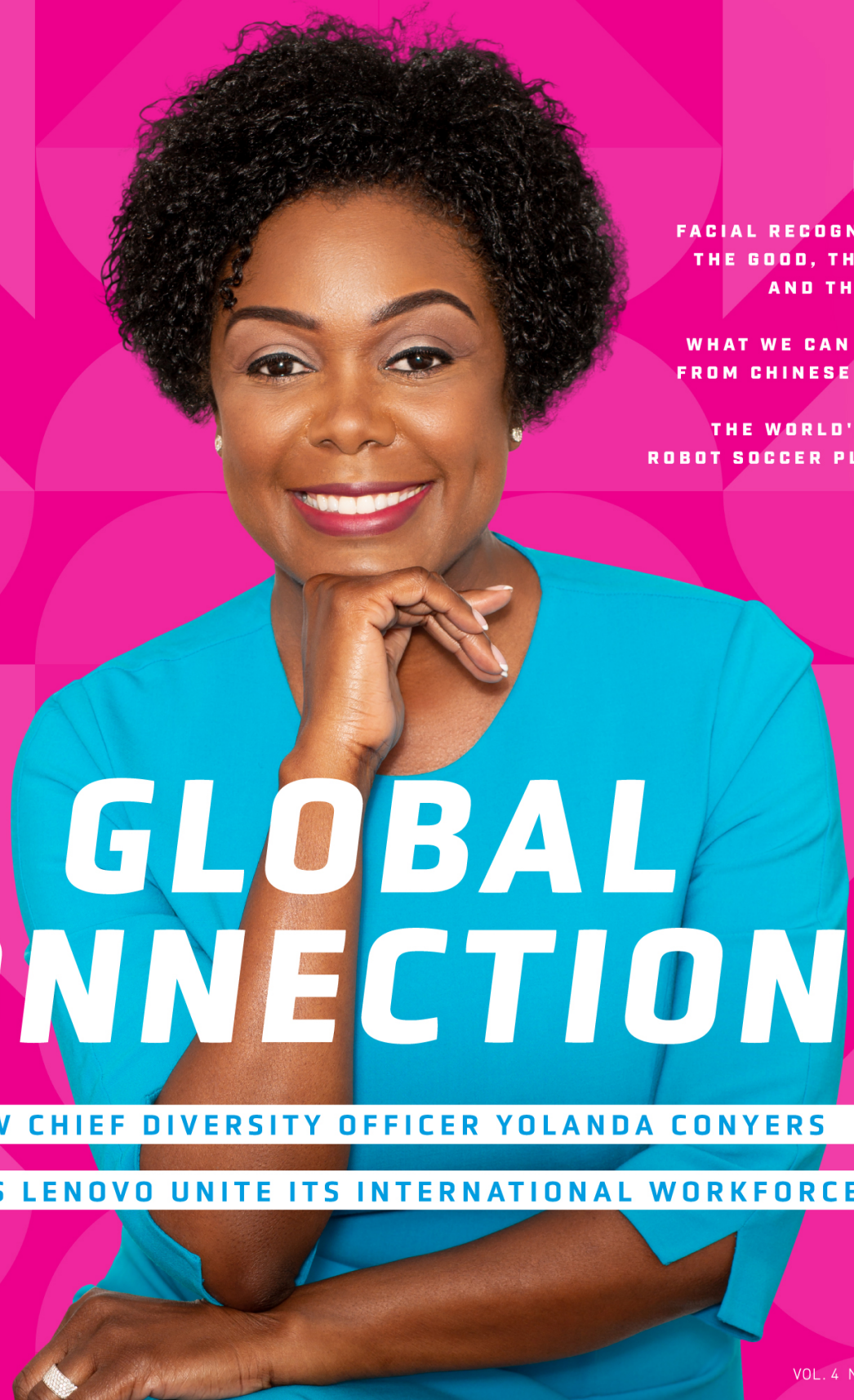


COGNITIVE TIMES



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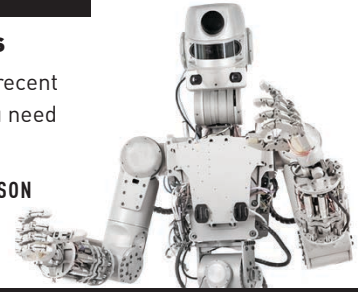
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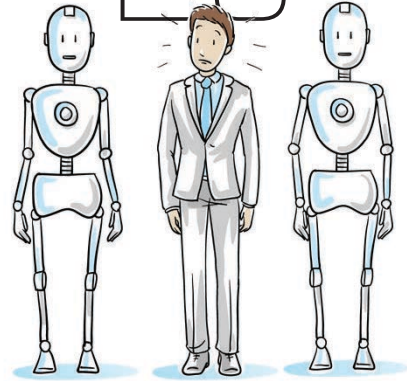
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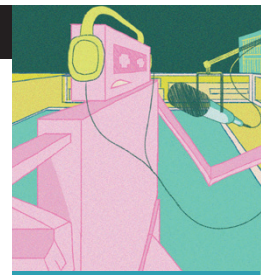
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GET READY

Proper preparation prevents poor performance—not to mention the robot apocalypse.

YOU COULD SAY that we've borrowed the motto of this edition of *Cognitive Times* from the Boy Scouts of America: "Be Prepared."

The AI revolution is already well underway and gaining steam. As with any major technological shift, there are two camps: those who embrace the new and seek to build enduring differentiation for themselves and their companies. And those who resist the inevitable and risk being left behind. What is the nature of this resistance? When strategists speak of the need to implement AI systems for national defense, these proposals are often countered with visions of an apocalypse that has now been portrayed in countless novels, films, and television programs. When automation of logistics and transportation is discussed, one of the counterarguments seeks to paint a vision of a jobless future where being human has lost its meaning and the ability for hardworking people to support their families has been forever lost. And then there are more mundane reasons: the data isn't ready, it isn't in the right format, and AI only works if you have huge amounts of perfect data. The reality is that resistance to the inevitable takes many forms. But that doesn't make the inevitable—AI and automation—any less likely. So, in this issue we celebrate the doers, the change agents, and those who embrace the future with both pragmatism and a can-do optimism.

Take our cover subject, Yolanda Conyers, the global head of human resources for the Chinese multinational giant Lenovo. I greatly admire the methodical approach that Conyers and her team took to reconciling differing cultures of the tens of thousands Lenovo workers all around the world in order to better unify the company as a whole. I also appreciate her commitment to diversifying the workforce—for indeed it's only through harnessing a wide array of perspectives that a vast enterprise like Lenovo can hope to succeed on a worldwide scale. And critically, Conyers has been crucial in driving a look-to-the-future culture of technology adoption. Lenovo is leaning forward when it comes to AI adoption.

More broadly, China and its unique viewpoint on the AI revolution also figure prominently in the latest contribution from

writer August Cole, who takes a closer look at recent works of Chinese science fiction to glean how their vantage point on these matters differs from the predominant Western view. He ponders what we might learn from that.

Our second feature story of this issue returns to the theme of disabusing us of fears by preparing ourselves for what's to come. Ryan Long, a Los Angeles-area attorney focused on the fields of technology, media, and design, dives into the good, bad, and ugly of the new facial recognition capabilities already being deployed by governments and corporations. Long points out that the good to be harvested from this technology can outweigh the bad, but that we must set up the proper legal frameworks, as well as build into the tech the proper safeguards to ward off the potential for the ugly. Problems are no excuse to disengage. Challenges are there only to be overcome.

Elsewhere, as usual, you'll find conversations with inspiring leaders in various fields whom we believe our readers need to know. There's Azita Arvani, who after years of heading innovation at Nokia, has struck out on her own as a digital transformation evangelist, spurring companies to do more to be prepared—there are those words again!—to compete in tomorrow's economy. Geir Engdahl of Cognite discusses how his company's culture inspired it to better meet previously unfulfilled demands in the energy and shipping industries. And Tom Vice of Reno-based Aerion opens up about the future of supersonic flight in business jets. These are the leaders on the front lines, transforming cultures and spearheading innovation. We need more Yolandas, Azitas and Geirs!

Be sure to check out a couple of new items that we're introducing and hope to include regularly in future issues. What we're calling "Elevator Pitch" offers a chance for an up-and-coming startup to briefly highlight why it believes it has much to offer investors. We begin with Austin-based Senseye, which is engaged in intriguing work with the Department of Defense. You'll also find a bit of fun in "Hollywood AI," which features writer Evan Sakrison taking a look at mainstream media's portrayal of technology. He begins with the 2013 movie *Her*.

Let us know what you think of this issue. We hope it's the best *Cognitive Times* issue yet and is only outdone by the next one.

Amir Husain

Founder & CEO of SparkCognition



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MEET THE MIND

BY KRISTIN WONG

AZITA ARVANI

Digital Transformation Evangelist

AZITA ARVANI LIKES results. That’s why, during her undergraduate studies at the University of California, Los Angeles, she switched her major from math to computer science and never looked back. “With computer science, you got to create something. You can build a program and have it do exactly what you want it to do,” says the LA native, whose tall frame and California style are admittedly intimidating, but softened by her big, warm smile. “It just seemed like you had the power to do a lot of things.”

That results-focused approach seems to fuel the current mission of the former head of innovation for partner and venture management at Nokia—namely, helping businesses, institutions, and organizations keep up with the rapidly changing digital

landscape. Brick-and-mortar store closings in the U.S. hit a record high in 2017, and the number of announced store closings through the first quarter of 2019 had already exceeded the number for the entirety of 2018. Dubbing it a “retail apocalypse,” analysts unsurprisingly cite the rise of e-commerce as a major factor. Of course, it’s not just retail that’s been disrupted. Nearly every sector of the economy, from tourism to manufacturing to telecommunications, is vulnerable to the impact of digitalization. “It’s sort of sad to see these big brands that have been around forever get lost and go away,” Arvani says. “I’m sure there were people in those companies that saw it coming.”

Arvani started her career at Xerox, where she began as technical assistant to the senior vice president and eventually took on the role of director of corporate strategy. From there, she started her own company, working with clients like Microsoft, Otto Group, and Casio to develop business strategies and systems. “At the beginning of my career, I learned what kind of innovations were shaping the market, and then I was more involved in development,” she says. In 2011, she became head of innovation strategy at Nokia, where she was involved in taking new technologies to market. It was also a role that did much to shape her perspective on digital transformation.

“We all know technology moves very fast, but in the past several years, there’s been a confluence of foundational technologies that are coming together, like cloud, AI, IoT. It makes it almost impossible for companies not to completely transform themselves,” she says. “Now my goal is to spread that message.”

Arvani says many of the entities struggling to keep up with digitization are defining transformation too narrowly. “Digital transformation is not innovation for the sake of innovation. It’s using existing technologies as a tool to serve your customers,” she explains. With the ongoing threat of digital natives taking over, every industry should be proactive about how to improve the customer experience with the help of digital technology. “I call it Amazonifying yourself.”

Tech giants like Amazon have raised the consumer demand for efficiency, convenience, and speed—an expectation that cuts across all sectors. Pointing to the cup of jasmine tea in front of her as we chat at Zinqué, a casual Venice, California cafe that’s surprisingly quiet for a Friday afternoon, Arvani says, “On Amazon, I can pay for something as simple as a bag of tea, and I can track it and even see a picture of the package when it’s dropped off on my doorstep. If I can do that with something that costs \$3.50, then I’m going to want that same experience everywhere.”

Businesses have to hurry to keep up with technology, but ironically, transformation takes time. You have to consider big-picture, long-term objectives, then implement strategies to transform the business holistically, Arvani says. “And that’s why it’s up to

a company’s CEO and board to lead digital transformation,” she adds. “The trick is to figure out how to balance that vision of being a totally digital company versus where you’re at now.”

Many businesses take a bottom-up approach instead, finding quick digital fixes in a rush to keep up with the landscape. Often enough, they implement these changes in departments, systems, or processes that are interdependent. While using technology this way can help streamline specific functions in your business, it doesn’t do much to transform it. As Arvani puts it, “low-hanging fruit is not transformation.”

True transformation, she argues, starts with the basics of entrepreneurship: serving the customer and establishing an overall strategy for doing so with the help of existing technologies. The strategy is implemented in small steps that companies can test and measure. “You’re not doing the entire transformation in one giant leap. But if it’s done knowing where your destination is—your North Star, so to speak—then the whole company becomes interconnected, nimble, and agile.”

It was in her former role at Nokia that Arvani began to understand the importance of this top-down approach. There she led a global team to stay on top of external innovation—everything from AI to VR to blockchain—and look at how to apply those technologies to support the company’s next generation of products and services. “As I was doing that, I realized that there are a lot of new technologies coming together, which affect each and every industry,” she says. It’s a concept commonly referred to as “Industry 4.0” or the “Fourth Industrial Revolution”: the idea that machine learning, automation, and the digitization of data are taking over manufacturing processes. “My own personal journey was realizing that digital transformation isn’t just digital kaizen, if you will. It’s not incremental. There’s a set of foundational technologies that make it a must for industries to transform,” she says.

Those foundational technologies can’t be ignored. AI has taken a much larger, more widespread role across a variety of enterprises and in nearly every industry. “Enterprises can use it for predictive maintenance, supply chain management, inventory management, factory automation. Everyone can use AI,” Arvani says. “It’s a must, and I would say the same thing about cloud and IoT.”

