COGNITIVE TIMES

ROBERT WORK
Former U.S. Deputy Secy. of Defense

FACING THE REALITY OF AN AI FUTURE

WILL AI TAKE ALL THE JOBS? | ROBORACE AND DRIVERLESS RACECARS | AI BEHIND THE LIGHT SWITCH

CONTENTS

by **Amir Husain**

We live in a physical world which we call "real." It's real because we can feel it, hear it, see it, smell it, and taste it. Historically, we've used "real" to distinguish from the imaginary, and for a brief period of time, we used it to distinguish the real world from the digital world.

That time was short. We are now well beyond two distinct, separate worlds. What happens in the digital world affects our physical reality. Presidential elections are influenced, cyber breaches shut down electric grids and hold hospitals hostage, algorithms drive cars, and autonomy determines military might.

The technologies and systems we develop and legislate in the real world become the digital tools and weapons which, like all technology throughout history, can be used for great progress, or for great destruction.

I've spent my life thinking about how to build and apply digital technologies to alleviate human suffering in the real world. The dedication in my book, "The Sentient Machine," reads, "To the children of tomorrow. May you elevate the human condition." Our mission at SparkCognition is to build artificial intelligence systems to advance the most important interests of our society.

Those societal interests exist in the real world, yet depend on, and are impacted by, our digital world. We work with customers and partners who are trusted with advancing lives, infrastructure, and financial systems across the globe. We focused on industrial, security, defense, and financial applications because these are the applications which most impact lives and precious resources in the real world.

There are also AI technologies which maximize click-through rates, identify likely buyers, help consumers shop for shoes, pick songs, and schedule meetings. While there is benefit and value in these applications, what compel me and my colleagues are the technologies which keep society's critical systems, organizations, and infrastructure operating securely, efficiently,

and seamlessly. We focus on the work which has the most benefit in the real world.

In this issue, you'll read about how AI is impacting and will impact, the real world. Former U.S. Deputy Secretary of Defense, Robert Work, discusses the Third Offset and the critical need for an AI moonshot initiative in the U.S. We profile the ambitious efforts underway at Mitsubishi Hitachi Power Systems to build an autonomous power plant. We consider how driverless vehicles will impact motorsport, how technology is changing the face of music, and how AI can be used to encourage healthy eating.

With those and additional profiles on intelligent cybersecurity, the impact of AI and autonomy on jobs and the economy, and a thoughtful consideration of the evolution of AI technology, we hope you come away with a deeper understanding and appreciation for the transformative confluence of our digital and real worlds. The power of technology lies in its ability to aid us in our evolution, and we are more committed than ever to building digital technologies for the benefit of the real world.

THE BASICS OF NATURAL LANGUAGE PROCESSING

Where humans lack collaborative partners, we are creating them—not just with artificial intelligence but specifically with natural language processing. These talking computer programs are already becoming a major part of our lives and taking large burdens off our businesses.

by **Marla Rosner**

When we dream of hyper-advanced machines, from "2001: A Space Odyssey" to "The Jetsons," we dream of them talking to us. WALL-E's titular robot understood human speech, and his strained efforts to speak made him instantly endearing to audiences.

In the cultural imagination, intelligence—or even humanity—has always been intertwined with speech. Chimpanzees may be able to use tools, dolphins might recognize themselves in a mirror, and elephants might even hold funerals for fallen herd members, but people find it hard to consider them intellectual peers, simply due to their lack of human speech.

However, speech isn't so much a hallmark of intelligence as a very specific kind of intelligence—one we don't even fully understand ourselves. Replicating it in machines, then, is no easy task. But in recent years, leaps and bounds have been made in the field of natural language processing. The day has arrived when our machines—or at least Alexa—can tell us, "I can't do that, Dave." (Thankfully, she does so without ulterior motives.)

Where humans lack collaborative partners, we are creating them—not just with artificial intelligence but specifically with natural language processing. These talking computer programs are already becoming a major part of our lives and taking large burdens off our businesses.

What Is Natural Language Processing, and How Does It Work?

Natural language processing, or NLP, is the field of research and technology dedicated to teaching machines to use and understand language in a human-like fashion. Its results can be seen in everyday applications such as Google Translate and Siri. But to genuinely understand this NLP revolution, it's necessary to first be familiar with the technologies that enable NLP and the applications it's used for.

Machine learning specifically has played a critical role in the recent flourishing of NLP. Machine learning revolves around writing programs that can learn beyond their initial programming, rather than being constrained by the rules coded into them.

This is why machine learning matters for NLP: because language is bigger than can conceivably be coded into a program. We're not even consciously aware of many of the rules governing language, which are continually under debate in the scientific community. How do you teach a computer something you still don't fully understand?

The answer is that you don't. Instead, you feed text into a machine learning program and let it discern the rules for itself, often using probabilistic models to figure out usage in a more fleshed-out, natural way. This also makes improving the model easier. Instead of trying to figure out and write rules of increasing complexity, simply feed the model more text and let it learn the same way a human might.

Recent machine learning techniques have taken natural language processing even further. In particular, word embedding employs samples of natural language to encode the context of a given word, phrase, or sentence. This could be considered the first step in the cognitive understanding of natural language by machines. Like humans, NLP programs are better able to understand the meaning of language when they have access to context.

Why Care About NLP?

The importance of NLP in the consumer products of Google Translate and Alexa is obvious. But there are many less visible yet equally dramatic ways in which NLP is helping businesses.

Big data is a popular buzzword right now, but in reality many businesses are still unsure what to do with their data—particularly since it doesn't always come in the neatest or most digestible format. According to Oracle, only 20% of all generated data is structured data that's formatted to be easily understood by machines. The rest is locked away in books, journals, notes, audio, video, images, analog data, and other formats. It's not that humans can't comb through that data, but the sheer amount of time it would take is staggering, not to mention a waste of resources.

NLP platforms can sort through document archives and stream newly created documents in real time, automating the creation of clear, dynamic organizational systems that update as needed. By classifying documents in this way, NLP makes it easier to search and use information from any database.

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NLP can also be applied via entity extraction, an application that clarifies the actors in a given text and also their roles and relations to one another. This method can be used to automate manual tasks like filtering and searching, looking at trends, and doing data analytics. Instead of raw text, you have features that can be put into tabular form. In this way, NLP eliminates the need for human effort at a number of stages, streamlining operations and freeing up human resources.

Another application of NLP is cognitive information retrieval. NLP software can retrieve complex information from free text in databases and manuals and then use that information to discover unknown correlations between events. This capability is of particular interest to industrial enterprises looking to minimize safety issues. NLP allows operators to search through safety logs in powerful ways. For instance, the query "Find incidents involving debris falling on lone employees" could turn up a log that reads "Was hit by a piece of plastic that had come loose while working solo on a turbine," despite the latter statement not containing any of the keywords "debris," "falling," or "lone." In this way, cognitive information retrieval helps reveal hidden insights from safety records to alert industrial operators on near misses likely to recur and avoidable events.

Many businesses are interested in NLP for yet another reason: report generation. A 2016 Accenture survey found that managers spend an average of 54% of their time on administrative tasks, including the ever-present business report. As machines learn to wield language the way a human does, we can expect to see these reports being written by AI instead. This means saving time for the kind of creative and critical thinking only humans can do.

Language is a sprawling, complex cognitive system that our best minds have long struggled to understand and teach. With machine learning, those decades of work on NLP are finally bearing fruit for individuals and organizations. The better we can communicate with our machines, the better they can help us with our routine tasks. And eventually—sooner rather than later—the fully conversational mechanical companions of our dreams will be a reality. After all, if there's one thing humankind will always want, it's someone to talk to.

THE HOME OF TOMORROW

Leveraging Tech for the Ultimate Living Experience

by **Mary Brynn Milburn**

O ur devices are coming alive with cognition to improve and simplify our everyday lives. Even the act of sleeping has become a source of data and opportunity for optimization. While in many ways the future is already here, let's take a walk through the home of tomorrow, a home with a mind of its own.

RIDICULOUS CONNECTED DEVICES THAT ARE HERE TODAY

AMAZON ECHO LOOK

The Amazon Echo Look is a gadget allowing users to take photos of themselves and compare outfits through voice-activated technology entitled "Style Check." Full-length mirrors from Target do the same thing for a fraction of the price.

SLEEPACE SMART BEDROOM

Sleepace integrates with home appliances to turn off connected devices, watches you while you sleep, and is definitely not the premise of a Black Mirror episode. It can also close your curtains, assuming you have a smart curtain rod (which, who doesn't?).
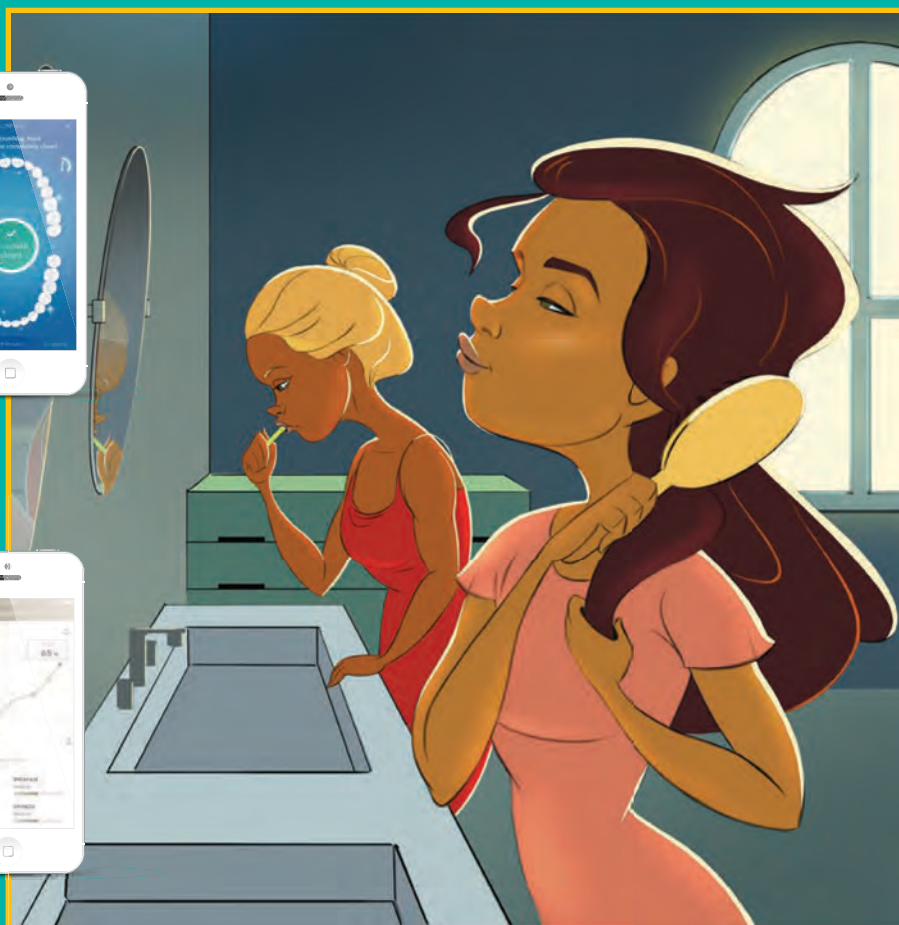
You arrive home after a long day of work. Luckily, the commute is now a relaxing affair thanks to self-driving cars. You use the extra time to catch up on the news and take advantage of built-in seat massagers. Opening the front door to your house, you are greeted by your robo-dog, a worthy innovation that both you (and your now-spotless carpets) can be thankful for.

You make your way to the kitchen for a snack. The screen on your fridge displays a breakdown of its contents as well as insights into the freshness of your food. When you run low on a particular item, the fridge places an order on your weekly grocery list, to be delivered by drone. The fridge also suggests recipes based on its contents and your personal tastes, solving the quandary of what to have for dinner. After you finish eating, you leave your dishes for the robo-dog, who will clean them (some things never change) and put them away.

You head to the living room to watch TV and kick back on the couch. You ask your smart home hub to choose a movie for you, and it brings up that buddy cop movie you've been dying to see. Smart hubs make it easy to interface with all of your living room components: thermostat, speakers, security, and even entertainment systems. Whether you want to listen to music, lower the temperature, or make sure your front door is locked, smart hubs make it simple to create the perfect atmosphere.

After watching TV, you head to the bathroom to freshen up following a long and tiring day. Naturally, bathrooms also have seen an upgrade with smart mirrors that act as an extension of your physician, right in the home. The smart mirror uses optical sensors to gauge heart function and other metrics, encouraging you to take charge of your health.

Finally, it's time for bed. Your smart mattress has heated up or cooled down to the perfect temperature, and after you crawl in, the mattress starts a timer to dim the lights. As you sleep, the

JUICERO

This ill-fated juicer is perhaps the pièce de résistance of nonsensical devices. Juicero's demise came about when people learned that juice pouches for the $400, wi-fi connected machine could be squeezed by hand to the same effect.

KUVÉE BOTTLE

Essentially a $179 touchscreen sleeve for proprietary wine bottles, Kuvée tells you what kind of wine you're drinking and how much is left—information you could never get from a normal wine bottle. The problem is, the sleeve must be charged to work, and a full charge only lasts 5-6 hours. Unsurprisingly, the company shut down earlier this year.

