could ultimately challenge the dominance of the [ruling Chinese Communist Party]," Lardy added.

Beijing's desire to exert heavier control over private enterprise comes from the government's faith that a state-managed planned economy is more effective than one that relies on a free market approach, and more importantly, more likely to allow the Party to preserve its power.

"The leaders of the tech firms that have become too powerful for the comfort of Xi and the Communist Party are put under pressure, as the monopoly of power across the board by the Party cannot be allowed to be challenged," said Steve Tsang, director of the SOAS China Institute at SOAS University of London. "Hence, they individually take actions to reassure the Party and Xi that they will not do so, by handing over the corporate leadership to protégés."

An unstable balance of power

China's internet companies aren't necessarily trying to rock the boat. Alibaba has worked extensively with the government on its Rural Taobao initiative, a program aimed at reducing poverty among farmers by helping them sell goods directly to urban consumers online. The company also developed a government-sponsored app — Xuexi Qiangguo — that teaches Xi's political philosophies.

China orders Tencent and other big tech firms to curb their finance businesses

"All of the big Chinese tech giants — in spite of their private nature — have cultivated a proximity to the government that presumably created the idea of balanced power relations," said Sonja Opper, a professor at Bocconi University in Italy who studies China's economy and its institutional transition to the private sector.

Tech entrepreneurs are also widely represented in Party circles.Tencent (TCTZF) founder and CEO Pony Ma and Xiaomi founder and CEO Lei Jun both serve as members of the National People's Congress — China's rubber-stamp parliament. Baidu (BIDU) founder and CEO Robin Li and NetEase (NTES) founder and CEO William Ding are members of the Chinese People's Political Consultative Conference, the country's top political advisory body. Jack Ma is a Communist Party member.

"The Party groomed rock-star like celebrities, [and] they were co-opted by making them members of the National People's Congress," Opper said, adding that tech entrepreneurs "certainly began to feel safe, because of their economic power and global visibility."

"They began to raise a critical voice and began to look like people who can challenge current thinking," she said. "What we see now is how unstable this balance was, and that control remains the government's key interest."

A risky strategy

Beijing's strategy is inherently risky.

China's long economic miracle and rapid ascent as a leader in tech has its roots in Beijing's farsighted decision in the late 1970s to give up some control over the economy and adopt a free market approach in many sectors. China's tech industry, for example, was free to raise capital oversees. Early bets by Japan's SoftBank (SFTBF) (Alibaba) and South Africa's Naspers (NAPRF) (Tencent) about 20 years ago paid off handsomely all round. Restoring a high degree of state control may curtail the freedom that these private companies have to innovate and keep up with major global competitors.

Investors may lose the incentive to pour money into private Chinese firms if they are worried about "unwanted government interference," Opper said, especially since some tech projects often take a long time to develop. And there's evidence that may already be happening.

China hits Alibaba with record $2.8 billion fine for behaving like a monopoly

Alibaba has lost more than $240 billion in market capitalization since Ant Group's IPO was pulled in November. Tencent has seen $173 billion in market value evaporate since a peak in January. E-commerce firms Pinduoduo, JD.com (JD), and food delivery giant Meituan, meanwhile, have lost a combined $231 billion since February peaks.

China's policymakers don't want to eliminate the private sector — it contributes nearly two thirds of the country's GDP and employs 80% of the workers. But it's very clear that Xi wants the state sector to lead, with private companies playing a supportive role.

"It's a paradox," said Lardy from the PIIE. "Xi wants the state to play a greater role. That's very clear from all the things he said from the last 10 years. He wants the government to play a bigger role to get things going faster."

But for Xi to achieve his ambitions of turning China into an innovation leader by 2035 and a global tech superpower by 2050, he'll need to rely more on private firms than he expects. The Chinese leader has increasingly stressed the need for China to shed its reliance on the West for technology over the past couple of years, especially as Washington curbs the ability for Chinese companies to access US tech. But the firms driving innovation and development in China aren't state-owned companies. Rather, private firms are leading the way: Huawei and Alibaba, for example, accounted for more spending on research and development than any other Chinese company last year, according to the China Enterprise Confederation.

"Looking back, there is a reason why China's tech giants were able to develop," Opper said. "They had a degree of freedom that allowed [them] to unleash productivity and innovation not seen in any state-owned enterprises in China."

Alibaba's co-founder Jack Ma (R) looks at Tencent Holdings' CEO Pony Ma during a celebration meeting marking the 40th anniversary of China's "reform and opening up" policy at the Great Hall of the People in Beijing on December 18, 2018.

Overly confident

That doesn't seem to be a lesson that China's policymakers want to heed right now.