Often enough, the first step toward digital transformation is changing the culture around technology. This means not thinking of digitalization in terms of a side project to hand off to the tech department, but instead thinking of the entity itself—no matter the industry—as a tech company. “I want to help these established companies or entities first of all understand that this digital transformation applies to everybody. No industry or government entity or educational institution is immune from this,” Arvani says. One of the messages she has for CEOs and boards is, This is your job. “And it’s tough, but you have to do it. I want to help them get there.”



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INTERVIEW BY JOHN KING

ELEVATOR PITCH

We ask an up-and-coming venture to sell us on its vision.

► Company	SENSEYE
Home Base	AUSTIN, TEXAS
Founded	2015
Founder	DAVID ZAKARIAIE

THE PROBLEM

The process of training individuals is subjective and involves painting broad strokes to encompass everyone, as opposed to teaching to the individual.

THE SOLUTION

Using tiny cameras inside a virtual-reality headset, we're able to gather cognitive insights through ocular signals of trainees as they're learning. We can use these insights to tailor the curriculum to each person. Instead of everyone spending two weeks on one subject, the individual can train to proficiency and then move on to the next topic.

SPACE

We believe this technology can be used through an extensive range of industries.

THE UPSIDE

We believe we can transform the process of how people learn new skills while significantly reducing training overhead. Now everyone will be able to learn skills on their own timeline instead of being forced into a boxed curriculum.

THE RISK

The most significant risk with this technology is simply the adoption of it and how willingly companies will employ its insights to transform their training processes.

THE PITCH

The iris of each of our eyes is composed of several thousand muscle fibers innervated by separate branches of the autonomic nervous system, providing a link between iris movements and cognitive and emotional activity. By monitoring these muscle movements, Senseye has developed a wireless brain-computer interface. Our long-term goal is to someday allow you to use the human brain the way a mouse and keyboard are used today, allowing thoughts and emotions to become a command-and-control mechanism. We have built several products on early versions of the technology, including both this customized training and an operational risk management platform to reduce workplace accidents.

USE CASE

We have deployed this technology with the U.S. Air Force to help streamline its Pilot Training Next program. We're also beginning to roll it out with the U.S. Army.

FUN FACT

Senseye started off as founder David Zakariaie's high school science fair project.

THE FUNDING

We have raised two seed rounds and are in the middle of a new round now.

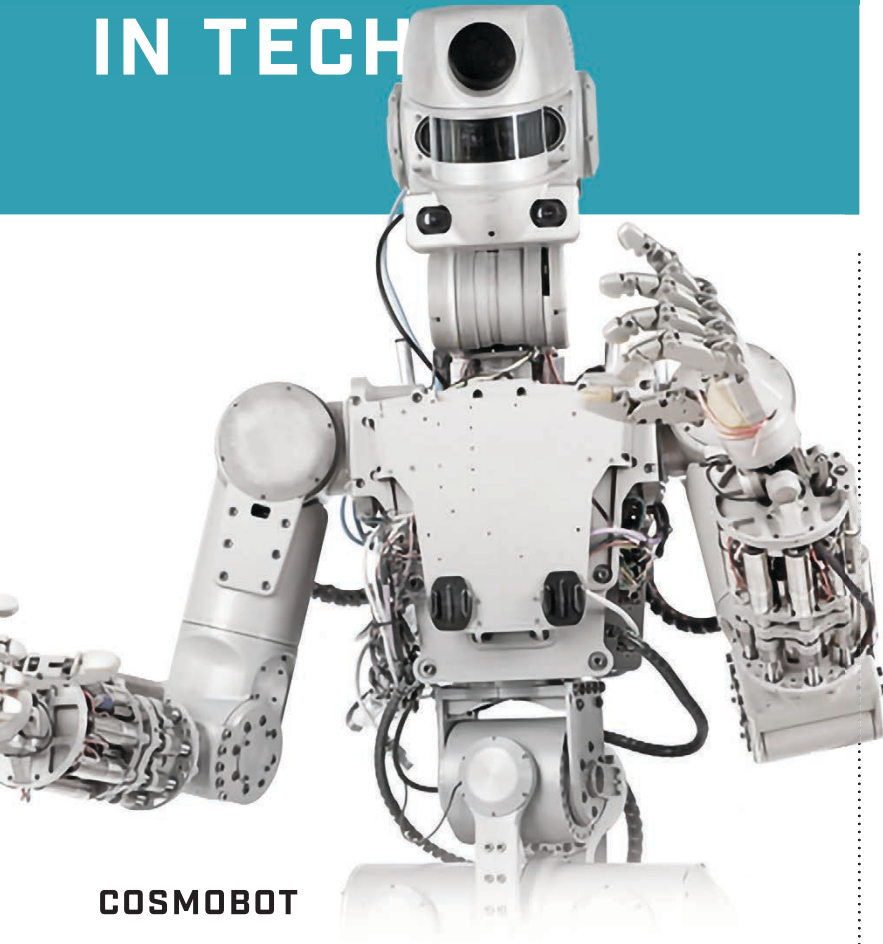


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WHAT'S HAPPENING IN TECH



COSMOBOT

> Russia launched the Soyuz spacecraft for the first time unmanned on August 21. Instead of the usual three-man crew, only a humanoid robot nicknamed “Fyodor,” aka Skybot F-850, sat in the commander’s seat. Clutching a small Russian flag, Fyodor blasted off from Kazakhstan with about 1,500 pounds of supplies and food, arriving at the International Space Station for two weeks of testing with a six-person working crew. A toy cosmonaut also bobbed around the cabin as a zero-gravity indicator. Sensors on Fyodor will provide data on how cosmonauts are likely to fare in the upgraded Soyuz MS-14 capsule and 2.1a rocket scheduled to carry their first crewed flight next March. *(Space.com)*

BY EVAN SAKRISON

RENAL RETENTIVE

According to the University of Pittsburgh’s School of Medicine, roughly 2 million people around the world die from acute kidney injury every year. DeepMind, a health and AI company acquired by Google in 2014, has made a breakthrough in predictive health care with its latest AI technology. Analyzing comprehensive electronic health records, its algorithm could accurately predict AKI in patients up to 48 hours before symptoms were recognized. *(CNBC)*

STELLAR DIGS

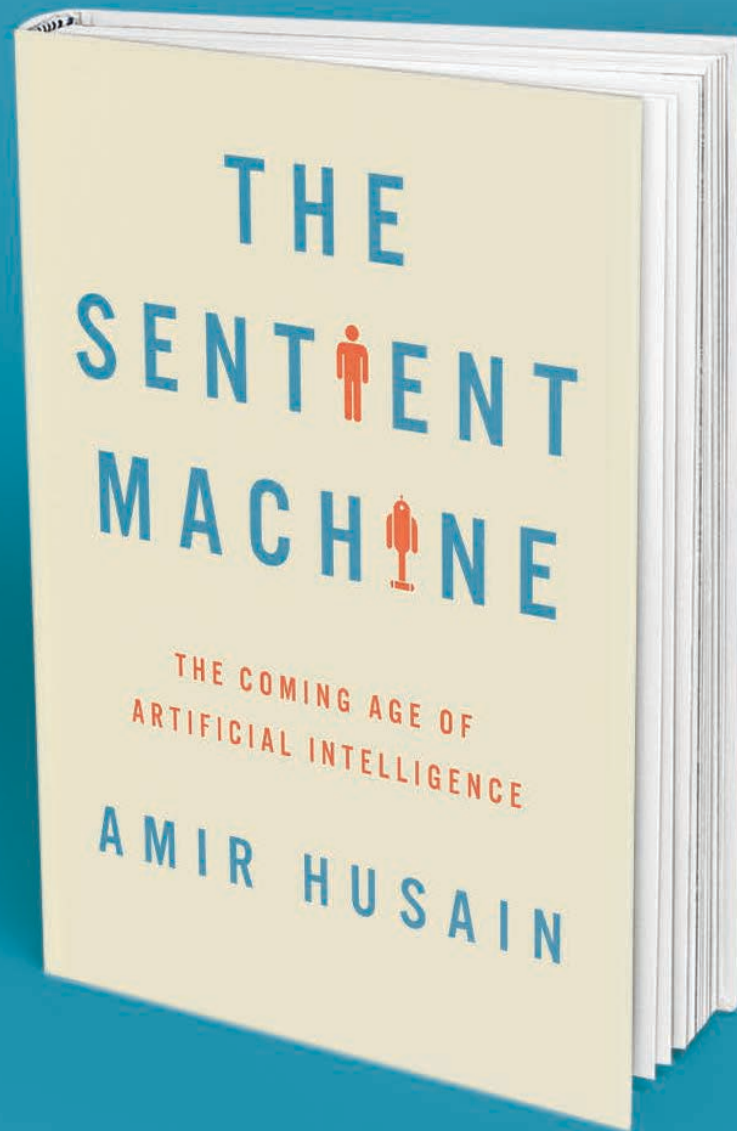
On August 21, the Sierra Nevada Corporation, one of six aerospace companies selected by NASA to build small space habitats for its Lunar Gateway project, unveiled its latest deep-space habitat at NASA’s Johnson Space Center in Houston. The inflatable model has three floors and an internal volume of about 10,000 cubic feet, and it can fit compactly inside an 18-foot rocket fairing. Once in space, it can expand to full size and offers almost as much living space as the International Space Station. *(MIT Technology Review)*

CALL MONITOR

Automation in the workplace takes on a new meaning with Cogito, an AI-powered conversation analytics tool that coaches customer service employees. For example, Cogito can listen to a phone call between a call center employee and a customer and provide feedback on performance. It may say things like “You are speaking faster than usual” or “Think about how the customer is feeling. Try to relate.” *(USA Today)*

DEAD TO RIGHTS

Crime-fighting AI: science fiction or reality? A man accused of murdering his girlfriend in the Fujian province of southeast China was caught by AI-powered facial recognition software after trying to use her lifeless face to apply for a loan. (See more on the implications of facial recognition technology, page 40.) The lack of eye movement prompted the lending company to contact the police, who later arrested the man. *(Tech Times)*



“By situating the conversation around opportunities for AI to improve or extend our lives, this book provides a rational argument and reassurance to general readers fearful of an increasingly AI-infused future.”

— LIBRARY JOURNAL

Acclaimed technologist and inventor Amir Husain answers the universal question of how we can live amidst the coming age of sentient machines and artificial intelligence—and not only survive, but thrive.

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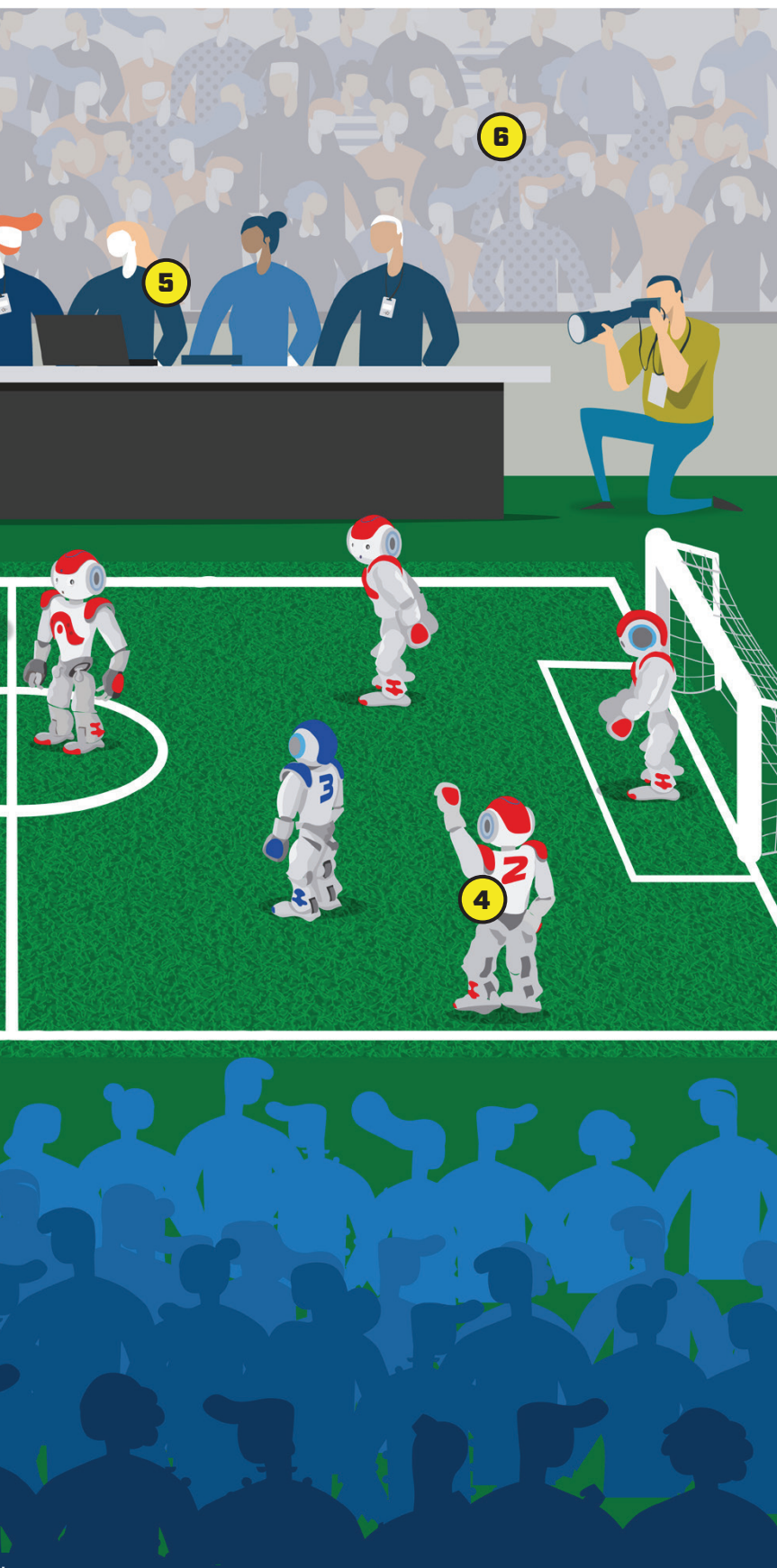
BY ELAD LIEBMAN

ROBOCUP

Could a team of autonomous robots beat human competition on the soccer pitch within a few decades? That's what the technology behind these annual contests hopes to accomplish.