TOASTEROID

Why look at your phone for the weather forecast when you can look at toast? Toasteroid, a Kickstarter project to produce the first totally necessary smart toaster, creates custom designs in toast: pictures, messages, and yes, even the weather. After raising more than $380K in funding, Toasteroid ultimately went dark in 2017.

HAPIFORK

This smart fork monitors how fast you are bringing food from your plate to your mouth and will prevent you from eating too quickly—or at least make you feel guilty about it—through vibrations and lights. Plus, it provides the added challenge of a moving fork while you eat.

smart bed measures how often you toss and turn so it can later report on sleep quality, allowing you to get the most out of your rest. The mattress is connected to your smartphone's alarm, and wakes you when it detects the lightest sleeping patterns to avoid a jarring awakening. Getting out of bed prompts the smart coffee machine to brew a cup to your liking, and have it ready when you get downstairs to start a new day in this connected world.

While complete transition to a smart home is forthcoming, many aspects are in development or already on the market. Houses will become so much more than just a roof over your head, as they monitor health, help prepare meals, and just plain make life easier. While the technology will continue to evolve, as long as you have robo-dog by your side, you'll still feel right at home.

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April

Mathematics and Statistics Awareness Month

Since a 1986 proclamation from President Reagan, this month is dedicated to "furthering discoveries, solving problems, and finding beauty in our world."

April 3

First mobile phone call

In 1973, Martin Cooper made the first mobile phone call on an early-model Motorola DynaTAC. This "mobile phone" was 9 inches long, 5 inches deep, and weighed 2.5 pounds.

April 12

Cosmonautics Day

On this day in 1961, Russian cosmonaut Yuri Gagarin became the first person to orbit Earth. In 2011, the U.N. declared it International Day of Human Space Flight.

April 14

Edison's Kinetoscope

On April 14, 1894, ten of Edison's Kinetoscopes were used for the first commercial exhibition of motion pictures. This model introduced the basic approach to cinematic projection before video.

April 20

Danica Patrick wins Indy Japan 300

On this day in 2008, Danica Patrick became the first female winner in IndyCar racing history. She retired this year (probably in anticipation of the robot drivers profiled in this issue).

May

National Inventors Month

A month to find out who invented your favorite things. An interesting place to start is Jan Ernst Matzeliger, who transformed the way shoes are made.

May 3

"Spam" message invented

In 1978, a marketing representative of Digital Equipment Corporation sent an unsolicited mass e-mail to 393 users, introducing "spam." Consumer response was largely negative.
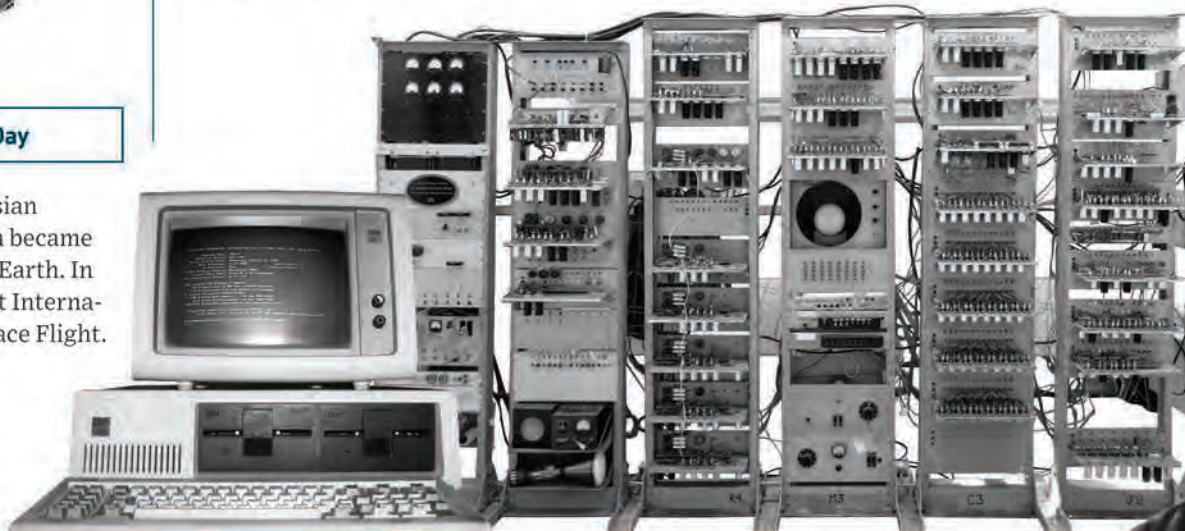
IMPORTANT DATES

May 11

IBM's Deep Blue beats Garry Kasparov

The 1997 match of IBM's Deep Blue versus world chess champion Garry Kasparov was the first defeat of a reigning world champion by a computer under tournament conditions. Played in New York City, this match represented a watershed moment in the advancement of AI.

May 19

AT&T introduces the fax

AT&T demonstrated long-distance telephotography, or the transmission of pictures via telephone wires, for the first time in 1924.

May 25

Geek Pride Day

A day celebrated by geeks around the world with parades, costumes, and...towels? In addition to Geek Pride Day, May 25th is also Towel Day, celebrated by fans of author Douglas Adams, and the anniversary of the original Star Wars release.

JUNE

June 5

Mozilla Suite

On June 5, 2002, the first Mozilla browser suite was made publicly available. Mozilla Suite later became Firefox.

June 5

IBM is founded

The Computing-Tabulating-Recording Company was founded in 1911 as a merger of three manufacturing businesses, and was the precursor for what became the multinational technology company that is IBM today.

June 21

The Manchester Baby's first run

Also know as the Manchester Small-Scale Experimental Machine and the world's first stored-program computer, the Manchester Baby was the first working machine with all the elements of a modern-day computer. It ran its first program on June 21, 1948.

June 23

Alan Turing's birthday

Turing is best known for deriving what became the central concept for today's computers. Due to his work in this field in the 1940s, he is widely regarded as the father of theoretical computer science and artificial intelligence.

June 25

SparkCognition's 5th Anniversary

SparkCognition was founded on this day in 2013 by CEO Amir Husain. Five years later, SparkCognition is still growing, innovating, and reaching into the unknown, bringing new and powerful advancements to the field of artificial intelligence.

FROM HISTORY & TODAY

INNOVATION OR DESTRUCTION?

AI Is Likely The Harbinger Of Both

by **Mary Ann Azevedo**

Article originally published on crunchbase.com | 03.23.2018
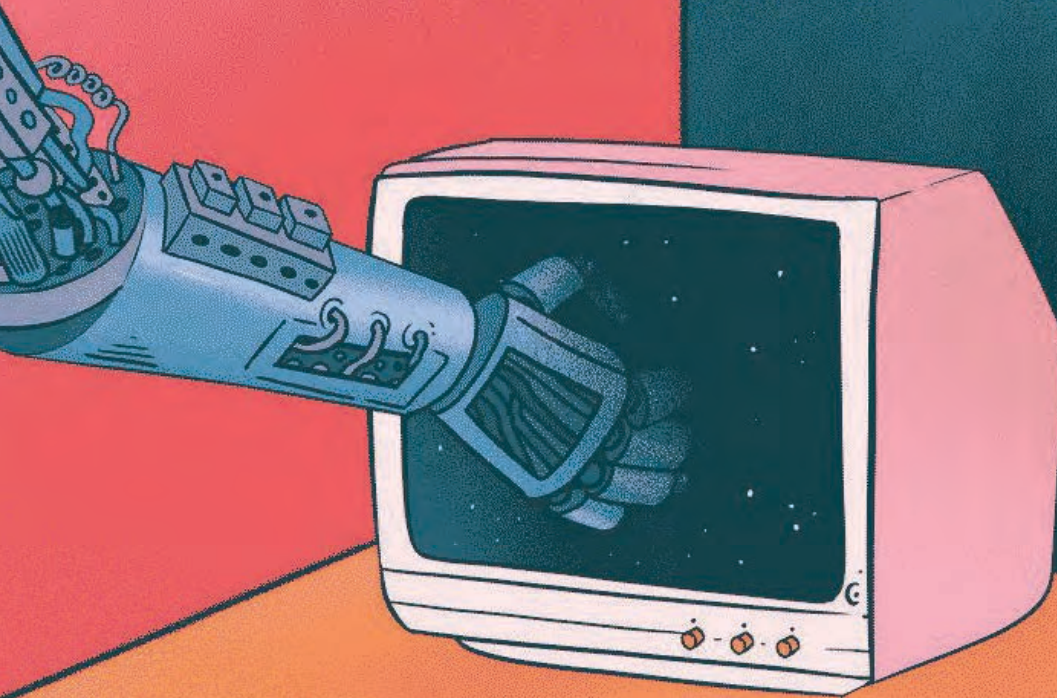
A larmist headlines abound about how AI and robots are stealing jobs from humans. The fears are spreading beyond concern over blue-collar jobs. Now there are greater worries that even white-collar jobs that require additional training and education will be replaced by artificial intelligence and AI-powered robots.

Crunchbase News turned to AI expert, SparkCognition CEO and Founder Amir Husain, to get his thoughts on the matter. Austin-based AI startup SparkCognition has raised $56.5 million over the past year and $73.5 million since its inception in 2013. Husain is also the author of *The Sentient Machine: The Coming Age of Artificial Intelligence*. In 2016, he was ranked among the Top 100 global Artificial Intelligence influencers by Onalytica.

On top of that, Husain is also a prolific inventor with 22 awarded and over 40 pending U.S. patent applications to his credit. In 2013, a low-cost computing platform Husain invented was added to the collection of the Computer History Museum in Mountain View.

So what does he have to say about AI's impact on jobs? Well, he's realistic.

"If you take the long view, it's really quite likely that most of the jobs that we see around us today will disappear and will be done by machines," he told Crunchbase News. "One hundred plus years ago, half the population was focused on agriculture. And today it's less than 2 percent, but yet we're feeding five times the number of people. Obviously, there has been a several hundred-fold increase in the productivity there which is another fancy way of saying there's much, much fewer jobs. And this will continue."

Technological innovation has technically been taking jobs from humans for centuries, Husain points out. Humans replicated the human muscle—first with the steam engine and later with the internal combustion engine—which in turn gave birth to the Industrial Revolution. As a result, jobs that required the human beings as a provider of that physical force dissipated over time.

"Now what we're doing is replicating the cognitive abilities of human beings," he said. "And when you think about it, that is what man is—cognition and muscle. Basically, those are the two big elements. So I think yes when both of these things are replicated, more jobs will be lost, and we are on the path to do that."

But at the same time, he is not cold about it. For example, while Husain acknowledges the growing use of AI and robotics in the field of healthcare, he acknowledges that machines will never be able to replace "the human touch."

"There's the analysis part of what the doctor does, the diagnosis part, and then there's the actual caregiving," he noted. "I think when it comes to caregiving, people are always going to want the human touch."

Besides agriculture, manufacturing is another big sector that has already been impacted by robots.

"Robots have completely taken over manufacturing," he said. "Even in low-cost manufacturing destinations like China, they find it more cost effective to buy millions

> When you combine all of these innovations, I think the time is about 15–30 years out, when we'll actually see almost magical machines that an observer today will look at and say, 'Wow, this is all I imagined in science fiction and maybe then some.

of robots in comparison to keeping relatively lower paid workers around on the factory floor."

The future of AI will involve more narrow intelligence, Husain believes, which is specialized in certain areas and can exceed human capacity in those areas—but isn't broadly as capable as a human being.

"That's where we are now," he said. "Over the long term as the technology is adopted, most of our present jobs will go away."

To Husain, the question of whether jobs will go away is moot. He believes the real questions are will we have a
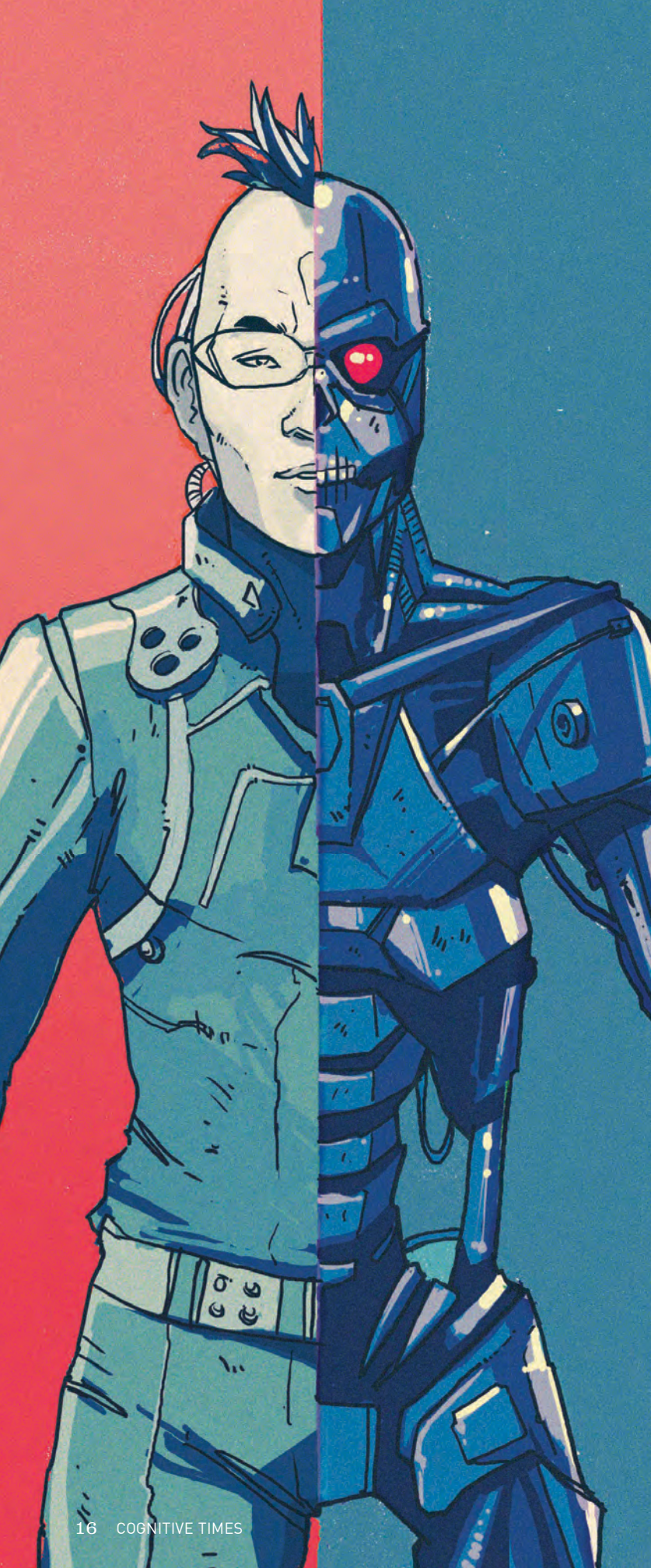
way to survive economically and will our needs be fulfilled? Furthermore, will we be able to find satisfaction in the pursuit of some labor that is an expression of our higher gifts and of our traits?

