DSN
Data Science Nigeria

ARTIFICIAL INTELLIGENCE SIMPLIFIED:
99 USE CASES AND EXPERT THOUGHTS FOR STARTERS

COMPILED BY
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& 30+ EXPERTS

ARTIFICIAL INTELLIGENCE SIMPLIFIED:

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Artificial Intelligence Simplified: 99 Use Cases and Expert Thoughts

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Introduction

Olubayo (Bayo) Adekanmbi
Convener, Data Science Nigeria

It is about twenty months since we kicked off Data Science Nigeria non-profit, with a clear and committed focus on local capacity building and research community development, with a view to accelerating Nigeria's development through solution-oriented application of Artificial Intelligence (AI) to solve social/business problems, particularly in the areas of millennial development goals and the galvanization of data science knowledge revolution for sustainable value creation.

The burden of socio-economic development is real and the opportunities provided by the ability of machines to mimic cognitive functions typically associated with humans will become the ultimate game changer for meaningful impact. The inherent possibilities in AI has evolved from futuristic sci-fi conjecture to high-impact reality, especially with the exponential processing, perceptive, predictive and prescriptive abilities of modern computing. Definitely, AI will be the new engine of development and will become the basis for the nation's future competitiveness.

At Data Science Nigeria, we understand that AI capabilities have transformational and far-reaching potential to enhance human welfare; hence, we have simplified our approach to finding the intersection of Artificial Intelligence and various domains of high impact application (Healthcare, Agriculture, Education, Finance, Public Accountability, Smart City). We believe that domain knowledge comes first while AI comes as an enabling tool, and this explains our strong focus on multidisciplinary research where every expert area can deploy the possibilities of AI for relevant breakthroughs.

Artificial Intelligence Simplified: 99 Use Cases and Expert Thoughts is an attempt to introduce more enthusiasts to Artificial intelligence by focusing on the possibilities first before the codes. We believe that when people can visually appreciate these possibilities, the path of capacity building becomes easier and exciting with a high sense of purpose. This ebook drives for solution-oriented

learning.

We are very appreciative of the global community of experts and users who have generously shared our vision and provided their rich perspectives in this ebook. Great thanks to the growing Data Science Nigeria community and our global network of mentors for their continued support. Great thanks to my co-partners on the Data Science Nigeria vision, Toyin Adekanmbi for her relentless passion to push knowledge-based development through Artificial Intelligence for social good.

The use cases are insights that I have picked from my own personal learning and are, therefore, not exhaustive or representative of all the possibilities. They are actually thought-starters, with each reference coming with the relevant hyperlinks for future reading. The use cases' theoretical concepts and applications are as reported in the hyperlink and not verified, thus usage is not an endorsement.

This e-book has been released as a free e-book as part of our knowledge democratisation agenda, which will evolve into many more expert-based e-books and Nigerian-centric learning videos, as part of our 3-year developmental roadmap (2017-2019).

We appreciate the continuous support that the community has enjoyed and we look forward to more collaboration for a positive impact.

About Data Science Nigeria

Data Science Nigeria is a non-profit organization run and managed by the Data Scientists Network Foundation, with the vision of accelerating Nigeria's social and economic development through the solution-oriented application of machine learning to solve social and business problems and to galvanize a data science knowledge revolution in the African continent.

Specifically, we aim to train, mentor and inspire 100,000 Nigerian undergraduates and graduates to build new skills in advanced analytics and data science and create 1 million jobs/opportunities in these areas. This will have a multiplier effect on Nigeria's economy when innovative data-centric solutions are built to accelerate economic well-being in areas such as agriculture, health, security, governance, education, financial inclusion and transportation.

Our Approach

We focus on use of data to stimulate robust insight required to solve local social and business problems with a focus on sustainable development goals (SDGs). We achieve this by adopting a practitioner-led model in which experienced and hands-on data scientists in Nigeria and in the diaspora train and mentor Nigerians via face-to-face virtual coaching classes, and through project-based support and holiday bootcamps funded by donations from individuals and corporate sponsors.