The Covid-19 pandemic has convinced China that a largely planned economy with strict regulation of many aspects of life is the best approach to running the nation. The country last year implemented some of the strictest measures worldwide to contain the virus. In turn, it emerged as the only major economy to avert recession, outperforming its Western peers.

"Our greatest advantage is that the socialist system can enable us to concentrate resources to accomplish large undertakings," Xi was cited as saying in an editorial by the People's Daily, the Communist Party's mouthpiece, earlier this year. "This is an important way for us to achieve our cause."

The editorial cited China's alleged victory in its years-long campaign of "eliminating extreme poverty" in 2020 — by lifting all of its people above its set poverty line of 4,000 yuan, or $626, per year — as an example, writing: "Our Party and our country are the only ones in the world who can accomplish this, which fully demonstrates our political system's and institutional advantages."

But skeptics warn Beijing might be overconfident in its top-down economic strategy.

China is rehearsing for when it overtakes America

"It is a strategy that prioritizes short-term goals of political control over medium-term growth and development objectives," Opper said. "State-owned enterprises will not be able to fill the gap given weaker profit incentives and tighter control structures."

State-owned enterprises, despite being important tools for the Party's control, are notorious for their inefficiency — both in allocating resources and competing with private firms. They contribute much less to overall employment than private firms, and they account for as much as 70% of the corporate debt in China outside of the financial sector. That poses a threat to financial stability and economic growth.

Nonetheless, it's clear that Xi favours promoting the state sector and having such enterprises take the lead.

During a previous crackdown in 2017, this time against high-flying financial tycoons, Xi talked openly about the importance of the Communist Party as the heart of everything in China, including an economic policy focused on advancing the state sector.

"Xi is taking China down a path more risky than the alternative," said Tsang from SOAS.

Chip, Automotive Industries to Collaborate on Forecasting

By Barbara Jorgensen

The electronics supply chain has so many foibles that sometimes procurement experts are confounded by its intricacies. Automotive OEMs earlier this year got a crash course on the semiconductor lifecycle when microcontrollers and other chips became scarce.

Component shortages have escalated well beyond semiconductors and the chip scarcity could last years, according to Intel Corp. The automotive situation is so dire that carmakers have suspended production and sought government intervention.

Bettina Weiss, head of SEMI's Smart Mobility initiative

There are multiple reasons for the "perfect-storm" chip deficit of 2021 – Covid-19, capacity constraints, low inventories and uncertainty leading to flawed forecasts. What it boils down to, said Bettina Weiss, who heads up the Smart Mobility initiative for SEMI, is a lack of transparency between car makers and the original component makers (OCMs) that supply them. The situation demonstrated the need for constructive dialogue and collaboration along the entire supply chain to better understand industry cycles and inform inventory planning.

Carmakers were seeking better supply-chain visibility even before the pandemic upended global supply lines. SEMI and the Center for Automotive Research (CAR) have since signed a memorandum of understanding to advance collaboration between the semiconductor and automotive industries. This could mitigate the effects of a sudden shift in chip demand.

The MOU lays the foundation to connect microelectronics manufacturing and design stakeholders with the automotive and mobility ecosystems through programs and events that advance both industries, SEMI said in a statement. The initiative builds on SEMI's Smart Mobility project, which fosters collaboration across the global automotive electronics supply chain.

Limited visibility is a common gripe across the electronics supply chain. The auto industry's structure further distances carmakers from components. Traditionally, said Weiss, Tier-1 automotive suppliers drove – and managed – carmakers' chip demand. The role of first-tier vendors in the vehicle market has since expanded and the electronics supply chain has become more complex. Second- and third-tier suppliers play an essential role in semiconductor manufacturing, but communication with OEMs and Tier-1s still needs to be more frequent and more direct.

Data sharing with multiple tiers of suppliers can head off unpleasant surprises. For example, a fire that occurred at a Taiwanese substrate factory in late 2020 is still impacting global chip production. Unimicron is a sole source for many chip companies and few substrate alternatives are available. Even if they were, vetting a new supplier for an approved vendor list takes months. Few OEMs have visibility beyond Tier-1.