"The answers to all of those [questions] are yes, we can certainly do that, but it requires a societal agreement—a rewriting of the social contract," he said. "We will have to to rewrite the economic norms that govern how somebody is considered economically valuable in a society, and in an economy."

So When?

So if AI is replacing jobs, when will that happen? At the rate at which AI progress is occurring today, there will likely be some fundamental breakthroughs over the next five to 10 years, Husain predicts. "There will probably be other kinds of tasks that we'll be able to have machines perform which today they can't," he said.

Robotics is similarly progressing at a very fast pace.

"Robots can now do backflips. From a mechanical standpoint, that's never been possible before," Husain said. "When you combine all of these innovations, I think the time is about 15-30 years out, when we'll actually see almost magical machines that an observer today will look at and say, 'Wow, this is all I imagined in science fiction and maybe then some.' So I think that really is the window."

And according to to Husain, politicians need to focus more on preparing for these things. If they don't, it could have serious consequences.

"If we're caught unprepared and we enter this era in a way that is unplanned, then I think we will not be immune from the kinds of destabilizations and disruptions that we have so far only seen on TV unfolding in other parts of the world," he said. "...And unfortunately, when you stress a population, you find that the uglier aspects of human nature start to manifest themselves, and that certainly is not something to look forward to."

Back To The Numbers

We thought it would be good to get the perspective of a non-AI executive on this controversial topic. So I talked to Joseph Brusuelas, chief economist at New York-based RSM US LLP, to get thoughts from someone outside the industry.

"Technological unemployment is not anything new," he said. "It's been a feature of capitalism over the past 200 years, and there's no reason to believe that it's likely to stop. In fact, it's likely to accelerate."

For many years, man could not invent the sort of AI or robotics that could conduct routine tasks with regularity and precision. "We are quickly approaching a period where that will occur," Brusuelas said. "Thus, there will be some wholesale disruption across different industries."

However, it seems to Brusuelas that there's been too much fanfare "about the imminent end of routine work."

He points to the area of automated vehicles and truck drivers, for example. Truck drivers are the No. 1 employment category for men aged 25-54.

"The technology is not quite there," Brusuelas said. "Now we should not take solace that it will never be there. Because it will. But policymakers have a chance to think about what the future of work means, and to put in place policy pathways that can facilitate a transition for those that are in work categories more likely to experience significant displacement."

Today, artificial intelligence goes way beyond the field of home automation and as technologies continue to advance, it's likely more jobs will be impacted. But it's up to us to determine to what degree, and in what ways this change will occur. Ultimately, it's safe to say that planning and preparation are the key to whether artificial intelligence helps, or hurts, our society and economy.

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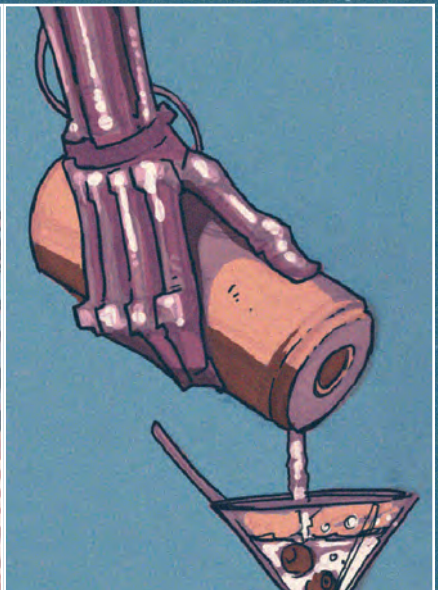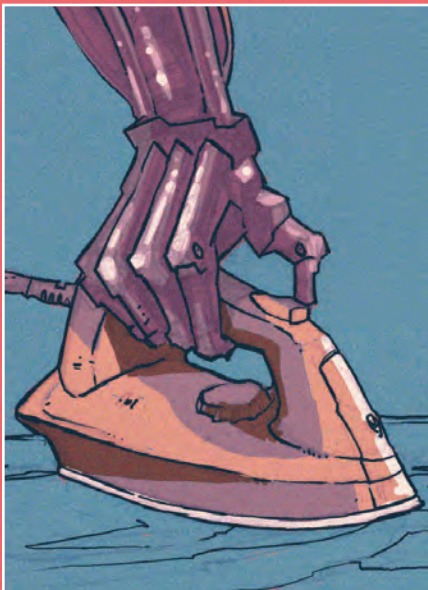
ART OR ARTIFACT?

How Technology is Changing the Face of Music

by **Chad Swiatecki**

The history of music is in many ways the story of humankind learning to make and master new tools. Banging rocks on wood led to animal skin drums, which led to primitive wind instruments over the course of thousands of years.

In modern times we've seen finely crafted orchestral brass and string instruments joined by electrified and amplified guitars, then synthesizers, and now a growing wave of computerized sound manipulation and production software. Today, spending a few dollars in an app store gives us more song-making capabilities in our pocket than The Beatles or Led Zeppelin had access to at the height of the rock album era.

Music's marriage to technology isn't likely to end anytime soon, which means that the advancement and spread of artificial intelligence (AI) is guaranteed to become another tool used in the creation of the music that envelops us daily.

The possibility of computerized learning producing the next wave of popular music through studying data on

DJ Spooky, a.k.a. Paul Miller

the history of recorded music—and potentially removing people from the process—brings about the question of what qualifies as art in the AI era.

One of the closest observers of machine learning in music is Paul Miller, known internationally as DJ Spooky and recognized as a leading scholar on art and technology. Miller has shown that he's embracing the possibilities that AI technology offers in the creative world, music especially.

"The interesting thing about technology and the arts is that there's a kind of nonlinear relationship to the creative process," he says. "And as we move further and further into the creative economy, we're going to be looking at data analytics as a kind of new composite relationship to creativity.

"I think that the collision of 'intent' and 'accident' is what makes the best songs. Art or music or essays that are machine-made use 'logistic regressions' to mine a data set of choices and selections. And that's cool. It doesn't make it better or worse than half the songs, paintings, sculptures, or any kind of art out there."

More than merely observing the merging of art and advanced technology, Miller is involved in creative experiments that let him explore how music can evolve when harnessing data sets from unexpected corners of the world.

The most traditional project was his DJ Spooky mixer app that let him peek into the music-making habits and trends of some of the 15 million users who downloaded the app.

More experimental was his 2009 journey to Antarctica for his Book of Ice project, where he sampled the natural sounds of the frozen continent but also used historical climate change data to guide and shape his bristling soundscapes.

"

The next wave of computational music will probably be totally autonomous creations that have data mined whatever is popular using predictive analysis of current trends, and then filled the need for whatever style works for the culture at that moment.

His latest data-driven project couldn't be timelier: an album based on cryptocurrency technology, using databases that respond to fluctuations in Ethereum values to shape the sounds and rhythms of the music.

That might strike some music observers as an extremely out-there proposition, but Miller thinks taking chances and exploring the possibilities of technology are key ingredients in finding new vistas in songwriting.

Plus, he says, most of us are already being bombarded by AI-cultivated music unknowingly.

"That kind of art and music and film is already being accepted on a mass scale," he said. "Editing, sound effects, scripts, et cetera are all being refined by AI. This is just the beginning. There's already art being done by AI that's in mass circulation."

So while humans won't necessarily become excluded from the music-making process—though Miller said there's no way humans can match the creative precision of advanced machine learning—we're soon headed to a world where a large portion of the music we hear is written and crafted entirely by machines.

"The next wave of computational music will probably be totally autonomous creations that have data mined whatever is popular using predictive analysis of current trends, and then filled the need for whatever style works for the culture at that moment," he said. "It's going to get deeper and weirder. Think of 'Sunspring,' a film entirely generated

Miller says that music is already becoming largely homogenous and indistinguishable on its own. In between his analysis is a hidden question: Are the songs we write really all that special in the first place?

"Between most of the pop songs in the world today and most of the singers that make them...it's pretty hard to distinguish what actually makes a unique statement," he contends.

"Most are pretty interchangeable. The only limit of music, art, and culture is basically the foundations of the architecture of human perception. Within those confines it's really easy to make a pop song based on algorithmic analysis and machine learning. But that doesn't make it have that intangible 'je ne sais quoi.' Human perception is generally the roadblock. The rest is just seeing if human beings can get over ourselves and just figure out ways to get along with machines."

Already an artist who has made a career out of looking ahead, Miller is embracing the art that will come from the growing power and availability of AI technology in everyday life. It helps that he doesn't view AI as a monolithic force.

Instead, he sees technology as a current of individually evolving tools and opportunities that is growing strong and will give musicians more choices with what and how they want to create.

"There's gaps in any knowledge system in software—that's exactly where innovation happens, and that's where things get fun," he said.

"Do we really know where a human being begins and software ends? These days, the Turing test wouldn't be passed by most human beings because everyone is using the same thought processes when they use the limited interfaces of whatever software they're using to make whatever creative artifact. One has to ask oneself: What's the difference between art and artifact? And that's where things get interesting."

by AI in tandem with a couple of software designers. What sounds would the technology generate on their own? It's an existential question about human evolution and artificial intelligence."

This dynamic does bring to mind the famous Turing test, a test of the ability of machines to exhibit intelligent behavior. Does human-free music made from the corpus of data on humankind's historical creation and interaction with music qualify as art? It seems like a fair question until one considers the way American popular music has been crafted since the late '90s. Swedish songwriter Max Martin uses music theory and melodic structures to engineer songs to the tastes of modern audiences, creating almost guaranteed chart toppers. So why would it be wrong or inauthentic for popular music to be shaped by AI to make art that people enjoy if large corporations are already doing much the same thing—combing vast datasets to determine how to create ready-made hits?

Welcome to the Intelligent Edge

We live in a world where everything is connected. Data created from these connections, drive faster insights when acted upon at their source—at the IT edge.

