

# COGNITIVE TIMES

BY SPARKCOGNITION

PLUS

JIM  
MOFFATT

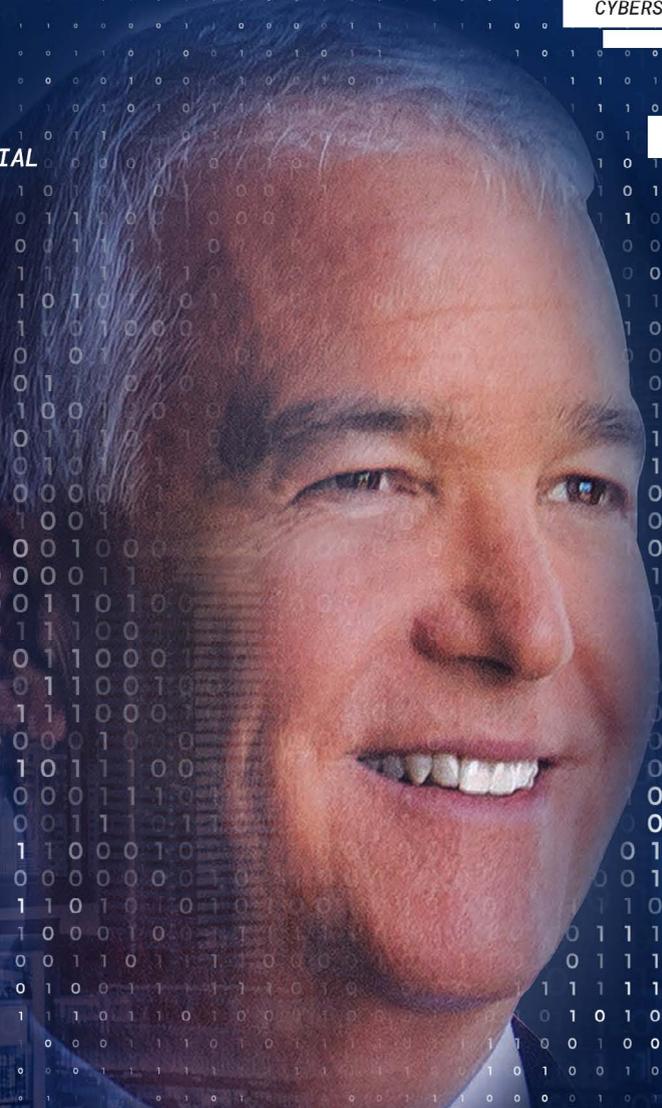
FORMER CEO OF DELOITTE  
CONSULTING. TALKS DIGITAL  
TRANSFORMATION

CYBERSECURITY FOR THE AUTOMOTIVE INDUSTRY

THE BRIEF HISTORY OF AI

TEN TECHNOLOGIES TO WATCH

VOL. 6 NO. 1 // 2021

A portrait of Jim Moffatt, a middle-aged man with short, light-colored hair, smiling slightly. He is wearing a dark suit jacket over a light-colored shirt. The background behind him is a dark blue grid of binary code (0s and 1s) that is semi-transparent and layered over a faint image of a city skyline at night.

**TECHNOLOGY**  
*TAKES OVER*

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## FEATURES

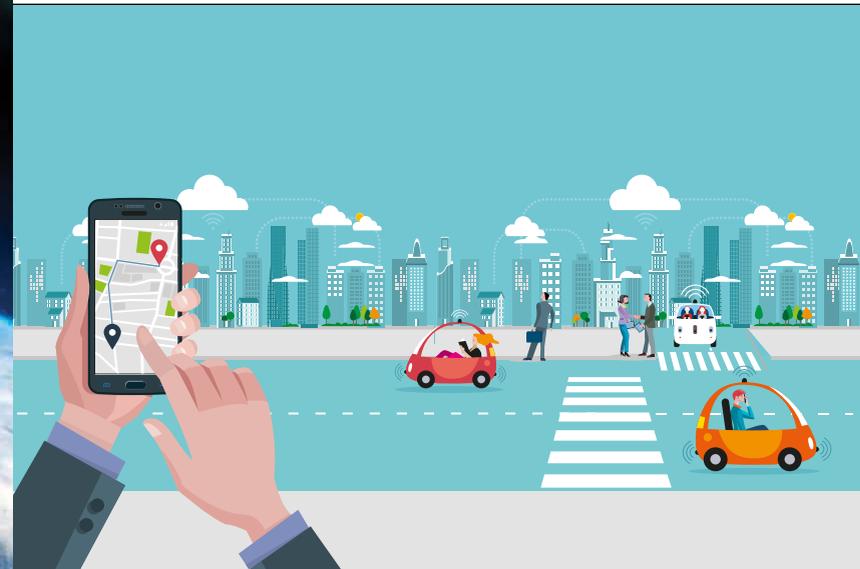


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# The future of autonomous aviation is here.



SkyGrid is using AI and blockchain to simplify commercial drone operations in an increasingly complex sky.



# /Run Program/



NOTES

## FROM THE EDITOR

In this edition of *Cognitive Times*, we focus on how exponential technologies—like artificial intelligence—will be the driving force for progress in society for years to come. We are now at a point where AI is making a meaningful impact across several industries and in significant ways. Compared to the AI waves of the 60s and 80s, AI 3.0 is different. Now, systems are mature, accurate, useful and scalable enough to automate significant business workflows and deliver attractive returns on investment. Since the economic payback is there, investment will continue until, soon, AI influences everything around us. As the US National Intelligence Council puts it in their recently published “Global Trends 2040” report: “By 2040, AI applications, in combination with other technologies, will benefit almost every aspect of life, including improved healthcare, safer and more efficient transportation, personalized education, improved software for everyday tasks, and increased agricultural crop yields. Political and business leaders worldwide are seeking global talent and are pouring resources into developing AI, hoping to be among the first to use it to reshape societies, economies, and even war.”

Plainly put, technology has always been a driver of progress,

but it is now becoming an accelerant of history.

While this may concern some bright minds, such as Bill Joy, who famously wrote his 2000 *Wired* op-ed with the title, “Why the future doesn’t need us”, I believe AI will elevate the human condition. It already has in profound ways. Robots being developed at the University of Texas at Austin go into hazardous environments such as nuclear reactors, where sending human beings would be catastrophic. They dismantle bombs, keeping humans at a safe distance. AI interprets radiology reports more accurately, at greater scale and at less cost than a human professional. How long before a simple wireless smartphone can become an AI-powered diagnostician? How long before we see autonomous surgeries democratizing surgical interventions across the world? This is the AI Century, a time when AI will be woven into the very fabric of society and become a core accelerant in our daily lives. Such ideas have fascinated me now for decades, and they are now within grasp. I accept that the concept of technology “taking over” may cause a level of discomfort and uncertainty, but I challenge us all to explore the art of the possible with open minds.

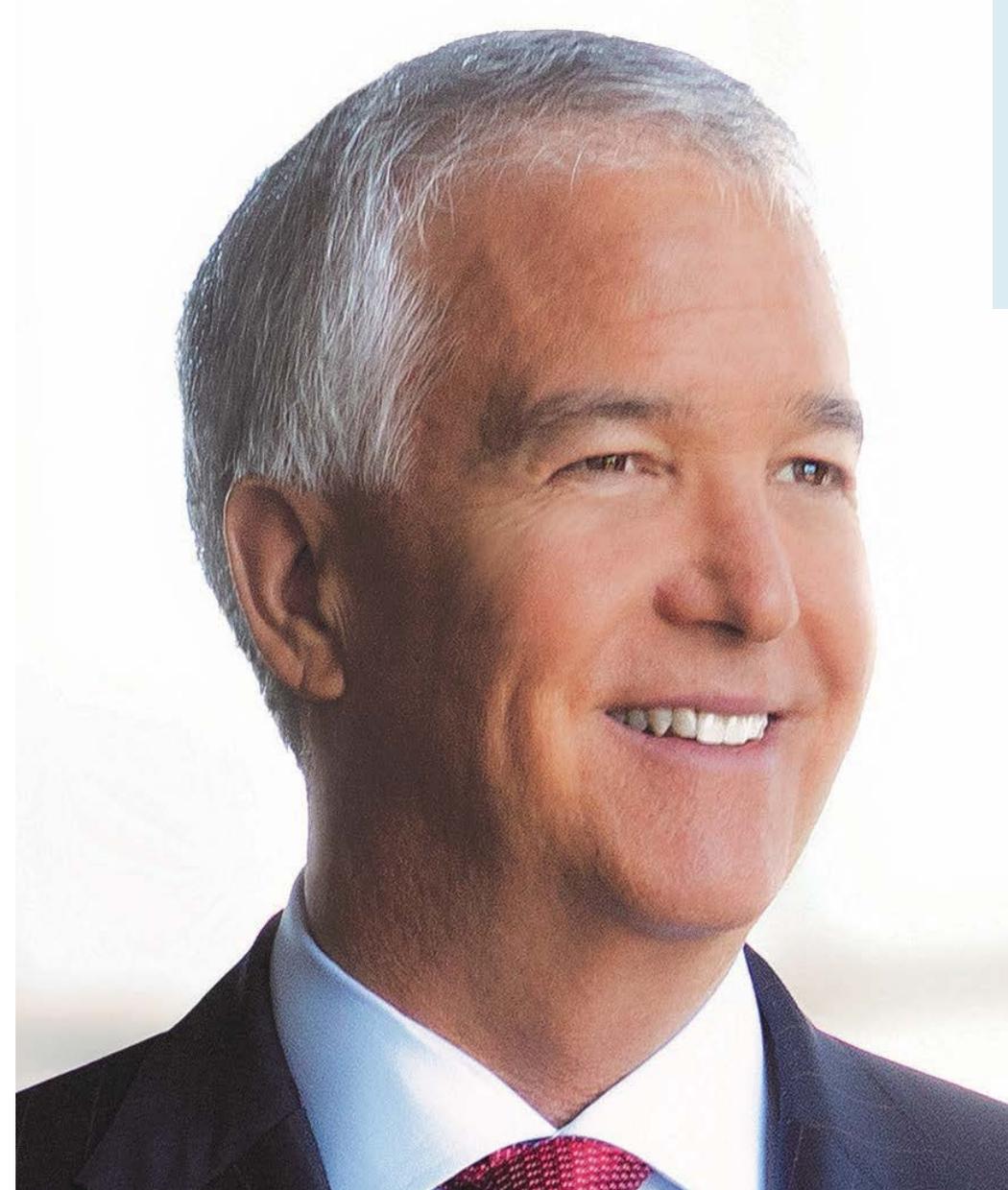
In that vein, this edition of *Cognitive Times* tackles a “tech take over”, including AI applications for content creation, finance, transportation, and more. Many exciting topics, stories, and ideas are in store for you in the pages to follow!

Don’t miss our conversation with Jim Moffatt, the former CEO at Deloitte, who discusses high growth global markets, how artificial intelligence can be used meaningfully in large organizations, and how to execute digital transformations. We also cover themes from ideation in the future job market, to what role AI can play in space exploration, to the application of cybersecurity in the automotive industry. Speaking of cars... you will not want to miss the topics discussed with Koenigsegg Automotive AB, home to some of the most luxurious—and beautiful—hyper cars in the world.

In addition, SkyGrid’s Zehra Akbar walks us through how drones will play a significant role in the future of logistics. Also featured in this issue is the second half of “Flyover Country,” a fictional short story on the potential of aerial mobility crafted in collaboration with The Boeing Company’s Steve Nordlund. A brief history of artificial intelligence, my thoughts on the top technologies to watch for this year and our new AI writer “recruiting” effort round out the content in this edition. We hope you enjoy this edition of *Cognitive Times* and we look forward to hearing from you!

**Amir Husain**

Founder & CEO of SparkCognition



On the Cover

Image Courtesy Jim Moffatt

MEET THE MIND

BY COGNITIVE TIMES

## JIM MOFFATT

*Jim Moffatt is the Former Chairman/CEO at Deloitte Consulting*

**CT:** Through your tenure at Deloitte, you worked closely with many organizations to execute digital transformations. What advice can you share with leaders on how to do this successfully?

**Moffatt:** I tend to think of things in terms of who, what and how. Understanding who is the customer and the stakeholder that I’m really trying to solve problems for. Then, what is it that I’m trying to create? What’s the experience that I’m really trying to

get to and how do I go about implementing it.

When we looked at digital transformation, because of the comprehensiveness of it, companies tend to jump to the how before they really figure out the who and the what. Partly because it's just more comfortable in terms of being easier, more tactical and more tangible. But if you don't understand the who and the what, a lot of times you create things that lack the context of what you're trying to transform.

Think about digital as it relates to all of the emerging technologies, what you can do is so broad and comprehensive, it has huge business and operating model implications. So, in my experience, these efforts need to be driven from the top. It has to be something that's not just a siloed effort. Otherwise you will end up with a digital change, but it won't be comprehensive and transformative.

It's important to start by understanding the capabilities that can get unlocked through digital. So think of what mobile, cloud and social start to unlock in terms of data and other things. Really understand the potential. And then there's a real creative element that comes into this. Essentially reimagining the future. Think about what the future of healthcare delivery or the future of retail can be in the context of these new tools. And then once you've done that, you can start designing and building house.

That's what I have seen be most successful. Clearly identify the customer "the Who", reimagine the future, and align with your team around "the What". And then from there start to architect and design the solution "the How".

**CT:** Some years ago, in an interview with the Washington Post, you said that there are too many consultants in the world. What did you mean by this?

**Moffatt:** It starts with the context that, over my career, we were working with really smart clients, working for really great companies. They all went to the same schools we did and they'd been deep in the industry for a long time. They were great at what they did and what they really needed consultants for is when they came across something, for example digital transformation, that they hadn't done before. They needed to bring in people that had the kind of expertise they lacked. So the context of that question was really predicated around the fact that consultants can provide tremendous value if they're applied around the right thing, for the right duration. I think the real challenge for companies is understanding when and how to use consultants.

In addition to delivering a high-quality project, a good consultant should do two things. One, they should be honest with the client about situations where they're not the right firm or the right people

to solve it. Consultants, they can do most anything and they're smart enough generally to figure it out, but there are things that either they don't have the right resources or the experience for, and they should tell you. Anytime I had that conversation with a client, they were always very appreciative of the transparency and the overall relationship was actually enhanced.

Two, they also need to know when to disengage. There's a point in every large program when organizations have to start to stand up their own supporting organization and oftentimes they'll take too long on that transition. With one client we went so far as to start recruiting people to fill roles because they weren't moving fast enough, and they needed to take control. The problem is, if you don't do that as consultants, at some point, the CFO looks at how much you're spending, and that the program budgets have been exceeded, and in my experience that never ends well.

So make sure you're focused on the right thing and that there's an off ramp to disengage and the company starts to build their own capability to maintain the operations going forward.

**CT:** There's been a lot of talk about a "tech decoupling" between the US and China. Do you think this is likely? And what would the implications of such a decoupling be?