The benefits of the SEMI-CAR pact are self-evident. "SEMI would like visibility into the auto industry, and we'd like to get a handle on the semiconductor industry," said Carla Bailo, CAR's president and CEO. "This is the right time to collaborate."
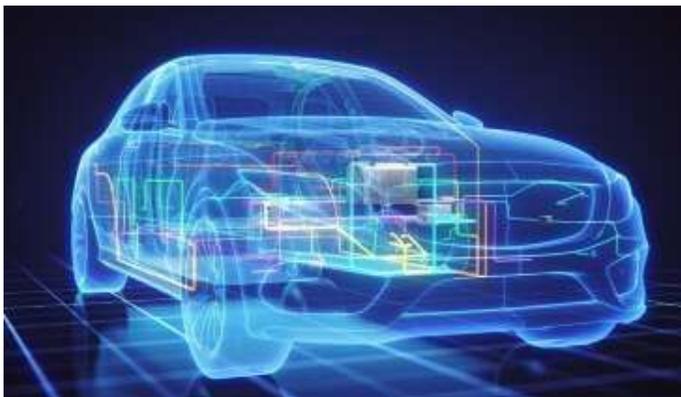
Electronics are not new to the car industry, but the volume and sophistication of the devices used in vehicles has skyrocketed. The global automotive semiconductor sector was valued at $48.13 billion in 2020 and is expected to reach $129.17 billion by 2026, according to Mordor Intelligence. One immutable fact about semiconductors is they take a minimum of

18 weeks to produce. Coupled with the lean inventory practices of the supply chain, there's no quick fix for sudden spikes in demand.

"I've seen one estimate that says a chip travels 25,000 miles during processing in different regions of the world," noted Bailo.

The chip deficit is expected to cost the global automotive industry $110 billion in revenue in 2021, according to consulting firm AlixPartners. To be fair, all business forecasts in 2020 carried a Covid disclaimer and automotive was no different.

"When the pandemic happened car makers took their forecasts way down," said Bailo. "Nobody knew when the recovery would hit. In the meantime, demand from consumers for IT and related equipment went through the roof. Semiconductors were shifted toward those products.

"It's not that easy to switch supply when demand comes from somewhere else," she added.

It's not that easy to expand capacity either. Semiconductor fabs take years and billions of dollars to build. Foundries, such as TSMC, have long-term relationships with customers that book capacity in advance. There's no quick fix for a chip shortage.

"The notion that an automotive plant would have to stall production because they can't get a microcontroller is alarming," said Weiss.

Having automakers, suppliers and semiconductor manufacturers work together more closely will add visibility into supply and demand trends, SEMI said. "The result is intended to help connect larger cross-sections of the supply chains and minimize the impact and risk of future chip shortages and over-supply."

Both industries see the pact as an opportunity. "This [MOU] has given rise to an opportunity that benefits both industries, bringing stakeholders from both sides together in a collective approach to address global challenges such as the current chip shortage," said Weiss.

As technology evolves, the automotive industry will become more semiconductor-intensive – advanced safety features, electric vehicles, powertrain controls, automated driving, telematics and infotainment all drive rapidly increasing auto chip demand, added Bailo.

CAR is a non-profit organization that conducts research and analysis into critical issues facing the automotive industry, and the industry's impact on the U.S. economy and society. The chip shortage has had an escalating effect on the economy as workers are laid off. The Bureau of Labour Statistics said the U.S. motor vehicle and parts sector lost 27,000 jobs in April.

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Barbara Jorgensen

Barbara Jorgensen is managing editor and co-founder of supply chain publication EPSNews, which was acquired by Aspencore in 2017. Barb has more than 28 years' experience as a journalist, working for leading electronics industry publications such as Electronic Business, Electronic Buyers' News (EBN) and EDN. Her focus areas include general business, electronics distribution, supply chain, trade and industry analysis.

Inside the fight to reclaim AI from Big Tech's control

For years, Big Tech has set the global AI research agenda. Now, groups like Black in AI and Queer in AI are upending the field's power dynamics to build AI that serves people.
by

- **Karen Haoarchive page**

Timnit Gebru never thought a [scientific paper](#) would cause her so much trouble. In 2020, as the co-lead of Google's ethical AI team, Gebru had reached out to [Emily Bender](#), a linguistics professor at the University of Washington, and asked to collaborate on research about the troubling direction of artificial intelligence. Gebru wanted to identify the risks posed by [large language models](#), one of the most stunning recent breakthroughs in AI research. The models are algorithms trained on staggering amounts of text. Under the right conditions, they can compose what look like convincing passages of prose.

For a few years, tech companies had been racing to build bigger versions and integrate them into consumer products. Google, which invented the technique, was already using one to improve the relevance of search results. OpenAI announced the largest one, called [GPT-3](#), in June 2020 and licensed it exclusively to Microsoft a few months later.

Gebru worried about how fast the technology was being deployed. In the paper she wound up writing with Bender and five others, she detailed the possible dangers. The models were enormously costly to create—both environmentally (they require huge amounts of computational power) and financially; they were often trained on the toxic and abusive language of the internet; and they'd come to dominate research in language AI, elbowing out promising alternatives.

Like other existing AI techniques, the models don't actually understand language. But because they can manipulate it to retrieve text-based information for users or generate natural conversation, they can be packaged into products and services that make tech companies lots of money.