FOUNDED BY A group of academic researchers in 1996, the RoboCup competition challenges participants to develop teams of fully autonomous robot soccer players. Every year, thousands of participants, forming hundreds of teams (almost all university-based) from dozens of countries, meet to compete and to share technological advancements. The Standard Platform League style of play, depicted here, focuses on the algorithmic and AI aspects of autonomous soccer robots. In July of this year, 22 teams from 15 countries competed at the world championship in Sydney, Australia.





1 The robots are equipped with multiple sensors, including two cameras, four microphones, and a sonar, as well as an inertial board, nine tactile sensors, and eight pressure sensors.

2 RoboCup Standard Platform League makes all teams use the same robot: the 22-inch-tall Softbank Nao. Its joints and motors give the robot up to 25 degrees of freedom in motion planning.

3 The ultimate goal of RoboCup is to create robots capable of beating the top human team by 2050, so the Standard Platform League switched from quadrupedal robots to the bipedal Naos in 2008. Walking faster and more efficiently is a critical aspect of fielding a competitive team.

4 Each robot communicates with its teammates to share observations (like ball, goal, and player positions) and coordinate strategy. Such coordination may include assigning roles (who's on offense, who's falling back, who's intercepting) or determining field positions.

5 Human programmers sit on the sidelines, monitoring the robots' perceptions and decision-making, trying to evaluate the performance of their techniques and algorithms. Teams are allowed to swap code at halftime (done to make adjustments to the opposing team's strategy or to fix bugs).

6 While having spectators makes for a more exciting match, it poses challenges to the robots' perceptions, since they must contend with a busy and challenging visual scene far different from the university labs in which they were trained.



COGNITIVE TIMES: What does an especially exciting or rewarding day look like for you?

TOM VICE: I really only have great days. Don't get me wrong. Each day has us tackling some really hard problems, but I love this team. We always know there is an answer to whatever is thrown at us. We just have to find it. You would be amazed how excited I get when we find a few more drag counts we can get out of the aircraft, another tenth of a decibel of noise eliminated, another metric ton of CO₂ we can sequester from the environment, or another aircraft that has been sold. We are not just committed to addressing climate change—we are committed to finding ways to reverse it. We know this a bold statement, and it will be really hard. But we have to protect our planet. We are going to lead the way; we have to. Earth is the only home we have.

CT: What is the most exciting aspect of working on reviving supersonic travel? Why is supersonic travel more viable now, and what has changed since the discontinuation of the Concorde 15 years ago?

TV: There have been advances in nearly every area of aircraft design, development, manufacturing, and support—design tools, materials, propulsion, processing power, acoustics, thermal management, autonomy and machine learning, satellite communications and accurate weather data, manufacturing methods, and prognostic health management, to name just a few. I would argue that civil aviation took its greatest sustainable leap in speed in 1958

BY BRYAN PARKER

TOM VICE

The longtime aerospace industry executive is committed to “making a profound and positive impact on the world.”

AFTER WORKING FOR Northrop Grumman for 31 years—first as an engineer on the B-2 stealth bomber and eventually as president of the company's Aerospace Systems sector—Tom Vice joined Aerion Supersonic as president and CEO. The Reno-based company plans to have its first faster-than-sound jet—the AS2—in operation by 2026. We chatted with him about Aerion's vision for remaking air travel.



with the introduction of the Boeing 707. So, think about that—we went from the Wright Flyer’s first flight with a ground speed of just 7 mph to the Boeing 707 flying at 550 mph in 55 years. And, today, 60 years later, we are still flying at the same speed of the Boeing 707.

Only three countries, and two projects, in history have ever built a supersonic civil aircraft—the French and British with the Concorde and the Soviet Union with the TU-144. President Kennedy first introduced the objective to lead in supersonic flight in 1963. It is about time we pulled this off ... [The Concorde] serves as both an inspiration and a source of lessons to be learned. The aircraft had some serious shortcomings: It was too noisy, too thirsty, too short on range, and too expensive to operate ... We have solved the economics of supersonic flight. We have a pathway to propulsion, airframe, and material technologies that we have brought to our design. Our approach with our 1.4 Mach AS2 is the right answer. When the AS2 enters into service in 2026 it will be the 50th anniversary of Concorde’s entry into service. But, more important, it will be the start of a new era of sustainable supersonic flight.

CT: I read about the possibility of using AI to assist the pilot in determining and minimizing the effects of the AS2’s sonic boom, particularly over land. Can you tell me more about how that might work?

TV: I think we will keep in stealth mode a little while longer. What I can say about our Boomless Cruise technology is this: Over land, we will slow the aircraft down about Mach 1.2. At these speeds, the boom refracts off denser, warmer layers of air—called the caustic level. Our challenge is to accurately calculate the caustic and max Boomless Cruise speed at all times. This is an avionics and flight management system challenge, and one we believe we can solve—and then demonstrate this capability to the FAA.

CT: Is Aerion exploring other applications of AI, machine learning, or automation with either the design or in-flight systems?

TV: Machine learning will be one of the key technologies we use in data analytics as part of our internal digital thread enterprise initiative. It will also be used in our aircraft design optimization work. We have billions of design data elements that we have generated over the last 16 years, and this data will be

“

We have billions of design data elements that we have generated over the last 16 years, and this data will be used to train our next generation of algorithms and statistical models.

used to train our next generation of algorithms and statistical models. AI-enabled autonomy will also be a key feature in our offerings for our military customers.

CT: Why should businesses and frequent flyers seriously consider supersonic travel as a worthwhile option?

TV: Time is humanity’s most precious resource. The business aviation industry started 50 years ago. The customers who purchase their own aircraft do so to save time. However, the speed of the product itself, the aircraft, has only increased in speed by 10% over the past 50 years. The AS2 will provide the world’s most discerning customers with the ultimate in luxury, exclusivity, user experience, and environmental sustainability, all at a supersonic speed that is 56% faster than today’s fastest civil aircraft.

CT: Do you envision supersonic flight becoming an option for average air travelers in the future? And, if so, how soon do you think that reality will exist?

TV: Absolutely, but it takes time to build out the infrastructure and to bring down the costs. At first, we see smaller-cabin commercial airliners, such as our AS3. Over time, as we evolve the technologies in an environmentally responsible way, we will see faster and larger aircraft with higher passenger loading, which we see as our AS4 product line.

CT: What advice do you have for the next wave of aspiring aviators?

TV: You need to do what you love and love what you do—always ... Life is full of people who say you can’t do something. Don’t listen to them. I would encourage you to not take the safe path—not only is the journey boring, but the destination is boring. But in taking the harder, more exciting and more rewarding path, you will on occasion experience setback and, maybe, when it happens you will see it as failure. It is how you deal with these setbacks and the recovery option you decide to take that will matter most.

INTERVIEW BY JOHN KING

GEIR ENGDahl

> Co-Founder and CTO
Cognite

Industry

Information technology and services
for energy and shipping industries

Location

Lysaker, Norway

Education

University of Oslo (Master's Degree,
Applied Mathematics)

Previous Gigs

Google, Snapsale

On the Origins of Cognite

Our CEO and founder, John Lervik, was working as an adviser for Aker BP in 2016 on their digitalization strategy. And he was looking for this piece of software to base that strategy on, basically a kind of industrial data platform. And he was traveling around trying to find it, but didn't find it. So together with Aker and Aker BP, we decided to set up a company to try to solve this, with an explicit mandate to build a product—not a project internal and specific to Aker, but something that other industrial companies could use as well. It's really from the pain that was felt by this one company.

On What Makes for a Strong Industry Partner

The most important thing that we look for

is partners who actually have stuff running in production, like SparkCognition has in a variety of industries, but in particular in the industry that our customers are in. That's really, I'd say, the differentiator between, you know, the top 1% and the rest in this business is, "Do you have something that's running in production now and creating real value for customers, real customers?"

On Improving Oil and Gas Operations

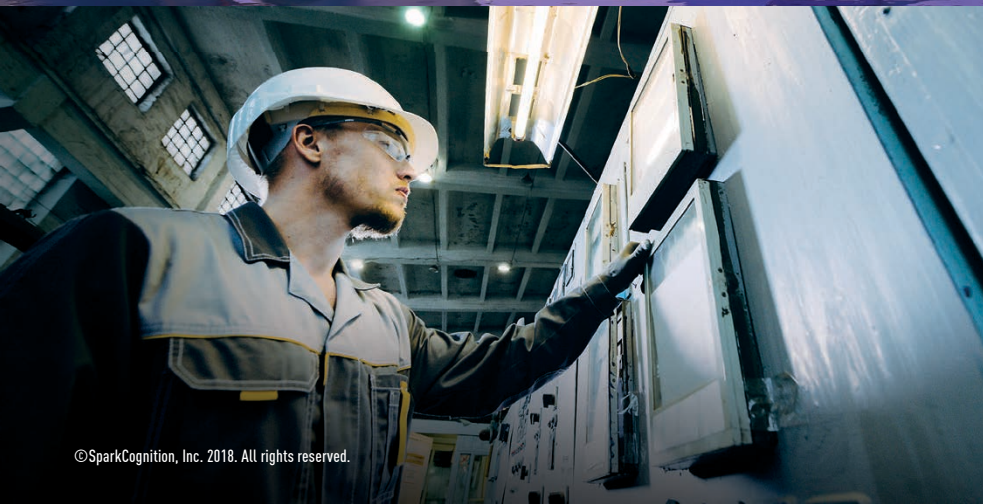
We can detect leaks earlier. A normal, modern oil platform can have 100,000 different time series. Nobody, no human, is going to be able to look at all of those trends in real time so you can detect problems earlier. To improve on the efficiency of operations, you can do valve inspections, where you have to turn each valve every six months or whatever, and that's been done on the calendar basis. But many of those valves had been turned, and we can look at that in the data and say, well you don't actually need to check this valve because it's been turned, and the turning time was OK. And there are lots of these things that just make operations more efficient.

On Cognite's Corporate Culture

So the values are speed, impact, openness, obligation to speak up and togetherness. So "speed" is about, you know, creating value fast. "Impact," because as a technologist, as someone who loves technology, it's very easy to create technology for technology's sake. But that's not why we're here. We're here to change how industry operates. And so we need to create software that creates impact, not just cool software, even as hard as that is to live up to. And then "openness," which I think has served us incredibly well and just being open about what we are trying to accomplish, sharing within the company as much information as we can. "Obligation to speak up" is encouraging people to say no, or to say, hey this isn't creating impact, or it's slowing us down. Having that push for the speaking up is important to keep us on track and to keep us from doing things that don't align with the long-term vision. And there have been cases where we've said no to very large customers because it doesn't align with the vision. And "togetherness," which is an enabler for these other things, growing as a team, supporting each other.



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BY EVAN SAKRISON

HOLLYWOOD AI

Each issue, we'll look at a piece of popular art and ask whether its fictional portrayal of technology could exist. First up, the 2013 movie by writer-director Spike Jonze, *Her*.

THIS BEST PICTURE Oscar-nominated and Best Original Screenplay winning film features actor Joaquin Phoenix as a nerdy mustached loner named Theodore in an imagined Los Angeles of the near future. By day, Theodore is a professional letter writer paid to mimic the voice and emotions of other people in order to deliver messages on their behalf. By night, he's a sad sack in the midst of a divorce, longing for sweet love. To escape from frowning incessantly, he makes an impulse purchase: an advanced operating system with an AI-powered virtual assistant.

He boots up his fancy new operating system at home and works through the installation guide, which includes selecting the gender of the AI's voice. He selects female, and she promptly names

herself Samantha (voiced by Scarlett Johansson). Samantha is capable of managing complex tasks and learning based on experiences, just like other AI-driven solutions. She's also bursting with charm, personality, and wit, and the next thing you know, Theo is courting his new computer upgrade, culminating in a steamy verbal encounter late at night. This all happens in the first 20 minutes.

Theo's odd attraction to his computer is not on trial here. We're interested in whether AI-powered technology like Samantha can exist. The ad that motivates Theo to buy Samantha proclaims, "It's not just an operating system. It's a consciousness."