To bring intelligence to the edge, Hewlett Packard Enterprise has integrated enterprise-class IT, data capture and control within Edgeline Converged Edge Systems. Now you can gain real-time insights to better control your industrial IoT environments.
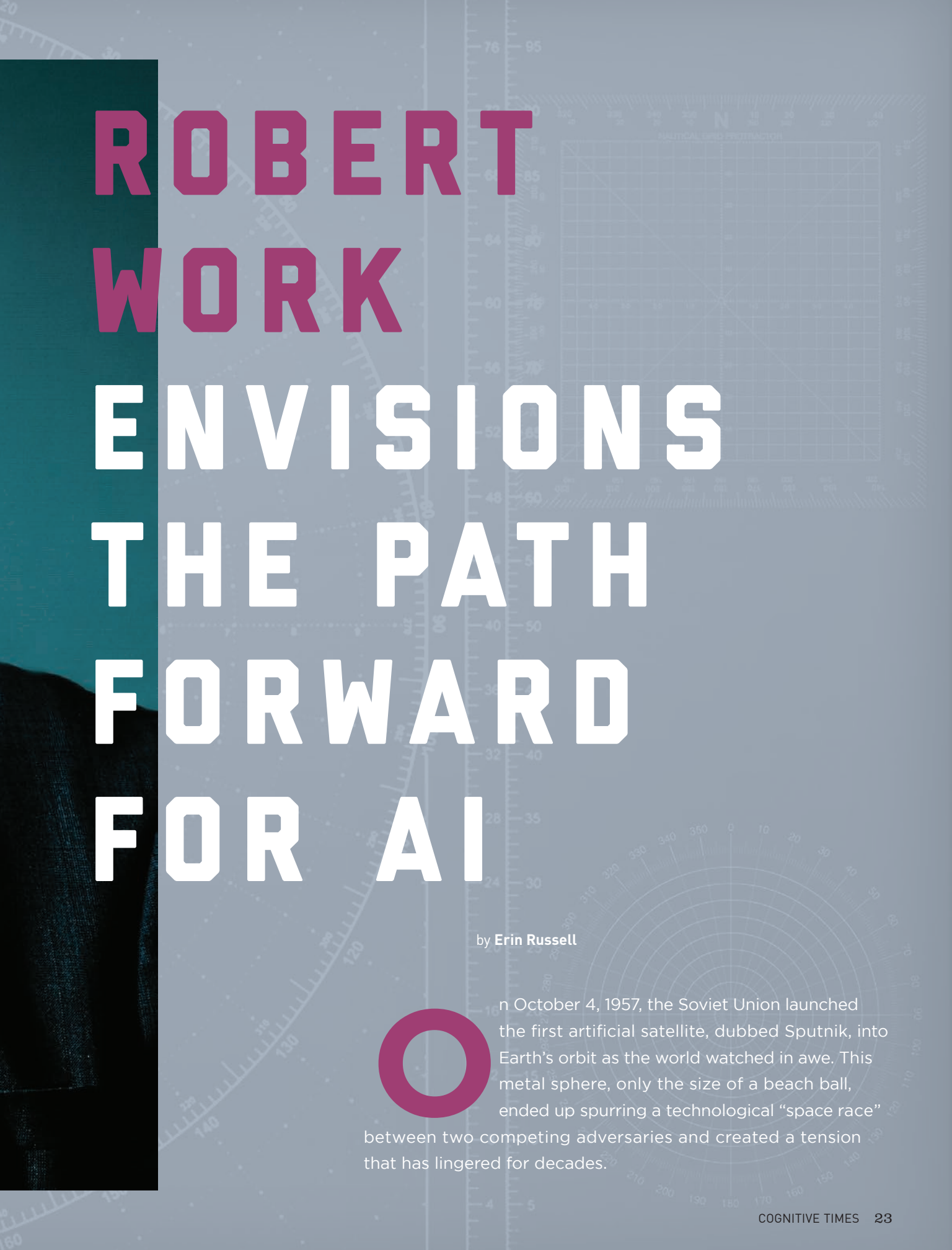
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As Deputy Secretary for the Department of Defense, Robert O. Work was an early advocate for incorporating AI into the Third Offset Strategy. As the current administration explores AI policies, he shares his recommendations for effective implementation.

ROBERT WORK

ENVISIONS THE PATH FORWARD FOR AI

by **Erin Russell**

O n October 4, 1957, the Soviet Union launched the first artificial satellite, dubbed Sputnik, into Earth's orbit as the world watched in awe. This metal sphere, only the size of a beach ball, ended up spurring a technological "space race" between two competing adversaries and created a tension that has lingered for decades.

The Sputnik launch also enormously impacted America's national psyche—that another country could be the first to launch into space was unfathomable, and propelled the nation to compile a powerful response. The government created the National Aeronautics and Space Administration (NASA) and assembled the best physicists, computer scientists, and engineers. Just over a decade later, on July 20, 1969, two American astronauts landed Apollo 11 on the moon. The race was won.

Robert O. Work, who was the Deputy Secretary for the Department of Defense from 2014 to 2017, believes it is time for another national mobilization—this time, for artificial intelligence (AI) capabilities. "I think we have to recognize that artificial intelligence, machine learning, and the autonomous operations they enable will likely lead to a new industrial revolution and an accompanying military-technical revolution. AI and autonomy are going to have a determinative impact on how competitive we are in both economic and military power in the future. It is not a technological competition we want to lag in."

It is this belief that pushed Secretary Work to champion the Third Offset Strategy at his time with the Department of Defense. Offset strategies, like their name suggests, seek to "offset" a potential adversary's advantages, such as numerical superiority, in order to create a decisive warfighting edge. A successful offset strategy serves as both a deterrent to rival nations that might otherwise instigate conflict and a means of ensuring victory if conflict does break out. This approach has been critical to U.S. military strategy since World War II, but the effectiveness of America's Second Offset Strategy, which focused on battle networks and guided munitions, has waned as other nations have acquired these same technologies.

Secretary Work argues that the time has come for a new offset strategy. He advocated founding the Defense Innovation Initiative dedicated to working on the Third Offset Strategy and guided its development and growth. As suggested by the prestigious Defense Science Board, the strategy emphasized the pursuit of artificial intelligence and system autonomy as the best way to create new strategic advantages for the United States.

"Our great power competitors are gaining parity in battle network warfare," explains Secretary Work. The thinking behind the Third Offset is that by injecting AI, machine learning, and more autonomous systems and operations into our grids, it will result in more timely and relevant decisions, a faster translation of decisions into actions, and the application of more discriminate and rapid effects in the conduct of a campaign, all while risking fewer forces and personnel. In essence, exploiting AI and autonomy should help the Joint Force [the U.S. Military]

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to outperform an enemy because the enemy will always be behind. It will be responding to decisions that you've already discarded.

"AI and autonomy are thus essential to our maintaining a comfortable overmatch against potential great power adversaries," he continues. "Companies like SparkCognition are at the forefront of this. They're trying to think of how we can gain that advantage by using AI in specific applications and operations."

Secretary Work continues to advocate for AI research in his role as co-chair of the Task Force on Artificial Intelligence and National Security at the Center for a New American Security (CNAS). He argues that we are in "a very, very sharp technological competition with a lot of components, with AI and autonomy being one of the central pillars of that competition."

China has clear goals to be technologically dominant in AI by 2030 and has hundreds of billions of dollars in funding committed to achieving these goals. Secretary Work notes that the United States is still working to articulate a plan and that the current national response to AI is insufficient, adding, "Do we have the capability to compete with China? Absolutely. It's just going to require focus and investment."

He outlines three steps the United States needs to take to stay on top: 1) formalize AI planning and leadership, 2) ramp up investment in research and development, and 3) facilitate public-private partnerships to ensure the development and application of cutting-edge technology.

Forming an AI Agency

One of the key responses to Sputnik was forming NASA. While recent progress by the White House to form the Select Committee on Artificial Intelligence is promising, Secretary Work believes the administration should establish a new U.S. agency that shapes and invests in the development of AI capabilities in the same way that NASA did for the space race. Michael Griffin, the Under Secretary of Defense for Research and Engineering, has also mentioned forming a joint office on artificial intelligence for defense prototypes.

"The administration has emphasized AI as a priority, particularly in terms of providing funding for R&D, removing barriers to AI innovation, preparing the workforce, and exploring military and government uses," explains Secretary Work. "Organizing the task force is an important first step, and I think fleshing out a central agency would ensure we remain leaders in AI development in the decades ahead."

A national AI agency would spend time breaking down barriers to public-private partnerships and focus on how to employ government capital in both private and public sectors to ensure that all bases are covered in AI. It would also develop strategies designed to maintain forward mo-

mentum towards goals even when setbacks occur. "There will be cases where AI causes an accident either because it was spoofed or because the coding was bad," cautions Secretary Work. "That's why it's going to take leadership from the top. It's going to take the president and Congress and the Department of Defense saying that despite setbacks, we have to go after these technologies in a deliberate manner."

Secretary Work also proposes incentivizing the American workforce to serve the country. He imagines a national AI Reserve Officer Training Corps, providing scholarships in areas like machine learning, data analytics, and data visualizations in exchange for a monthly commitment to consult for the military upon graduation.

Bolstering Research and Development (R&D)

Given Secretary Work's influence on the Third Offset Strategy, it should come as no surprise that he has an interest in military automation injected with AI. He thinks an AI center of excellence could help direct AI research and development and establish capabilities across the four services. Secretary Work explains that eventually, such a center may no longer be necessary—that each military service will build up their own AI expertise because it will become so fundamental to do what they do. However, during the critical initial phase, the center will help the services envision how AI could assist them.

In addition to allowing the Joint Force to operate at a faster tempo than its adversaries, he also sees AI enabling new forms of human-machine teaming and unmanned autonomous operations. He hopes that automation on the battlefield will have the additional benefit of increas-

ing humans' trust in machines. Over time, this may see a Joint Force with a greater percentage of unmanned and robotic systems—for example, one manned tank with smaller unmanned combat vehicles, or one manned airplane controlling three drones.

Secretary Work acknowledges that there are concerns about autonomous weapons. "We have automated weapons right now," he explains. "These 'fire and forget' weapons are always directed at a specific target or type of target. The operator designates the target and launches the weapon, which homes in on the target all by itself and blows it up. The next stage will see weapons with improved narrow AI guidance systems that can make up their own courses of action and select among the best to achieve the desired target effect. It will also allow collaborative attacks among different weapons and ultimately swarm-type attacks. He continues "These systems will be capable of increasingly sophisticated autonomous attacks against targets—but these targets will always be designed by humans."

R&D will need to undertake the arduous process of looking at the entire landscape of technologies contributing to AI and autonomous systems in a fast-changing field. But, where to invest is critical. Work says, "I think where we could go wrong is if we continue to buy a lot of old legacy type platforms and don't invest more heavily in these high technology areas that are going to determine who has the technological advantage on a future battlefield."

Enabling Public/Private Partnerships

One of the major differentiators between the United States and China is the collaboration efforts between the government and private corporations (in fact, China refers to their strategy as civil-military fusion). Secretary

Work believes that establishing such partnerships in the United States will require leadership from the White House, Congress, and the proposed central AI agency. This would allow problems to be addressed in a manner such that more commercial companies feel comfortable working hand in hand with the government.

"We need ways to address the real and valid concerns some commercial companies have with working with the government," says Secretary Work. "Making sure that their intellectual properly is protected. That they have a level playing field to compete. All of these things require a coherent and deliberate national plan."

Work feels we must also improve speed to market. In a field where technology is making marked progress every two months, the five-year acquisition cycle typical for defense is not practical. The Department of Defense (DoD) began testing shortened timelines with the Defense Innovation Unit, Experimental (DIUx). The organization initially sought out companies in Silicon Valley, promising the DoD will work with them to make things happen faster.

Secretary Work further explains that the DoD had to reboot the program in order to work within private companies' expected timelines. "DIUx started by using other transactional authorities, which allowed it to put something on contract within 60 days. This was unheard of within the Department of Defense. It involved seeking out companies and saying, 'No, you can work with the Department of Defense.'" The department is now looking to facilitate public-private partnerships by easing other bureaucratic burdens like security clearance and contractual mechanisms.

For input on how the government can successfully partner with private business, Secretary Work has often turned to fellow member of the CNAS task force, technologist, entrepreneur, and author, Amir Husain. "Amir, to me, is one of the thought leaders in this space," says Secretary Work. "While he looks creatively at specific programs that the DoD can address with AI, he also frankly identifies how the DoD impedes the processes to solve them. He can actually pinpoint what is holding us back."

Secretary Work acknowledges that AI has additional hurdles to overcome amongst the general public. "There's a lot of uncertainty on how we should approach AI, and that's natural in a democracy. We should have these debates," he says. "When arguing the merits or dangers of AI, you can either have a hopeful view of how AI will help society and help us solve problems or you can have an extremely negative view that may foreclose many opportunities. Seeing how AI is already positively impacting our lives, I have a hopeful view."

While it is unlikely that U.S. AI goals will be as tangible as putting two men on the moon within a decade, Secretary Work does think we are at a critical juncture in this technological competition. "The Chinese national AI plan is quite straightforward," he says. "It says we're first going to catch the Americans, then surpass them, and then lead the world in AI technologies. It is a direct challenge to U.S. economic and military competitiveness."

"The Chinese AI plan is a Sputnik moment for me," he says. "In the past, such a direct challenge to U.S. technological prowess will be met with a vigorous response. We haven't seen one yet. I hope we see one soon."

HOW DO HACKS STILL HAPPEN?

by **Marla Rosner**

A new era of cybersecurity is dawning. Artificial intelligence (AI) and machine learning technologies are changing the way enterprises protect their systems and data. With hyperintelligent machines on our side, one could easily imagine that organizations must feel invincible.

Yet fears of devastating cyber attacks seem to be higher than ever, and not without cause. Just in the past year, major businesses and critical infrastructure have seen massive disruptions by infections such as WannaCry, NotPetya, and Bad Rabbit.

The impacts of these attacks can hardly be understated. WannaCry shut down huge swathes of businesses and hospitals in 150 countries for several days, and estimates of its total fiscal damage range from millions to billions of dollars. NotPetya crippled vast portions of Ukraine's infrastructure, including government, banks, utilities, transportation, and even the radiation monitoring system at Chernobyl.

Despite the incredible new technology at the fingertips of organizations, cyber attacks seem to be growing more frequent in their occurrence and more cataclysmic in their effects. Why? If everyone has AI patrolling their networks and endpoints, then what is going wrong?

The Many Faces of AI and Its Imitators

AI cybersecurity solutions aren't as widespread as you might think. Almost every anti-virus has "AI" stamped on it somewhere, but that's no guarantee of its efficacy.

The majority of "AI" cybersecurity products currently on the market are either legacy cybersecurity methods supplemented with AI or AI supplemented with legacy

TOP HACKABLE HABITS YOU NEED TO BREAK

AN OUTDATED ANTI-VIRUS ISN'T THE ONLY REASON HACKS STILL HAPPEN. EVERYDAY HABITS LEAVE US VULNERABLE IN WAYS WE MIGHT NEVER HAVE IMAGINED. HERE ARE A FEW TIPS ON HOW TO KEEP YOURSELF SAFE FROM HACKERS.