That November, Gebru submitted the paper to a conference. Soon after, Google executives asked her to retract it, and when she refused, they fired her. Two months later, they also fired her coauthor Margaret Mitchell, the other leader of the ethical AI team.

The dismantling of that team sparked one of the largest controversies within the AI world in recent memory. Defenders of Google argued that the company has the right to supervise its own researchers. But for many others, it solidified fears about the degree of control that tech giants now have over the field. Big Tech is now the primary employer and funder of AI researchers, including, somewhat ironically, many of those who assess its social impacts.
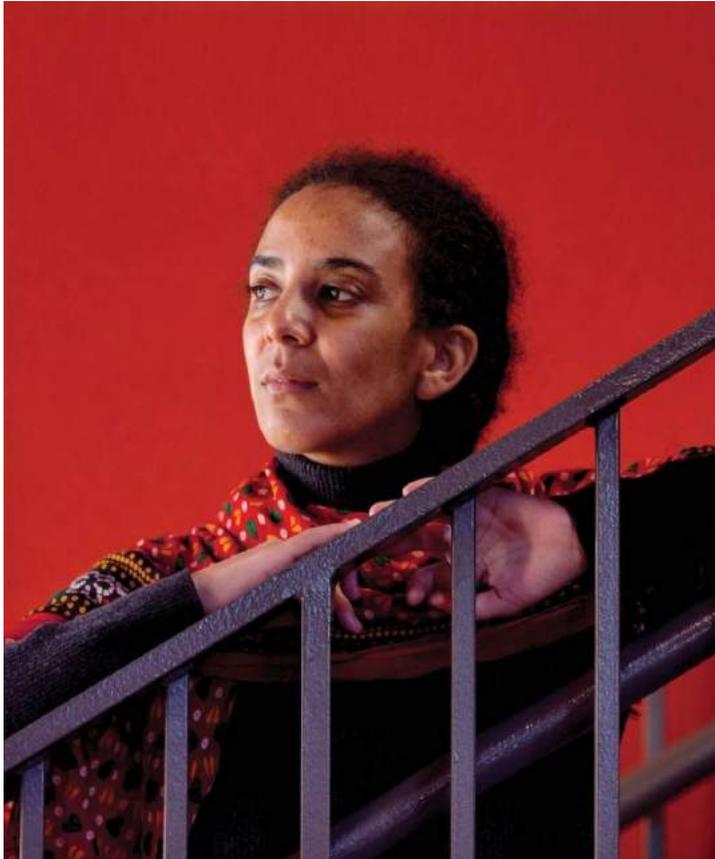
We read the paper that forced Timnit Gebru out of Google. Here's what it says.

The company's star ethics researcher highlighted the risks of large language models, which are key to Google's business.

Among the world's richest and most powerful companies, Google, Facebook, Amazon, Microsoft, and Apple have made AI core parts of their business. Advances over the last decade, particularly in an AI technique called deep learning, have allowed them to monitor users' behavior; recommend news, information, and products to them; and most of all, target them with ads. Last year Google's advertising apparatus generated over $140 billion in revenue. Facebook's generated $84 billion.

The companies have invested heavily in the technology that has brought them such vast wealth. Google's parent company, Alphabet, acquired the London-based AI lab DeepMind for $600 million in 2014 and spends hundreds of millions a year to support its

research. Microsoft signed a $1 billion deal with OpenAI in 2019 for commercialization rights to its algorithms.

At the same time, tech giants have become large investors in university-based AI research, heavily influencing its scientific priorities. Over the years, more and more ambitious scientists have transitioned to working for tech giants full time or adopted a dual affiliation. From 2018 to 2019, 58% of the most cited papers at the top two AI conferences had at least one author affiliated with a tech giant, compared with only 11% a decade earlier, according to a study by researchers in the [Radical AI Network](#), a group that seeks to challenge power dynamics in AI.

The problem is that the corporate agenda for AI has focused on techniques with commercial potential, largely ignoring research that could help address challenges like economic inequality and climate change. In fact, it has made these challenges worse. The drive to automate tasks has cost jobs and led to the rise of tedious labor like data cleaning and content moderation. The push to create ever larger models has caused AI's energy consumption to explode. Deep learning has also created a culture in which our data is constantly scraped, often without consent, to train products like facial recognition systems. And recommendation algorithms have exacerbated political polarization, while large language models have failed to clean up misinformation.

It's this situation that Gebru and a growing movement of like-minded scholars want to change. Over the last five years, they've sought to shift the field's priorities away from simply enriching tech companies, by expanding who gets to participate in developing the technology. Their goal is not only to mitigate the harms caused by existing systems but to create a new, more equitable and democratic AI.