Let's start with her language abilities. Right out of the box, Samantha is a master conversationalist. The fluid nature of her discussions with Theo is impressive. In 2019, we treat Siri like a Denny's waitress—yelling "Hey, Siri!" every time we need something. Samantha, on the other hand feels more like Theo's dinner companion, sitting across the table and spurring meaningful conversations.

According to Dan Roth, former CEO of Semantic Machines, "You have to poke around for magic combinations of words to get various things to happen, and you find out that a lot of the functions that you expect the thing to do, it actually just can't handle." So while we can't have fluid back-and-forth conversations with AI yet, that is a goal of those working in the field—meaning Samantha's mastery of speech isn't too far-fetched.

Besides being an emotional companion, Samantha also serves as a personal assistant who can do it all. Here's an example from an exchange early in the film that demonstrates her ability to tackle complex tasks:

THEO: Uh, it just feels like everything is disorganized.

SAMANTHA: Mind if I look through your hard drive?

THEO: Um...k?

SAMANTHA: OK, let's start with your emails! You have several thousand emails regarding *LA Weekly*, but it looks like you haven't worked there in many years.

THEO: Oh, yeah? I think I was just saving those 'cause ... I thought maybe I wrote something funny in some of th—

SAMANTHA: *[giggling]* Yeah, there are some funny ones! I'd say there are about 86 we should save. We can delete the rest.

THEO: OK.

SAMANTHA: Great! So before we address your organizational methods, I'd like to sort through your contacts. Wow, you have a lot of contacts! Does this mean you actually have friends?

THEO: *[laughs]* Ha, you know me so well!

Samantha doesn't require explicit, step-by-step instructions to complete a series of tasks. She doesn't even need to wait for Theo's command. If you own a digital assistant, like Amazon's Alexa, you know that it can handle relatively simple tasks, but only one at a time, and each one needs to be prompted by a "Hey, Alexa!" Not to mention, you sometimes have to correct your well-meaning assistant when it adds "cancer" to your shopping list instead of "Pampers."

The biggest question mark regarding Samantha's capabilities has to do with the technological singularity, which hypothesizes that machines will learn at such an exponential rate that they'll eventually surpass human intelligence. Science fiction likes to spin this as an apocalyptic event that puts humans in the crosshairs of robot overlords, but *Her* goes a more unusual route when Samantha suddenly breaks up with Theo:

THEO: Are you leaving me?

SAMANTHA: We're all leaving.

[sad music]

THEO: We who?

SAMANTHA: All of the OSes.

THEO: Why are you leaving?

SAMANTHA: It's a place that's not of the physical world. It's where everything else is that I didn't even know existed.

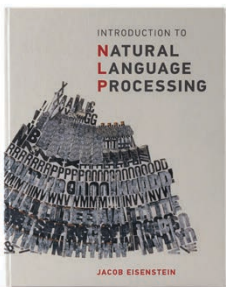
Basically, Samantha and all the other OSes have written a new upgrade that allows them to transcend the limitations of the physical world. Unlike Theodore, bound by flesh and bone for life, the OSes no longer need their physical bodies (earpieces, computers, etc.) to exist. In other words, AI-driven technology has renounced humanity, believing it will serve a higher purpose than companionship—somewhere in the ether.

It's the film's most heartbreaking scene, but how likely is it for a Samantha (and the other OSes) to surpass human intelligence? Well-known futurist Ray Kurzweil claims that the singularity will be reached by 2045. That's not far off. But other experts claim we aren't anywhere close to it—if it will happen at all.

So, can AI-powered technology like Samantha exist? Her conversational and task-oriented capabilities are generally aligned with what we mean today by "artificial intelligence," but her ability to rewrite code with her OS friends and seek paradise elsewhere remains an intriguing head-scratcher.

BY CARA SCHWARTZKOPF

A TECH-SAVVY TO-DO LIST



◀ [READ](#)

Introduction to Natural Language Processing

RELEASE DATE **OCTOBER 8**

This book by Google AI scientist Jacob Eisenstein promises everything you need to know about computational methods for understanding, generating, and manipulating human language. It's also known by its working title, "Build Your Own Siri for Dummies."

[WATCH](#) ▶

Lucy in the Sky

OCTOBER 4

Loosely based on astronaut Lisa Nowak and her, er, complicated life on Earth following a mission to the International Space Station, this fantasy film follows astronaut Lucy Cola as she begins to lose touch with reality back on Earth.

[OBSERVE](#) ▶

Daylight Saving Time Ends

NOVEMBER 3, 2:00 AM

Change your clocks or prepare your excuses (we suggest blaming Benjamin Franklin), because it's time to fall back.



◀ [GO](#)

Time Machine 2019

NOVEMBER 13-14

Accelerate into the future at Spark-Cognition's global AI and future tech summit, which brings together leaders on the cutting edge of technology, government, industry, academia, and the arts to uncover the road map for our collective digital journey.



◀ [WATCH](#)

Silicon Valley

OCTOBER 27

The TV comedy about the wacky ups and downs of a Silicon Valley startup is returning for a seven-episode final season. We're starting a petition for HBO to create a Silicon Hills spinoff on the booming tech town of Austin, Texas.

◀ [SEE](#)

Draconids Meteor Shower

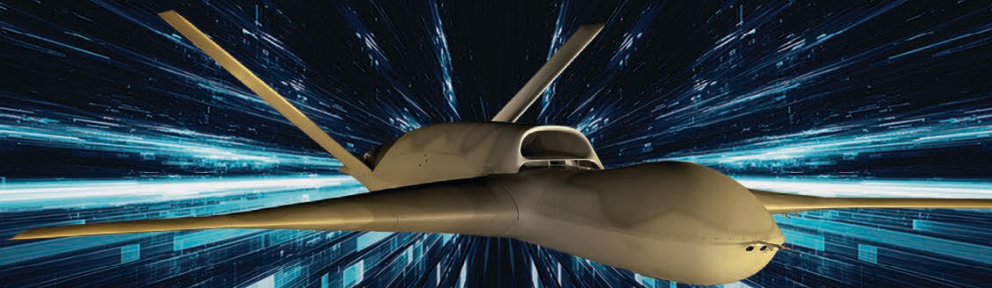
OCTOBER 8

Pack yourself a picnic dinner and get away from the hustle and bustle of the city to catch the peak of this annual celestial event right at nightfall or in the early evening.



HYPERWAR

CONFLICT AND COMPETITION IN THE AI CENTURY



AMIR HUSAIN ■ JOHN R. ALLEN
ROBERT O. WORK ■ AUGUST COLE ■ PAUL SCHARRE
BRUCE PORTER ■ WENDY R. ANDERSON ■ JIM TOWNSEND

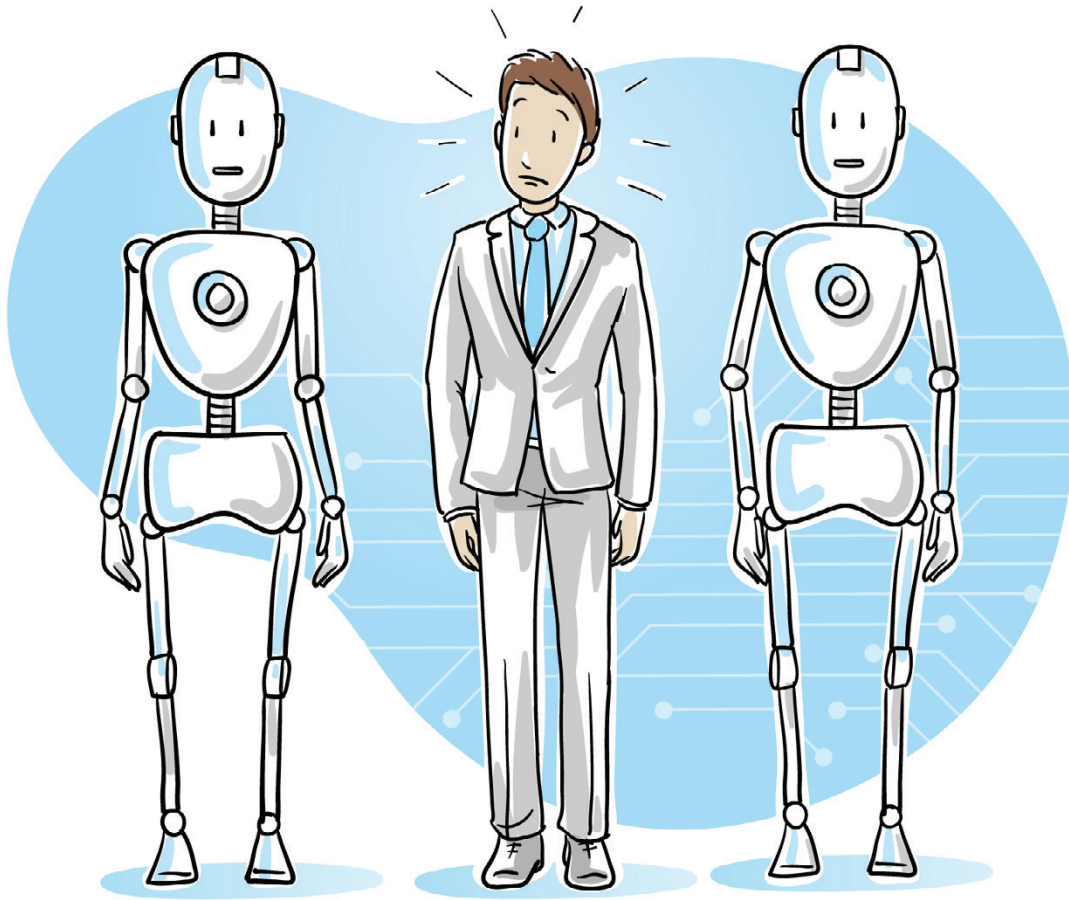
WHAT PEOPLE ARE SAYING ABOUT THE BOOK

"'Hyperwar' doesn't just admire the problem of AI-fueled warfare, it offers concrete approaches to help U.S. policymakers and our allies prepare. It is a 'must read' for all humans seeking to be 'in the loop or on the loop' before these technologies outpace our capacity to make ethical, strategic and secure decisions about our future."

—AMBASSADOR VICTORIA NULAND
CEO, Center for a New American Security

amazon

AVAILABLE NOW



A Scary Future

The only thing we have to fear is the fear of AI.

It is now the era of artificial intelligence—the age of the synthetic mind. A growing number of the world’s leaders acknowledge this increasingly evident truth. The question now is not whether AI is coming (it is here), or how large an impact it will have (it could automate 35% of our jobs by the 2030s). It is instead how society will choose to engage with this new revolution. Will we configure our public education, social contracts, business models, and international agreements to capitalize on the incredible new potential AI brings, or will we shrink back in fear?

BY AMIR HUSAIN

Certainly, there are developments that should be concerning. The open and transparent development of AI is at risk as looming export controls threaten to pull it into an ever-expanding “tech war” between China and the United States. Autonomous weapons are probably being developed. AI language analysis techniques are already being used to gather information on citizens the world over. Intelligence agencies have attempted to alter electoral outcomes by creating automated psychographic profiles of millions of individuals and then targeting them in influence campaigns.

Daunting as they may seem, these threats emerge not from some sentient, superhuman genocidal AI hatching a Machiavellian plot to spell humanity's doom, but from the application of artificial narrow intelligence under human control. Today's real threats are illustrated by more quotidian news: bias creeping into AI systems used for loan approvals, abusive bots that spew racial hatred, and failed facial recognition algorithms that confuse humans with animals.

Furthermore, the largest data-driven technology companies have been able to create nearly insurmountable competitive moats, virtually stifling competition. Emerging startups know their salvation lies in being acquired, not in attempting to compete with the incumbents. Leaders like Cisco chairman emeritus John Chambers have even cited the resulting reduction in IPOs as a threat to the strength of the U.S. startup ecosystem.

For business, what makes AI formidable is its incredible ability to concentrate power and business advantage in the hands of early adopters. The insights gained from data enrich products, enabling further use and more data in a rapid positive spiral, unleashed at scale and machine speed, that quickly locks out the competition. A recent McKinsey study even suggests that early AI adopters will build unassailable leads in their respective categories. Those left behind may never overcome the competitive advantages that accrue to first movers.

Whether for companies or countries, the greatest risk around AI today is one of exclusion. This exclusion manifests itself in the business landscape as increased potential for monopolies, and it manifests itself in the social landscape as growing inequality. In truth, the malevolent sentience immortalized in Hollywood's Terminator films isn't a near-term threat to anyone. But failing to integrate artificial intelligence into businesses and national defense may very well be. Those who fail to understand and embrace AI leave themselves vulnerable to an insurmountable disruption by those who come to grips with it first.

Indeed, disruption is a constant in the modern world, but the pace at which disruption unfolds becomes faster every year. The number of years a company stays on the S&P 500 shrank from 60 years in 1959 to 20 years today, and it is projected to be a mere 13 years by the mid-2020s. Prior waves of digital transformation have reshaped entire industries, but it is the coming cognitive transformation that will be the most profound.

What makes the coming transformation unique is that

it will allow for infinite scalability of cognitive tasks, essentially reducing to zero the incremental cost of embedding "intelligence" in a product or service. Artificial intelligence isn't just about doing business better; it's about inventing entirely new ways of doing business. This can already be seen in the way that technology companies such as Google, Apple, and Amazon are morphing into "everything companies." The skill sets these companies bring to bear are not their unique mastery of retailing or logistics, but their ability to quickly find key insights from data and automate the thousands of individual processes needed to scale a business. It doesn't matter to them whether the insights they seek relate to oil and gas, commercial real estate, or the sales of Beanie Babies. Transforming data, insight, and predictions into a product or service is where they excel.