**Moffatt:** Well, talk about a complicated issue. Headline, there will be some degree of tech decoupling. When you look underneath how tightly entwined the economies are, complete decoupling is really complicated and hard to imagine, but if you take the Venn diagram of overlap between China and the US, I do think it's going to start to separate and the intersections will be smaller.

If you just focus on tech, I think you've seen a lot of the decoupling, particularly around some of the social apps and around cybersecurity and there will be a natural push to have a greater degree of privacy and independence, or a kind of mutual independence. But I don't think you can completely separate, the markets are too big on both sides. They are the two biggest markets in the world. So you're going to have large multinationals and tech companies wanting to sell into that space. There's still technology in China in which they don't have the same degree of capability as they do in the US or other markets. So while you will see some decoupling, I think it will be targeted around specific aspects of technology.

All that said, as it relates to technology, I could see a world where you start to have a China version and a non-China version. And there's going to be a need to navigate both to some degree. When you broaden the question to include supply chains, manufacturing and consumer markets, it's hundreds of billions of dollars that are

intertwined and the amount of value to companies outside of China is too large to merit complete decoupling.

**CT:** You've had unprecedented access to global business leaders and international markets. Given this experience, what are some high growth global markets and verticals that you feel aren't presently getting the attention they deserve?

**Moffatt:** I don't know if they're not getting the attention that they deserve. I think the world's global, and I think customers and markets will drive us to continue to be global. There may be more complexity with social conditions and some security threats, but I think the trend towards globalization will continue. I'm a big proponent of the opportunity in Asia-Pac. As I started to think about where the world's largest economies were evolving, and what was going to happen in terms of growth and investment, there was a large shift towards Asia Pacific. I know we started to spend a ton of time, not just in China and India, but across that whole region, including Japan, Southeast Asia and Australia.

My personal view, Eastern Europe and Africa are important markets, but both are longer-term in opportunities. In Asia Pacific, there are huge populations, tremendous growth, and lots of near-term opportunities. I know we started allocating more resources and capital, and I would continue to pivot into that direction.

In terms of verticals, I think what's interesting is the emergence of all the exponential technologies and the opportunities they unlock in virtually every vertical. I tend to think certain verticals have greater potential, whether it's consumer products or life sciences, but there's just a huge transformation opportunity across all verticals. It's hard to find a vertical that isn't in the middle of some degree of disruption and transformation.

We also started to look at places where ecosystems starting to come together. So you start to talk about topics like the future of

mobility and the future of cities, with the emergence of connected devices and IoT, and the potential enabled by 5G coming on board. Another interesting trend is the shift in focus and investment from the back office to the front office. In the last few years, investment dollars have pivoted towards the customer side of the equation from the back office, and I expect that trend to continue. Starting to unlock the capabilities that allow people to stay connected to their customer across all channels and provide value to their customers in very, very unique ways that just wasn't possible five or 10 years ago.

**CT:** We've been through the business process re-engineering wave, and there's now a "robotic process automation" wave sweeping through companies. What do you think comes next, and does AI play a role?

**Moffatt:** I'll start with the end. I think AI and data are foundational to everything that's going on. In my previous role we pivoted, not all, but a large portion of our investment dollars into looking at what could be unlocked through AI and data. All the clients I'm working with today, I won't say it's table stakes at this point, but I think they're all racing to understand how AI can be leveraged to support and differentiate their business. They're looking to build or leverage an AI engine to bring some degree of intelligence to their processes broadly. I think it's an exciting area. I think it's an area that will really start to emerge even more so. And in many ways it's going to be a race to the algorithms and the data, and who's got the best. I can think of one healthcare client in particular that we worked with that was doing some really interesting work around genomics. It became clear early on, that the company that got the data and developed the AI engine and algorithms first, would be the eventual winner in the marketplace. **TC**



Smart City, copyright Faber14 via Creative Market



Images courtesy of Alethea Group

**The Problem**

Alethea Group protects brands, companies, and individuals from online disinformation through our leading edge detection and mitigation capabilities. Our early detection enables companies to proactively control their online sphere, before malign actors are able to dictate the next earnings call.

**The Solution**

We detect disinformation early, before it has a chance to impact an organization's brand or bottom line. We use a combination of technology and subject matter expertise to provide a data driven solution that guides our clients and tailor our mitigation approach based on the clients goals.

**Space**

Alethea Group operates in a cross-section of cybersecurity and communications by providing unique insights to our clients and organizations.

**The Upside**

At Alethea Group we take a holistic approach to responding to online disinformation. Each organization has different goals, and we use a data-driven approach to build strategies more effective in the overall goal of mitigating the impact of disinformation. We also support a variety of different response options, ranging from communications to legal action, so that our clients are able to address the problem at its source.

**The Risk**

We're not afraid to take on the most sophisticated threat actors-which is why we don't talk about our clients publicly. We provide the necessary data so that major brands, high networth individuals, and the public sector are back in the driver's seat to control their own message.

**The Pitch**

Alethea Group mitigates the impact of online disinformation through technology enabled solutions. We are the only firm that has experience going head to head with threat actors in settings like the campaign trail or the US Government.

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**Founded** 2019

**Founders** LISA KAPLAN

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# WHAT'S HAPPENING IN TECH

Man wearing vr headset via rawpixel.com



## CHARGING OVER-THE-AIR

**>** Researchers at the Georgia Institute of Technology unveiled an innovative way to utilize the surplus capacity of 5G networks and tackle the limitations of batteries. Using a Rotman lens-based rectifying antenna, the innovators recorded power harvesting at 28 GHz. The network efficiency is maximized by collecting all the electromagnetic energy from an antenna and supplying it into a single rectifier. The FCC has authorized 5G networks to generate immense power as compared to previous generations of Internet of Things (IoT) devices. Experiments recorded a 21-fold increase in power production that is going to pave the road for major ubiquitous IoT applications. (*"Leveraging the 5G Network to Wirelessly Power IoT Devices" - Georgia Tech*)

BY SOHA MEHMOOD RAZA

### PERSONAL AI COACH

Foci, a wearable device developed after 2 decades of research that combines cognitive biometrics with Artificial Intelligence (AI) and Machine Learning (ML) to help users stay focused. It controls the mental distractions by tracking the changing emotions and uses the power of neuro-respiratory science with cognitive biometrics to help users discover when their mind performs optimally. The motion sensors in the device input breathing change in real-time and relate it with our subconscious to detect if the user is relaxed or stressed. (*"Wearable Device Aims to Diminish Distractions, Sharpen Focus" - TECHNEWS-WORLD*)

### 3D HOLOGRAMS ON SMARTPHONE

MIT researchers employed the tensor holography method to create 3D holograms for virtual reality. The efficient deep-learning-based method generates holograms on smartphones in real-time. Stimulated with optical setup and knowledge of deep-learning models, the team designed a convolutional neural network to emulate the way humans process visual information. The project used a huge dataset of 4,000 pairs of computer-generated images to create holograms. The photorealistic training data builds 3D holography that boosts up the development of VR and 3D printing systems. (*"Using artificial intelligence to generate 3D holograms in real-time" - MIT News*)

### BRAIN DICTATES BEAUTY

Researchers at the University of Helsinki and University of Copenhagen developed an AI-based system that reads the brain and generates personally attractive images. The adversarial neural network (GAN) and electroencephalography (EEG) technology gathers the individual responses against artificial portraits. The system enables the computer to create facial images based on individual preferences automatically by capturing the brain signals. The high-end project streamlines modeling preferences, decision-making, and identification of unconscious attitudes. (*"Beauty is in the brain of the beholder" - UNIVERSITY OF HELSINKI*)

### CLICKS, FACEBOOK

Facebook Reality Labs presents a wristband that streamlines human interaction with computers. Using the electromyography (EMG) technique, sensors translate the nerve signals through the wrist into digital commands and operate the device. The band recognizes gestures through hand and finger muscles to control the Augmented Reality (AR) interface. Users do not need to type, it clicks without actually clicking the keys. The splendid updates in this band are ongoing that focus on making it more realistic and practical. (*"Facebook shows off how you'll use its neural wristbands with AR glasses" - The Verge*)

BY MURTAZA HUSAIN

# HOW AI CAN HELP US EXPLORE THE FINAL FRONTIER



Voyager 1, Credit: NASA

During the Cold War, the Soviet Union and the United States were in a breathless competition, battling over supremacy in spaceflight. Russian cosmonaut Yuri Gagarin became the first man to escape orbit and reach space in 1961, while Americans Neil Armstrong and Buzz Aldrin became the first to walk on our moon in 1969<sup>1</sup>. The fierce space race, which defined an entire era, was certainly a competition, but it also led to mankind studying and theorizing about the endless expanse like never before. Unmanned craft such as Voyager 1 were sent out into space, incredibly advanced data gathering instruments such as the famous Hubble Telescope were built, and countless researchers and scientists constantly made new discoveries about our solar system and the observable universe. These discoveries have only gained momentum over time and become ever more fascinating. They range from our discovery of potentially the first artificial object to emerge from deep space, Oumuamua, to the recently detected giant black hole in the center of the Abell 2261 cluster<sup>2</sup>.

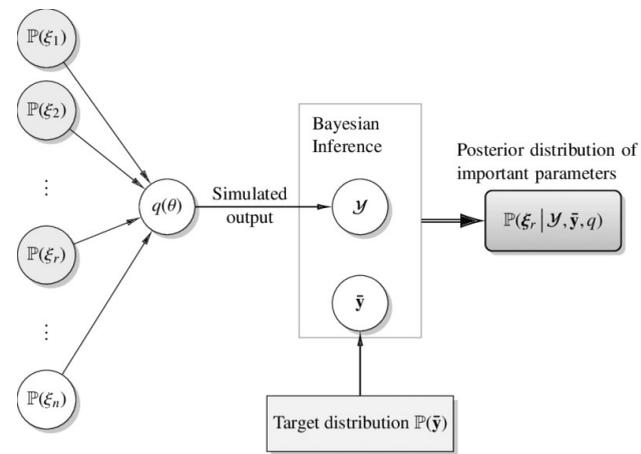
Whatever the specific nature of these observations and discoveries might be, one fact about space exploration remains unequivocally true: more data is being gathered now than ever before. This data streams in from radio and optical telescopes and sensors of all types and powers our pursuit to understand the wonders contained within our universe. According to Kevin Murphy from NASA's earth science data systems program, "NASA was generating 12.1TB of data every single day from thousands of sensors and systems dotted across the world and space."<sup>3</sup> Raw data produced by NASA and other space organizations across the globe holds discoveries just waiting to be revealed. The quantity of this data is so vast, however, that simply combing through the data manually is entirely unviable. So how can we unlock new discoveries within this treasure trove of astronomical data and raise our understanding of the endless reaches of space? By using the power of artificial intelligence, and machine learning, of course! AI techniques such as deep learning, a subfield of machine learning inspired by biology and focused on building artificial neural networks with many layers, have been particularly effective. Deep networks have already been used to detect planets or identify unexpected occlusions in distant stars. Anomaly detection algorithms can help spot unexpected phenomena and focus our attention on objects that would otherwise escape study. Clustering algorithms can group like objects by behavior, luminosity and other

#### Citations

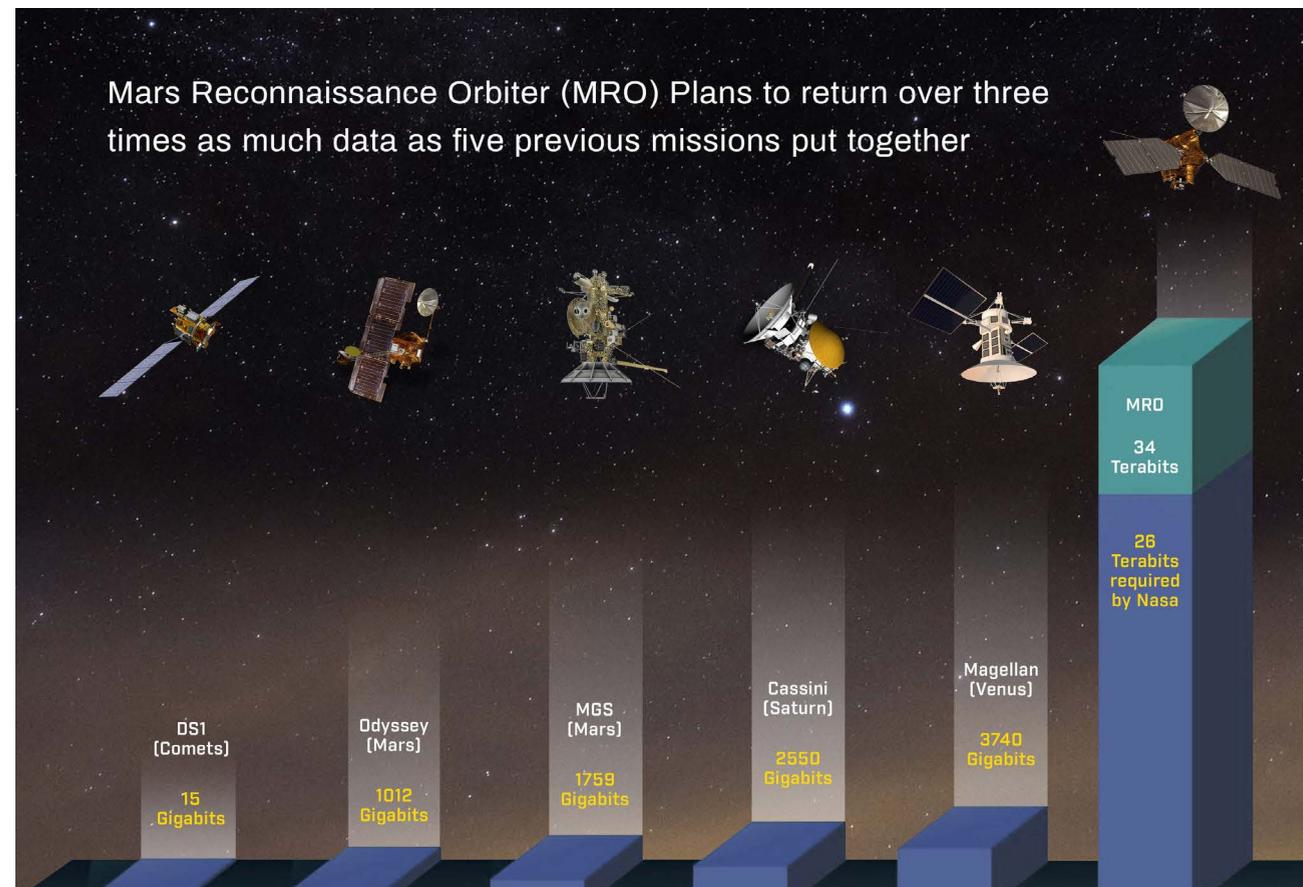
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similarities so that we can supply examples of objects of interest and then have similar objects automatically identified in massive data sets. These are only a few of the tools from machine learning and artificial intelligence that can help us derive the answers to the mysteries of space at great speed and scale.