"Hello from Timnit"

In December 2015, Gebru sat down to pen an open letter. Halfway through her PhD at Stanford, she'd attended the Neural Information Processing Systems conference, the largest annual AI research gathering. Of the more than 3,700 researchers there, Gebru counted only five who were Black.

Once a small meeting about a niche academic subject, NeurIPS (as it's now known) was quickly becoming the biggest annual AI job bonanza. The world's wealthiest companies were coming to show off demos, throw extravagant parties, and write hefty checks for the rarest people in Silicon Valley: skillful AI researchers.

That year Elon Musk arrived to announce the nonprofit venture [OpenAI](#). He, Y Combinator's then president Sam Altman, and PayPal cofounder Peter Thiel had put up $1 billion to solve what they believed to be an existential problem: the prospect that a superintelligence could one day take over the world. Their solution: build an even better superintelligence. Of the 14 advisors or technical team members he anointed, 11 were white men.

While Musk was being lionized, Gebru was dealing with humiliation and harassment. At a conference party, a group of drunk guys in Google Research T-shirts circled her and subjected her to unwanted hugs, a kiss on the cheek, and a photo.

Gebru typed out a scathing critique of what she had observed: the spectacle, the cult-like worship of AI celebrities, and most of all, the overwhelming homogeneity. This boy's club culture, she wrote, had already pushed talented women out of the field. It was also leading the entire community toward a dangerously narrow conception of artificial intelligence and its impact on the world.

Google had already deployed a computer-vision algorithm that classified Black people as gorillas, she noted. And the increasing sophistication of unmanned drones was putting the US military on a path toward lethal autonomous weapons. But there was no mention of these issues in Musk's grand plan to stop AI from taking over the world in some theoretical future scenario. "We don't have to project into the future to see AI's potential adverse effects," Gebru wrote. "It is already happening."

Gebru never published her reflection. But she realized that something needed to change. On January 28, 2016, she sent an email with the subject line "Hello from Timnit" to five other Black AI researchers. "I've always been sad by the lack of color in AI," she wrote. "But now I have seen 5 of you :) and thought that it would be cool if we started a black in AI group or at least know of each other."

The email prompted a discussion. What was it about being Black that informed their research? For Gebru, her work was very much a product of her identity; for others, it was not. But after meeting they agreed: If AI was going to play a bigger role in society, they needed more Black researchers. Otherwise, the field would produce weaker science—and its adverse consequences could get far worse.

A profit-driven agenda

As Black in AI was just beginning to coalesce, AI was hitting its commercial stride. That year, 2016, tech giants spent an estimated $20 to $30 billion on developing the technology, according to the McKinsey Global Institute.

Heated by corporate investment, the field warped. Thousands more researchers began studying AI, but they mostly wanted to work on deep-learning algorithms, such as the ones behind large language models. "As a young PhD student who wants to get a job at a tech company, you realize that tech companies are all about deep learning," says Suresh Venkatasubramanian, a computer science professor who now serves at the White House Office of Science and Technology Policy. "So you shift all your research to deep learning. Then the next PhD student coming in looks around and says, 'Everyone's doing deep learning. I should probably do it too.'"

But deep learning isn't the only technique in the field. Before its boom, there was a different AI approach known as symbolic reasoning. Whereas deep learning uses massive amounts of data to teach algorithms about meaningful relationships in information, symbolic reasoning focuses on explicitly encoding knowledge and logic based on human expertise.

Some researchers now believe those techniques should be combined. The hybrid approach would make AI more efficient in its use of data and energy, and give it the knowledge and reasoning abilities of an expert as well as the capacity to update itself with new information. But companies have little incentive to explore alternative approaches when the surest way to maximize their profits is to build ever bigger models.

In their paper, Gebru and Bender alluded to a basic cost of this tendency to stick with deep learning: the more advanced AI systems we need are not being developed, and similar problems keep recurring. Facebook, for example, relies heavily on large language models for automated content moderation. But without really understanding the meaning behind text, those models often fail. They regularly take down innocuous posts while giving hate speech and misinformation a pass.

AI-based facial recognition systems suffer from the same issue. They're trained on massive amounts of data but see only pixel patterns—they do not have a grasp of visual concepts like eyes, mouths, and noses. That can trip these systems up when they're used on individuals with a different skin tone from the people they were shown during training. Nonetheless, Amazon and other companies have sold these systems to law enforcement. In the US, they have caused three known cases of police jailing the wrong person—all Black men—in the last year.

For years, many in the AI community largely acquiesced to Big Tech's role in shaping the development and impact of these technologies. While some expressed discomfort with the corporate takeover, many more welcomed the industry's deep well of funding.