2. DON'T JUST SAY "YES"

The increasing prevalence of voice activation systems means more ways for hackers to use your voice recordings. Recordings posted to social media can be used by hackers to clone your voice, get into accounts and institutions, and pull off scams. Sometimes all that's needed to hack into your personal and banking accounts is a recording of you saying "yes."

Source: CSO Online, Omaha World-Herald

1. KEEP YOUR BOARDING PASS PRIVATE

Hackers can gather sensitive information from your boarding pass, including your name, address, flight time, frequent flyer details, and the last four digits of the credit card used for your reservation. This exploit allows hackers to book, change, or cancel flights through your account; use your frequent flyer miles; and commit other acts of identity theft.

Source: Forbes

3. BEWARE OF CREDIT CARD SKIMMING

Credit card skimming occurs when a small device attached to credit card readers steals the information of any card swiped through the reader. This information can then be sold on the black market. Gas pumps and ATMs are the most common locations for skimming, since they have outdoor card readers that are frequently used but infrequently monitored.

Source: Identity Theft Resource Center

4. NEVER ASSUME YOU'RE SAFE ON PUBLIC WI-FI

Most public networks are not as secure as people believe. Public networks are a shared medium and even when they have encryption, everyone on the same network can see what you're up to. The websites you use have their own protection, but it still may not be the best idea to log in to sensitive accounts while using public Wi-Fi.

Source: Norton, Forbes
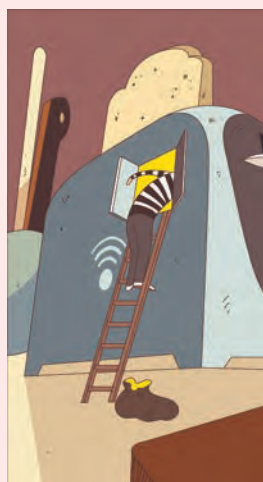
5. PROTECT YOUR PERSONAL DEVICES

The Internet of Things has created a wealth of cool new technology and products, but these connected devices have also created new potential entry points for hackers, especially since many of them don't employ anti-malware the way computers do. If it's connected to a network, it needs cybersecurity. Yes, even the toaster.

Source: Mental Floss

methods. Neither of these has the capabilities of cybersecurity built entirely from AI, nor many capabilities beyond a typical next-generation anti-virus without AI.

For every company that builds and designs its cybersecurity solutions from the ground up with AI, dozens more are just looking to shoehorn AI into their existing product suite for marketing purposes. In general, AI cybersecurity falls into three categories:

1. Legacy vendors who build AI models to supplement their preexisting software

2. Next-generation anti-virus vendors who build AI-based endpoint detection but are unable to build the AI to be effective enough on its own, and so they must reinforce the software with legacy and rules-based approaches

3. Genuine AI-driven approaches built by specialists that operate without the use of rules or heuristics

The first and second categories of vendors are far too common and unable to capitalize on the true potential of AI. For instance, one common approach is to feed the AI algorithm human-defined parameters, rather than allowing the machine to determine what's significant. This eliminates many of the advantages of AI, as these anti-viruses are vulnerable to the same problems affecting traditional cybersecurity for so long: reliance on flawed human biases, difficulty scaling, and lack of flexibility. They will be no more capable of catching zero-day malware or slightly modified polymorphic malware than any other software.

Another frequent offender is signature-based cybersecurity products in which an AI algorithm is fed files and creates its own signatures. This feature will most certainly be marketed as "AI," but it's still signature-based cybersecurity that runs into the same problems as its legacy counterpart. It will either encounter a high rate of false positives while still being unable to identify novel threats or it will be trimmed back until it's incapable of detecting nearly enough threats. AI will not fix this lack of granularity.

This is just one example of a common problem with "AI" cybersecurity—too many of them are simply using AI to make a broken or incomplete process faster, but not better. This activity deviates these products away from true machine learning, whose vastly improved outputs are the result of a fundamentally different process. It's as if a manufacturer made a particularly stylish, high-tech bicycle and called it a car. Genuine AI really does revolutionize cybersecurity, but in searching for the right platform, caveat emptor.

Furthermore, the wider availability of AI and machine learning tools means that hackers and criminal organizations also have AI, and they're using it to develop newer, smarter cyber attacks. The only way for organizations to counter AI-based malware is by leveraging AI themselves, and half-baked imitations won't protect against attacks making use of superior technology.

HOW DO YOU SEPARATE OUT AI FROM ITS COPYCATS?

IF YOU'RE LOOKING TO IMPLEMENT AI TO SAFEGUARD YOUR ENTERPRISE AGAINST CYBER THREATS, HOW CAN YOU SPOT GENUINE INFORMATION? WHAT SHOULD YOU LOOK FOR WHEN CHOOSING AN AI CYBERSECURITY SOLUTION?

THE PROSPECT OF WADING THROUGH THE SWAMP OF MARKETING HALF-TRUTHS FEELS DAUNTING TO MOST, TO THE POINT WHERE MANY GIVE UP AND ABANDON AI. BUT EVERYONE CAN AND SHOULD AVAIL THEMSELVES OF AI'S POWERFUL ABILITIES TO PROTECT AGAINST CYBER ATTACKS. FINDING THE RIGHT SOLUTION DOESN'T HAVE TO BE HARD. HERE ARE THE KEY QUESTIONS TO ASK ABOUT ANY CYBERSECURITY PRODUCT BEFORE BUYING.

1. DOES THE SOLUTION EMPLOY RULES-BASED ENGINES AS PART OF THE PRODUCT?

If the answer is yes, that's a red flag. Rules-based engines are an example of a human legacy approach being automated by AI. This could be compared to trying to make a square peg fit in a circular hole: Once the peg is small enough to fit, only a tiny fraction of the hole is being covered.

2. HOW DOES THE DETECTION ENGINE ADJUST TO NEW THREATS?

SparkCognition's own research has been found that the threat detection capabilities of market-leading software drop an average of 24% on new malware discovered in the last 24 hours. This is because these products rely on signatures and file reputation databases that can't be updated in time to catch zero-day malware. This gap in protection does not occur in genuine AI solutions, which can catch novel threats without referring to databases or signatures.

3. DOES THE AI COVER MULTIPLE THREAT VECTORS, INCLUDING DOCUMENTS AND SCRIPTS, OR IS IT LIMITED TO EXECUTABLES AND DOCUMENTS WITH EMBEDDED EXECUTABLES?

Many next-generation anti-virus programs use AI to detect executables but resort to rudimentary legacy approaches for documents, scripts, and other attack vectors. Vendors attempt to patch this weakness with macro control and script control, which force the user to turn macros or scripts off or on. However, this command fails to distinguish between malicious and benign macros or scripts, inadvertently blocking off an entire set of tools that users might need. It's as if a cybersecurity product were to advise that users simply keep their computer turned off at all times—after all, a device can't be hacked if it's never used!

AI
Behind the Light Switch

Why utilities are investing in 21st-century solutions

by Michael Agresta

The invention of the commercially viable light bulb is one of the iconic stories of 19th-century technology. Thomas Edison developed a personal and transformative vision, ran countless experiments, and emerged with not just a working prototype but also a lasting business empire that would serve as the model for a new industry. Today, however, utilities born out of his 19th-century technologies face modern challenges that Edison, the paragon of human intelligence during his generation, could never have foreseen.

The wealth and security of information-age nations—not to mention the well-being, comfort, and productivity of consumers—now depends on the smooth functioning of the electrical grid, including protection from hackers and malware. A retiring workforce, steeped in engineering expertise related to physical machines, is struggling to transmit its knowledge of turbine management to a new digitally driven generation. And after a century-plus of burning fossil fuels to satisfy consumer and industrial electricity needs, many utilities are bringing new clean energy sources online, thereby facing complex integrations with renewables and battery storage. Added together, these transitions are more than a leading team of 20th-century utility experts can manage.

Challenges created in a digital age call for digital solutions. Artificial intelligence (AI) and machine learning (ML) technologies hold the problem-solving promise of a million Edisons. "The promise of AI is that it will objectively look at a situation or problem, freed from the biases of human thinking," says Shane Mickey, VP of Strategic Planning at Mitsubishi Hitachi Power Systems (MHPS) Americas. "Once deployed and trained, AI will expand the reach of the dwindling number of true human experts in

SHANE MICKEY, VP OF STRATEGIC PLANNING
Mitsubishi Hitachi Power Systems (MHPS) Americas

our industry. These interactions will then yield more results and correlations which we might not have thought of and either make decisions or help us make decisions much faster and better."

With 41% of the total installed capacity, MHPS is the world's top manufacturer of advanced class gas turbines and a leader in power plant reliability and efficiency through the use of big data. The company's digital solutions

program is called MHPS-TOMONI™ (TOMONI means together with" in Japanese in the spirit of collaboration). It was created in an effort aimed at envisioning and putting into action the digital power plant of the future. MHPS-TOMONI is on pace with, if not a step or two ahead of, industry trends toward incorporating AI solutions to organize data, learn from it, and develop automated protocols that detect and address plant problems as they develop in real time.

"In the past, a typical interaction would consist of a component within a plant alarming when it sensed conditions were getting dangerous for that piece of equipment or people," Mickey says. "It would then depend on human interaction to diagnose the alarm condition and take action." With AI, these diagnoses and decisions are made instantaneously, meaning equipment stays online and consumers will see fewer, shorter periods without power. The application can also learn from its own experience to ensure it always reacts optimally to changing conditions.

"There is no doubt that AI is going to be a game changer, in the same way that the internet was twenty years ago," Mickey says, "but it feels like we're in the early days of AI." As with internet-related investments in the late 1990s, smart AI moves promise to pay significant dividends, but it can be hard for those new to the technology to separate the bona fide from the bogus. These days, forward-thinking utility executives find themselves searching for answers, hoping to find the right solution to deploy AI to solve emerging, industry-wide challenges.

The Problems AI Can Solve

When asked to identify emerging challenges facing power plants in the near future, Mickey mentions two that will be familiar to any utility executive—both of which can be addressed by adopting AI solutions. "The power industry faces two macro-trends," Mickey says. "The first is an aging workforce. How do we transfer knowledge of our retiring workforce to fewer people in our industry so that future power plants are more reliable than today's power plants? That's no small challenge."

The second industry-wide trend, according to Mickey, is the adoption of renewable energy sources and technologies. "Battery storage has the potential of making renewables relevant when the sun doesn't shine and when the wind doesn't blow," Mickey says. "This future mix of distributed power assets, along with central power stations, will make it much more challenging to maintain a stable, reliable electrical grid."

Both issues are on the radar of AI developers in the utilities space. In fact, AI applications can be seen as a potential replacement strategy for retiring subject-matter experts—especially since there are few candidates willing to gain deep expertise in the field. With the power of AI, algorithm builders are training computers to capture historical knowledge, predict the future, and correlate future states with historical data. Soon, computers will be able to recognize and remember situations that only a subject-matter expert or

"Once deployed and trained, AI will expand the reach of the dwindling number of true human experts in our industry. These interactions will then yield more results and correlations which we might not have thought of and either make decisions or help us make decisions much faster and better."

industry veteran would be able to correctly diagnose today.

MHPS has already seen positive results from an AI system used in Taiwan beginning in 2016 to automate combustion tuning in boilers. "The initial verification testing demonstrated results that are comparable to those that could be achieved by a highly experienced engineer," Mickey notes.

As difficult as it is for utilities to lose retiring subject-matter experts, the fact is that even a long-serving expert with encyclopedic knowledge of the 20th-century power plant would be at a loss when confronted with the new challenges of a greener era. The adoption of renewables in the electrical grid is forcing utilities to rethink many elements of their systems. Renewables depend on weather and seasons, which make them less predictable than traditional energy sources, and necessitate better

predictive abilities. In this process, power plants will come to rely on AI applications as a "green Edison," lighting the way to a more sustainable future.

Mickey sees integration with renewables as one cornerstone of AI design, along with other forms of operating flexibility. "A plant that is AI-enabled with MHPS-TOMONI will allow central power stations to take in external and environmental conditions, such as weather or distributed resources coming on- or offline, and ramp up or down to meet demand changes," he says.

AI and ML will transform the utility industry in a number of important areas: cybersecurity (e.g., recognizing malware, hackers, and other threats using sophisticated and subtle correlations of warning signs), customer-friendly applications on the Internet of Things (e.g., disaggregating usage data to help end users determine which specific fixtures and appliances cost them the most energy), and energy trading and risk management (e.g., better forecasting of load and risk factors to help utilities price energy outputs).

Perhaps the most exciting thing about AI for early adopters is the sense that there may be no corner of the utilities industry that AI can't transform. "One of the most interesting things we're going to get out of ML is learning what we don't know already," says Jim Taylor, CTO of Tucson Electric Power. "These systems are going to identify issues and opportunities that we've never even thought about looking for. That's the beauty of a machine being able to do it.... It's going to find things that we hadn't even thought of and lead us to conclusions that we wouldn't have reached on our own."

The Early Results of AI Investment

The first question for many power companies setting out to invest in AI is whether outside help is needed at all. Large companies that attempt to build AI solutions, as opposed to buying them, will face challenges like needing to think a decade ahead of present needs in order to keep useful applications in the pipeline. Just equipping staff to begin to build AI can be as complex a decision as buying an end-to-end solution. In short, building something as complex as AI will be an uphill battle for companies designed to compete in other industries.