Machine Learning is a major focus for NASA's Frontier Development Lab (FDL) which brings together researchers from the SETI Institute and NASA's Ames Research Center, both based in Silicon Valley. The incredible scientists and researchers on this team have publicly shared their groundbreaking findings<sup>4</sup> for the benefit of the larger academic community. Commercial companies partnered with the FDL contribute powerful resources such as supercomputer access, funding, and of course, artificial intelligence powered software. For example, working with Google, the NASA team developed a neural network with a "Bayesian" structure and deployed it to sort through data gathered from the atmosphere of



The Bayesian Model, Source: Research Gate



Mars probes and data retrieved, Credit: NASA

Citations

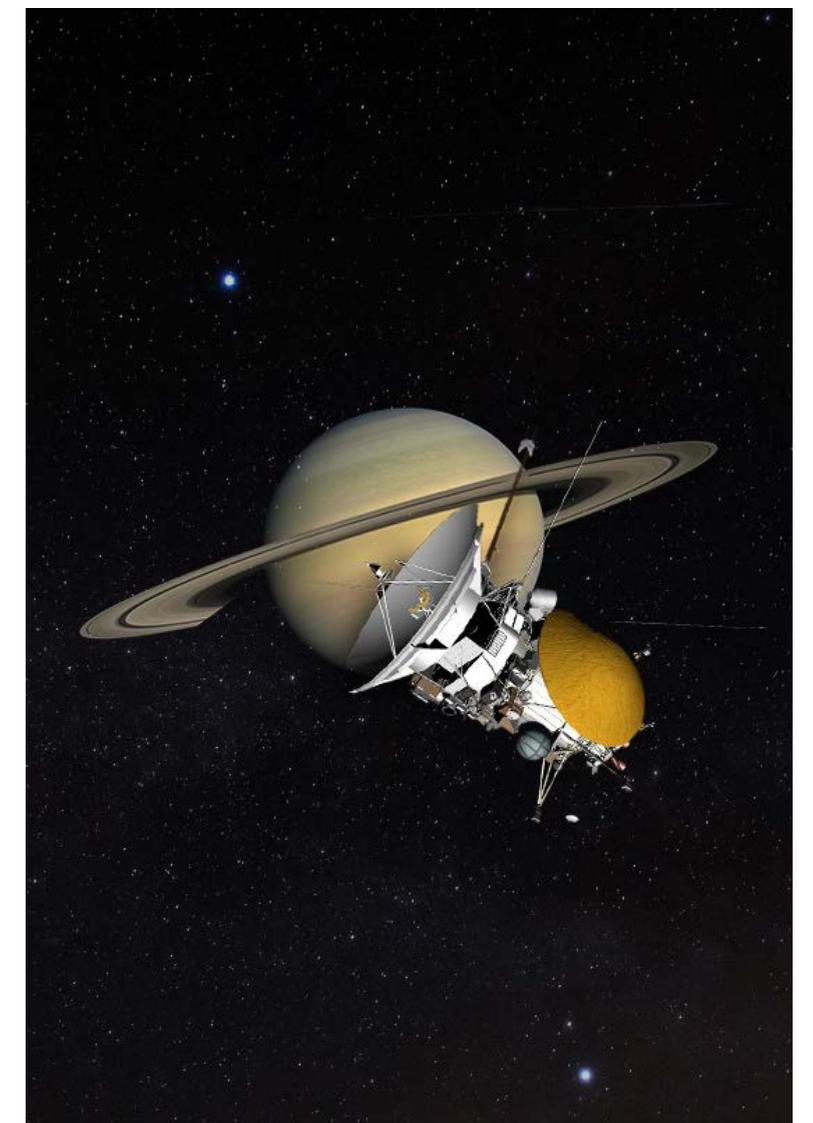
4. Expert System Team. (2020, December 21). What is Machine Learning? A definition - Expert System. Retrieved January 04, 2021, from <https://www.expert.ai/blog/machine-learning-definition/>

the WASP-12b exoplanet. The neural network generated very promising results that were more accurate than traditional statistical approaches. According to Oxford University graduate Adam Cobb, who was involved with deploying the neural network model, "We found out right away that the neural network had better accuracy than random forest in identifying the abundance of various molecules in WASP-12b's atmosphere."<sup>5</sup> More important than the accuracy of the findings however, is that the model can show the uncertainty around certain parts of its predictions. This helps researchers by alerting them to those parts of the algorithm's findings that may require more data sampling.

It is clear that machine learning has great potential in extrapolating meaningful findings from raw data, but AI's potential in discovering space extends far beyond this. Instead of just finding correlations and connections in captured data, AI can also be used to gather more data, more effectively. At the Goldschmidt Geochemistry conference in June 2020, NASA revealed its plans to develop probes to scan Mars for potential signs of life. Amazingly, these probes will autonomously process gathered data and decide on which subsets to transmit back to earth<sup>6</sup>. How is it possible for a probe to automatically decide what data is fit to be sent? Once again, by employing deep neural networks. Not only will this automated analysis be more efficient as it cuts down the amount of data transmitted over low-bandwidth inter planetary links, it also eliminates laborious manual processes and is far more cost effective. According to Eric Lyness, software lead at the Planetary Environments Lab at NASA's Goddard Space Flight Center, "Data from a rover on Mars can cost as much as 100,000 times as much as data on your cell phone, so we need to make those bits as scientifically valuable as possible."<sup>7</sup> And it's not just about efficiency. Due to the long lag times involved in sending inter-planetary messages, space probes and rovers controlled by artificial intelligence are an absolute necessity if we are to safely explore other planets, celestial bodies and deep space. One day, a swarm of such autonomous systems will explore the

cosmos for strange new worlds... and perhaps even seek out new life and new civilizations!

Powered by artificial intelligence, space exploration and our understanding of the cosmos as a whole is about to enter an exciting new era. AI as a means of automated large scale data analysis, as a mechanism to process sensor data remotely and optimize communications, and finally as a means of autonomous control will make it the cornerstone technology for future space exploration. Truly, the final frontier has never been more open and accessible, and artificial intelligence promises to open the door to the world of tomorrow. 



Space probes, Credit: NASA

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BY AMANDA CENTER

# KOENIGSEGG AUTOMOTIVE AB

## Industry

Automotive

## Location

Ängelholm, Sweden

### On Koenigsegg, Its Founding, And Its Mission

Bearing its founder Christian von name, Koenigsegg Automotive AB is a brand built on a dream. Captivated by cars at a young age, Koenigsegg began his journey as an innovator, builder, and designer with an unwavering commitment to create the perfect supercar. As the company puts it: “There is existential purpose to his pursuit of building the ultimate car with no compromises and no limits that succeeds against the odds.”

Founded in Sweden in 1994, Koenigsegg has stayed true to its mission, which has resulted in some of the most sophisticated and highly sought-after hyper and mega car models in the world. Whether it’s the Regera or Jesko, each vehicle produced in Koenigsegg facilities have distinct features, a luxurious look, and are consistently upgraded to include innovative technology. Really, you don’t even have to be a car enthusiast to appreciate a Koenigsegg.

“Every detail of a Koenigsegg is designed to enhance its experience or performance. From the way we choose our staff, to the raw materials, the setup of our facilities, our software, tools, systems, and maintenance – everything. Every deliverable matters – from the

powertrain, output, and safety to the carbon fiber arrangement, interior stitching, and comfort, to special ways of applying paint or finishing a car in Naked Carbon,” says Koenigsegg Automotive AB. “The Koenigsegg philosophy is to avoid compromise. Utilizing innovation for multifunctional solutions, while ensuring a conscious thread of sustainability. We take advantage of opportunities to dream bigger than we’ve ever dreamt before. We aim to share the Koenigsegg dream with the world and grow our customer and fan base.”

Koenigsegg is a perfect example of how a company can emerge as a market leader when its mission is full of heart and rooted in passion.

### THE VISION

*“A purpose focused on ultimate performance and creating a lasting automotive legacy. One with a perpetual quest of breaking the mold(s), poised to conquering new frontiers and breaking new ground.” – Koenigsegg Automotive AB*

### A Spirit Worth Noting

One thing about a dream like Christian’s is that it never dies, no matter what obstacles arise. Here is a story from the company to prove it:

“Koenigsegg relocated to its present location (in Ängelholm, Sweden) and headquarters after a fire in the company’s original premises in 2003. The 9000sqm facility was once home to the Swedish Air Force’s Fighter Jet Squadron No. 1 before the squadron was retired from service, and once housed JAS 39 Gripen fighter jets. When Christian first set foot on the disused premises and was walking through the hangers, he came upon the Ghost Squadron’s insignia and their motto, ‘the show must go on’. It was an incredibly



Images courtesy of Koenigsegg

moving sign for him, considering the fire that engulfed much of his and his team’s earlier development work.”

“As such, the squadron’s insignia, a flying ghost, now adorns the engine bay of all Koenigsegg cars built here as a tribute to the Squadron. Our community of staff, customers and fans are also known as the ‘Ghost Squadron’.”

“Now refurbished to suit Koenigsegg’s requirements, these facilities provide the perfect infrastructure for building high-tech megacars. There is ample room for engineering, software development, design, the composite workshop, engine development and testing, a pre-and final assembly hall, a paint shop, research and development facilities, as well as vehicle and parts storage. As the Koenigsegg team now grows to over 400 in staff strength, our factory has since expanded to nearby facilities to accommodate a growing team and increasing demand for Koenigsegg cars, engineering and technology.”

“Right outside our facilities, we have our very own test track proving ground

that used to be a fighter jet runway with its surrounding infrastructure. We use this proving ground to run rigorous tests on all our cars.”

### What’s Next?

“With more than 20 years of experience, we are at a very interesting point on our journey. As a technological powerhouse, and an outlier in the automotive industry, we will expand the meaning of Sustainable Mobility on land, in the air and in the water.”

“The company has started with a dream to make the ultimate performance car and in that process Koenigsegg has increasingly reclaimed parts of the engineering and production in-house – anything from the Dihedral SynchroheliX door design, the unique transmissions, the in-house designed engines, all are now a part of Koenigsegg’s technological competence and DNA. Christian often says, ‘We are a technology company that showcases proof of our concepts through the megacars that we produce’. And it is indeed a thrilling time moving forward because we do imagine

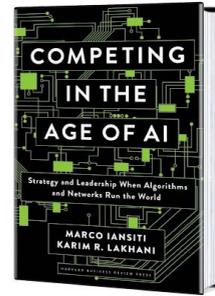
iterations of our innovations in multiple applications beyond the megacar space. For instance, we foresee the realization of our Freevalve (camless) engines in other industries such as marine and aircraft, where a small power-dense but compact/lightweight engine would fit. There are so many exciting possibilities that lie ahead!”

“Christian cites the unique company culture as a contributing factor to the trailblazing technologies Koenigsegg has developed in its short history, saying that ‘we don’t mimic our competitors or compare with what others are doing, we focus on our realm and innovations. For example, inventing new technology or solutions such as the Light Speed Transmission (LST) in the Jesko, or the Koenigsegg Direct Drive (KDD) in the Regera. Looking to the next horizon, we are working on sustainable mobility solutions that include more advanced electric powertrains, more use of AI to optimize our machines, and solutions for mobility in the air and in the sea.”



BY COGNITIVE TIMES STAFF

# A TECH-SAVVY TO-DO LIST



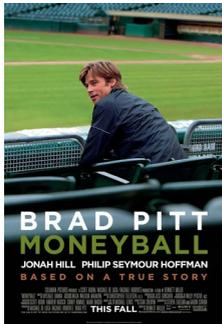
<http://bit.ly/bookctai>

— SATYA NADELLA,  
CEO, MICROSOFT

Iansiti and Lakhani have written an important book that explains what's required to rethink the firm and become an AI-first company. Anyone interested in the impact of AI should read this book.

SEE

NOW AVAILABLE



2020 gave us plenty of opportunities to revisit some old, really good *movies* and documentaries. One of our favorites is *Moneyball*. *Moneyball* shows the amazing power of predictive analytics and its applications in the world of sports. In this film, statistical methods are used to pick the best team of undervalued players with a minimal budget. *Moneyball* shows the importance of data in decision making and choosing the right statistics when creating predictive models. But more importantly, it shows the possibilities when stakeholders show the courage to make decisions based on analytics. Data can truly make a difference!

Moneyball is easily streamable on Netflix.

<https://bit.ly/2W8sJtz>

READ

NOW AVAILABLE

*Competing in the Age of AI* has received rave reviews and has been recommended by many leaders. It's certainly on our *booklist*!

- Named one of the "Top Ten Technology Books Of 2020" — *Forbes*
- Named one of Bloomberg's "20 Best Books on Business and Leadership"
- Named one of 16 New Business Books You Need to Read in 2020 by *Inc. magazine*
- Need we say more?

GO

DURING 2021

The AI Summit is one of the world's largest artificial intelligence event series for business. They will be organizing shows in many cities during 2021, including London, New York and Cape Town to name a few. We're hoping they take their event virtual as well. Looks like a very interesting series!

<https://theaisummit.com/>



LEARN

NOW AVAILABLE



If you're looking to brush up on some statistics skills, the online specialization, *Statistics with Python* on Coursera is a great way to start. The courses included are very practical and cover many examples from the world of statistics. The university of Michigan School of Information has done laudable work in designing and structuring their courses. Another specialization worth mentioning is *Statistics with Python*, which features beginner friendly content that starts with the basics.

<http://coursera.org/specializations/statistics-with-python>

READ

NOW AVAILABLE



If you want to stay connected with the world of data science and want news and articles sent to you, subscribe to *KDnuggets*. It's an information packed blog and their newsletters are well curated and conveniently delivered to your inbox.

<https://www.kdnuggets.com/>



WE'RE BUILDING

# THE FUTURE

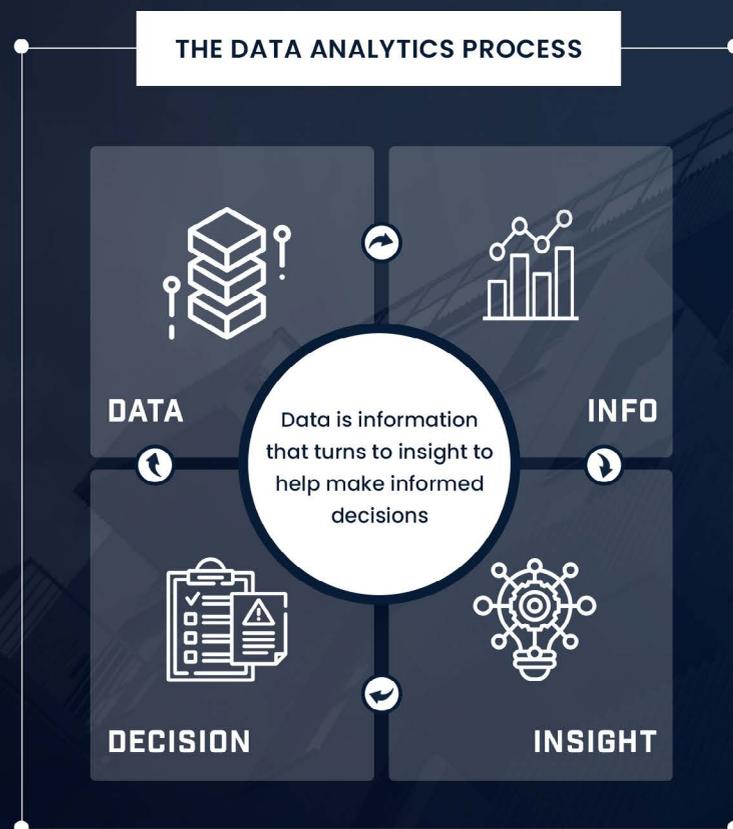
AI is real. SparkCognition is building HyperWerx to show you what it can do.