Data Science Nigeria is also leading the PhD4 Innovation Hub project, which it is proactively driving the application of Big Data in solving problems in the areas of financial inclusion, agriculture, health and social well-being. This is aimed at bridging the academic and industry gap and to support high-impact data-oriented academic innovations focussed on scalable local solutions that can drive socio-economic development and profitable business use cases. This will contribute to reform the economy as well as stimulating and sustaining growth.

Data Science Nigeria 3-Year AI Roadmap (2017-2019)

All ongoing activities are in black colour while plans are in green colour.

(1) Robust AI Capacity Building
· Inter-University Machine Learning Competition
· Development of Nigeria-centric AI curriculum for students
· #DeepLearningNigeria expert bootcamp/Hackathon
· All-expense-paid residential learning bootcamps with world-class experts
· Access to best global AI communities for knowledge exchange/collaboration
· Special Support/sponsorship of female learning programmes/event
· Travel Grant/support for local/international learning events

(2) Learning Communities/Platform
· 3 AI Hubs for community engagement and learning in Nigeria's 3 regions
· AI+ Club on 40 campuses with mentors and weekly learning sessions
· Industry Meet-Ups for use case and best practice sharing
· Regular competition-based learning (Kaggle, Zindi)
· AI free Summer schools for preteens/kids
· AI Library and Access to AI tools

(3) Content Development (local, context-based and use of local data and scenarios)
· Introductory AI Books with e.g. AI for beginners
· AI Naija Online School (Nigerian-centric AI learning videos with local context and data)
· AI intro for pre-teens ebook
· Machine and Deep learning Learning Series

(4) Talent support and deployment for industry
- · AI Talent deployment via internship and project exposure
- · AI Talent recruitment, job placement & onboarding programme
- · Freelancer/Outsourcing projects to engage community members
- · Expertise building through direct industry projects (Data Scientists on-demand)

(5) World class mentoring
- · #MentorAfricanDataScientists –one-on-one Mentorship by pairing local AI talent with offshore world-class experts
- · NYSC Corp member mentorship programme to support Campus-based AI+ Clubs
- · International Competitive Pitch/Competition Support

(6) Topdown AI awareness and Executive Immersion
- · AI/Big Data Summit for executive engagement
- · Executive Masterclass for C-level executives on AI and Business performance
- · Industry Deep-dive (seminars on industry-specific AI application)
- · Industry Hackathon ideation and AI design thinking
- · AI Naija/Data Weekender – professional training for middle-level Business Analysts

(7) Upscaling PhD research in AI for high-impact
- · PhD4Innovation programme (focus on MDGs)
- · Promotion of solution-oriented AI research (financial inclusion, health)
- · Building a community of Nigeria-based PhDs in AI
- · Supporting MSc/PhD AI researchers with platform, data and Mentorship
- · Strategic research collaboration with global AI centers of excellence
- · Participation at International ML/AI conferences

(8) AI for Social Good

- · Development of 2 pan-Nigerian data collection apps (text, audio & video)
- · Use of AI for tracking social impact, socio-economic trends, community welfare and public accountability
- · Support for AI-centric local innovation (health in children, sanitation, Agricultural yield)

(9) National AI Agenda Support And Promotion

- · Government engagement on AI for better society
- · Participation in government AI/Big Data for development plans
- · Contribution to Nigeria AI for development roadmap

(10) AI Entrepreneurship Support

- · AI ideas-to-market/incubation
- · Expert support and kick-off fund for AI start-ups
- · AI Venture Fund programme

2017/2018 Annual Report & Video References

ANNUAL REPORT

DSN Annual Report July 2017- June 2018
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EVENT VIDEOS

Kick off of the Artificial Intelligence Community Hub at the University of Lagos, Nigeria

1st Big Data Summit and Bootcamp
Summary review

AI Summer School for Grade 7-9 feedback

1st Big Data Summit on WebTV

1st Big Data Summit on ChannelsTV

1st Big Data Summit Use case session on Zenvus by Prof Ndubuisi Ekekwe

Knowledge Session on Natural Language processing with Raj Khrishnan, IIT Chicago Adjunct Professor and Microsoft Azure expert