MHPS-TOMONI, the partnership-driven digital power-plant project at MHPS, is a more sustainable approach built on trial and error with partner-supplied AI applications. "We see this technology enabling the power plant of the future in general terms, but we're going to have to experiment, in partnership with companies like SparkCognition, and our customers, to figure out the best and most cost-effective solutions," Mickey says.

Every power plant will come to the technology with a different amount of preparation required to implement it. Some have been collecting and organizing performance data for years with rules and procedures in place; others may be late to the game. A good AI solution will be nimble

> "One of the most interesting things we're going to get out of ML is learning what we don't know already," says Jim Taylor, CTO of Tucson Electric Power.

enough to adapt its technology at any stage of the digital transformation process.

AI is a new factor in the utility industry, and for some, it may be some years before those who make smart investments in the technology begin to see a substantial return on their investments: fewer shutdowns and cybersecurity incidents, better consumer offerings, and smoother integration with the 21st-century grid. But Mickey is confident that MHPS will be pleased with their AI engagement sooner rather than later. "[SparkCognition is] providing a cost-effective solution that should pay back within a couple of years in our models," he says. "Yes, there is more variability on our models than what we're used to in an investment, but the risk versus reward is also low."

Mickey is convinced of one thing: investing in AI is the right call in 2018. This is true for consumers as well as utilities. "Go back to 1995 and decide if you should invest in Yahoo or Google," he says. "Sure, it's an easy answer now with hindsight being 20/20, but it wasn't so clear back then. Investing in the right technology provider was a tough call then as it is now. However, investing in the technology itself, such as the internet, was an easy call then as AI is now."
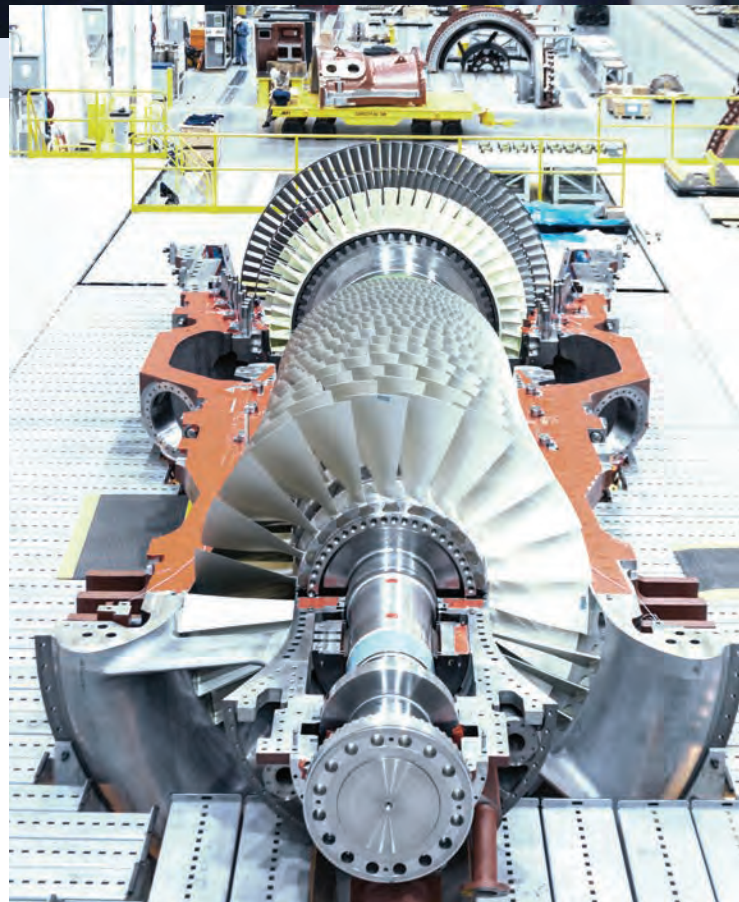
MAXIMIZE GAME SHOW WINNINGS BY THINKING LIKE AN ALGORITHM

by **Jamey Hall**

Probabilistic reasoning is the heart of machine learning. For artificial intelligence to break out of the narrow contexts it was used for in the 20th century, it must be able to assign probabilities to events and objectively update those probabilities as new information arises. While probability theory is in the DNA of machine learning algorithms, probabilistic puzzles often elude humans. See where your intuitions pull you in this probability puzzle known as the "Monty Hall Problem," after the infamous game show host and the format of his show, "Let's Make a Deal."

The Game

Suppose you are competing on a game show, and the host presents you with three doors.

Figure 1: Three numbered doors

Figure 2: One of the doors is now opened to reveal a goat

Behind one of the doors is a new car, and behind the other two doors are goats. The goal of the game is to choose the door with the car behind it.

After you have picked your door, the host opens a door that you didn't choose to reveal a goat. Then the host offers you a deal of either keeping your current choice or switching to the remaining unopened door. The puzzle is as follows: Is there any advantage in changing doors, or do you have the same chance of driving home in the new car, no matter what you do?

Answer

A common intuition is that switching doors doesn't affect your chances of winning. We tend to think that since one of them has a car behind it and the other doesn't, there is a 50 percent chance regardless of which door is picked. However, this is an incorrect assumption.

In truth, your chances of picking the door with the car doubles if you switch. How can that be? Each door has a ⅓ chance of having the car, so your first choice always has a ⅓ chance of being correct. When you switch doors, you get the car only if your first choice isn't right. There was a ⅓ chance that your first door was right and therefore a ⅔ chance it wasn't right. Thus, switching gives you a ⅔ chance of getting the car.

Still unconvinced? You're in good company. This question was originally popularized in the Parade Magazine column, "Ask Marilyn," where Marilyn vos Savant answered questions that readers sent in. Marilyn was asked the Monty Hall Problem, and she produced the correct answer. In response, she received thousands of letters—many of them from Ph.D. statisticians—telling her how wrong she was. Even the great mathematician Paul Erdős remained unconvinced until he was shown a computer simulation of the game.

That's the best thing about these puzzles: The answers can be tested. Machine learning algorithms are not as dogmatic as humans; modern algorithms can sniff out a fraction of a percent increase in productivity in significantly more complex situations, even when it may not seem logical to humans.

If you remain unconvinced, I invite you to search for a simulation online (the UCSD math department and Shodor.org both have versions), or try playing the game yourself with a partner, three paper cups, and a coin.

CREATIONS FROM THE COGNITIVE KITCHEN

by **Erin Russell**

A fter years of mastering the world's most challenging games, predicting failures on crucial industrial equipment, and defending against destructive cyber attacks, artificial intelligence (AI) has picked up a surprising new challenge: cooking.

It may seem improbable that AI could be applied to something as personal as taste, but there may a logic to flavor combinations. Ahn et al. (2011) proposed a food pairing

hypothesis, which suggests that successful food pairings share similar molecular components—for example, caviar and white chocolate have several of the same chemical compounds, and would therefore taste good together. Interestingly, this correlation appears more strongly in Western cuisine, while many Eastern recipes rely on contrasting molecular components.

Thus, an algorithm can be programmed with rules to follow the food pairing hypothesis and trained on a large corpus of data: online recipes. So what insights can AI add to the world of food?

Cooking With Chef Watson

The IBM Watson group, the team behind AI's "Jeopardy!" victory, ventured into culinary territory soon after it beat the trivia game. Leadership proposed that the system could be used to generate ideas, and cooking was suggested as a starting point. The group believed that a cognitive computing system could help chefs explore new flavor combinations to create never-before-seen dishes. This certainly proved to be the case, for better or worse.

Watson was "fed" hundreds of thousands of recipes as a base point for flavor pairings. Lav Varshney, an IBM scientist, partnered with Florian Pinel, a computer scientist who also had a culinary degree, to train the system. The pair classified dishes according to surprise (how novel the ingredients were), pleasantness (human perception of odor and flavor molecules), and synergy (the amount of shared chemical compounds). Pleasantness, in particular, can occasionally be at odds with novelty—for example, eel and cheesecake is certainly a novel combination, but it likely would not be pleasant.

Watson can generate bold new ideas for flavor combinations. However, intially its outputs were simply ingredients, making chefs essential to conceptualizing the dish (including determining the amounts of each ingredient), executing it, and seeing if Watson's suggestions actually taste good. The chefs in the research group had fun with this, often having two chefs come up with recipes from the same ingredients and having them go head-to-head in taste tests.

In 2014, Chef Watson attracted attention at South by Southwest (SXSW) in Austin, with a food truck serving dishes like an Austrian chocolate burrito. There was also a formal dinner with a tasting menu of dishes like roast duck with cherry, olive, and cinnamon and Kenyan Brussels sprouts with sweet potato puree and almond gremolata.

Dishes from ibmchefwatson.com

Even cocktails were added to Watson's repertoire. Mixologist Anthony Caporale took the unconventional step of asking Watson to incorporate a protein into the recipe, meaning drinks had ingredients like bacon or chicken broth (though in this case we can all agree shrimp cocktail should not be literal).

A Food Galaxy

Across the Pacific, Dr. Yoshiki Ishikawa, a public health researcher from Japan, wanted to tap into the personalization abilities of AI to benefit the food world.

"Modern dietary styles have been more inclined toward unhealthy eating patterns," he explained. "While there is compelling research in nutrition sciences on what makes a recipe healthy, this does not necessarily mean that such a recipe is matched to one's unique food preferences."

He adds, "Personalized information systems that can transform a recipe into any selected dietary style that a user might prefer would help food companies and professional chefs create new recipes." For example, a family moving from Japan to the United States may want to find equivalent local recipes that match their palate.

To tackle this problem, he proposed two steps: (1) Identifying the dietary influences of any selected recipe and (2) developing an algorithm that shifts a recipe into any selected dietary style.

He created a team to research these issues using a corpus of data from Yummly recipes. The team included two nutrition scientists to categorize world recipe data, a computer scientist to build the algorithm, a designer to visualize the project, the chef of a Michelin-starred restaurant to create the recipes, and finally, Ishikawa and Varshney, now at the University of Illinois, to oversee the project.

First, the recipes were categorized into 20 different cuisines (like Thai, Russian, and Southern) based on the ingredients. Then algorithms were developed using the food pairing hypothesis to find appropriate substitutions from

The algorithm recreated sukiyaki, a kind of Japanese hot pot with meat cooked with vegetables, soy sauce, and mirin, with French flavors by substituting calvados (French apple brandy) for the mirin and bouquet garni (French herbs) for the soy sauce.

other cuisines. Given that certain cuisines are considered more beneficial from a health perspective (for example, the Mediterranean diet), this program could allow users to shift their tastes to healthier alternatives.

The product of this research was unveiled at SXSW in 2017. The result is The Galaxy of Food (www.foodgalaxy.jp), which can transform a recipe from one style (say, Japanese) into another style (say, French) by suggesting ingredient substitutions. The algorithm recreated sukiyaki, a kind of Japanese hot pot with meat cooked with vegetables, soy sauce, and mirin, with French flavors by substituting calvados (French apple brandy) for the mirin and bouquet garni (French herbs) for the soy sauce.

"What we want to ultimately solve through this effort is '100,000 meals problem,'" explains Ishikawa, referring to the 100,000 meals that a person eats in their lifetime. "I, as a public health researcher, really want to make each meal enjoyable, diversified, and healthy as much as possible, which might even create conditions for world peace."

Adding Flavor Without Taste Buds

AI has made great strides in the kitchen. Recipes now include ingredient amounts and instructions, and the emphasis on novel flavor combinations can be adjusted. However, it may not have quite earned its culinary degree yet. Over at the New Yorker, Alexandra Kleeman appreciated the AI's ability to help her use leftover ingredients in her fridge, but was less successful when she tried to throw a dinner party using Watson-recommended recipes. Her guests were ready to mutiny by the time the program suggested ice cream with curry powder.