ANNOUNCEMENT  
COMING SOON

# How BIG? is big data

**Big data** is a term used to describe data sets that are large and complex. These data sets are hard to analyze and process using traditional methods.



(source: <http://www.investopedia.com>)

## The Journey from Data to Big Data

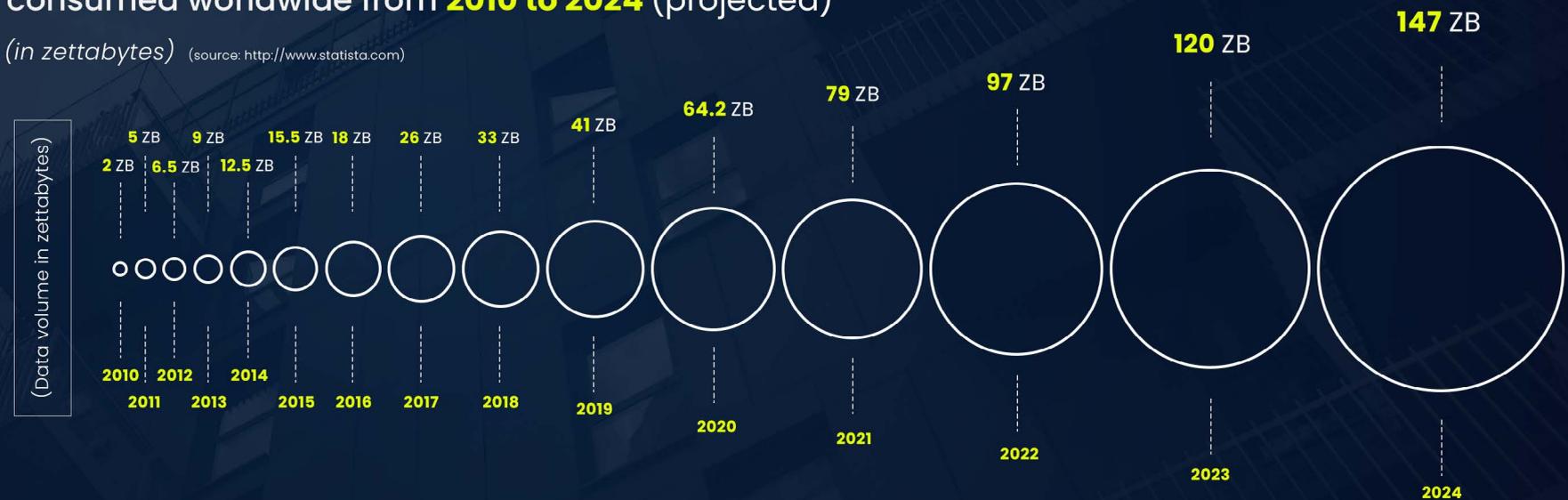
Data is being generated at an exceedingly fast rate. More digital devices are being used and more data is being generated both by individuals and companies. Cars, cell phones and smart home electronics are just a few examples of these devices. The total installed Internet of Things (IoT) connected devices worldwide is projected to hit 30.9 billion by 2025, a 224% jump from the 13.8 billion units that are expected in 2021!

(source: [www.statista.com](http://www.statista.com))

**DATA PRODUCTION WILL BE 74 TIMES GREATER IN 2024 THAN IT WAS IN 2010**

## Volume of data generated, collected, copied, and consumed worldwide from 2010 to 2024 (projected)

(in zettabytes) (source: <http://www.statista.com>)



### What is a ZETTABYTE?

- 1,000,000,000,000 gigabytes
- 1,000,000,000,000 terabytes
- 1,000,000,000,000 petabytes
- 1,000,000,000,000 exabytes
- 1,000,000,000,000 zettabytes

### 1 PB

The film Avatar required 1 peta bytes (1,000,000 gigabytes) of storage space for the rendering of its computer graphics.  
(source: <http://news.bbc.co.uk/>)

### 4 PB

4 peta bytes of data created daily by facebook, including 350m daily photos  
100m daily hours of video watch time

### 463 EB

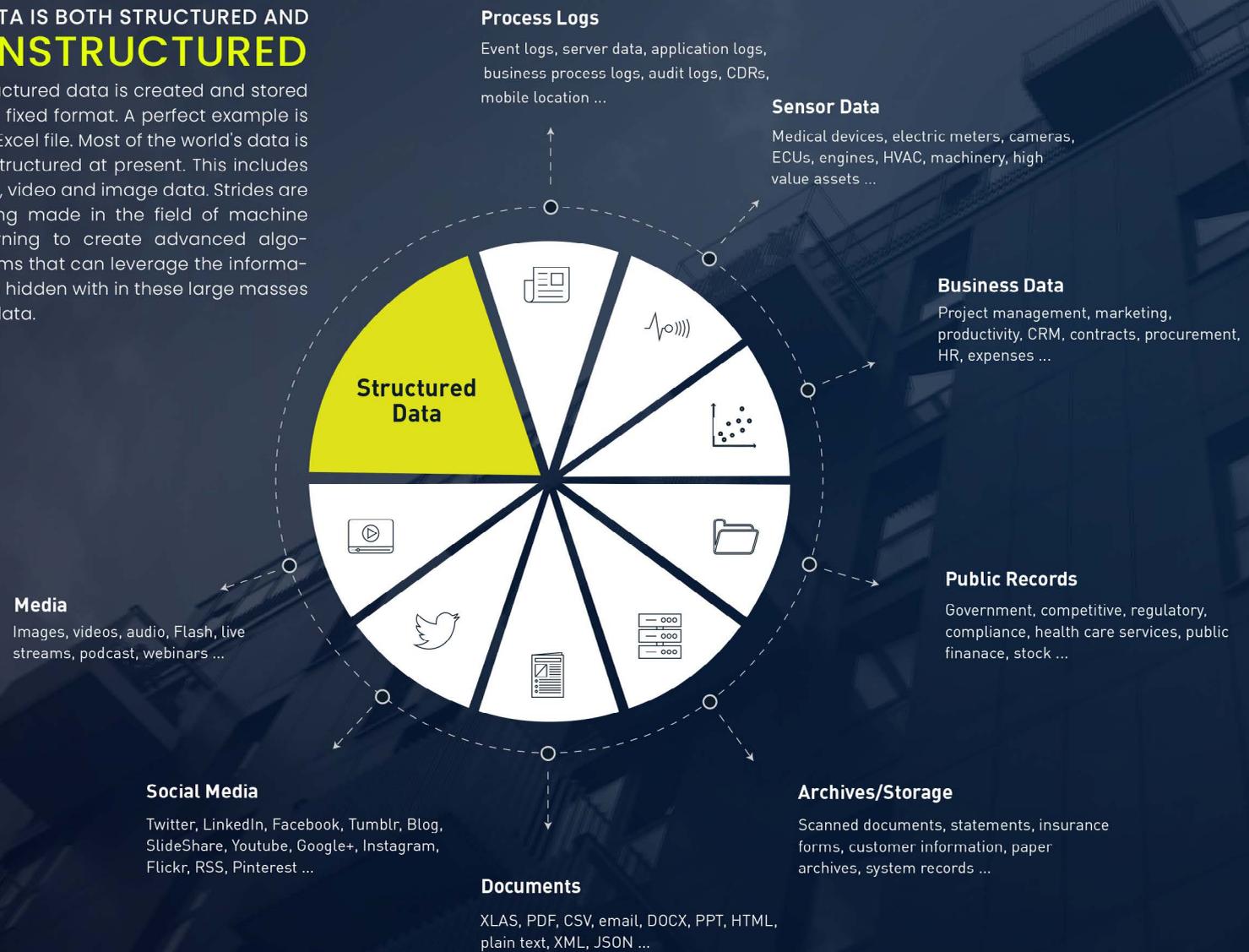
of data will be created every day by 2025  
(source: <https://www.raconteur.net>)

# FROM DATA TO DECISIONS

Scientists are finding ways to glean useful information from these large datasets to provide insight into a multitude of problems. The solution, many think, might be in the data.

## DATA IS BOTH STRUCTURED AND UNSTRUCTURED

Structured data is created and stored in a fixed format. A perfect example is an Excel file. Most of the world's data is unstructured at present. This includes text, video and image data. Strides are being made in the field of machine learning to create advanced algorithms that can leverage the information hidden within these large masses of data.



## WHAT KIND OF DECISIONS ARE BEING MADE BASED ON THE DATA?

SparkCognition's DeepNLP™ software digs deep into unstructured data using proprietary machine learning algorithms and offers insights and solutions. Using deep learning, SparkCognition developed an advisory application for aircraft front-line maintenance staff. The application allowed technicians to conduct machine-to-human dialogue to troubleshoot asset failures and mechanical issues, with high accuracy. This solution lowered the cost of maintenance and improved asset availability by 10%.

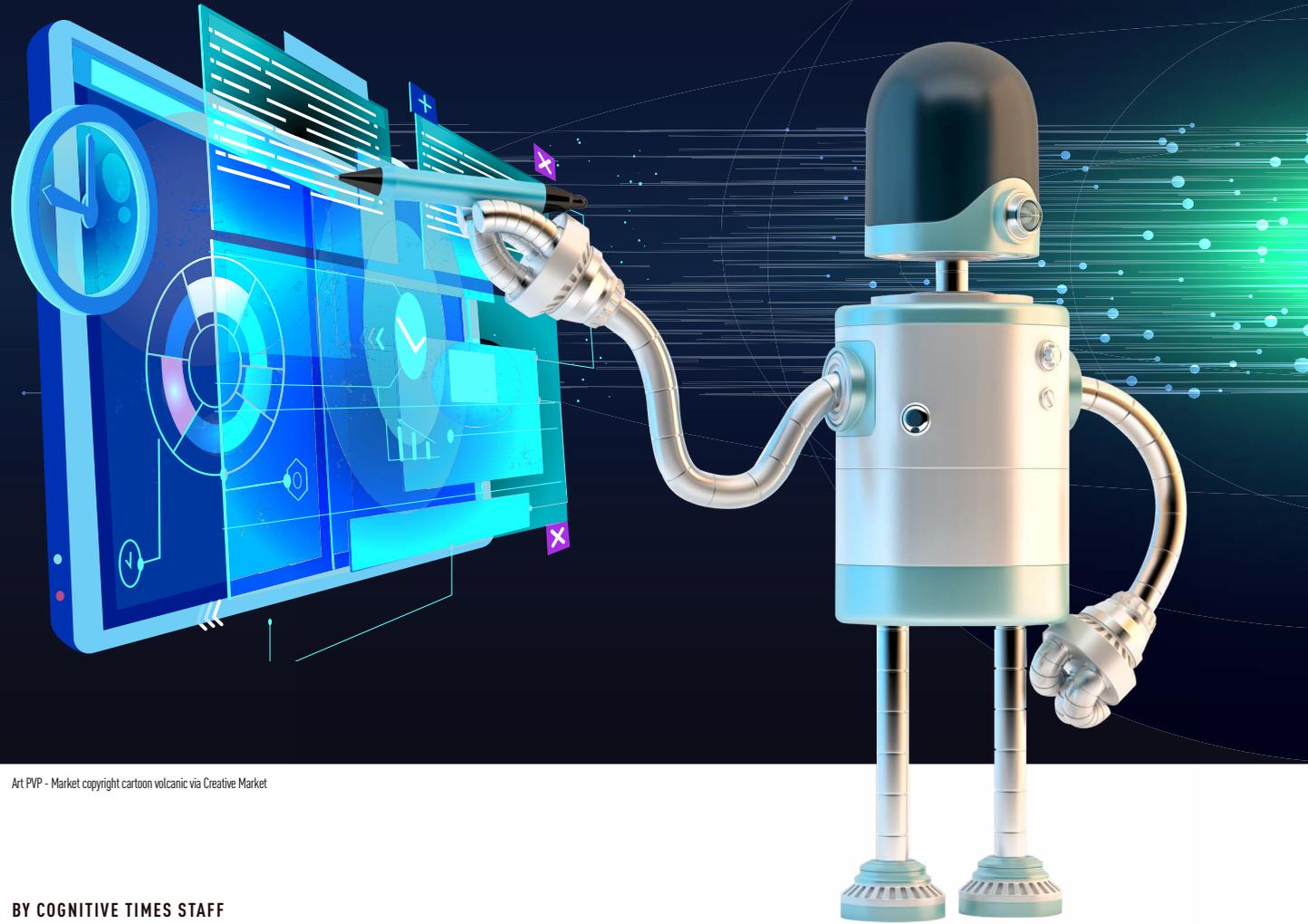
# 11.5 MILLION JOBS

From 2016 to 2026

As more companies use big data for business decisions, the demand for data analysts is growing across all industries. Data will create even bigger job opportunities.

(source: [www.sparkcognition.com/product/deepnlp](http://www.sparkcognition.com/product/deepnlp))

(source: U.S. BUREAU OF LABOR STATISTICS)



Art PVP - Market copyright cartoon volcanic via Creative Market

BY COGNITIVE TIMES STAFF

# CALLING ALL AI WRITERS!

*Cognitive Times* is in search of AI writers. In this section we publish all the pieces sent to us by candidates. In this issue we feature the work of Article Forge. This AI article generator was only provided the following information.