But as the shortcomings of today's AI have become more evident—both its failure to solve social problems and the mounting examples that it can exacerbate them—faith in Big Tech has weakened. Google's ousting of Gebru and Mitchell further stoked the discussion by revealing just how much companies will prioritize profit over self-policing.

In the immediate aftermath, over 2,600 Google employees and 4,300 others signed a petition denouncing Gebru's dismissal as "unprecedented research censorship." Half a year later, research groups are still rejecting the company's funding, researchers refuse to participate in its conference workshops, and employees are leaving in protest.

Unlike five years ago, when Gebru began raising these questions, there's now a well-established movement questioning what AI should be and who it should serve. This isn't a coincidence. It's very much a product of Gebru's own initiative, which began with the simple act of inviting more Black researchers into the field.

It takes a conference

In December 2017, the new Black in AI group hosted its first workshop at NeurIPS. While organizing the workshop, Gebru approached Joy Buolamwini, an MIT Media Lab researcher who was studying commercial facial recognition systems for possible bias. Buolamwini had begun testing these systems after one failed to detect her own face unless she donned a white mask. She submitted her preliminary results to the workshop.

Deborah Raji, then an undergraduate researcher, was another early participant. Raji was appalled by the culture she'd observed at NeurIPS. The workshop became her respite. "To go from four or five days of that to a full day of people that look like me talking about succeeding in this space—it was such important encouragement for me," she says.

Buolamwini, Raji, and Gebru would go on to work together on a pair of groundbreaking studies about discriminatory computer-vision systems. Buolamwini and Gebru coauthored Gender Shades, which showed that the facial recognition systems sold by Microsoft, IBM, and Chinese tech giant Megvii had remarkably high failure rates on Black

women despite near-perfect performance on white men. Raji and Buolamwini then collaborated on a follow-up called Actionable Auditing, which found the same to be true for Amazon's Rekognition. In 2020, Amazon would agree to a one-year moratorium on police sales of its product, in part because of that work.

Related Story

"I started crying": Inside Timnit Gebru's last days at Google—and what happens next

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At the very first Black in AI workshop, though, these successes were distant possibilities. There was no agenda other than to build community and produce research based on their sorely lacking perspectives. Many onlookers didn't understand why such a group needed to exist. Gebru remembers dismissive comments from some in the AI community. But for others, Black in AI pointed a new way forward.

This was true for William Agnew and Raphael Gontijo Lopes, both queer men conducting research in computer science, who realized they could form a Queer in AI group. (Other groups that took shape include Latinx in AI, {Dis}Ability in AI, and Muslim in ML.) For Agnew, in particular, having such a community felt like an urgent need. "It was hard to even imagine myself having a happy life," he says, reflecting on the lack of queer role models in the field. "There's Turing, but he committed suicide. So that's depressing. And the queer part of him is just ignored."

Not all affinity group members see a connection between their identity and their research. Still, each group has established particular expertise. Black in AI has become the intellectual center for exposing algorithmic discrimination, critiquing surveillance, and developing data-efficient AI techniques. Queer in AI has become a center for contesting the ways algorithms infringe on people's privacy and classify them into bounded categories by default.

Venkatasubramanian and Gebru also helped create the Fairness, Accountability, and Transparency (FAccT) conference to create a forum for research on the social and political implications of AI. Ideas and draft papers discussed at NeurIPS affinity group workshops often become the basis for papers published at FAccT, which then showcases that research to broader audiences.

It was after Buolamwini presented at the first Black in AI workshop, for example, that FAccT published Gender Shades. Along with Actionable Auditing, it then fueled several major education and advocacy campaigns to limit government use of facial recognition. When Amazon attempted to undermine the legitimacy of Buolamwini's and Raji's research, dozens of AI researchers and civil society organizations banded together to defend them, foreshadowing what they would later do for Gebru. Those efforts eventually contributed to Amazon's moratorium, which in May the company announced it would extend indefinitely.

The research also set off a cascade of regulation. More than a dozen cities have banned police use of facial recognition, and Massachusetts now requires police to get a judge's permission to use it. Both the US and the European Commission have proposed additional regulation.

"First we had to just be there," says Gebru. "And at some point, what Black in AI says starts to become important. And what all of these groups together say becomes important. You have to listen to us now."

Follow the money

After Gebru and Mitchell's firing, the field is grappling anew with an age-old question: Is it possible to change the status quo while working from within? Gebru still believes working with tech giants is the best way to identify the problems. But she also believes that corporate researchers need stronger legal protections. If they see risky practices, they should be able to publicly share their observations without jeopardizing their careers.

Then there's the question of funding. Many researchers want more investment from the US government to support work that is critical of commercial AI development and advances the public welfare. Last year, it committed a measly $1 billion to non-defense-related AI research. The Biden administration is now asking Congress to invest an additional $180 billion in emerging technologies, with AI as a top priority.