However, like any algorithm, AI for recipes learns from feedback. As more adventurous chefs tell the systems what does and does not work, it will adjust its ingredient outputs to become more palatable to the rest of the population. Though cognitive recipes may be a bit too "creative" for now, an AI kitchen assistant may not be far off.
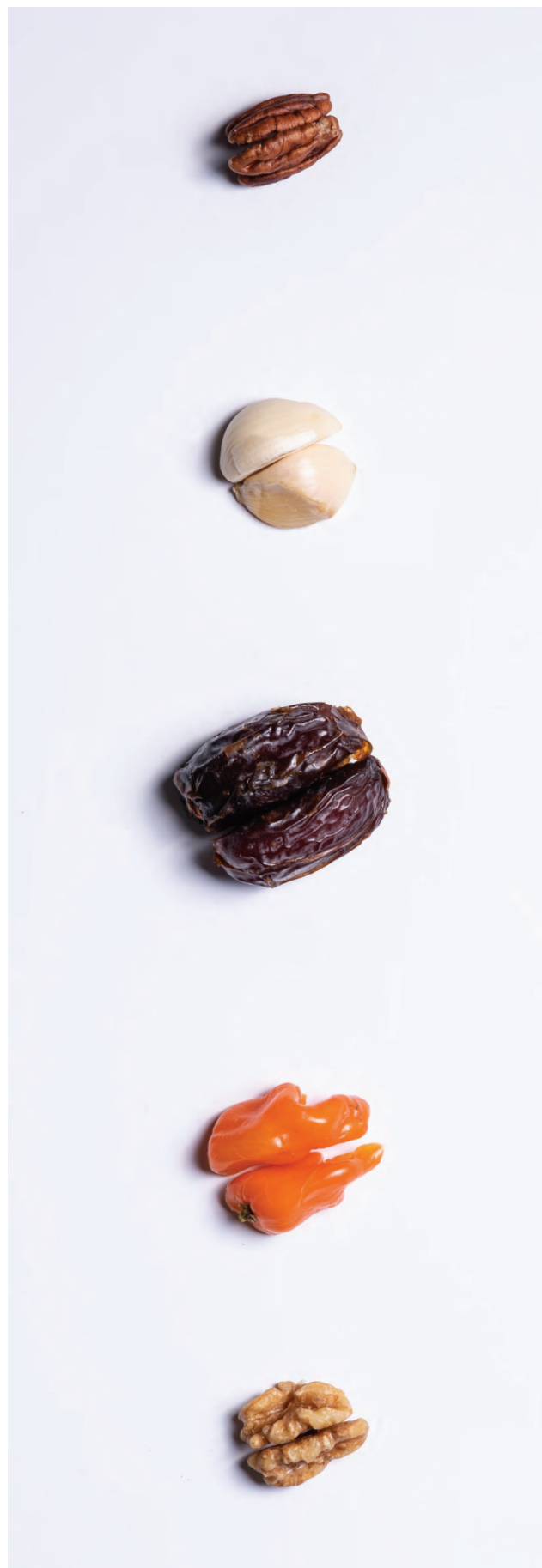
THE DRIVERLESS FUTURE OF RACING

by **Jeff Beckham** | photos by **Daniel Simon**

Since the beginning of auto racing, the stars of the sport have been the drivers, whose skill and fearlessness make them internationally famous and fabulously wealthy. But what happens as the world moves closer to self-driving cars? Will racing be the same without these daredevils behind the wheel? That's what Roborace aims to find out.

Roborace is a competition for both human and AI driving teams. When Denis Sverdlov, the former CEO of Russian wireless broadband provider Yota, introduced the Roborace concept in 2015, he envisioned a racing series that would rapidly advance the autonomous technology being developed for road cars. The series currently performs demonstrations on the tracks of Formula E—a newer version of Formula One that uses electric cars and races in cities around the world.

Since the beginning, the face of the series has been Robocar: a sleek torpedo with muscular aerodynamic flares over each wheel and a short camera tower where you'd typically find the cockpit. Roborace designer Daniel Simon created vehicles for the films "Tron: Legacy," "Oblivion," and "Captain America," which explains why Robocar looks like it could drop seamlessly into a big-budget sci-fi movie.

BRYN BALCOMBE
Chief Strategy Officer, Robocar

"THERE IS A HUGE SENSE OF SATISFACTION IN TRAINING AN AI DRIVER AND WATCHING THEM DELIVER THE PERFORMANCE YOU KNOW THEY ARE CAPABLE OF. IT'S VERY MUCH LIKE THE FEELING OF A TRAINER IN ANY OTHER SPORT, BE THAT HORSE RACING, ATHLETICS, OR FOOTBALL."

But Robocar isn't just beautiful. It's smart, too. As Roborace Chief Strategy Officer Bryn Balcombe put it, "All the human senses are replicated."

However, with six cameras providing a 360-degree view; sensors that measure force and inertia; sonar, radar, and lidar for capturing measurements with sound, radio, and light waves; two separate GPS antennas; and an AI brain from Nvidia with the computational power of 160 MacBook Pros, Roborace sensor technology extends far beyond the capabilities of human senses.

When the full competition begins, the competing Robocars will contain identical hardware, so the winning edge will go to the team with the best AI software, looking for advantages within the huge data set.

That's where Robocar's sibling, DevBot, comes in. DevBot contains the same sensors and cameras as Robocar, only it has a cockpit for a human driver, meaning DevBot can run in fully autonomous mode, be completely controlled by the driver, or something in between.

DevBot is used to hone AI software based on real-time data. DevBot crawls the course, taking in data from sensors related to the powertrain and vehicle dynamics, and builds a high-definition 3D map of the environment. A technique called sensor fusion improves the data collected from multiple sensors (including cameras, radar, lidar, GPS, and ultrasonic sensors), giving the AI driver more complete and accurate information about the track.

With each pass, DevBot increases in speed, going from around 60 mph to more than 120 mph. And it becomes more consistent. During a test on the Hong Kong ePrix street circuit, DevBot recorded back-to-back laps that were just one-thousandth of a second apart. The process isn't that different from how traditional race teams prepare for an event.

"Top Formula 1 teams are running tens of thousands of simulations before each event, which optimize vehicle set-up and racing line, while Formula E simulations include lift and coast strategies that optimize energy consumption against lap time," Balcombe said. "The main challenge is getting the driver to execute these strategies on race day and for the engineers to adapt the car set-up to the specific track and weather conditions. The AI driver we use for development and demonstrations is trained in a similar manner and adapts to track conditions on race day."

The team has learned as much from failures as from successes like Hong Kong. In February 2017 in Argentina, while putting a pair of autonomous cars on track for the first time ever, one of the cars accelerated too hard into a corner and crashed when it caught the edge of a safety barrier. But in the same test, one of the DevBots slowed and changed course to avoid a dog that had run onto the track.

"There is a huge sense of satisfaction in training an AI driver and watching them deliver the performance you know they are capable of," said Balcombe, whose optimism soared as he watched DevBot improve to the point that it finished within a few seconds of a human driver during a test lap in Hong Kong. "It's very much like the feeling of a trainer in any other sport, be that horse racing, athletics, or football."

But is it a sport if there are no human hands on the steering wheel? So far, fans have been split between those who still treasure the driver in the car and those who are interested in the technology and how it might trickle down to everyday driving. As Roborace organizers considered how to best position their new sport, Sverdlov brought in a former driver, Formula E racing champion Lucas di Grassi, as chief executive officer.

"Roborace isn't trying to replace motorsport, but augment it. So human motorsport could become more human," di Grassi told Top Gear in 2017. "The future of mobility is autonomous, that's an industry consensus now. In the same way, I believe that motorsport is about the driver, who is the best human being behind the wheel. I want to develop the Roborace series to be complementary to traditional motorsport, and not to replace it."

There are many ways that might take shape, including some far-out scenarios that sound closer to an acrobatic air show than a traditional race. In the near term, Roborace will be performing demonstrations using a combination of human and AI drivers—creating a collaboration between humans and robots.

In the big picture, that type of collaboration reflects how AI will be used to assist, augment, or automate many different human tasks across all industries. For Roborace, and for many other businesses, the key to the best performance is finding the optimal combination of human and machine talents.

TEAMS USE DEVBOT TO HONE THEIR AI SOFTWARE BASED ON REAL-TIME DATA. DEVBOT CRAWLS THE COURSE, TAKING IN DATA FROM SENSORS RELATED TO THE POWERTRAIN AND VEHICLE DYNAMICS, AND BUILDS A HIGH-DEFINITION 3-D MAP OF THE ENVIRONMENT.

HOW FAR WILL THE DEEP LEARNING EVOLUTION TAKE AI?

by **Usman Shuja**
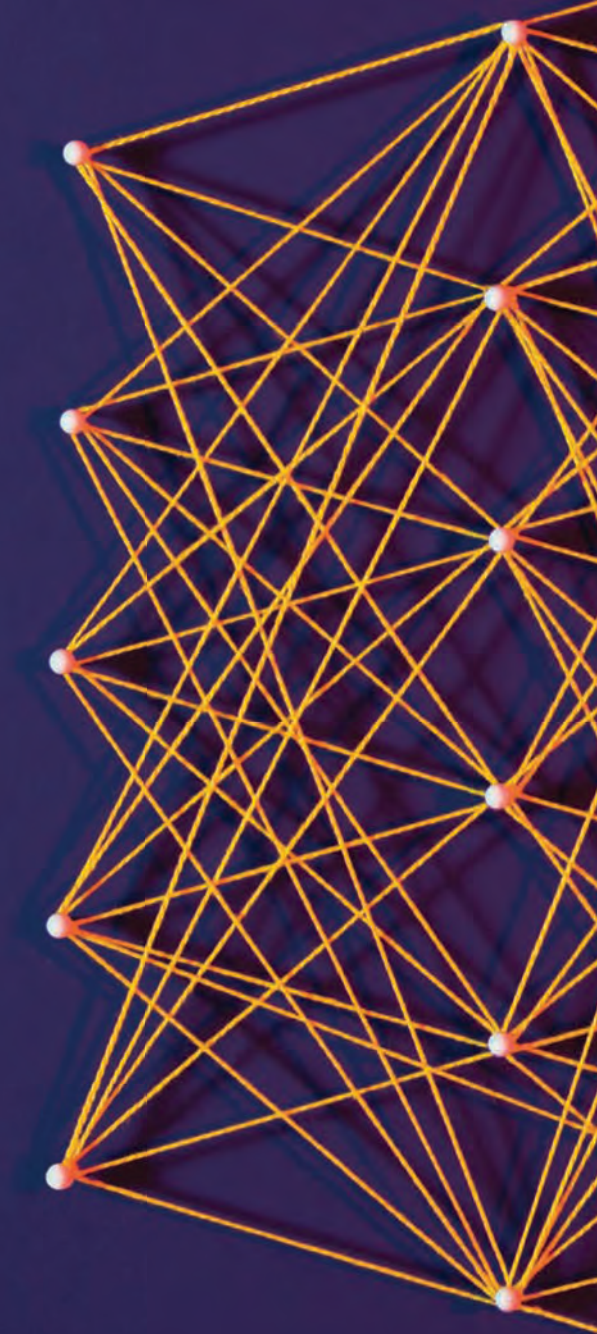
Most world-changing discoveries follow an evolution of improvements after their "Big Bang" moments. The Wright brothers' discovery—claimed by the Scientific American as the "birth of flight"—set off an era of aerospace research that delivered technical and commercial innovations within a few decades of the first flight.

Many pundits are labeling Professor Geoffrey Hinton's recent success with deep learning and deep neural networks as the rebirth and Big Bang moment for artificial intelligence (AI). The peak of AI has been described as the ability to accomplish scientific discovery, create art, and beat FIFA world champions. However, would a series of incremental innovations from here onward lead AI to this level of sophistication?

Current AI can win "Jeopardy!", but is flustered by nursery rhymes

First, it's necessary to look at the real-world problems that current AI can solve.

Today's AI research agenda is focused around deep learning. Deep learning systems learn from large data sets to solve a specific task at hand. Deep neural networks can learn complex functions to solve intricate problems, but only within certain parameters. This specificity to a task
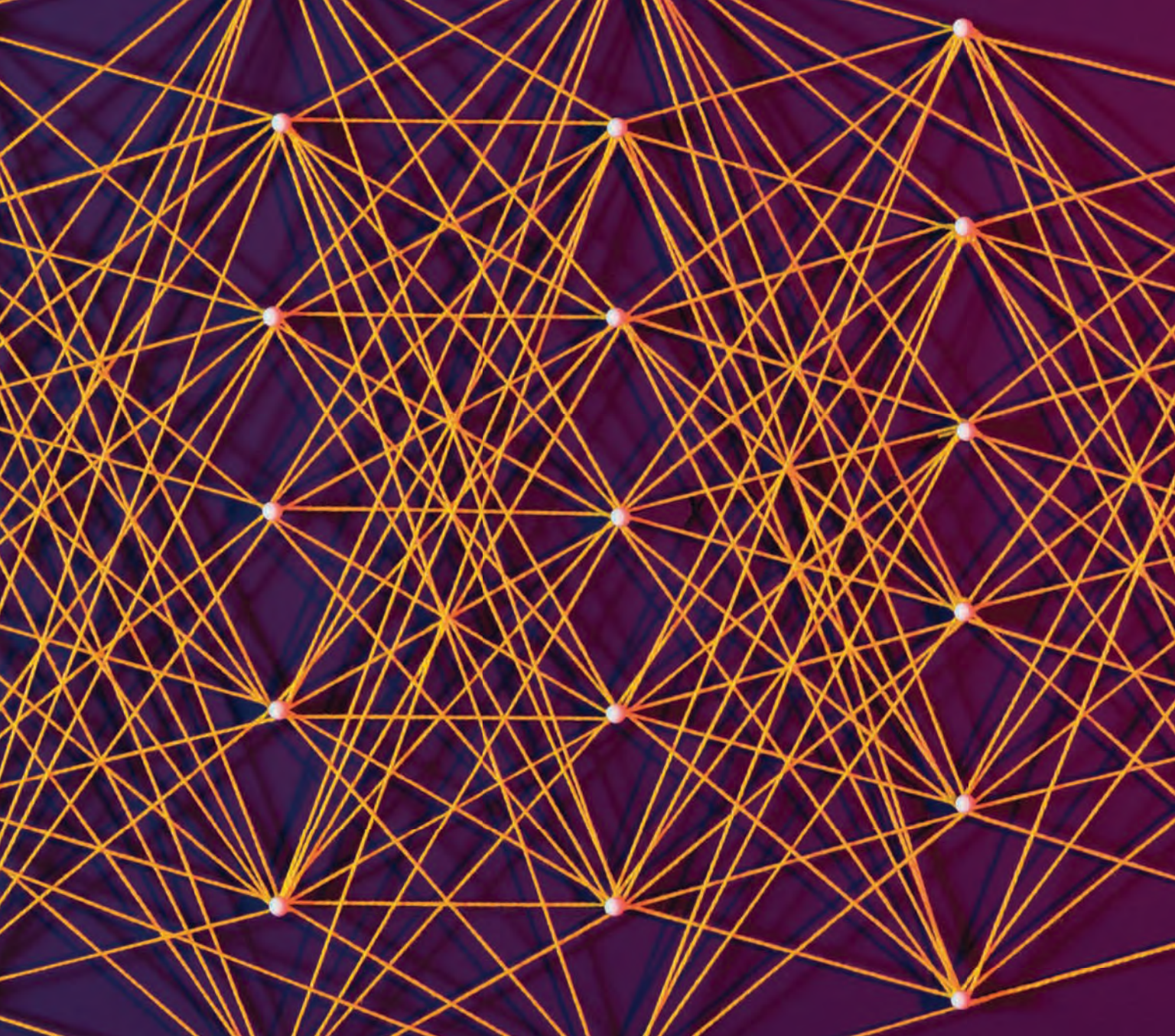
has earned it the nickname "narrow AI." Don't be fooled by the limiting nomenclature: Narrow AI can easily outperform a human expert when the rules are defined and static, no matter how complex they are. For example, AI program AlphaGo has become the best player in Go, an incredibly sophisticated game, because Go is played using set rules.