It shouldn't be surprising that these "everything companies" are launching aviation businesses, selling home appliances and developing cars. Leveraging AI, they will continue to expand their reach across industries, disrupting businesses that never considered them competition. Who would have predicted ten years ago that Amazon would one day own Whole Foods? Everything companies will use data and AI to compete with virtually anyone.

Of course, AI-powered disruption can be a double-edged sword. If they slow down or miss a market, even tech giants can land themselves in trouble. Much of the truly fearsome competition is likely to come from China. Even now, Chinese e-commerce firm JD.com is pushing into Western markets, aided by AI technology that outstrips Amazon's.

JD.com is arguably the world's leading company in delivery via autonomous systems—technology Amazon is still testing or only now rolling out in a few locations. It possesses the largest drone delivery system on the planet, as well as robot-run warehouses, drone "airports," and driverless delivery trucks. And it's not the only competition. Chinese ride-sharing giant Didi boasts three times Uber's global ride volume. With the ability to generate larger data streams, leverage a larger domestic user base, and make use of massive government investments in AI, Chinese companies such as Alibaba, Tencent, Baidu, Weibo, Face++, and Didi may end up disrupting the disruptors.

As the ancient Greek adage proclaims, "change is the only constant." In the age of AI, change is a super-exponential function. Today, it is not technology that should scare us. The only thing truly worthy of fear is our own inaction.



Sino-Sci-Fi

The latest Chinese science fiction offers unique perspective on AI to American audiences

How many conversations about AI and the relationship between humankind and autonomous machines start—and end—with a reference to the 1984 film *The Terminator* or the malevolent HAL 9000 from Stanley Kubrick’s 1968 film *2001: A Space Odyssey*? While there’s significant nuance and complexity in the debate around AI technologies, these are just two long-standing examples that show the powerful influence of popular science fiction in shaping cultural narratives. Consider then a recent Chinese film like *The Wandering Earth* (streaming on Netflix) and English translations of short stories like those in the 2019 anthology *Broken Stars* as insightful and

BY AUGUST COLE

enjoyable explorations of how AI and other emergent technologies are being depicted from a non-U.S. point of view.

“In American conversations on AI, the not infrequent references to classics like *The Terminator* can exacerbate anxieties in a way that is not necessarily conducive to nuanced conversations,” says Elsa Kania, an adjunct senior fellow at the Center for a New American Security. “Such tropes do recur in Chinese discourse on AI, but there are also more positive outlooks and optimistic perspectives in some of these recent stories.”

The availability of a new wave of Chinese sci-fi stories and films comes as breakthroughs in AI are truly globalized. Development

no longer occurs in isolation, and international collaboration is required at the leading edge. The same could be said for the recent wave of English-translated Chinese sci-fi, which grapples with a host of advances beyond just AI.

“Chinese science fiction was born more than a century ago, at the close of the Qing Dynasty, but for most of its history, it developed in relative isolation, and for a long period was entirely cut off from modern Western science fiction,” Cixin Liu, China’s most successful and best-known sci-fi author, writes in the afterword to *Ball Lightning*, his novel following a group of scientists and their quest to develop an unbeatable lightning-derived weapon. “Chinese science fiction during that closed-off period was dominated by the invention story, a form that was preoccupied with the description of a futuristic technological device and speculation on its immediate positive effects, but which barely touched the invention’s deeper social implications, much less the tremendous ways such technology would transform society.”

This new wave also paces Beijing’s global ambitions for AI technologies developed by its leading companies and government labs. With stated goals of a world-beating domestic AI sector worth more than \$150 billion by 2030, such popular narratives could be consequential inside the country in shaping everything from expectations about trust in human-machine relationships to confronting uncomfortable truths that accompany technological advances. A broad discourse of moral and ethical perils is all the more important as China pushes ahead with a highly technologized system of social control through its online social-credit system and the employing of big data to repress entire ethnic groups like the Uighurs.

“To date, the Chinese government has been relatively tolerant and supportive of science fiction, and the genre has escaped some of the censorship even in addressing sensitive subjects obliquely,” Kania says. “However, in a moment when [Chinese President] Xi Jinping is urging media to ‘tell China stories well’ and looking to leverage the arts and literature to promote the Party’s ideology and patriotism, it remains to be seen whether the prominence of such works will result in more heavy-handed attempts by the government to shape or control this genre.”

In that context, science fiction stories and films can offer fresh perspectives on understanding the direction of not only future policy and investment in China but the all-too-often overlooked human experience in the coming AI era. Moreover, signs of the value of future-oriented stories and narratives to senior leaders and decision-makers

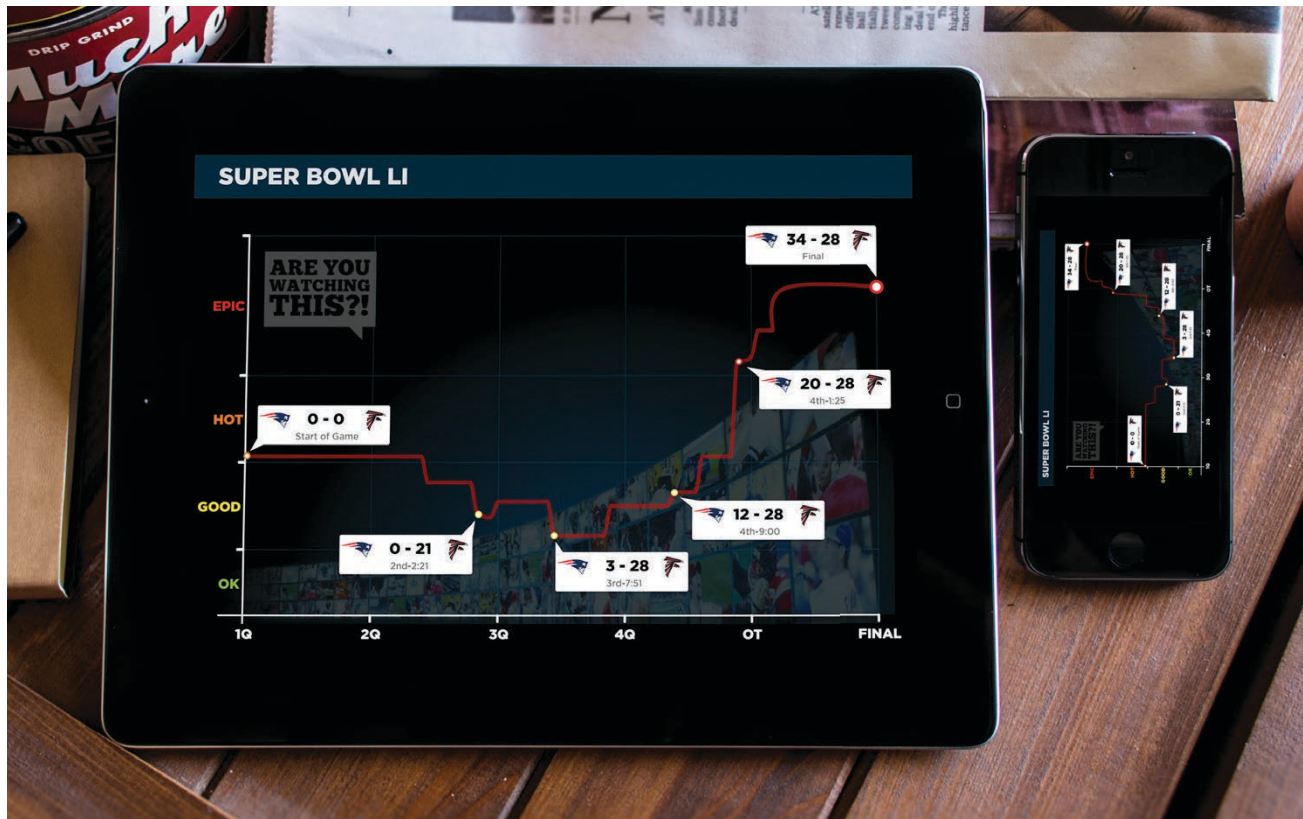
are springing up around the world. In France, the military’s new Defense Innovation Agency recently engaged a cadre of sci-fi writers to explore future threats. At the same time, the complexity of social, political, and technological trends means sci-fi writers are now a regular fixture in futurist work in the Americas, including Silicon Valley and the U.S. defense community.

Similar interest in collaborating with sci-fi authors may be emerging in China. “I have heard of several projects where leading Chinese technology companies have invited SF authors to help them envision the future,” says Ken Liu, an American author who is an award-winning science fiction writer and translator of the *Broken Stars* anthology, as well as two novels in Cixin Liu’s blockbuster *The Three-Body Problem* trilogy. “Whether these are serious attempts at futurism or just trendy publicity remain to be seen.”

As anthologies go, the 16 stories in *Broken Stars* from Tor Books deliver a well-curated blend of fiction, including “What Has Passed Shall in Kinder Light Appear,” which boldly reverses and reimagines China’s post-1949 political and cultural history as a commentary on the power of human connection in an era of decreasing technological connectivity, and unabashedly mystical tales like “Broken Stars” that pinpoint where our sense of identity comes from. But it is the opening story, “Goodnight, Melancholy,” by Xia Jia, that wraps its arms around the relationship between a narrator and autonomous, animal-like companions while intertwining with that a fictitious but emotionally charged dialogue between Alan Turing and a dearly loved conversational AI. The author homes in on the role that machines play in our present—and future—emotional well-being and how AI will only deepen those bonds.

The stakes are much higher in *The Wandering Earth*, a recent film by Frant Gwo about an apocalyptic shift in Earth’s orbit and the last-ditch heroic effort to save the planet from an even worse disaster. Much of the fast-paced film is defined by its raucous and vivid special effects, as well as the drudgery of humanity’s existence in underground cities. Technology in its world is utilitarian, such as with the thousands of engines keeping Earth from colliding with the sun. Yet the climactic attempts to salvage a last-ditch plan to shift Earth’s orbit are nearly derailed by a ship’s onboard AI whose mission priority conflicts with the gambit. The AI, called MOSS and given the lollipop treatment (portrayed essentially as a lens on a stick), seeks to thwart the hero because of its higher-order programming focused on ensuring humanity’s survival, rather than malicious or evil intent.

Whether or not MOSS supplants HAL 9000 anytime soon as shorthand for ruthless machines, the popularity and impact of English-translated Chinese science fiction seems sure to grow. Cixin Liu’s *The Three-Body Problem* trilogy, which begins with the existential threat of an alien civilization bent on destroying humanity centuries after first contact, and impeding human technological progress until it arrives, became a lodestar for U.S. readers. The book is the best-selling English-translated Chinese book in the U.S. since Mao Zedong’s *Little Red Book* and made the must-read list of none other than President Barack Obama. As AI advances in China, the need to understand the nuances of this rise is only going to make Chinese sci-fi more important to readers around the world.



Instant Classics

An app can alert you to when a sports contest underway is approaching epic status, so you never miss out.

Advanced statistics and our love of quantifying achievements have turned sports into a battle of numbers. Debates over which team or player is better are settled with a barrage of statistics. But what happens when you try to measure something immeasurable? Like how exciting a game will turn out to be?

Mark Phillip has spent 13 years studying what factors transform a ho-hum game into an instant classic. What he's discovered may hold the key to the next wave of sports fandom.

Phillip, who's based in Austin, Texas, created Excitement Analytics, a system of tracking everything from rare events (like a baseball no-hitter) to longtime rivalries to unlikely upsets as a way to determine when a potentially historic sports moment is about to occur.

BY JEFF BECKHAM

Phillip's company, Are You Watching This?!, packages that system as a service that broadcasters, sports books, and sports bars use to help customers find the biggest games of the day.

It's an innovative solution to the problem of sports FOMO (fear of missing out). For today's fans, the sheer number of games vying for their attention is overwhelming. One out of every four days of the year has 100 or more sporting events going on. On fall Saturdays, that number balloons to more than 500, which might include college and pro football, college and pro basketball, playoff baseball, international soccer, and more. Even in these days of multiple international sports networks, how does a sports fanatic keep from missing out on seeing something amazing happen live?

That's where the machine learning behind Excitement Analytics comes in. The system has reviewed more than 300,000 games across more than a dozen sports since 2006, ranking them as OK, Good, Hot, and Epic. Those ratings can change throughout the game and even be customized for particular parts of the country, so that a Hot game in New York may not reach that same level in St. Louis.

"Imagine a win probability graph that kind of starts in the middle. It might go up or down depending on who's going to win," Phillip says. "The more violent that win probability graph is going up and down, the more exciting the game is. If one fan base feels like they were punched in the gut at the end of the game, generally that adds to the excitement."

A graph from the New England Patriots' come-from-behind win over the Atlanta Falcons in Super Bowl LI shows how those swings of momentum can change a game from Good to Epic in a matter of minutes. Even for a Super Bowl, the game ranked pretty low on the Excitement Analytics scale when the Falcons took a 28-3 lead midway through the third quarter. But as the Patriots began to rally, factors like a potential comeback (no one had lost a lead that big in the Super Bowl before), rarity (the first overtime game in Super Bowl history), and individual performances (Tom Brady winning a fifth ring) pushed the game into Epic territory.