'Bayo Adekanmbis interview with WebTV

Compiled by
Olubayo (Bayo) Adekanmbi

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FOREWORD

Professor Ndubuisi Ekekwe
Inventor of the Zenvus Agriculture AI product,
and Chairman of the Fasmicro Group

Many centuries ago, during the great debate of the material components of the universe, a period of fundamental knowledge generation and accumulation, in which some of the finest philosophers and thinkers like Thales, Heraclitus and Pythagoras participated, the world was explained. Pythagoras postulated that the world is made up of numbers, implying that everything we do is about numbers. Largely, across markets and industrial sectors, and in our personal lives, every human and business activity comes down to numbers. It could be click analysis, videos, sleep or practically anything; behind it all are numbers.

With the realisation that everything is numbers, the pursuit of processing and manipulating numbers became essential if we desire to fix the frictions that exist in markets. Companies are founded to fix frictions, and a better understanding of numbers has always helped the missions of growing ventures.

Because all frictions are numerical, throughout human history innovators have worked to develop tools to help calculate and process numbers. So, from the abacus to the slide-rule, the world has advanced through different computational systems like the Difference Engine, ENIAC, UNIVAC, and the modern microprocessor. The invention of the microprocessor was a significant moment in human history as it provided the capacity to process numbers at a much greater scale.

Powered by the microprocessor, mathematics (the beautiful science of numbers) has transmuted, with software helping us to make better sense of the world. With cloud computing, immersive connectivity, and mobile devices, a 21st century Cambrian moment emerged: the data everywhere met cheap, ubiquitous and intelligent digital systems to process them.

As a result, artificial intelligence (AI) is evolving, enabling the combination and recombination of systems to engineer intelligence on machines. Though

narrow at the moment, AI promises to become general purpose and over time super-general-purpose, possibly ushering in the dawn of singularity. The implications would be huge, as all industries would be radically transformed with changes in the current global architecture of commerce. Many people have predicted that the impact of AI could be as catalytic as the invention of electricity, triggering dislocations in labour and the ways we live.

Yet there is no reason to panic because if we look back at our history, we see a future of abundance over scarcity. Over the last five centuries the penetration of any technology at such a huge scale has typically resulted to higher productivity. And with higher productivity, human welfare and our standard of living have always improved. I am confident that AI will continue on that trajectory, liberating humanity from many things while enabling a new era, which no one has ever dreamt of at the moment. Our present world is limited by knowledge; AI would expand that horizon, anchoring new possibilities for the future.

However, this AI redesign may not be uniformly distributed across cities and communities as the Internet, with its unbounded and unconstrained distribution channel, may enable some big technology empires to dominate. This is the challenge for Nigeria. We have to prepare and commit to becoming creators instead of mere consumers of AI. Our universities and companies already know that data is the new oil. Only nations with the modern refineries of AI systems would have the capacities to refine data. Our AI efforts must not mimic the petroleum sector in which the multinational companies run the upstream leaving the less lucrative downstream for us. Data Science Nigeria is calling for a new dawn in Nigeria; we have to respond.

In my companies, we have been working to acquire and refine the use of data in agriculture (Zenvus) and healthcare (Medcera), and other sectors where we do business. This is a promising moment in Africa because AI is still largely in its infancy. The 99 use cases of AI, as noted in this book, gives us a window to invent that era of exponential growth in Nigeria across our industries.

I am very confident that after reading this book you will be inspired to pursue the acts of fixing many frictions in our country, through using products and services with AI. Make it happen!

Professor Ndubuisi Ekekwe

WHAT DOES ARTIFICIAL INTELLIGENCE MEAN TO ME?

Short Essays by Artificial Intelligence Business Users, Leaders and Practitioners

Professor Yoshua Bengio

Scientific director of Mila,
Professor of Computer Science at the University of Montreal,
Senior Fellow of the Canadian Institute for Advanced Research

What Artificial Intelligence Means to Me

When I started my graduate studies I was not sure what to study, as I had many interests. But then I started reading papers on artificial intelligence (AI) and neural networks and I quickly realized that I had found my calling. Science is not just about rigor and reason, it is also an emotional adventure where a person falls in love with some ideas. I always had had an interest in human intelligence and in computers, and this was just at the intersection, taking inspiration from brains to explore mathematical and computational principles which may explain our intelligence and make it possible to build intelligent machines.