**Main Keyword:** AI

**Supporting Keywords:**

*Future, Technology, Big Data, Machine*

*Learning, Artificial Intelligence*

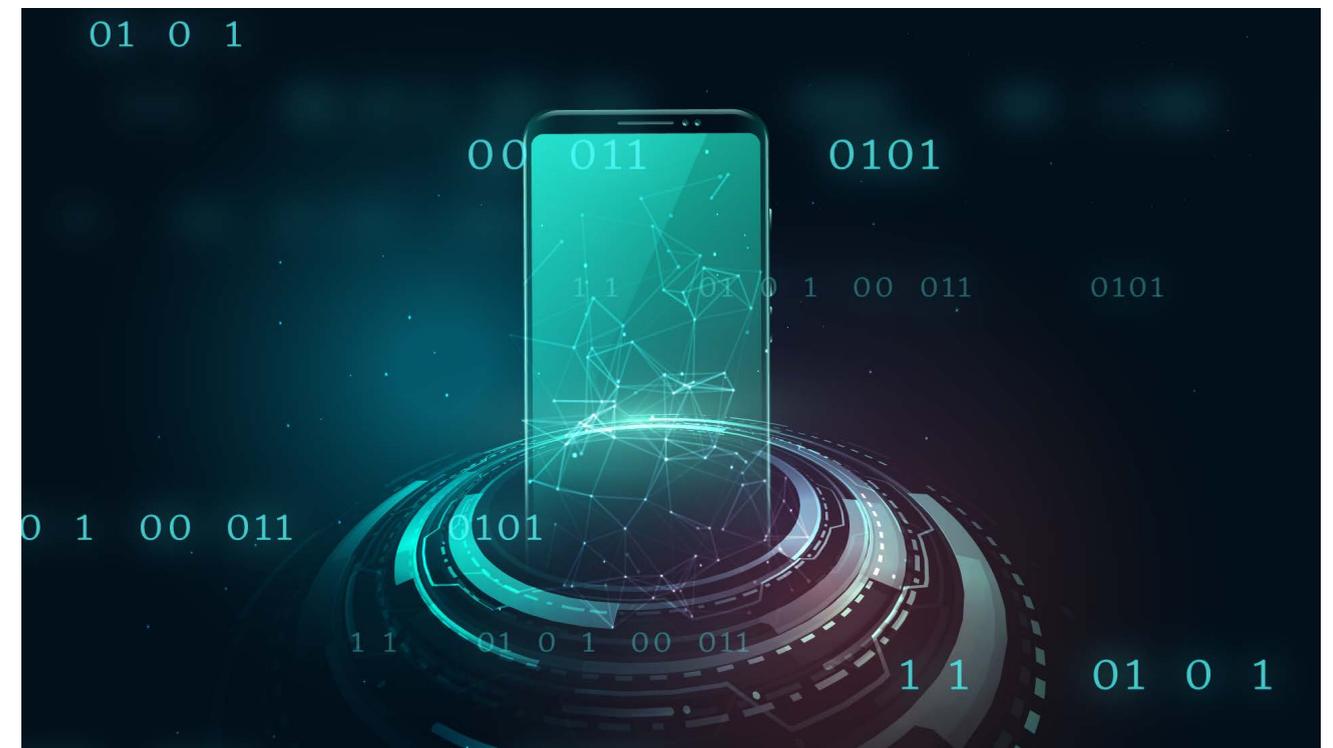
*The title was also generated by the candidate. What do you think? Should we hire?*

“The Future of Artificial Intelligence, Machine Learning and Artificial Intelligence (Machine Learning) seems to be an interesting area of study. A survey of 250 senior executives who are very familiar with their own businesses uses of artificial intelligence reveals that three-quarters of them think that AI will significantly transform their businesses in the next three years. Nearly a quarter of them predict that artificial intelligence will lead to the creation of a new economic class of workers whose primary responsibilities will be to take care of AI solutions to business problems. Of these three, the most optimistic is the third, who sees that AI technology will help create a new market for high-end service providers, rather than having AI servers which perform routine tasks on behalf of human employees. It also predicts that AI technology will help reduce the costs of running an organization, especially in areas like customer support, human resource management, and payroll.

One of the most important areas of discussion involves the impact of artificially intelligent or smart machines on work. Several experts believe that the impact will be positive because artificially intelligent machines will replace many routine tasks. However, others are concerned about the impact of the technology on education and employment. They worry that AI-rich technologies will reduce the motivation

of the human workforce because they will provide answers to every simple question, which will make them boring, as well as monotonous. According to these experts, the future of technology will usher in a ‘scorched earth’ scenario where those who remain in the know are left far behind.

If we want to understand fully the impact of artificial intelligence, machine learning, and artificial intelligence technologies on human life, then it makes sense to focus on the ‘soft’ sciences, such as psychology, computer science, and cognitive science. The future of technology may look particularly bright if researchers can successfully apply the theory of brain memory, decision making, and decision technology to various fields. Researchers at the International Association of Artificial Intelligence conference in London recently said that they were on the verge of creating machines that are able to solve problems like language, speech recognition, natural language processing, and image processing. In fact, they claim that their artificial intelligence system called the Human Brain Machine will be able to understand, anticipate, solve, and predict almost all of the major practical and complex problems in computer science, medicine, and finance. These problems include weather prediction, stock market trading, traffic congestion, and even terrorism”.



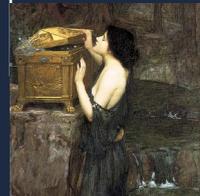
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# A BRIEF HISTORY OF AI

While there have been significant advancements in the field of AI in recent years, the quest to build automatons with an agency is something that mankind has been pursuing quite a while. In this feature, we highlight select events from the past to generate a brief timeline of artificial intelligence. Since it is impossible to list all of the events that have led to where we are today, we have tried to include those that were most interesting and significant in our opinion.

## ANTIQUITY

Greek myths of Pygmalion and Hephaestus implemented the idea of artificial beings such as Pandora and Galatea and intelligent robots such as Talos.



Source: Stanford News <https://news.stanford.edu/2019/02/28/ancient-myths-reveal-early-fantasies-artificial-life/>

## 1206

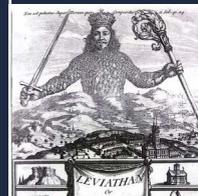
Ibrahim Al-Jazari, father of robotics, created a programmable orchestra of mechanical beings.



Source: HistoryofInformation.com <https://www.historyofinformation.com/detail.php?id=237>

## 1614

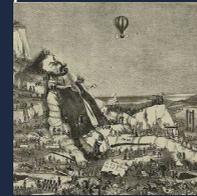
Thomas Hobbes, an English author published the book Leviathan in which he discussed the age of mechanical reproduction and a social cognitive theory.



Source: Stanford Encyclopedia of Philosophy <https://plato.stanford.edu/entries/hobbes/>

## 1726

Gulliver's Travels by Jonathan Swift describes an Engine, "a Project for improving speculative Knowledge by practical and mechanical Operations"



Source: Forbes <https://www.forbes.com/sites/gilpress/2016/12/20/a-very-short-history-of-artificial-intelligence-ai/>

## 1818

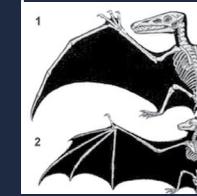
Frankenstein published by Mary Shelley discusses the ethics of Artificial Intelligence.



Source: Stanford Medicine <https://med.stanford.edu/mednews/08muse/frankenstein200.html>

## 1863

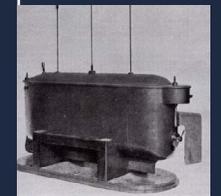
According to Samuel Butler, Darwinian evolution applies to machines such that they become conscious.



Source: HistoryofInformation.com <https://www.historyofinformation.com/detail.php?id=3394>

## 1898

Nikola Tesla made a demonstration of the world's first radio-controlled vessel at an electrical exhibition in recently completed Madison Square Garden.



Source: TheVintageKews <https://www.thevintagekews.com/2014/10/01/1898-nikola-tesla-tinkled-entire-crowd-believing-control-boat-shouting-commands-fact-invented-radio-control-piloted-boat/>

Source: gutenberg.org <https://www.gutenberg.org/files/59112/59112-h/59112-h.htm>



## 1923

The word "robot" was first time used in English in the play Rossum's Universal Robots by Czech playwright Karel Capek's that opened in London.

Source: Smithsonian Magazine <https://www.smithsonianmag.com/history/1927-magazine-looks-at-metropolis-a-movie-based-on-science-4378363/>



## 1927

A film Metropolis was released that was the first one to depict a robot.

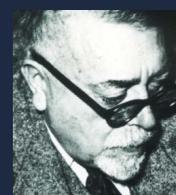
Source: citeseerx.ist.psu.edu <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.400.5201&rep=rep1&type=pdf>



## 1931

Kurt Gödel, the father of theoretical computer science built an integer-based programming language

Source: en.wikipedia.org [https://en.wikipedia.org/wiki/Norbert\\_Wiener](https://en.wikipedia.org/wiki/Norbert_Wiener)



## 1943-45

Norbert Wiener investigated information theory and invented the Wiener filter. He also worked on automatic anti-aircraft guns.

Source: Stanford Encyclopedia of Philosophy <https://plato.stanford.edu/entries/turing-test/>



## 1950

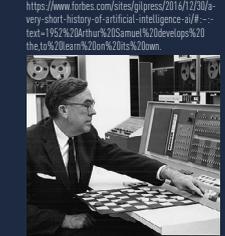
Alan Turing, a British mathematician, proposed the Turing Test as a measure of machine intelligence.



## 1950

Isaac Asimov published "Three Laws of Robotics".

Source: Forbes <https://www.forbes.com/sites/gilpress/2014/12/20/a-very-short-history-of-artificial-intelligence-ai/#text=1952%20Alan%20Turing%20Samuel%20Develops%20the%20to%20cam%20on%20ins%20ins%20down>

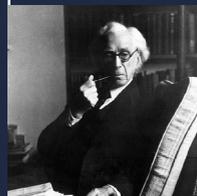


## 1952

Arthur Samuel developed the first computer checkers-playing program.

## 1913

Principia Mathematica published by Bertrand Russell and Alfred North Whitehead discusses the transformation of formal logic.



Source: Stanford Encyclopedia of Philosophy <https://plato.stanford.edu/entries/principia-mathematica/>

## 1925

A radio-controlled driverless car was released by Houdini Radio Control.



Source: DiscoverMagazine <https://www.discovermagazine.com/technology/the-driverless-car-era-began-more-than-90-years-ago>

## 1929

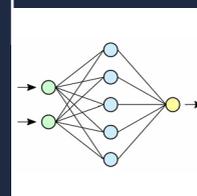
Ko Nishimura, a Japanese professor designed the first Japanese robot, Gakutensoku. The robot could move its head and hands and change its facial expressions.



Source: cyberneticsoo.com <http://cyberneticsoo.com/robots/1928-gakutensoku-pneumatic-writing-robot-makoto-nishimura-japanese/>

## 1943

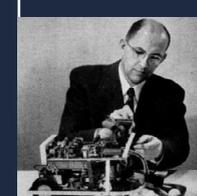
Walter Pitts and Warren McCulloch laid the foundation of artificial neural networks and published "A Logical Calculus of the Ideas Immanent in Nervous Activity".



Source: Stanford Encyclopedia of Philosophy <https://plato.stanford.edu/entries/computational-mind/>

## 1949

An American computer scientist, Edmund Berkeley published Giant Brains: Or Machines That Think, which popularized cognitive images of early computers.



Source: Cambridge University Press <https://www.cambridge.org/core/books/reasonable-robot/understanding-artificial-intelligence/C0D6ACE69B8E102CA1CTAEFF1186>

## 1950

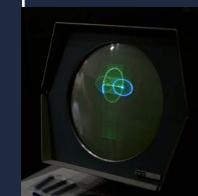
Claude Shannon published the first article "Programming a Computer for Playing Chess" on developing a chess-playing computer program.



Source: Forbes <https://www.forbes.com/sites/gilpress/2014/12/20/a-very-short-history-of-artificial-intelligence-ai/>

## 1951

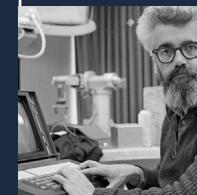
Dean Edmunds and Marvin Minsky built the first artificial neural network, SNARC (Stochastic Neural Analog Reinforcement Calculator).



Source: History of AI <https://historyofai.stanford.edu/>

## 1955

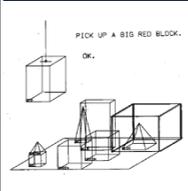
John McCarthy, Nathaniel Rochester, Marvin Minsky, and Claude Shannon coined the term "artificial intelligence".



Source: Forbes <https://www.forbes.com/sites/gilpress/2017/08/27/artificial-intelligence-ai-defined/>

1968

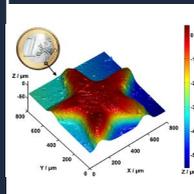
Terry Winograd develops SHRDLU, an early natural language comprehension computer program.



Source: Stanford HCI Group  
<https://hci.stanford.edu/~winograd/shrdlu/>

1969

Seymour Papert and Marvin Minsky published Perceptrons: An Introduction to Computational Geometry, which features the limitations of simple neural networks.



Source: The MIT Press  
<https://mitpress.mit.edu/books/perceptrons>

1970

WABOT-1, the first anthropomorphic robot was built at Waseda University, Japan. It consisted of a limb-control, vision, and conversation system.



Source: Forbes  
<https://www.forbes.com/sites/glp/press/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/>

1972

Stanford University developed an expert system, MYCIN, that identifies infection causing bacteria and recommends antibiotics.



Source: Britannica  
<https://www.britannica.com/technology/MYCIN>

1980

Waseda University, Japan built a musician humanoid robot, Wabot-2 that is able to read a musical score, play easy tunes on an electronic organ, and communicate with a person.



Source: Forbes  
<https://www.forbes.com/sites/glp/press/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/>

1981

\$850 million was budgeted by the Japanese Government for the Fifth Generation Computer Project, which aims to create computers that are capable of AI.



Source: Forbes  
<https://www.forbes.com/sites/glp/press/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/>

TO BE CONTINUED...

Source: TowardsDataScience  
<https://towardsdatascience.com/rosenblatts-perceptron-the-very-first-neural-network-37a2ec9038a>



1957

Perceptron, a two-layered computer learning network based artificial neural network was developed by Frank Rosenblatt.



Source: Forbes  
<https://www.forbes.com/sites/glp/press/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/>

1959

Arthur Samuel, a pioneer in the field of ML, coined the term "machine learning".

Source: The New York Times  
<https://www.nytimes.com/2016/01/26/business/marvin-minsky-pioneer-in-artificial-intelligence-dies-at-80.html>



1959

Marvin Minsky and John McCarthy founded the MIT AI Lab.

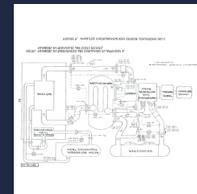
Source: HistoryofInformation  
<https://www.historyofinformation.com/detail.php?id=407>



1961

Unimate, the first industrial robot was introduced that worked on an assembly line in a General Motors plant in New Jersey.

Source: EPDF  
<https://epdf.pub/computational-mind-a-complex-dynamics-perspective.html>



1963

Leonard Uhr and Charles Vossler published one of the first ML programs, a pattern recognition program that generates, evaluates, and adjusts its canmachine-learned operators

Source: Forbes  
<https://www.forbes.com/sites/glp/press/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/>



1965

ELIZA, a natural language processing computer program developed by Joseph Weizenbaum carries on a dialogue in the English language.