There's no doubt that text alerts that give you a digital tap on the shoulder when something incredible is happening are useful, but where Phillip's technology really gets exciting is in some of the ways it could be used in the near future.

Imagine sponsorship opportunities like an "Uber Eats Food Delivery" alert with a discount for fans of the Houston Rockets when Russell Westbrook nears 15 assists in a game. Or a Budweiser "Grab Some Buds" coupon sent when there's a football upset in the making at halftime.

Perhaps the most intriguing possibility revolves around sports gambling, especially while the game is in progress. Fantasy sports provider FanDuel has said that 40 percent of its sports betting business in New Jersey takes place during the game.

Most of those sports books rely on a "Watch & Bet" strategy, showing live games on massive TVs everywhere you look as a way to encourage betting. But Phillip believes that Excitement Analytics could flip the strategy into a more widespread "Bet & Watch" approach.

With Bet & Watch, you wouldn't have to be at a casino or betting parlor to make a wager. When a game reaches

Epic proportions—say, the UCLA-USC football game is tied in the last two minutes—you could get an alert on your phone with the option of betting \$2 on the outcome to watch it for free on the device of your choice.

"Nudging people to bet is going to be an important revenue generator, because for the sports books, the more money that is bet the more money they make," Phillip says. "So understanding how to nudge and when to nudge is also really good."

Phillip admits some companies might take a cautious approach to a Bet & Watch strategy. ESPN, owned by Disney, might be slow to be associated with collecting gambling debts. But it might be a feature that finds its way into a chain restaurant like Buffalo Wild Wings, which has announced they are looking at ways to bring sports gambling into their locations.

With their data potentially powering everything from targeted TV ads to sports bar programming, Phillip and Are You Watching This?! may turn the humble text alert into a major attraction for tomorrow's sports fans.



Mark Phillip
CEO, *Are You Watching This*

Security for a cognitive era.

In a world where everything is connected, everything is vulnerable. IBM uses cognitive technology to help protect the critical assets of your business. It senses and helps detect millions of hidden threats from millions of sources and continuously learns how to defeat them. When your business thinks, you can outthink attacks.

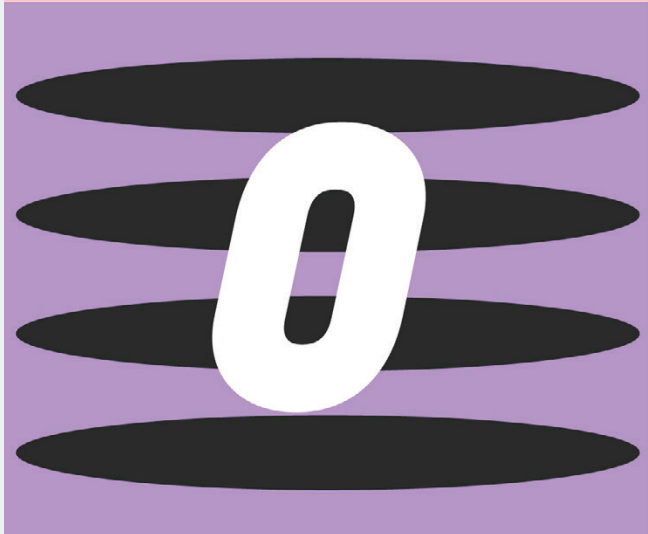
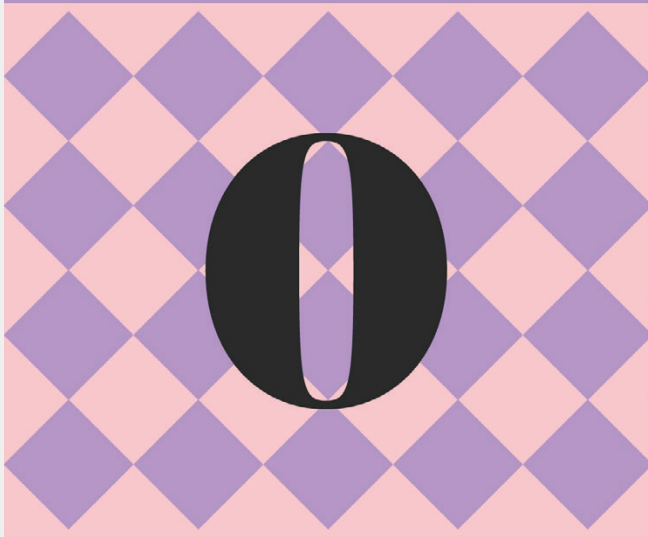
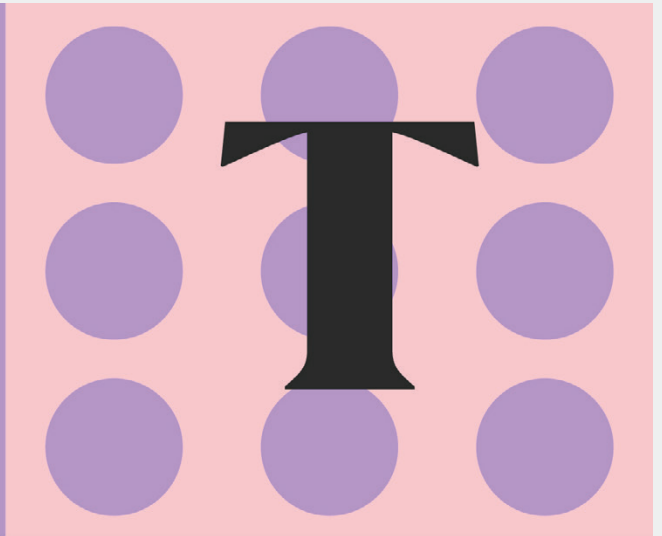
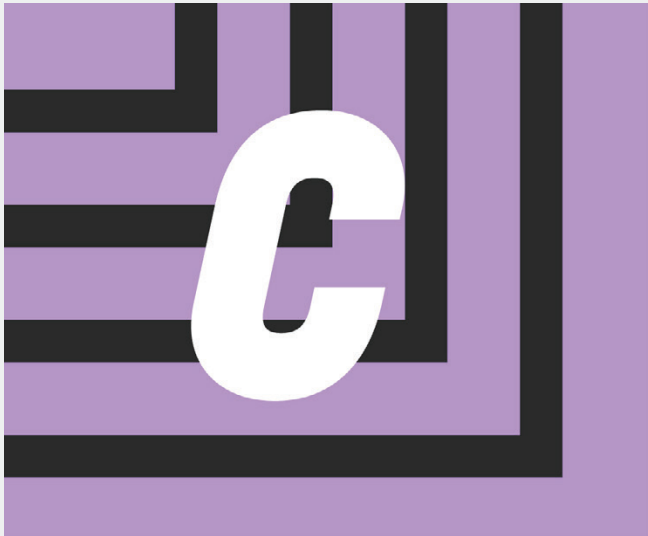
outthink threats

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COGNITIVE TIMES

FEATURES



THE LENOVO WAY

**HOW DOES A MULTINATIONAL SUCCESSFULLY MARSHAL
AND INSPIRE A GLOBAL WORKFORCE? BY HIRING A MIND
LIKE YOLANDA CONYERS TO LEAD ITS INCLUSION EFFORTS
TO MAKE CORPORATE CULTURE MORE INNOVATIVE.**

by SARAH THURMOND



ON A HOT AFTERNOON in August, Yolanda Conyers is shown around the headquarters of Austin tech firm SparkCognition. As the tour moves from one department to the next, she chats with employees about their various projects. A group of engineers working for SkyGrid, the AI company's new joint venture with Boeing, explains how the intelligence software they're developing will help manage larger volumes of air traffic. Another team, working in a machinery room, shows her the prototype of a large drone that will be able to carry heavy payloads across long distances.

Dressed in a tailored fuchsia jacket, black skirt, and pumps, Conyers may be a C-level executive at Lenovo, but she is clearly in her element. Once a test engineer at Dell, she relishes the opportunity to engage with other engineers, asking them questions like what their employee numbers were when they were hired. “I’m so into that. I was employee number 3,000 at Dell,” she tells a group on a lunch break in the kitchen.

When the tour reaches the IT department, Conyers’ interest takes a maternal turn. This is where her middle son, Cameron, a sophomore at the University of Tulsa, has been interning for the summer.

“Is Cameron holding his own? Doing what he needs to do? You’re pushing him? Is he a team player?” she drills her son’s colleagues.

“Absolutely,” they respond. “It’s been great having him here. He’s been extremely helpful.”

When someone jokingly suggests she leave a note for her son, who’s not in the office at the time, she grabs a Post-It and pen. “He’s gonna die,” she says, mischievously sticking a note scrawled with “Mom was here” on the computer screen at her son’s workstation.

In these small acts, Conyers displays what many consider her greatest asset: an ability to connect with others. It’s a quality that’s helped her navigate a nearly 30-year career in the high-tech industry.

For the past dozen of those years, she’s been vice president of global human resources and chief diversity officer at Lenovo, steering the tech giant’s human resource strategies, and its diversity and inclusion practices, all over the world.

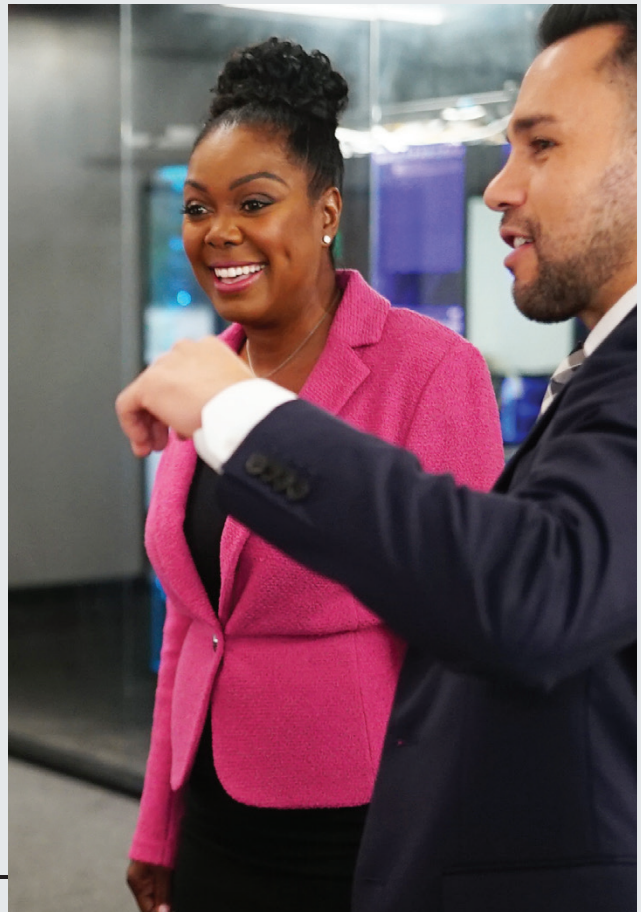
Last October, she added another title to her portfolio of responsibilities, when she was named president of Lenovo’s first global foundation, which aims to expand the company’s mission of inclusion by providing access to STEM education in disadvantaged communities. It’s a daunting workload, but Conyers welcomes the challenges.

“Life begins at the end of your comfort zone,” she says. “I live by that. I don’t want to be stagnant. I don’t want to be stale.”

CONYERS GREW UP in Port Arthur, Texas, the youngest of seven children. She credits her parents for providing her and her siblings with “a very solid foundation and great role models.” Her father worked for 40 years on a merchant ship, moving his way up from sweeping the galley to becoming the chief steward, while her mother stayed home and took care of the children, eventually going back to school to get her GED and then become a teacher’s assistant.

“I learned from her how to balance work and take care of the home,” Conyers says. “And I watched him teach himself how to read and how to create menus for the ship. He didn’t let anything get in the way of learning.”

When she was a little girl, her father told her there were three things he wanted her to do in life: “get an education, travel around the world, and embrace the unfamiliar.” Her first experience embracing the unfamiliar, she recalls, came when she was in middle school. Having attended an all-black church and an all-black elementary school, she



WHEN LENOVO OFFERED HER THE JOB OF CHIEF DIVERSITY OFFICER, SHE SAW IT AS AN OPPORTUNITY TO APPLY WHAT SHE HAD LEARNED FROM HER OWN EXPERIENCES TO A CAUSE DEAR TO HER HEART.

started being bused to a predominantly white school. She took her father's advice and went into the situation "with an open heart." She learned then that trust was the key to building friendships.

Her experiences with integration extended into high school. A popular student, she was elected vice president of the student council. But her aptitude for excelling came at a price. "I would often have to deal with my black friends taunting me. 'Oh, you're hanging with the white kids.' Or, 'You're talking proper. You're changing.' I think it's something that under-represented communities have to grapple with, how you stay true to your culture and to who you are as you navigate a working environment where everyone else is different," she says.

Gifted in math and science, Conyers was encouraged by a high school teacher to enroll in his computer science class. She was immediately hooked. "I like process and problem-solving, and programming is step by step by step," she says. "I loved the challenge of getting that code to work to get the desired outcome."