Over the last few decades, we have made amazing progress with a new approach to neural networks called deep learning and AI has gone from a dream in the heads of a few university researchers to a technology deployed by most of the big tech companies around the world. We are still far from human-level AI but we have reached a level where this technology can have a huge impact on our society. It can be used for good in many ways, to help the material, medical and intellectual improvement of many. It can also be misused or concentrated in a few hands, if we are not careful of how we organize our societies. It is thus very important that more people understand this technology, that more people be empowered by it and grasp the underlying science, to democratize AI and bring its benefits to all.

For that to happen, it will also be necessary that we become collectively wiser, that we put in place governments which work for the benefit of all people rather than for the benefit of a few.

Professor Thomas G. Dietterich

Co-Founder and Chief Scientist, BigML
Distinguished Professor Emeritus,
School Of Electrical Engineering And Computer Science,
Kelley Engineering Center, Oregon State University, Oregon, Usa

As the former President of the Association for the Advancement of Artificial Intelligence, I tend to think of AI in very general terms. To me, it means the study of methods for creating "smart software". I have devoted my career to studying algorithms and methodologies (mostly using machine learning) for making computers more intelligent. I have worked on AI assistants for the desktop knowledge worker, machine learning methods for designing drugs, machine learning methods to support biological conservation (species distribution models, plant-pollinator interactions), and reinforcement learning for ecosystem management (managing invasive species and wildfires).

My current work pursues two directions: (a) automated data quality for the Internet of Things, and (b) robust artificial intelligence.

(a) Data quality: I am part of the Trans-Africa Hydro-Meteorological Observatory project that is designing, deploying, and operating a network of 20,000 automated weather stations throughout sub-Saharan Africa. I am responsible for developing machine learning methods to detect failed sensors. This combines anomaly detection and probabilistic reasoning.

(b) Robust AI: As people consider deploying AI technology in safety-critical applications, it is essential that this technology be robust to both the "known unknowns" (i.e., the variables for which we explicitly model our uncertainty) and the "unknown unknowns" (i.e., important aspects of the world that we incorrectly omitted from our models). Using anomaly detection as a tool, I have been studying methods for detecting novel classes in supervised learning (the "open category" problem) and novel subspaces in reinforcement learning.

My AAAI Presidential Address surveyed the many issues involved here. https://www.aaai.org/ojs/index.php/aimagazine/article/view/2756.

Prof. Dr. Max Welling
Research Chair in Machine Learning, University of Amsterdam

Responsible AI to Make the World a Better Place
It is by now very clear that AI will transform the world we live in. It has the potential to make the world safer, with less traffic accidents, less people dying unnecessarily from disease, and less crime. With the help of AI we can educate people who never enjoyed education before and we can unlock information for everyone in the world. AI can improve agriculture and help to reduce the number of children that have to go to bed hungry.

At the same time, a potent technology like AI has its dark sides. Data provides power, and in the hands of the wrong people it leads to manipulation and extortion. AI can also lead to discrimination and inequality. Hence, we stand at a crossroads where we need to develop AI technology responsibly, and use it to create a better world for our children.

Think big and think responsibly! You live in a time where an individual can literally save millions of lives by developing new technologies for diagnosing disease or improving crop yields. These are extraordinary times and I am convinced that Africa will play a major role in shaping our future with AI.

Dr. Welling has appointments at the University of California, Irvine and at the Canadian Institute for Advanced Research

Dr. Stephen Odaibo, MD

CEO & Founder of RETINA-AI, USA

The Only Ophthalmologist and Retina Specialist in the world with Advanced degrees in both Mathematics and Computer Science

Artificial Intelligence in Retinal Disease

I have long been fascinated by Neuroscience and how the brain works. I topped my class at Duke University School of Medicine in Neurology primarily because of the depth of my interest. In addition, I obtained advanced degrees in Mathematics and Computer Science, and I am the only board-certified ophthalmologist in the world with these qualifications.