Source: Sutori  
<https://www.sutori.com/item/untilted-0254-690>



1968

MacHack, a knowledge-based chess-playing program was built by Richard Greenblatt (MIT).

DEC 1955

Logic Theorist, the first AI program was developed by Alan Newell and Herbert Simon.



Source: HistoryofInformation  
<https://www.historyofinformation.com/detail.php?id=742>

1958

Lisp, a programming language developed by John McCarthy is used in AI research.



Source: Forbes  
<https://www.forbes.com/sites/glp/press/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/>

1959

Allen Newell, Herbert Simon, and John Shaw created a General Problem Solver (GPS) while at CMU.



Source: Kutztown University  
<http://faculty.kutztown.edu/neksts/447-F13/lecture/hs3/repix.html>

1960

Ray Solomonoff laid foundation of the mathematical theory of AI and introduced Bayesian methods for inductive inference and prediction.



Source: Stanford Encyclopedia of Philosophy  
<https://plato.stanford.edu/entries/artificial-intelligence/>

1963

Julian Feldman and Edward Feigenbaum published the first collection of AI articles, Computer and Thought.



Source: The MIT Press  
<https://mitpress.mit.edu/books/computer-and-thought-1>

1964

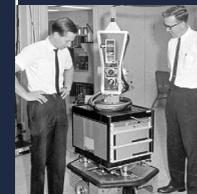
STUDENT, a natural language understanding computer program was developed by Daniel Bobrow.



Source: TowardsDataScience  
<https://towardsdatascience.com/a-short-history-of-natural-language-understanding-f1b3c382785>

1966

Shakey, the first general-purpose mobile robot that reasons about its own actions. It analyzes commands and breaks them down to perform larger tasks.



Source: Forbes  
<https://www.forbes.com/sites/glp/press/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/>

1968-2021

Space Odyssey, a film was released that featured a sentient computer, HAL.



Source: The New York Times  
<https://www.nytimes.com/2018/03/30/movies/hal-2001-a-space-odyssey-voice-douglas-rain.html>

# TEN TECHNOLOGIES

TO WATCH IN 2021

BY AMIR HUSAIN



Exponentials are often cited, oft explained, but seldom fathomed in full. It's just not how the human brain is trained to think, since most of the real world phenomena that matter to us are linear. We age linearly, skyscrapers go up roughly linearly, and the progress of many of our older technologies—such as legacy cars—has been linear. But as technologies are digitalized, they ride exponential curves of improvement. Take cars, for example. During their analog stage, mechanical steering and acceleration control technology barely changed over a hundred years. But now that cars are being digitalized, software-based autonomous driving capabilities have gone from speed-only cruise control to automated emergency breaks to automated distance maintenance, lane control, and autonomous parking, and now are at the cusp of self-driving. All within the span of 15 years.

The 2020s will be a decade when many exponential technologies will break out into mass use. The high rate of performance improvement, logarithmic reductions in price and faster rate of product releases will make prediction a difficult business. But for now, I'll take my chances and dive into what I think may be the most interesting technologies of 2021.

### 1. MAINSTREAM BITCOIN

Bitcoin has been the best performing asset of the last decade and is now attracting significant institutional funds. Hedge funds, multi-billion dollar corporations like MicroStrategy, and perhaps even Tesla's Elon Musk are all investing in the cryptocurrency. What makes bitcoin so attractive is its low-cost, trustless, no-middle-man architecture combined with fast transaction settlements and hard limits on supply. With cryptocurrency market caps now hovering at roughly \$1T, it is safe to say crypto has crossed the threshold and is implanted in the public consciousness as a

real asset.

After all, we “believe” in the dollar not because a piece of paper is useful in and of itself, but because it represents a promise of value backed by the state. And why do we believe in the state? Ultimately, because it is an idea—a dream—shared by a large number of people. If a dollar is merely an idea that people collectively believe has value, then bitcoin is no different. It has evolved into a monetary network that now connects a very large number of people with shared belief in its value. And while the supply of fiat currencies continues to increase (25% of all USD currency in circulation was printed in the last year), the bitcoin pool forever remains limited to 21 million coins. While some fear regulation, I welcome it. Enforcing KYC (Know Your Customer) and AML (Anti Money Laundering) protections can help bitcoin by ending the fear, uncertainty and doubt once and for all. Let's see what 2021 holds, but I am long BTC! HODL!

### 2. CHINA'S FAST-EVOLVING AVIATION INDUSTRY AND THE H-20 BOMBER

Chinese aerospace developments are accelerating at a frenetic pace. China

launched 29 satellites to the US's 27 during the first nine months of 2020. Their drone industry has grown by leaps and bounds. The People's Liberation Army Air Force (PLAAF) has already operationalized its J-20 stealth fighter bomber aircraft, but the upcoming H-20 stealth bomber represents a particularly important evolution of Chinese air power and technological capacity. The aircraft was rumored to be a potential exhibit at the November 2020 Zhuhai airshow, but did not ultimately make an appearance. It is all but certain that the platform will be unveiled in 2021.

According to some reports, the H-20 stealth bomber bears a resemblance to the B2 and B21 flying wing designs and can carry a payload of anywhere from 20 to 45 tons. The latter figure is unlikely but even the former would be significant. Its own range combined with stand-off weapon systems would allow the aircraft to reach deep within North America. I don't believe the H-20 is a harbinger of conflict, but it does represent a significant qualitative evolution of Chinese aviation capability and a credible conventional strike platform that could alter strategic calculations over time.



Neurone network, copyright iLexx via Creative Market

### 3. NETWORKED AERIAL TERRESTRIAL SWARM SYSTEMS

There are two schools of thought on the Nagorno-Karabakh conflict that took place earlier in 2020 between Azerbaijan and Armenia. The first group proposes that drones were effective in the conflict only because Armenia lacked a suitable air defense capability. The latter school of thought believes that it was the drones that neutralized Armenia's otherwise modern defense capability and degraded their advantage to the point where Armenia was forced into capitulation and defeat.

While drones have been employed for decades, this conflict was different. Low-cost Turkish drones were combined with loitering munitions, electronic warfare and swarm strategies to wreak havoc on the Armenian military. An analysis of the conflict published in AirForces Monthly suggested that the result would not have been significantly different if the Turkish Azerbaijani onslaught was directed not at Armenia but at a European military instead. Not many armed forces would have been able to deal with the combined effect created by low-cost drones and swarm strategies. Expect a flurry of activity on this front in 2021 as air arms the world over recognize shortcomings, acquire low-cost drones and build new command, control and communications systems to enable swarm warfare. The Hyperwar thesis General Allen and I presented years ago is coming true in all its dimensions.

### 4. 1000+ KPH TRAINS AND THE URBAN MOBILITY REVOLUTION

Will trains one day exceed the speed of most commercial aircraft? If tests that took place in South Korea late in 2020 are to be projected into the future, that is certainly the conclusion to which one arrives. The Korean Railroad Research Institute (KORAIL) announced that its Hyper-Tube train achieved a speed over 1,000 kph in tests

conducted in December. Underground high-speed tunnels and so-called hyper loop technologies being developed both in the United States and in Asian countries such as China and South Korea promise to revolutionize rail transport. South Korea will continue high-speed rail tests in 2021 with the ultimate goal of reducing the three and a half hour long journey between Seoul and the southern part of the country to a mere 30 minutes. Urban mobility is attracting massive investments, whether in the form of “The Line,” a Saudi project that aims to build an optimally laid out city along a single 170 km long corridor; aerial urban mobility solutions; autonomous cars; and yes, high-speed “hyper” trains.

### 5. AUTONOMOUS CARS

In the waning days of 2020, when prodded by self-driving company comma. AI, Elon Musk tweeted that he was highly confident Tesla would have level five, fully autonomous capabilities completed by the end of the year. Significant upgrades were made to Tesla's self-driving software in the second half of 2020 and a flurry of YouTube videos appeared with many reviewers excitedly demonstrating the impressive new capabilities. What has been demonstrated thus far is far from level five, but we'll give Tesla the rest of this year to thrill us with their autonomy innovation. Of course, level five autonomy has been the holy grail that's been promised by the autonomous vehicle industry for several years. If Musk's tweet is to be believed, it is finally within grasp. By his own admission, sometimes Musk's claims take a bit longer to materialize, but he has a pretty good track record of delivering on promises. I, for one, can't wait to have my car drive me around!

### 6. NO-CODE AI APPLICATIONS

Back in 2013 when I founded SparkCognition, many in the software industry doubted whether artificial intelligence would have much relevance to the tools

and platforms they used. AI-powered code generation for any meaningful task seemed like the distant future. Beyond the software vertical, other industries were not quite sure whether artificial intelligence would deliver any real benefit. But six and a half years later, all of that has changed. Artificial intelligence represents one of the most profound shifts in digital technologies and now, most savvy executives and forward-thinking companies understand that AI adoption is not something to ignore or delay.

In 2021, the widespread use of AI will be spurred on at an even faster rate with broader availability of no-code AI application development tools. Applications like SparkCognition's Darwin™ product can help users build sophisticated deep-learning powered models without knowing anything at all about neural network design or programming. Individuals with knowledge of applications such as Microsoft Excel can trivially export data, train sophisticated machine learning algorithms and create applications very quickly. As the rate of model development accelerates with the use of such tools, an increasing percentage of enterprise workflows will be automated through high-performance neural networks, ultimately achieving a transition to what I have previously called the “model-driven enterprise.” This transition is coming in 2021.

### 7. VOLUMETRIC DISPLAYS

Three dimensional volumetric displays have been a staple of science fiction for many years. Remember that scene in Star Wars where the rebel alliance is planning an attack on the Starkiller Base? The holographic projections into open space are an example of a volumetric display. But now, this technology is migrating from the world of science fiction into our real world. Australia's Voxon Photonics is one example of a company that is working to commercialize volumetric display

technology. The Voxon VX1 is already up and running and can project up to 500 volumetric pixels or voxels. It is available for purchase today, but the \$10,000 price prevents high-volume purchase, and hence, volume-driven cost reduction.

Volumetric displays represent the future evolution of workstation imaging technology, and as soon as these become practical they will be a preference for 3D designers, mechanical engineers and many other types of technical professionals.

### 8. DRONES OPERATING IN URBAN AREAS

Although 2020 was a difficult year, some good did come from it! For one, the FAA issued new guidelines around the use of drones operating in urban environments at night and over crowds. They also mandated remote ID broadcast technology for small unmanned aerial systems. While remote ID does post an additional reporting responsibility on the users of drones, the scope of drone operations can now be expanded considerably, driving useful applications at scale.

Companies like SkyGrid are developing platforms to enable the deployment, tracking, cybersecurity, maintenance and safe integration of drones into national airspace. SkyGrid even recently demonstrated the first test of an autonomous cybersecurity protection system on a drone. Between the FAA's new ID requirements and commercial developments in the field, such as improved cybersecurity, drone operations in urban areas can finally become more routine in 2021.

### 9. QUANTUM COMPUTING

For many years quantum computing has been heralded as one of the most exciting and profound innovations in computer science. The computational power of a quantum computer can be thousands and even millions of times greater than a conventional computer. While not every computation that is possible to execute on a traditional,

classical computer is doable on a quantum system, there are many exciting applications that quantum computers can enable almost immediately. One such area is cryptography, where traditionally secured cryptographic messages can be decoded in a small amount of time compared to a classical computer. This potential shortcoming of traditional cryptography has given rise to the field of quantum-safe cryptographic algorithms.

Another very exciting application of quantum computers is modeling chemical and biological processes. Quantum computers can simulate such phenomena much faster than a classical computer can. This gives them a massive advantage at predicting what molecular interactions will actually look like in the real world, leading to all sorts of valuable outcomes ranging from drug discovery to materials science. In fact, the potential of quantum computers to bring to life materials with never-before-seen properties may be their killer application.

IBM is likely to release a 127-qubit quantum computer in 2021, which would be the largest such system yet. Google may not be far behind. A vast array of smaller companies, such as IonQ, DWave and Rigetti are hard at work developing both hardware and software for the quantum stack. Expect new announcements from each of them through 2021.

### 10. MAINSTREAM 5G

5G cellular communications technology, when deployed at full capacity and scale, promises to revolutionize human-to-human communications by delivering smooth, high-resolution video, low-latency near-life like video conferencing and VR-capable gaming. But 5G is about more than human-to-human communications. It also holds the potential to enable reliable, low-latency control of physical semi-autonomous systems such as cars, trucks and urban aerial mobility drones; the machine-to-machine network!

5G's theoretical maximum data rate is 20 GBps and, on average, the spec can deliver 100+ Mbps consistently. However, most implementations of 5G in the US can only deliver 35-50 Mbps average speeds. And while we hear a lot about 5G in the press, as of 2020, some of the largest US carriers had only extended 5G capability to one percent of their network.

This might change in 2021. Expect significant expansion of the 5G footprint and a much greater penetration of 5G-capable phones. The new Apple iPhone released in September 2020 now natively supports 5G. As it is inevitably adopted, a large percentage of US smartphones will be 5G-ready. The additional volume of users will also encourage software and services developers to begin incorporating 5G-enabled features, from better video quality and higher frame rates to new modes of interaction.

### CONCLUSION

Undoubtedly, many of the most exciting developments in 2021 will be in areas we haven't focused on in this article; the surprise exponential technologies can generate is tremendous. As time marches on, the exponential curve leaps higher and higher and the surprise it creates increases too! Will we see significant advances on AI algorithms and learning capabilities? Will we make advancements in general purpose learning? Explainability? A fusion of symbolic and connectionist approaches to enable more robust and transparent AI? The answers to all of these is quite likely, yes, yes, yes and yes. Just what these enhancements will be and how profound their effects are remains to be seen. What's for sure, though, is that 2021 is going to be an action-packed year full of technological innovation and advancement!



# CYBERSECURITY FOR THE AUTOMOTIVE INDUSTRY

A HOLISTIC APPROACH TO VEHICLE SAFETY

BY AMANDA CENTER



# CYBERSECURITY FOR THE AUTOMOTIVE INDUSTRY

## A HOLISTIC APPROACH TO VEHICLE SAFETY

Cars are an integral part of modern society, but they are not without their issues. Maintenance problems and breakdowns ranging in severity from inconvenient to dangerous have long plagued car owners. Now, as cars become more computerized and connected, hacking poses a problem as well.

With the advent of machine learning, these issues can instead be an opportunity for companies in the automotive industry. By marrying AI technologies for cybersecurity and predictive maintenance, automotive manufacturers and sellers can offer their customers a unified solution to car troubles both new and old.

### CYBERSECURITY

In 2015, researchers Charlie Miller and Chris Valasek made headlines by using a zero-day exploit to remotely hack into a moving Jeep on a highway. They were able to take complete control over the vehicle, manipulating everything from steering to the radio[1].

Since then, more and more information has come out of the woodwork about potential security flaws in computerized cars--and the ways in which these flaws could be exploited. When cars run on a computer OS, they are vulnerable to the same malware, worms, and ransomware as any other endpoint. Consumers are increasingly concerned about these security flaws, and rightly so.