Such funding could help people like [Rediet Abebe](#), an assistant professor of computer science at the University of California, Berkeley. Abebe came into AI with ideas of using it to advance social equity. But when she started her PhD at Cornell, no one was focused on doing such research.

In the fall of 2016, as a PhD student, she began a small Cornell reading group with a fellow graduate student to study topics like housing instability, health-care access, and inequality. She then embarked on a new project to see whether her computational skills could support efforts to alleviate poverty.

Eventually, she found the Poverty Tracker study, a detailed data set on the financial shocks—unexpected expenses like medical bills or parking tickets—experienced by more than 2,000 New York families. Over many conversations with the study's authors, social workers, and nonprofits serving marginalized communities, she learned about their needs and told them how she could help. Abebe then developed a model that showed how the frequency and type of shocks affected a family's economic status.

Five years later, the project is still ongoing. She's now collaborating with nonprofits to improve her model and working with policymakers through the California Policy Lab to use it

as a tool for preventing homelessness. Her reading group has also since grown into a 2,000-person community and is holding its inaugural conference later this year.

Abebe sees it as a way to incentivize more researchers to flip the norms of AI. While traditional computer science conferences emphasize advancing computational techniques for the sake of doing so, the new one will publish work that first seeks to deeply understand a social issue. The work is no less technical, but it builds the foundation for more socially meaningful AI to emerge.

"These changes that we're fighting for—it's not just for marginalized groups," she says. "It's actually for everyone."

The Path to the Electronics Graveyard

By Rebecca Day

Last weekend was the first electronics recycling event in Manhattan since the before times — pre-Covid-19, that is. I scoured shelves and drawers and headed off to the midtown location with three overstuffed bags of electronics detritus and the carcass of a desktop PC — all accumulating since the last time I recycled about three years ago. That'll teach me to put off until a post-pandemic tomorrow what can be done today.

The desktop was the most recent discard. With the mounting concerns over identity theft and privacy, I didn't want to take any chances with lingering sensitive data on the hard drive. Adding muscle and brain power from my partner Liz, we extricated the hard drive and summoned our best 7-year-old demons to scratch up the shiny disk with a Phillips-head screwdriver, then passed a strong magnet over the top for good measure, before pummeling it with a few whacks of a hammer. We repeated the cycle for the hard drive from the PC before this one. Who needs meditation when you can smash up an old hard drive or two?

It was less satisfying to go through generations of consumer electronics products that had at one time brought me joy and now were collecting dust. I was a little surprised that not only had I gone through one iPad, but I had two that were beyond the software upgrade stage. I hate to think about what I spent on them, especially when I don't use an iPad all that

often. Here's hoping the current one lasts through several more iPadOS update cycles.

I'm still able to use the proprietary Apple lightning cables that came with those two iPads, along with the power adapter that was included in the box. That's good, since Apple doesn't include power adapters anymore with the iPhone. My luck? The next time I get a new phone, Apple will have switched to USB-C — or God forbid, another proprietary charging connector — and I'll have to haul off the lightning connectors on my next trip to the Eco-Tech truck.

One bag on Saturday was filled entirely with connectors, power cables and adapters I no longer need — red and white RCA audio cables, a yellow S-Video one, and a bunch of proprietary power cords that I assume I won't need again because I couldn't identify the gadgets they came with. I had no idea why I had an HDMI-to-Mini-HDMI adapter cable and did a Google search hoping to find out. That didn't help, but I did see that Amazon warned on a product listing about confusing a Micro-HDMI port with a Mini-HDMI port. I wondered how many people bought the wrong one … and if I was one of them.

I dumped two Sonos components: a bridge that was once required to connect Sonos speakers to the internet via direct connection to the router (glad those days are gone) and an Amp that connected my integrated amplifier to the Sonos network. The Amp went the way of the Sonos S1 operating system that's no longer able to get software updates, having left me with a forced upgrade for a $649 piece of gear.

An old digital camera body also went to electronics heaven. We thought about putting it on eBay, but between the plunge in standalone digital SLR sales due to advances in smartphone cameras — and this one's 20-year-old age — we found there was little to no value in the old girl. I hope she's worth something to someone in reclaimed materials.

I feel very different about my old Nikon FM film camera that, it seems, I'll never give up. I'll also likely never take a roll of film to be developed again, but I have a fondness for that old camera and its manual functions: loading the film, threading it onto the sprockets, setting the aperture to get the desired depth of field, adjusting the focus…. We had a physical connection, that camera and I, and that's something I'll never have with my iPhone camera. There's no going back, but there was something satisfying about the manual side of film photography.