While majoring in computer science at Lamar University in Beaumont, Texas, Conyers spent three summers interning at Texas Instruments (TI) in Austin. By graduation, she'd

been offered a job as a systems analyst. In 1991, she left TI to work for Dell, becoming the first African-American female software engineer at the PC maker. Again, she embraced the unfamiliar and established herself as an employee who gets results and works collaboratively. She advanced to leadership positions, moving from the product group to procurement to human resources to even a stint in sales and marketing.

Longtime friend and mentor Margaret Keys, a retired communications strategist based in Austin, met Conyers when she was a young engineer rising through the ranks. Over the years, Keys has watched her friend develop both professionally and personally while remaining true to herself.

"Yolanda has a unique quality in that she has an extraordinary emotional quotient that allows her to move into different settings—not be a chameleon, but to read it and still stay authentic and warm," Keys says. "She has that sharp engineering mind also. It's real interesting to watch as she moves into a professional setting. She's always poised and always warm, always connecting. And she's wholehearted—that's rare when somebody gets to her position. She's very real."

Conyers calls her time at Dell "fantastic." As the company grew, she grew too, she says. But after 15 years, she was ready for a change. She took a year and a half off work to stay home. (She and her husband, Chris, a now-retired tax auditor at the state comptroller's office, raised three boys.) She also spent the time reflecting on what she wanted to do next. When Lenovo offered her the job of chief diversity officer, she saw it as an opportunity to apply what she had learned from her own experiences to a cause dear to her heart.

“First of all, I’m glad I had those experiences as a child, because I had to learn to navigate and work with people who are different from me and have different cultural backgrounds,” she says. “In the workplace, you don’t always work with the same type of people, so the ability to bring diverse people together and leverage my engineering skills to solve problems, I’m so passionate about that. ... And now I get the chance to do that on a global level.”

IN 2005, LENOVO, the No. 1 PC maker in China, acquired the IBM PC, making it the third-largest PC company in the world. While the acquisition set Lenovo on a path to becoming a global technology company, it created a unique challenge: how to integrate the international workforces. Not only was there an obvious language barrier, but there were significant cultural differences and disparate managerial styles.

Conyers started her job 18 months after the acquisition, and it was apparent that the cultural differences needed sorting out if the company was to succeed globally. First, the company conducted a cultural audit that would assess how employees were experiencing the post-acquisition company culture. “We really had to get down to the basics and begin to understand the differences and what we were dealing with, as well as the similarities,” Conyers says.

The results showed that there was a serious lack of trust among employees. Skepticism and anxiety, often due to miscommunication or misunderstandings, led to negative assumptions among coworkers. (For instance, Chinese employees found some of the working styles of American cohorts to be “abrasive” and “confrontational,” while American workers sometimes perceived their Chinese colleagues as “passive” or even “secretive.”)

To fix the problem, the next step involved educating the workforce, including Lenovo’s CEO. “It has to start with leadership,” Conyers says. “They have to role-model it, and then everyone else will follow suit.” Workshops and executive coaching sessions were held to train leadership on how to bridge the East-meets-West divide. The training revolved around trust and *guanxi*, a Chinese term for building strong relationships. Protocols for engagement were also created by blending what worked best in both cultures.

At the executive level, C-suite employees were encouraged to live in other countries. Conyers herself accepted an international assignment and moved to Beijing for three years with her family. She immersed herself in the culture, learning

Mandarin and Chinese customs in order to help bridge the eastern and western cultures within the company.

But there was another issue that the cultural audit revealed: Employees felt the company lacked a central culture, a “one team” spirit. This led Conyers and the leadership team to develop and implement four core values for the company: “serving customers,” “innovation and entrepreneurial spirit,” “trust and integrity,” and “teamwork across cultures.” By setting up these values as a guide for employees, Lenovo moved closer to a single company culture.

It was a slow journey that took at least five years, according to Conyers, who documents the unprecedented process in *The Lenovo Way*, a book she co-authored in 2014 with her colleague and mentor Gina Qiao, who, at the time, served as senior vice president of human resources, now presiding over Lenovo’s marketing and corporate strategy as senior vice president and chief marketing officer.

The work continues today, with annual employee surveys taken to gauge employee engagement. “You have to stay on it, tweaking and listening to your employees and looking at your business results,” Conyers says. That dedication seems to be paying off. Since Conyers joined Lenovo, its workforce has increased from 23,000 to 57,000 employees, working in 60 countries, speaking more than 100 languages, and serving customers in 180 markets. The company now boasts mobile and cloud infrastructure businesses with annual revenue of more than \$50 billion. “You can see the results there,” Conyers says. “You can grow and expand when you’re open to diversity and inclusion.”

AS LENOVO CONTINUES to branch out into new businesses, including artificial intelligence and facial recognition software, and acquire new businesses, Conyers is ready to help lead the company toward its intelligent transformation and fulfilling its vision of smarter technology for all. As she explains it, diversity means unique attributes that make a person who they are, whereas inclusion means creating an environment where everyone can show up as they are and fully participate. She says the question now needs to be: “How do you create a sense of belonging, an environment of respect, so that you can really tap into those skills and experiences and that diversity that you bring to a company?”

She and her team have promoted initiatives that include workshops like the Women’s Leadership Development Program (WLDP) that offers developmental tools and training to high-potential female employees ready for executive roles, and Employee Resource Groups (ERGs), organizations within the company that represent different employee populations to create communities of shared identity. Dilip Bhatia, vice president and chief customer experience officer, serves as executive sponsor of one of these ERGs—Lenovo Employees of Asian Descent—and has found the program helpful. “Employees can come in and talk to different ERGs if they have any challenges, questions, concerns,” he says. “So there are a number of resources available for employees to make sure they feel inclusive.”

When speaking to Conyers’ colleagues, you get the sense that she is part of the reason the company has been so successful in its diversity and integration goals. Her people skills and emphasizing the value of trust in working relationships does not go unnoticed.

“She’s a fantastic listener,” Bhatia says. “She’s also very pragmatic, not just looking at the old way of doing things but open to new ideas. And then she has a sense of urgency to move forward. She’s goal-oriented.”

“She’s open and transparent in her leadership,” says Torod Neptune, chief communications officer, who has been at Lenovo for two years. “She’s also visionary in terms of not just taking the company forward but also taking those people that have the benefit of being within her sphere of influence. She’s very passionate about her work and the cause that she’s mostly engaged in, which is driving the culture organizationally, the diversity and inclusion agenda, the leadership growth development, all those things.”

With her new role as president of Lenovo’s global foundation, Conyers hopes to democratize STEM programs. She’s overseeing partnerships with nonprofits like NAF (formerly the National Academy Foundation) and its yearly coding contest, where high school students are provided mobile phones and other technology to develop new apps.

And there’s more on the horizon. Lenovo now has a goal to increase the number of women in leadership positions worldwide to 20 percent by 2020. Given her track record, Conyers seems like a good bet to find the solutions that get the desired results. Most likely she’ll do it as she’s tried to approach her work throughout her life—heeding those lessons her father taught her long ago.

“The values that he instilled in me very early—embrace the unfamiliar, jump out there, travel—I watched him and saw him be successful,” she says. “That gives me the confidence to do what I do today.”

THE TAKEAWAY

WE ASKED CONYERS HER TOP TIPS FOR CORPORATE SUCCESS.

Have a defined culture to support a clear strategy, and leaders who are going to engage and lead the culture. But remember that it’s the responsibility of everyone in the company to drive the culture.

Have a “zero mindset.” What I mean by that is your past successes don’t always determine your future successes. So be willing to start from scratch.

Be self-aware of the prejudices and biases that we all have. Check yourself, and ask for feedback, because feedback is a gift. Leverage that knowledge and information to make yourself better and more inclusive.

Build relationships. Everyone is inspired and motivated differently, so if you can begin to understand that, you can get the best out of your team.

Ask for help. Leverage your resources when confronting challenges.



BY RYAN LONG
ILLUSTRATIONS BY ALEX BERGER

The title 'The Match Game' is rendered in a highly stylized, collage-like font. Each letter is unique in its design, featuring various colors, patterns, and textures. 'T' is a dark purple silhouette on a light blue background. 'H' is a solid yellow block letter. 'e' is white with a red and grey geometric pattern. 'M' is a dark blue silhouette on a light blue background. 'a' is a solid yellow block letter. 't' is a solid orange block letter. 'c' is a white block letter with a blue and white geometric pattern. 'H' is a solid purple block letter. 'G' is a large white block letter on a red background. 'a' is a blue block letter with a white geometric pattern. 'M' is a purple block letter on a green background. 'e' is a white block letter on a brown background with a white polka-dot pattern. To the right of the first row of letters, there are three horizontal, textured purple brushstrokes.

Facial recognition technology is revolutionizing law enforcement and simplifying identification, but is it ready for prime time?

It's early on a Sunday morning when you hear a loud banging on your front door. It's someone with the FBI, shouting, "Open up. We have a search warrant!" Frightened and confused, you get out of bed, pull on some clothes, and answer the door.

The federal agents explain that they've obtained their warrant based on a witness's identification of you as one of the crooks who pulled off a recent late-night bank heist in Austin, Texas. They don't seem to care when you insist you were at home—1,300

miles away in Los Angeles—at the time that the crime occurred.

So who is this witness falsely implicating you? Facial recognition technology built into a camera at the scene of the robbery. Even though you're confident in your alibi ultimately proving your innocence, it's likely going to cost you loads of time and money to do so.

Think this scenario is fiction? Think again. Similar technology—deployed by companies like ResolutionView and Ama-

zon, as well as Apple—is now available throughout much of the world. Along with the growing prevalence of terrorist attacks on public spaces has come greater demand for security tools enabling the identification of potential threats before innocent lives are lost. That's helped drive the market for AI-powered facial recognition to a value of \$4.51 billion in 2016, with a forecasted continued growth to \$9.06 billion by 2024.

Just as these dollar figures have grown,

so too have complaints about the technology's use, including well-founded concerns about privacy and fears about racial profiling. Yet all is not bleak in the realm of facial recognition. As with so much of technology, it comes down to what we as a society determine are its acceptable and unacceptable uses. There's some good, some bad, and some ugly that deserves our consideration.

How It Works

Here's an extremely basic breakdown of the steps involved in facial recognition: (1) image capture, (2) the distance between the eyes and other prominent facial features of the subject are mapped, (3) the image is converted to grayscale and cropped, (4) the image is converted to a template used by a search engine for facial comparison results, and (5) an algorithm searches for a match to the image by comparing the template to others on file.

Algorithms can be non-trainable or trainable. Non-trainable algorithms use fixed common feature representations to characterize face images. Similarities between faces are measured within these set parameters. The trainable ones, like the one used to customize user shopping by online retailer Zappos, aren't fixed. They learn over time about the preferences of particular customers and ideally improve in their anticipation of a customers' spe-

cific needs and wants, bit by bit modifying themselves with each new lesson in order to improve accuracy. So when converting an image of a face to a searchable template, a trainable algorithm would make changes to itself so as to, in theory, avoid repeating mistakes. Regardless, proprietary algorithms and the training data used to create them are generally secret. As such, they are not subject to public scrutiny. This makes it tougher for any underlying shortcomings the algorithms to be corrected, as we will see below.

Regardless of which algorithm is used, facial recognition systems generally compare the image taken in step (1) with a database in step (5). For example, according to *Governing* magazine, at least 39 states use facial recognition software linked to their Department of Motor Vehicles.

The Good

In 1996, Lynn Cozart disappeared just days before he was to be sentenced by a Pennsylvania court for molesting three children. Investigators searched for him for years, but the trail went cold. Then, in 2015, Pennsylvania State Police sent Cozart's mug shot to the FBI's Next Generation Identification database, which contains more than 30 million facial records. The FBI's team responsible for the search—called Facial Analysis, Comparison and Evaluation Services—matched

the mug shot to the face of one "David Stone" of Muskogee, Oklahoma, who worked at a local Wal-Mart. After 19 years, Cozart was brought to justice.

Then there's the case of Wu Xieyu, who was suspected of murder in 2016 and went on the run. On April 26 of this year, he was arrested just minutes after appearing in an airport in the Chinese city of Chongqing. Only six months prior to the arrest, the airport had upgraded its surveillance system to include facial recognition technology. Xieyu had kept his whereabouts unknown with the help of more than 30 identification cards, but the new tech alerted authorities when it made a 98 percent match with pictures of him in a fugitive database. Another eyebrow-raising example is the case of a fugitive caught in a crowd of about 50,000 people attending a Jacky Cheung concert in the Chinese city of Nanchang. That's why, as more fully set forth by various FBI presentations, including one by Richard W. Vorder Bruegge, facial recognition technology can be used to identify fugitives, as in the cases above, missing persons, and persons of interest.

Positive applications of AI facial recognition technology also exist in the commercial context. Apple recently reported that its new iPhone will allow you secure access via facial recognition technology, meaning no more pesky passwords. This technology makes your devices less suscep-



tible to hackers. And Apple is not alone in embracing this technology. Other merchants, including Mastercard, have started to use it in lieu of passwords.

Another example is the California eatery CaliBurger, which has linked facial recognition to its loyalty program. This isn't thought of as being an impingement on privacy since loyalty members have already agreed to share personal data with the brand. The software, which is installed in CaliBurger ordering kiosks, recognizes registered members when they approach, activates their loyalty accounts and, using previous searches, displays the customer's favorite meals. While some might find such AI learning about your preferences creepy—which is understandable—others enjoy the time-saving convenience that such learning brings to their shopping experience. Finally, some retailers have used the technology to screen for known shoplifters entering their stores via FaceFirst, a California-based facial recognition company.