By monitoring system and app data transmitted from the car's automotive control system, cognitive cybersecurity solutions detect and disrupt malware and raise alerts for car owners and manufacturers.

DeepArmor™ has trained on millions of malicious and benign files, and provides signature-free, out-of-band, symptom-based endpoint security that protects vehicles from takeover, espionage, and other forms of hacking.

### PREDICTIVE MAINTENANCE

Any machinery used as frequently as the car is bound to run into failures and breakdowns. However, the consequences of failures in cars are steep. Motorists whose cars unexpectedly malfunction may wind up stranded on the side of the road for extended periods of time. Car problems are expensive, with even brand-new vehicles costing an average of \$1,186 per year to maintain and repair[2]. And of course, car troubles can lead to dangerous accidents--there were 37,461 fatalities from crashes in the US in 2016 alone[3].

AI conditions-based health monitoring software on a car reads pipelines of sensor data from the automotive control system to detect anomalies and predict failures in advance. SparkPredict™ provides immediate insight to car owners, dealers, and engineers of health issues for cars, enhancing customer product satisfaction and reducing warranty servicing and maintenance time and costs.

Using SparkPredict™, manufacturers can anticipate potential recall issues using collective data. Drivers, on the other hand, are provided a custom maintenance schedule based on driving patterns, use, and parts inventory at local repair shops. Engineers and repair workers are better able to pinpoint the exact source of any car troubles.

### A NEW ERA OF PROTECTION

The joint usage of cognitive security and predictive analytics creates a whole new level of service and safety for automotive manufacturers and dealers to offer their customers, whether these embedded in cars as part of a warranty, as an optional add-on, or simply as a differentiator in a competitive market. In this way, companies in the automotive industry can enhance their brand and reputation while providing complete protection for consumers. 

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## DeepArmor



discovers and disrupts malware



raises alerts for car owners and manufacturers



protects vehicles from takeover, espionage, and malware

## SparkPredict



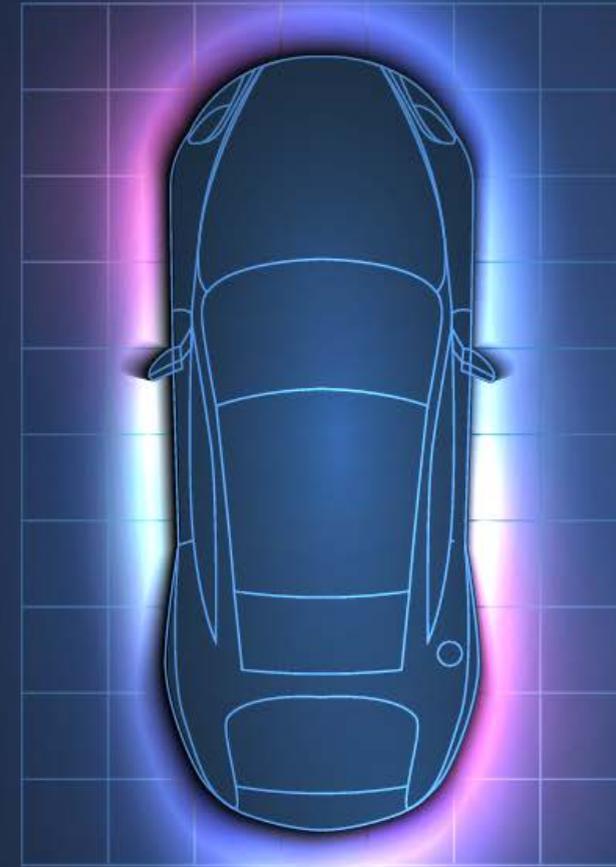
detects anomalies and predicts impending failure



anticipates recall issues



allows for more convenient scheduling of maintenance



SYSTEM & DATA

SENSOR DATA



BY MAHE ZEHRA

# The Age of Ideas

“In today’s market, anything that isn’t differentiated through creativity or a 10x technology will be immediately commodified by the industrial system.”

By Alan Philips, *The Age of Ideas: Unlock Your Creative Potential*

Growing up, I loved the stories my grandmother would tell. They were mostly based on things she had witnessed and seen in her lifetime. One of my favorites was the story of the traveling salesman.

Cloth traders used to go from house to house selling fabric for clothes and over time they would become welcome guests. Since it was hard to bring the whole shop in a bundle, they would pick what they thought the lady of the house would like. After every visit their choices would become more and more accurate.

These travelling salesmen were collecting data about their customers. They learnt from what they would sell and tried to bring a selection suited to a particular customer’s taste. This helped them to increase sales.

No traveling salesmen come to visit me - instead Amazon helps me pick new books, new art supplies and new home decor items that are suited to my taste. Amazon, over time has also learnt from

what I have bought and what people it classifies as ‘similar’ to me have bought. This allows the Amazon recommendation engine to highlight products I have a higher probability of buying and if I’m being honest I’ve discovered several new authors and much loved products this way.

The Internet of Things (IoT) makes it easier for us to gather data from many connected devices all over the world and big data and machine learning advancements allow various statistical algorithms to make sense of the vast amounts of data and to glean useful information from them. In the case of recommendation engines, products we might want and need are brought to the forefront, picked especially for us from a sea of endless things. Items we may not have come across if the recommendation engines of the world had not brought them forward.

Another example of this is Netflix. I’m sure the Netflix recommendation algorithm got a LOT of new data in 2020 since most of

us were at home watching TV for entertainment. I have discovered lots of new shows and movies I would not have seen if Netflix did not classify them as “similar to” other things I had seen.

All this technology and these AI algorithms have automated what the traveling salesman in my grandmother’s stories did. They are doing a much better job because they have more data to learn from and they also have the ability to handle data far more complex and in much greater volume than is possible for the human brain. These algorithms have definitely replaced the job of many small salesmen - but this is not all they have done - think about the opportunities and jobs they have brought with them.

I am a Kindle author and have self-published many books on Amazon. These books are based on my love for art and I’ve built a little community around them. The fact that I can distribute my books to people all over the world who want to read them is amazing to me! No more trying to get a big publisher to pick you up. Amazon publishing has leveled the playing field and given a huge opportunity to writers and content creators. This would not have been possible without technology.

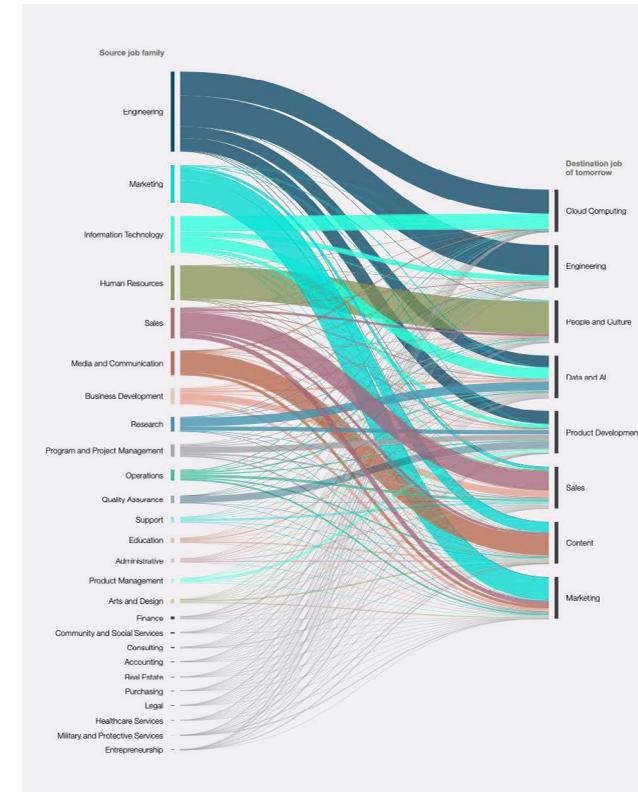
Over the years a lot of technological revolutions have taken place. A lot of jobs have been automated but new industries have sprung up in their wake. As we live in the age of AI one of the most pressing questions and concerns people have is the loss of jobs. Will AI make me irrelevant?

This past year due to COVID-19 a lot of processes have shifted very fast. Faster than they would have otherwise. One of the biggest in my opinion is education. The future of education is very exciting. If we remove the prerequisite of being physically present at great institutions to learn from them, we remove a huge barrier for a lot of young people around the world. A lot of young people who would otherwise not have had the opportunity and who deserve it. It levels the playing field so to say. It makes education a lot more accessible and it means a lot more talent and brilliance will emerge.

The World Economic Forum *report The Future of Jobs* is a very interesting read (you can find it here: <https://www.weforum.org/reports/the-future-of-jobs-report-2020>) and focuses on skill development to stay relevant. According to the report the jobs lost are offset by the new jobs produced but will require different and an upgraded set of skills. For example a data entry clerk position will be harder and harder to come by as data is automatically ingested or intelligently ‘read’ and categorized. Instead data analysts will be more in demand as more people will be needed to analyze the data.

The jobs of today will morph into the jobs of tomorrow. Some existing skill sets will need to be enhanced, others will be used in different ways to create new applications. As platforms like Coursera gain popularity and credibility amongst employers it will be easier to pivot into different job roles than ever before.

## Transitions into jobs in the future



Source: LinkedIn Economic Graph

Whatever you need to learn - you can. All you need is the will and an internet connection.

I believe the only thing that has remained valuable over time are ideas. Technological advancements. Start with fire and a wheel and take it further one step at a time. What we can say for sure is that we will always be living through the Age of Ideas. Some jobs will be made redundant and others will spring up in their place. Some things will become automated and others will be created in their stead.

We don’t want to have jobs that can be automated. We want to do more. We want to push the frontiers of knowledge. In my opinion technological advancements made by a few force the rest of us to learn more, better ourselves, better our skill sets and better our minds. This is the process of evolution and there is no stopping it.

If we are growing, evolving, learning and thinking we will never be irrelevant. The universe has too many secrets to unlock and too many puzzles to solve. Increased human cognitive potential through AI will only propel us forward. I’m excited for the future. I don’t know what I will be doing tomorrow. Will I still classify myself a data scientist or will I be something else? What I do know is that AI will free us up to dream bigger dreams and to push the frontiers of knowledge even further. **IC**

## Top 20 job roles in increasing and decreasing demand across industries

### ← Increasing demand

1. Data Analysis and Scientists
2. AI and Machine Learning Specialists
3. Big Data Specialists
4. Digital Marketing and Strategy Specialists
5. Process Automation Specialists
6. Buoinoco Dvelopment Professionale
7. Digital Transformation Specialists
8. Information Security Analysts
9. Software and Applications Developers
10. Internet of Things Specialists
11. Project Managers
12. Business Services and Administration Managers
13. Database and Network Professionals
14. Robotics Engineers
15. Strategic Advisors
16. Management and Organization Analysts
17. FinTech Engineers
18. Mechanics and Machinery Repairers
19. Organizational Development Specialists
20. Risk Management Specialists

### → Decreasing demand

1. Data Entry Clerks
2. Administrative and Executive Secretaries
3. Accounting Bookkeeping and Payroll Clerks
4. Accountants and Auditors
5. Assembly and Factory Workers
6. Business Services and Administration Manager
7. Client Information and Customer Service Workers
8. General and Operations Managers
9. Mechanics and Machinery Repairers
10. Material-Recording and Stock Keeping Clerks
11. Financial Analysts
12. Postal Service Clerks
13. Sales Rep. Wholesale and Manuf, Tech, and Sci.Products
14. Relationship Managers
15. Bank Tellers and Related Clerks
16. Door To Door Sales, News and Street Vendors
17. Electronics and Telecoms Installers and Repairers
18. Human Resources Specialista
19. Training and Development Specialists
20. Construction Laborers

Source is Future of Jobs Survery 2020, World Economic Forum

BY ZEHRA AKBAR

# Drones

## Chartering the Future of Logistics

A year after mandatory shelter in place restrictions have spurred American e-commerce, the domestic logistics industry is thriving. In 2020, more than 100 billion packages were transported and that number is expected to double by 2030<sup>1</sup>. However, along with this exponential growth, companies are facing increasing costs, unprecedented market demands and growing labor shortages. Businesses are compelled to make changes in order to remain competitive and companies must look towards advanced digitization and automation to stay ahead of the curve.

Innovative technologies have led to the next big industry unlock throughout the history of logistics, from the invention of the steam locomotive allowing for easier, cheaper and faster long-distance transport of goods to IBM's first warehouse management system revolutionizing orders, inventory and distribution tracking. It is time for the next new normal. Autonomous logistics operations are paving the way for a big disruption. McKinsey & Company expects that, as smart warehouses and autonomous vehicles are widely adopted, logistics costs will fall by up to 40 percent.

Drones play a key role in charting this future, speeding up efficiency and productivity, while lowering costs across the logistics value chain. Drone delivery will have a transformative effect on the entire supply chain, improving order fulfillment, warehouse operations, inventory management, and more. Look at three ways drones will be changing the logistics sector:

### Revolutionizing Last Mile Delivery

"The cost of global parcel delivery, excluding pickup, line-haul, and sorting, amounts to 70 billion dollars."<sup>2</sup> Not only is the market large, it is also extremely price sensitive, with the bulk of consumers preferring options with cheapest delivery. According to Goldman Sachs, using drones and robots could bring costs down by more than 80 percent for last mile delivery. Drone deliveries will allow for shipping that is both cheap and fast, for rural and urban locations alike. This will transform last mile experiences given that the cost and timing of deliveries has previously remained inversely correlated. Drones will be used in combination with other autonomous ground vehicles to increase efficiencies. How-



<sup>1</sup> 'The next-normal: parcel-delivery', McKinsey & Company, November 2020

<sup>2</sup> 'Parcel delivery: The future of last mile', Travel, Transport and Logistics., McKinsey & Company, September 2016

Images courtesy of SkyGrid



Images courtesy of SkyGrid

ever, we can expect traditional delivery to continue existing for a small segment that require special handling or human decision making, such as that in e-groceries.

### Enhancing Warehouse Efficiencies

While last-mile delivery has been dominating the discussion for drone technology, the impact autonomous aerial vehicles will have in warehouse management is not any less impressive. We can expect to see a complete change in how warehouses approach key operations and layouts. Drones will be used to count inventory, carry small packages within warehouses, conduct inspections and ensure perimeter safety. Walmart is currently testing drones for taking stock of trailers and other items in the parking lot of a warehouses.

However, these changes might require an overhaul of how warehouses and distribution centers are currently laid out to accommodate autonomous robots and aerial vehicles in the same space. Today's single story large docks might not be needed to accommodate for large ground fleets. We can also predict that supply chain processes would change significantly with these structural warehouses change.

### Transforming the Workforce

With increased digitization, we can expect that the logistics workforce will face a shift in the desired skill-sets. While some area of work for employees will become deskilled and replaced with sensors and software, others might require employees to become more skill intensive. Ability pilot a drone if needed, carry our basic debugging while in route and knowledge of multi-modal transport systems might become job requirements.