I also tossed some old speaker cable and realized that there's a generation or two who would have no idea what to do with speaker cable — how to clip off the ends to get to the exposed wire and then wrap it around speaker terminals with the correct polarity. I enjoyed that aspect of the electronics setup process when getting new speakers. Today, it's about the invisible pairing between the phone and the Bluetooth speaker — another convenient technology advancement that has made music more accessible but removed from the hands-on experience.

A couple of sets of old wired headphones completed my electronics purge, and they made me think about how important wireless headphones have become to our daily lives. What were once accessories have become not only the standard way to listen to music but also essential work attire for employees in open-plan offices who want to block ambient noise. When the pandemic hit and people began working from home, headphones also became an enabler for Zoom calls.

Headphones, whether wired or wireless, have a shorter lifespan than the rest of the items we sent for shredding and sorting. A 2019 *Vice* article stuck with me. Though I get longer use out of a pair of headphones than the typical 18 months cited in the article (only because I alternate between earbuds and cans), the end-of-life scenario is disturbing:

"Then the lithium-ion batteries will stop holding much of a charge, and the AirPods will slowly become unusable. They can't be repaired because they're glued together. They can't be thrown out, or else the lithium-ion battery may start a fire in the garbage compactor. They can't be easily recycled, because there's no safe way to separate the lithium-ion battery from the plastic shell. Instead, the AirPods sit in your drawer forever."

Apple, for its part, has a way to take old AirPods off your hands, but the idea of cycling through earbuds (or over-the-ear headphones) due to wear and tear every couple of years just doesn't sit well. It seems that as consumer electronics do more, their lifetimes shrink, and some become more disposable. Let's hope someone is working on making the hardware stand up for a few more rounds.

Rebecca Day

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<u>**Issue 19 - June 2021**</u>

<u>NEWS FROM THE IPC</u>

Industry Survey Finds U.S. Electronics Manufacturers May Exit the Defense Market Due to High Costs Associated with CMMC

In a new IPC industry survey and report, one-quarter (24 percent) of electronic manufacturers say the costs and burdens of compliance with the Cybersecurity Maturity Model Certification(CMMC)may force them out of the U.S. Department of Defense's (DoD) supply chain.

The survey conducted by IPC, the global electronics manufacturing association, also finds that for many small- to medium-size businesses (SMB), the costs and burdens of CMMC compliance may outweigh the benefits of doing business with the DoD.

In addition, 33 percent of respondents say the CMMC will weaken the U.S. defense electronics industrial base, while 18 percent are unsure, highlighting the uncertainties involved. And 41 percent believe applying the CMMC clause to their suppliers will create other problems in the supply chain.

"Cybersecurity is a must for U.S. national security, but the costs and burdensof achieving CMMC compliance under the current approach will likely force many small and medium-sized manufacturers out of the DoD supply chain, negatively impacting national security," said John Mitchell, IPC president and CEO. "The objectives of CMMC are well-intentioned, but they must not be achieved at the expense of other key aspects of supply chain health."

Most suppliers expect and are willing to spend upwards of $50,000 on CMMC readiness, and nearly one-third (32 percent) report that it will

take them one to two years to prepare to undergo CMMC assessment. However, more than half of the suppliers say implementation costs of more than $100,000 would make CMMC readiness too expensive. DoD's own cost analysisestimated the cost of a CMMC Maturity Level 3 (ML3) certification to be more than $118,000 in the first year. This means DoD's own estimate of CMMC compliance costs is too high for 77 percent of the IPC survey respondents.

"The Pentagon needs to take into consideration that most SMBs do not have dedicated cybersecurity personnel to achieve the prerequisites, and while many commercial electronics manufacturers have considerable business with the defense community, they themselves do not consider themselves a defense contractor," added Mitchell.

The study's author, cyber security expert Leslie Weinstein, says the DoD can reduce the costs and uncertainties of CMMC compliance by leveraging existing industry standards and certifications, such as IPC-1791, the electronics industry's "Trusted Supplier" standard, which was designed in collaboration with the DoD; or the certifications offered by HITRUST or the International Standards Organization.

"The DoD recognizes a variety of respected, industry-driven certifications when it comes to hiring cybersecurity professionals," says Weinstein. "Taking the same approach to certifying suppliers would allow companies to invest more in security than in redundant audits, and it would quickly create a pool of companies who are able to bid on DoD solicitations containing the CMMCDFARS clause. And importantly, it would prevent further erosion of the U.S. defense industrial base."

IPC fielded the survey between February 25 and March 5, 2021 and garnered 108 responses from contract manufacturers, printed circuit board fabricators, original equipment manufacturers and suppliers who self-reported they are planning to undergo a CMMC assessment in the next five years.

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