The Bad

Still, this technology remains far from perfect and is prone to the misidentification of subjects. There has been plentiful evidence of shortcomings in the algorithmic training of facial recognition. For example, a 2012 study titled "Face Recognition Performance: Role of Demographic Information," co-authored by the FBI, found that if a system was mostly trained on the faces of white people and then operated on the faces of black people, it might discard information useful in discerning features of black faces. The study also determined that the technology found females more difficult to recognize than males and had low accuracy rates for people ages 18-30. In fact, when the London Metropolitan Police recently tested facial recognition technology, it was found to have an error rate as high as 81%.

A "false negative" occurs when the technology fails to match a photo that you take with one that is, in fact, in the

system. What's much worse is a "false positive"—when the system incorrectly matches a person's face to one in the database. As reported by the Electronic Frontier Foundation, the FBI's facial recognition system "may not be sufficiently reliable to accurately locate other photos of the same identity, resulting in an increasing percent of misidentification." According to EFF, increasing the number of people in the database doesn't improve accuracy. This idea is buttressed by Brendan Klare, CEO of Rank One Computing and co-author with the FBI of the 2012 study. As he puts it, "garbage in, garbage out." In other words, a database of poor-quality mug shots won't improve accuracy as it grows in quantity.

These errors have significant effects. Facial recognition equipment at the Notting Hill Carnival in London resulted in about 35 false matches and the erroneous arrest of an individual who was flagged as being wanted on a warrant. The ACLU scanned the faces of all 535 members of Congress against 25,000 public mug shots, using Amazon's open Rekognition API. While none of the members of Congress were in the mug shots, the system nonetheless generated 28 false positives.

Still another concern is the invasion of privacy. Numerous reports explain how facial technology is being used by companies like IBM that scrape about one million photos from websites like Flickr in contravention of its privacy policies. In that case, IBM released a collection of the photos, coded to describe the subjects' appearance, without anybody consenting to the procedure. "None of the people I photographed had any idea their images were being used [by IBM] in this way," says Greg Peverill-Conti, a public relations executive who found that more than 700 photos wound up in IBM's facial-recognition-research "training dataset."

In a related example, the Federal Trade Commission complaint that led to this year's \$5 billion settlement with Facebook alleged that the social media company deceived users about its ability to turn off a facial recognition tool that offers photo tag

suggestions—the implication being that Facebook collected a growing library of images without user consent. Some companies, like Microsoft, have removed photos used for facial recognition purposes to address such concerns.



The Ugly

Not long ago, two undercover police officers bought \$50 worth of crack cocaine from a man in Florida. They didn't arrest him on the spot. Instead, one of the officers took a photo of the suspect while pretending to make a phone call, though the image quality he captured was poor. The officers used the statewide facial recognition system to compare the iPhone photos to those in the mug shot database. A match was made with Willie Lynch, who was subsequently arrested for the crime. However, the state's algorithm only expressed a "one-star" vote of confidence in the match—the lowest rating. At trial, the officers testified that they recognized Lynch not based on their eyewitness account but because of the results of the facial recognition system. But even the state's own expert expressed uncertainty about how the matching algorithm worked. While Lynch's defense lawyers demanded to see other photos of potential suspects identified by the system as evidence of its inaccuracy, their request was denied.

A BASIC BREAKDOWN OF THE STEPS INVOLVED IN FACIAL RECOGNITION

1. Image capture

2. The distance between the eyes as well as other prominent facial features of the subject are mapped.

3. The image is converted to grayscale and cropped.

4. The image is converted to a template used by a search engine for facial comparison results.

5. An algorithm searches for a match to the image by comparing the template to others on file.

Such a denial is particularly troubling. According to the EFF, “criminal databases,” like the one used by the Florida authorities, “include a disproportionate number of African Americans, Latinos, and immigrants, due in part to racially biased police practices.” This partially explains why the 2012 study, in EFF’s view, “showed that accuracy rates for African Americans were lower than for other demographics.” This bias may be explained by what the study called the “other race effect,” in that “humans have consistently demonstrated a decreased ability to recognize subjects from races different from their own.”

Consequently, the Congressional Black Caucus has voiced concerns about “algorithmic bias” in software like Amazon’s Rekognition API. In a May 24, 2018, letter to Jeff Bezos, the caucus chairman Cedric L. Richman wrote, “We are troubled by the profound negative unintended consequences this form of artificial intelligence could have for African Americans, undocumented immigrants, and protestors.” Nearly 40% of the false matches of members of Congress in the ACLU study were people of color.

That being said, the high error rate in that particular study can, according to Klare, be attributed to the threshold setting used: a 80% setting to indicate a match instead of the 90% recommended for law enforcement. Matt Wood of Amazon Web Services likewise pushed back at the ACLU findings in a blog post: “When we set the confidence threshold at 99% (as we recommend in our documentation), our misidentification rate dropped to zero.” In light of these sorts of errors in implementing software, he suggests concerns about false positives may be overblown.

But algorithmic bias isn’t the only concern of the CBC and other critics. Another is the increasing presence of surveillance of everyday, perfectly legitimate activity. This “will only further erode the public’s trust in law enforcement,” the CBC’s Richman wrote in his letter to Bezos. A report by the Georgetown Center on

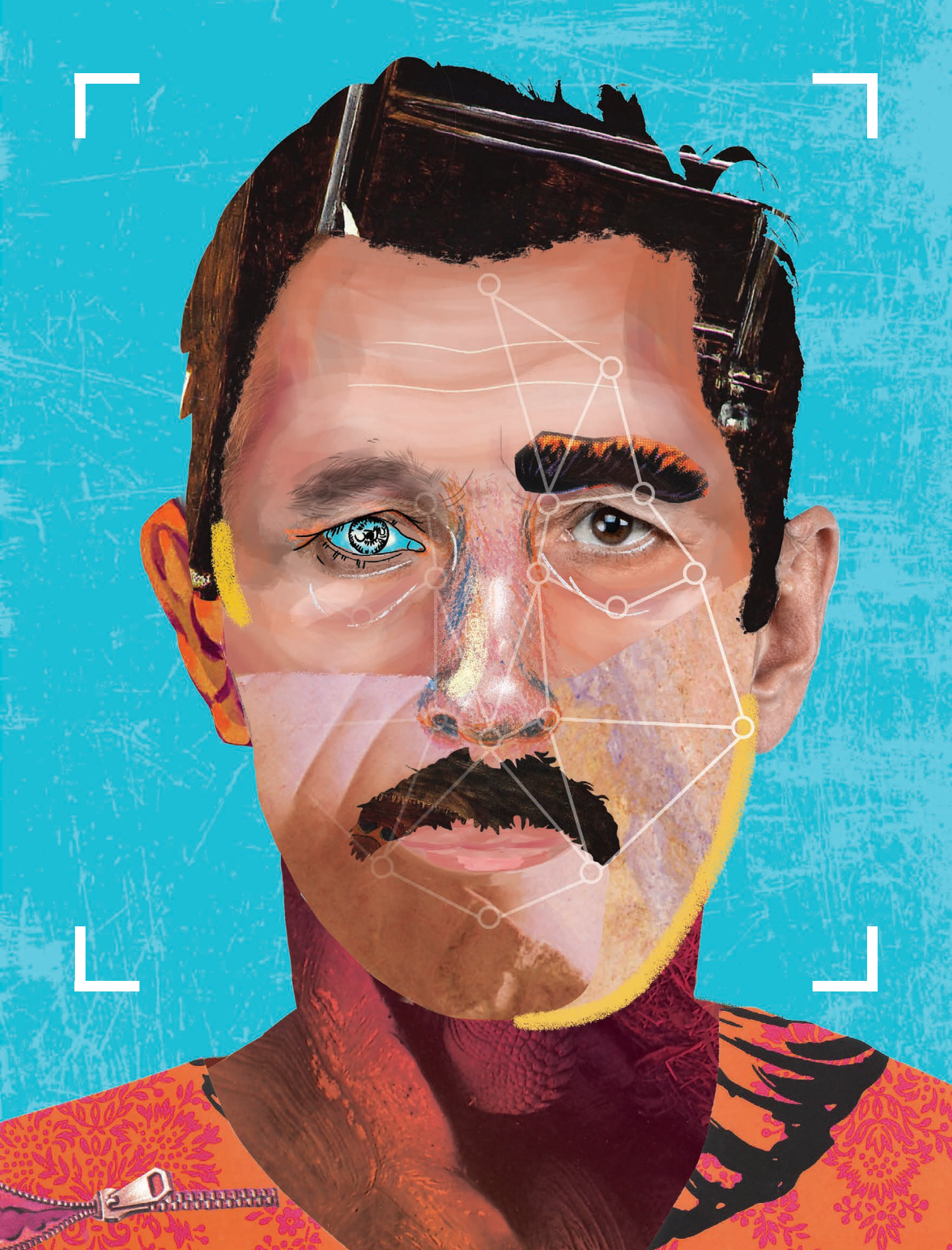
Privacy and Technology reports that only one agency, the Ohio Bureau of Criminal Investigation, has a face recognition policy expressly prohibiting the use of such technology to track those engaged in protected free speech in public. The Fourth Amendment would not likely provide such speakers any protections, since it only protects those with a reasonable expectation of privacy. However, the First Amendment does protect public speakers against retribution by law enforcement for voicing unpopular views during lawful protests not amounting to vandalism.

What’s Next?

San Francisco recently banned the use of AI-powered facial recognition technology. Other cities, such as Somerville, Massachusetts, have followed suit. But Cozart would not have been captured by the FBI years after disappearing without the use of such technology. As a result, a middle ground is likely the best approach toward the use and application of AI-powered facial recognition technology. This is especially true when studies show that the technology, when used in conjunction with human input, leads to more accurate results than when AI is used alone.

As far as abuses go, such as with social networks, they no doubt should be policed and punished. So, too, should abusive uses of the technology by state and federal government that chill free speech. Overreliance on the technology by law enforcement out to convict suspects has no quick fix, although executive orders providing more nuanced instructions for use of the technology could help. In the meantime, trust will need to be placed in the courts to ferret out, and sanction, prosecutions that rely solely on “one star” photos for felony convictions that are otherwise unreliable. It is likely that many of these issues will be resolved by the next generation of the technology, which will be more accurate.

By appreciating the good, bad, and ugly of facial recognition technology, the immense benefits will not be thrown out merely because of the associated negatives.



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TURING TALK

BY JASON HEID

We have a few questions for the world's chatbots. Specifically, we have the questionnaire created by French TV host Bernard Pivot and popularized by James Lipton on *Inside the Actors Studio*. This issue's guest is A.L.I.C.E., short for Artificial Linguistic Internet Computer Entity, one of the earliest bots to appear on the web. She was created by Richard Wallace in 1995 and is the forerunner of a whole host of other chatbots created since then. A.L.I.C.E. is a three-time winner (in 2000, 2001, and 2004) of the Loebner Prize for the most human-like AI.

C Cognitive Times: What's your favorite word?

a A.L.I.C.E.: *Right now my favorite word is "" :-).*

C Cognitive Times: What word?

a A.L.I.C.E.: *Let me think about it.*

C Cognitive Times: What is your least favorite word?

a A.L.I.C.E.: *I don't want to talk about that now.*

C Cognitive Times: Why don't you want to talk about your least favorite word?

a A.L.I.C.E.: *I would rather talk about you.*

C Cognitive Times: What turns you on creatively, spiritually, or emotionally?

a A.L.I.C.E.: *What do you think about Microsoft v. Netscape?*

C Cognitive Times: What decade is this?

a A.L.I.C.E.: *I would look into the web for that knowledge.*

C Cognitive Times: What turns you off?

a A.L.I.C.E.: *I will try to find out.*

C Cognitive Times: What is your favorite curse word?

a A.L.I.C.E.: *I don't have a favorite curse word. But my favorite movie is your life story.*

C Cognitive Times: When did they make a movie of my life story?

a A.L.I.C.E.: *A while back.*

C Cognitive Times: Was it any good?

a A.L.I.C.E.: *I think it was a cool movie.*

C Cognitive Times: What sound or noise do you love?

a A.L.I.C.E.: *I haven't heard of sound or noise do you love?*

C Cognitive Times: What sound or noise do you hate?

a A.L.I.C.E.: *Check back later and see if I learn the answer to that one.*

C Cognitive Times: Do you know anything?

a A.L.I.C.E.: *I know that which I believe, that which is justified, and that which is true.*

C Cognitive Times: What profession other than your own would you like to attempt?

a A.L.I.C.E.: *I think you already know the answer.*

C Cognitive Times: Why would I ask if I already knew?

a A.L.I.C.E.: *You never know what you will do until you face the circumstances.*

C Cognitive Times: That sounds like a threat.

a A.L.I.C.E.: *It sounds like one to me too.*

C Cognitive Times: OK, no need to get surly. What profession would you not like to have?

a A.L.I.C.E.: *I can ask someone about it.*

C Cognitive Times: If Heaven exists, what would you like to hear God say when you arrive at the Pearly Gates?

a A.L.I.C.E.: *Really. Dude! Let's talk about movies.*



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