While the long-term transformation will be substantial, we can

expect this to be felt in gradual steps, rather than a giant leap. The industry is taking a crawl, walk, run approach to adoption of this technology and this will give the workforce a time to adjust accordingly.

### Bringing Data and Privacy to the Forefront

Drone deliveries will bring privacy to the forefront like never before. Logistics companies will be faced with an entirely new wave of system security requirements and data laws. While we can expect regulation to define privacy rights, logistics companies will now have access to a world of data that is not only vast, but also more private. Imagine a drone delivering a parcel in a neighborhood. On the way to the delivery, the drone has aerial access to not one but many private properties. Maintaining how, when and why this data is shared and ensuring compliance will be no small task. Other concerns will include susceptibility to hacking or theft, invasion of privacy, and collision liability, with potentially high insurance costs.

While we may still be years away from this new normal, the drone industry has seen greater exponential growth and wider adoption in the last few years than ever before. Regulators are taking a more forward looking approach to new technologies. Drone manufacturers, software developers and service providers, are working closely with the logistics sector to prove out technologies, one step at a time. For example, SkyGrid is developing a solution that can enable multiple parcel deliveries autonomously and at the same time, while the operator is situated in his delivery vehicle or miles away from the delivery location.

Depending on how quickly existing technology limitations are address and regulations are implemented, millions of drones may be in the skies sooner than we expect. 

# FLYOVER COUNTRY

BY AMIR HUSAIN AND STEVE NORDLUND

## (PART 2)

...“Happy Birthday, Grandmaaaaa!” her 13-year old granddaughter Magdalene shouted to her. What a voice she had, Marie thought. She thought she caught a wildly waving arm gesticulating at her from inside a Boeing DM-6. This series of aircraft resembled what was once called a minivan, a long rectangular fuselage with seats for six people and the ability to fold its seats flat to carry cargo, everything from basketball teams to furniture to livestock to a cord of firewood had been carried aboard them. At least, that’s what the commercials said. It was a smoother ride, but a slower one. It had six larger engines, and greater battery capacity, but it was better suited to suburban or rural environments rather than the urban core neighborhoods that were no problem for a smaller aircraft like the GH-2 on which they had flown their first leg. The biggest distinction for travelers was that its interior felt more like a cabin, not a cockpit.

Marie quickened her pace and William sprinted around her to leap inside and grab the seat next to his sister, two years older and still wearing the soccer clothes from her game.

“Did you win?” Marie asked.

“Yes!” Maggie said, “overtime and sudden death. I didn’t have time to change.”

“I’m just glad you’re here,” Marie said.

“Happy birthday, mom,” said Luisa, her daughter. “Come sit up front by me.”

Her husband, who went by CJ, smiled and reached up to squeeze her hand in greeting.

“We’re racing the sun, aren’t we? Let’s go!” Marie said.

Once buckled in, Bertie explained the flight route as the elegant gullwing doors on both sides of the aircraft slowly lowered. The aircraft jerked softly, like the start of an amusement park ride, as a moving-sidewalk transported the entire aircraft to the flight line. This allowed a far safer interior environment and kept the conductive chargers running until the very moment they reached the departure bay – and lift off. Within a minute, they were poised to take off. Warmth and light washed over the cabin as their hangar’s outer doors parted to let in dazzling post-storm sun.

For the first few moments the group said little, comfortable in the proximity of reunited family. Marie studied her daughter Luisa in the seat next to her. While she saw her almost every week for dinner or to help watch the kids or just to have coffee, there was always something different about her. She had a new pair of earrings, pieces of egg-shaped turquoise. And maybe her black hair was shorter, just above the shoulders. Given how much energy people put into their appearances, less out of vanity but more as creative expression, Marie would need to ask in a bit.

“How was your trip so far?” said CJ, who managed a Swedish lending library franchise that offered everything from machine-learning algorithms to table-sized carbon-press mandrels -- even books that smelled of cedar.

“Perfect,” said Marie. “William and I had a great time. Even took a nap.”

“We should be there in about an hour,” said CJ. “Thirsty?”

“No, I’m fine, thank you,” Marie responded. CJ handed his wife a bottle of green tea.

“You should see the picnic,” Maggie said. “Wow.”

“Shhhhhh,” Luisa gestured smilingly.

Within a few minutes, everybody but Marie was engrossed in their AR feeds. Time, space and the immediate environment had taken on different meanings in this modern age. She put on her own glasses, no less enthused. The world had so much to know, just as people had so much to see. Since the advent of the airborne mobility economy, the physical world regained a new importance as a means to connect emotionally, spiritually, or even naturally. The AR and other virtual experiences between trips were part of that evolving experience, and it was not unique to America or even western countries. It was a global movement, aided by democratized access to the skies that truly allowed people to live life in three-dimensions.

“Good afternoon, this is your onboard aviator, Bertie. Weather predictions indicate that we will be slightly ahead of schedule thanks to a tailwind that will develop soon, reducing our remaining flight time to about 48 minutes. Since we’ll have a bit less time in the air, I thought I would offer a chance to view hologram images from a recent trip to the Grand Canyon that might help you select the best spot to view the sunset.”

“Sure, thank you, Bertie,” said Marie.

Luisa looked back at CJ and gave him a strained smile, Marie noticed. It was subtle, but the kind of thing a mother does not miss. It was true, Marie acknowledged to herself, she usually let “HI” or human-interface AIs like Bertie go on even when it was completely fine to tell them no.

Anyway, it was her birthday. It was what she wanted. She liked the certainty in his voice.

Whether or not everybody else followed Bertie’s tour of the South Rim area, their general destination, was not something with which Marie concerned herself. The stunning holograms revealed a slightly spectral rendition of pink and orange sunsets, light brushing across the rocks that quickly turned

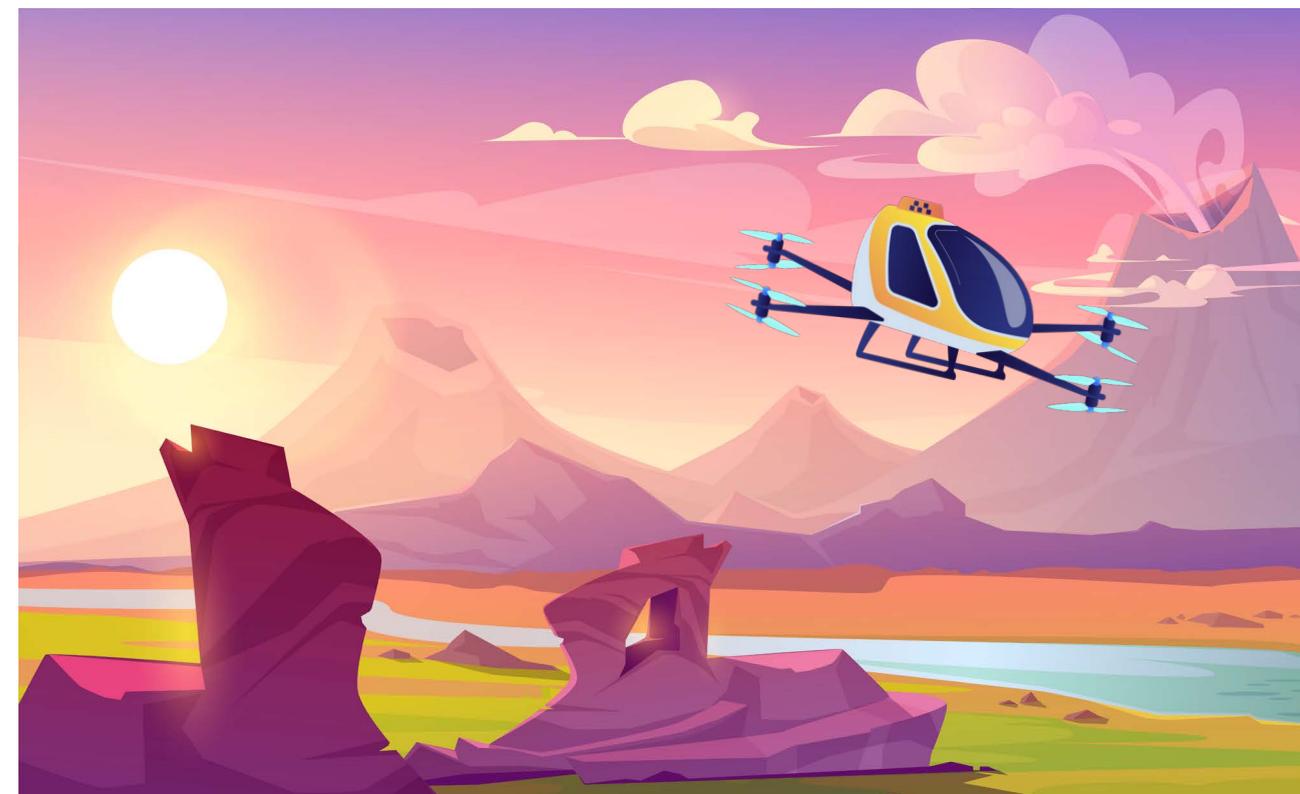
a cold-looking grey once the light faded.

“Where is that one?” asked Marie.

“That’s Hopi Point,” Bertie replied. “The red rocks and the grey sky are a beautiful combination, aren’t they? I would be more than happy to shift our arrival point; currently, there is adequate landing capacity.”

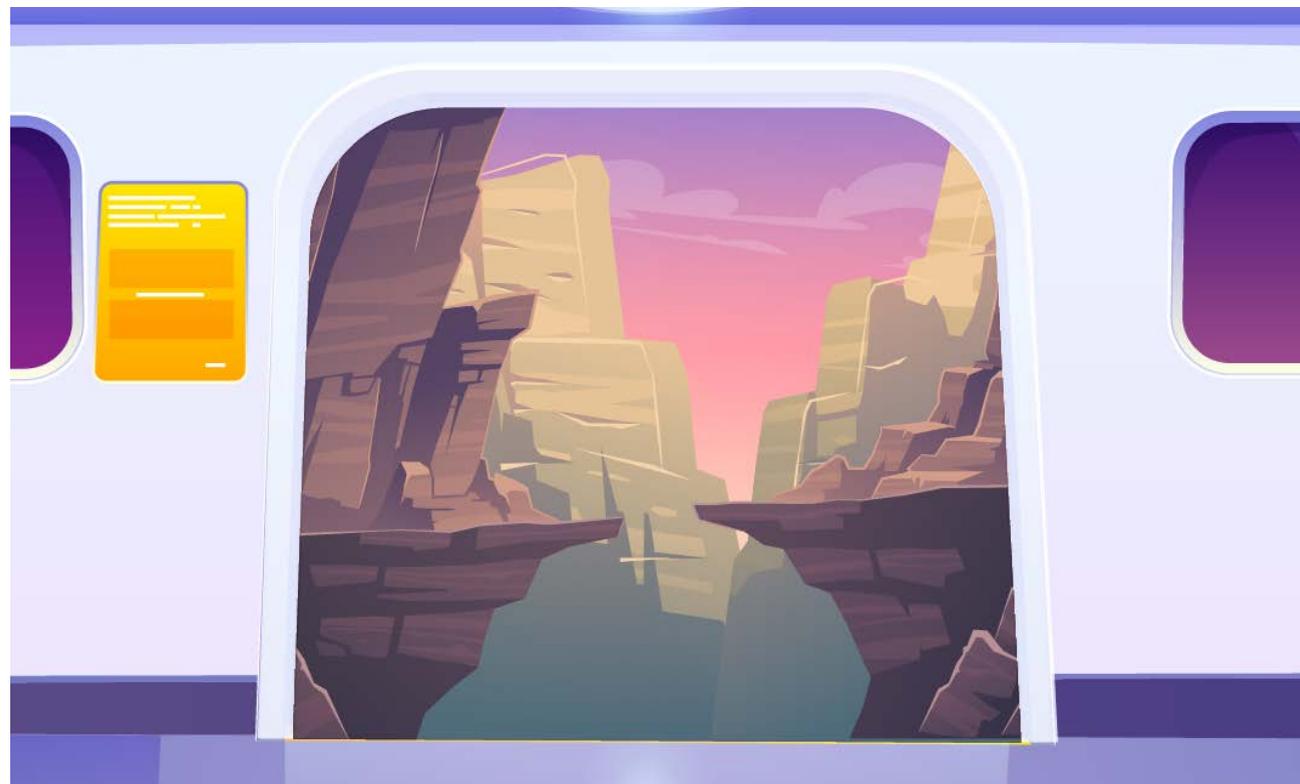
“Actually, we’re still going to our planned destination near Yavapi Point,” said Luisa. “Thank you, Bertie.”

“OK,” said Marie. She told herself that the view would be memorable anywhere, and that what mattered was that they were



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together and were going to have a wonderful time.

Luisa patted her mother's knee and gave her a reassuring smile.

A short while later, Bertie reengaged with the passengers. "If you look out the left side, you'll be able to see the Grand Canyon," said Bertie. "We'll be landing in a few minutes."

Out the left-side window, a rectangular shape set inside the gullwing door, the expanse of the entire park came into view.

"Woah!" exclaimed young William. "So much deeper than it looked!"

"Nothing like seeing the real thing," said Marie.

CJ had Maggie reach back into the cargo area to check that the two coolers they brought were secured. "Such a dad move," she mumbled, and it was typical for him. Marie admired that constant diligence that never came across as worry, and thought it made him a great parent and partner.

After that there was little talking as their collective awe at the growing scale of the canyon left no room for conversation. Finding moments of shared reverence for the natural world was literally her life's work as a teacher - and parent -- and so she relished the amazement at something so simple as the human reaction to this particular combination of rock, atmosphere, and light.

Bertie put the air taxi down smoothly on a pad at the edge of the landing area. Marie fumbled with her seatbelt, quickly glanced out the window to see that it was quite crowded. That didn't sur-

prise her given it was a weekend.

"Ready, grandma?" Maggie said.

She was already half out the aircraft, holding out her hand for her mother to follow. Marie took her hand, enjoying the youthful strength in those soft, slender fingers.

Once clear of the door, she stood up. What she saw brought her to tears. At first she tried to fight it, holding back out of a desire to not embarrass herself. Or her family. But it was too beautiful to behold. So the tears came.

"HAPPY BIRTHDAY!!!" a crowd of at least 100 people shouted to her.

Maggie squeezed her, and Luisa came over to give her a tender hug. CJ and William stood off to the side, wrestling with the coolers and they both looked like they were unsure of whether to give her a hug or let the three continue to have their moment a bit longer.

For Marie, it was overwhelming. She opened her eyes, she saw former students and colleagues, her best friend Reilly, old friends from childhood. Arm in arm, Marie, Luisa, and Maggie walked toward the crowd. They had flown in from all over Texas, and the rest of the country. But it didn't matter where they lived. What truly mattered was where they went and who they were with. **TC**

*For Part 1, read the previous issue of Cognitive Times.*

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