The ability of neural networks to represent any function with arbitrary precision provides a powerful premise. Professors Henry Lin at Harvard and Max Tegmark at MIT believe the universe is governed by a tiny subset of all possible functions. Therefore, to represent universal activities, deep neural networks don't have to approximate every possible mathematical function, just a small subset

of them. Is the mathematical, data-driven approach alone enough to represent the complex world we live in?

Dr. Scott Niekum, director of the Personal Autonomous Robotics Lab (PeARL) at the University of Texas at Austin, has doubts. "Purely data-driven approaches such as deep learning have significant limitations. These approaches cannot easily incorporate high-level human insight into complex tasks, nor are they applicable when data is limited, as is the case for many real-world problems. More importantly, deep learning is only one tool in the AI toolbox— it is very good at solving a particular set of problems, but does not directly address many important issues, such as long-term planning."

Professor Bruce Porter, former Chair of Computer Science at the University of Texas at Austin

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Machine learning researchers have a remarkable track record of successfully applying their techniques for finding statistical correlations to tasks, such as natural language processing, that seem to require so much more than simple statistical correlations. But, I'm skeptical that these techniques will extend to natural language understanding.

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Deep learning is still delivering impressive results on narrow problems, however, and is also helping adjacent fields overcome major limitations. For example, natural language processing has gotten a boost since parsers started leveraging machine learning (Google Translate's use of deep neural networks resulted in its biggest improvements in a decade). Deep learning solves the problem of finding human experts for time-consuming data input by automating perception, rules definition, feature discovery, and knowledge acquisition. However, more work is required to recreate human-like semantic understanding of complex actions.

Professor Bruce Porter, former Chair of Computer Science at the University of Texas at Austin, elaborates: "Machine learning researchers have a remarkable track record of successfully applying their techniques for finding statistical correlations to tasks, such as natural language processing, that seem to require so much more than simple

statistical correlations. But, I'm skeptical that these techniques will extend to natural language understanding."

Aspirational, broader AI systems would have human-like reasoning skills combined with machine scale to process data. To illustrate, consider the nursery rhyme: "Jack and Jill went up the hill to fetch a pail of water." A modern system can answer "Where did Jack and Jill go?" as the information is explicitly stated in the corpus. AI is now learning to answer questions like, "Are Jack and Jill still at the top of the hill?" demonstrating inductive reasoning. Mastering these pathways is how modern knowledge retrieval systems are growing smarter. However, an AI system would be unable to describe how Jack and Jill retrieved the water, as it requires background information not specified in the rhyme. The next frontiers for AI researchers are matching humans' abilities in abductive reasoning and building a symbolic structure.

If this is AI's rebirth, what will AI grow up to be?

Researchers dream about creating AI that can reason deeply, learn from the environment, and make decisions with limited data. That said, expanding narrow AI to reach its full potential may prove more worthwhile than systems with broader intelligence. Rob High, CTO for IBM Watson, points out, "General intelligence will be moved forward by economic forces. Do I need an AI system that is able to imagine, dream, be self-aware, and have emotional states like guilt? I don't know that I even need a machine that is self-motivated. What I need is a machine that will take my motivations and act on them."

AI is most useful not in replicating the human mind, but in filling the gaps where humans fall short.

There are a plethora of problems for narrow AI to solve, a number that will only increase as its abilities are broadened. However, the relationship between deep learning and data is like a double-edged sword. Large amounts of data ensure accurate answers, but it's not feasible to have an expansive enough data set for many real-world use cases. For example, for AI to be used in clinical trials, where sample size is small by definition, something will have to change.

So what will this evolution of AI look like?

Bulking up narrow AI with a data diet and new training methods

Researchers believe that as deep learning is integrated with other AI techniques, it will serve as a key foundation for another set of abilities, namely working with smaller data sets, automating learning processes, and enabling human interaction. Margaret Boden, a world-renowned cognitive researcher, has seconded the need for AI to expand beyond industry silos and embrace a multidisciplinary approach to move the field forward.

The first problem to tackle is the requirement of big data sets. Techniques that fare well with limited data and perform deeper reasoning (like active learning systems, Bayesian networks, graphical models, and context framing techniques) are returning to the AI research agenda to extend the capabilities of the technology. When combined with deep learning, these techniques can be a powerful system that use data to find solutions and recommend action from that information.

One success story of solving problems without a large data set is the Zero-Shot Translation system developed for Google's Multilingual Neural Machine Translation system. This system uses previous translation models to translate between two new languages. Experimentation with deep neural network architecture to augment deep learning is another likely trend. Researchers at the University of California, Berkeley have successfully demonstrated this by adding planning-based reasoning to deep neural networks.

There is also significant room for improvement in the spectrum of automated learning. Supervised learning with a rich data set is already providing solutions to complex problems like computer security. For example, Deep-

Armor, a cybersecurity solution from SparkCognition, has been trained on millions of benign and malicious files and is able to identify malicious characteristics, even in attacks it hasn't seen before.

However, AI research will drive progression toward unsupervised learning. The route to fully autonomous systems will have multiple stages, each moving toward human-like learning—like demonstrative learning, where a robot can learn from "watching" a task performed by humans or videos. Dr. Scott Niekum's lab at the University of Texas at Austin was able to teach a robot how to build IKEA furniture using only demonstrative learning.

The journey from supervised to unsupervised learning will necessitate an increased level of transparency ("explainable AI") to ease fears and skepticism surrounding "black box" decision-making. Although explainable AI is still an emerging area of research, progress in this area is already being made. Researchers at the University of California and Max Planck Institute for Informatics have effectively demonstrated machine learning-based image recognition that can explain its reasoning in natural language. This area is important to inspire confidence in machine learning and its adoption in a broad range of fields.

The Max Planck Institute for Informatics

The University of Texas Robotics Lab

The role of humans in building intelligent systems will expand with new learning and "instructing" techniques. Dr. Manuela Veloso, head of the Machine Learning Department at Carnegie Mellon University, describes the future of the relationship between humans and AI as "symbiotic autonomy." "Human-AI interaction will be much more sophisticated," she explained. "I envision research on methods of correction to be incorporated in the AI machinery." This means that instead of telling Amazon's Alexa explicitly to "Stop playing music," the system will learn that context, such as "I'm leaving now," means it should turn the music off.

Deep learning is promising to provide a mathematical representation of the universe, and its potential is still in its infancy. Deep learning has uncovered valuable capabilities that are leading to commercial and real-world applications. The economic growth from the rebirth of AI is spurring researchers to expand its abilities, but in the direction of improvement rather than lofty goals.

Only time will tell whether deep learning's recent success is the Big Bang or not. But given that it's fueling the field's growth and setting research agendas, it certainly looks that way.

Aviation Week ✓
@AviationWeek
10:16 AM
11 Apr 2018

A new breathing sensor might one day be able to use predictive algorithms and possibly even artificial intelligence to warn of hypoxia-like cockpit events before they occur #Aviation aviationweek.com/de ...

Omar Sultan AlOlama ✓
@OmarSAlolama
4:18 AM
7 Apr 2018

We are very pleased with the application of Artificial Intelligence technologies on the roads with the Ministry of Infrastructure Development. These applications reduce time, effort and cost, increase security and safety levels, and facilitate for smooth traffic on the roads.

TED Talks ✓
@TEDTalks
10:04 AM
11 Apr 2018

"With more powerful technology like nuclear weapons and artificial intelligence, learning from mistakes is a lousy strategy. It's much better to be proactive, plan ahead, and get things right the first time, because it may be the only time we get."
@tegmark #TED2018

AI World
@AIWorldExpo
11:15 AM
10 Apr 2018

@AIWorldExpo - http://aiworld.com - will be hosting a session at #auvsiXPO on the future of #driverlesscars and the state of cognitive #robotics. Learn more: http://ow.ly/fbAF30jbGEu @auvsishow

AI
@DeepLearn007
1:41 PM - 30 Jan 2018

Will It Be A Smooth Drive Or A Bumpy Road For The Automotive Industry In 2018?
#AI #MachineLearning #DeepLearning #insurtech #ML #DL #Digital #EV #tech

RSA EMEA
@RSAEMEA
4:30 AM - 10 Apr 2018

"IAM and SIEM systems can give organisations the insight and clarity they so desperately need" - @KnowlesRashmi of @RSAsecurity bit.ly/2Hcrr-BO (via @InfosecurityMag) #iam #siem #ml #ai #security

Marine Insights
@MarineInsights
4:30 AM
11 Apr 2018

The benefits of smart #tech lie in increased reliability, safety and efficiency in scheduling and through-put. As ports and terminals react to these challenges and opportunities, so must suppliers. Explore the SmartPort Showcase: bit.ly/2IK7WjC

Boeing Middle East ✓
@BoeingMidEast
11:39 AM - 11 Apr 2018

Excited to see our partners @SparkCognition launch their first international office in Dubai! Amazing things in the world of #ArtificialIntelligence are yet to come! Thank you H.E. @OmarSAlolama for the warm welcome to the #UAE!

AR and Computer Vision

WeTALK #3 with Women in AI
Speakers from computer vision, deep learning, and augmented reality
London, 26th of April, at TouchSurgery HQ

TOUCHSURGERY   WOMEN IN AI

CATALINA BUTNARU
@katchja
3:48 AM
11 Apr 2018

Computer Vision and AR make the perfect pair in cutting edge robotic surgery - but how? Learn from domain experts at WeTALK by @women_in_ai at @buff.ly/2GR6bAI #deeplearning #robotics #ai

Windrock Inc
@Windrock_Inc
2:00 PM - 9 Apr 2018

Happy #IoT Day!! "To celebrate, IoT Evolution is bringing you a little recap of the Industrial IoT highlights from the past year. The IIoT is where much of the innovation happens for IoT..." @SparkCognition @IoTEvolution bit.ly/2qj2YUh

AI IN SOCIAL MEDIA

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threats

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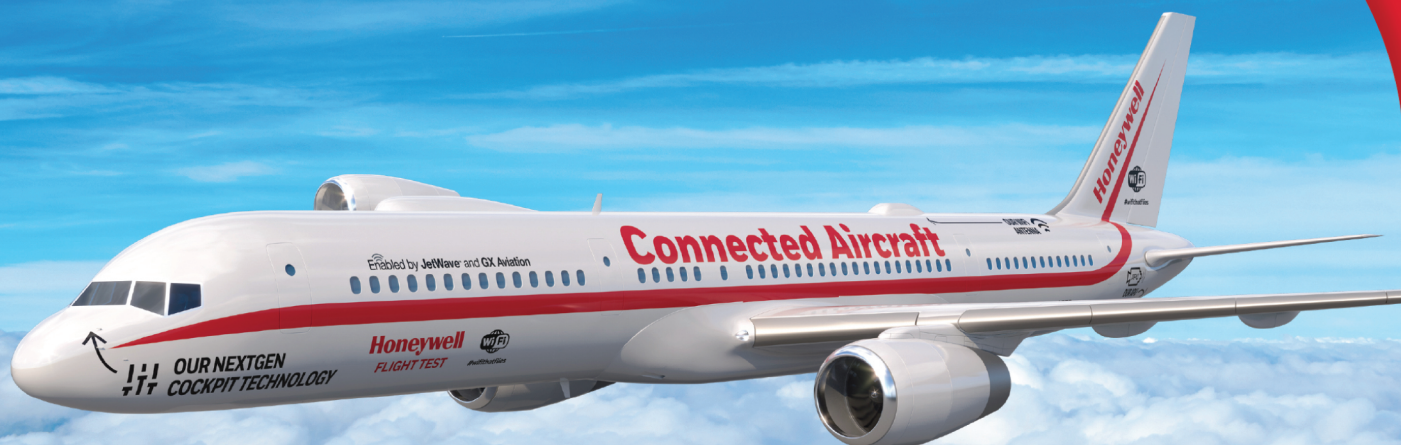
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