Clinically, I chose to specialize in the most fascinating part of the human nervous system-—the retina. There's a theme here. Interestingly, convolutional neural networks which are the workhorse of AI are modeled after the visual nervous system. The future of science and computing is exciting, and I am astonished daily by these connections.

My company, RETINA-AI, is using artificial intelligence to build autonomous diagnostic systems for retinal diseases. There are currently too few retina specialists in the world, and we are using AI to provide specialized care to more people in the world. The upcoming progress of AI in healthcare over the next two to five years will be absolutely stunning. I am thrilled to be living at this time in history, as the fourth industrial revolution begins.

In July 2018, Retina-AI has developed and released the first Artificial Intelligence mobile app for eyecare providers. The app, Fluid Intelligence detects macula edema and sub-retinal fluid on O.C.T retinal scans with greater than ninety percent accuracy.

https://www.prnewswire.com/news-releases/retina-ai-releases-the-first-artificial-intelligence-mobile-app-for-eye-care-providers-fluid-intelligence-by-retina-ai-300681891.html

Dr. Jacques Ludik

Founder and President, MIIA,
Founder and CEO, Cortex Logic, South Africa

As a smart technology entrepreneur, AI expert, investor, and ecosystem builder that is driven by a massive transformative purpose to help shape a better future in the Smart Technology Era, I've been fortunate to not only have my whole career shaped by AI and related smart technologies (I also did my PhD and MSc in AI/machine learning), but have witnessed firsthand the impact of AI on real-world applications through my business ventures (helping to operationalize AI for companies to increase revenues, reduce risks and save costs).
AI is an exponentially transformative technology that can be used to help shape a better society for everyone.

Apart from the wonderful learning experience, it has been a rewarding career so far that started as AI researcher and academic at Stellenbosch University before embarking on my entrepreneurial journey in applying AI/Machine Learning across multiple industries around the world via CSense Systems, the first AI software and solutions company on the African continent that was sold to a multi-national company (GE), multi-national corporate experience and Silicon Valley exposure at GE as Big Data & Analytics Leader and Director of GE Intelligent Platforms, as Vice President Data Science and CDO at Jumo to help build the next generation mobile money marketplace in Africa and other emerging markets, and currently, CortexLogic, an AI software and solutions company that provides an AI Engine for Business to solve strategic and operationally relevant problems through operationalizing AI and delivering state-of-the-art AI-based applications, solutions and products. I also founded the MachineIntelligence Institute of Africa (MIIA) as a non-profit organization to be an innovative community and accelerator for AI and Data Science Research and Applications to help transform Africa (making a contribution to help ensuring that the continent and its people is not left behind).

Adewale Akinfaderin

Graduate Researcher at Florida State University and the National High Magnetic Field Laboratory in USA; Incoming Senior Data Scientist, Lowe's Inc, USA.

From Physics to Artificial Intelligence

I have been a physicist for most of my life, and I have been involved in different research areas including Nuclear Physics and Experimental Condensed Matter Physics. I studied physics because I wanted to work on interesting, fundamental, and interdisciplinary problems. As time goes on, I am learning to take a broader approach towards making an impact.

I believe that machine learning is a comprehensive tool for probing statistical irregularities and building impeccable data-driven applications. During the second half of the 20th century, most traditional AI systems were either very limited in scope, strictly based on using approximate solutions, or both. However, this millennium has brought substantial growth in the field of AI due to increased processing power by graphics processing units, the robust development of advanced algorithms and the exponential explosion of available data. This rapid growth and the ubiquity of AI have drawn physicists to use it as a problem-solving tool. Analysis of massive amounts of experimental data from the Large Hadron Collider are being sped up with the use of AI, and neural networks are being trained to unravel the mystery of the universe with unconventional data from large astronomical telescopes.

With the total daily generated data exceeding the exabyte scale there is a lot of value to be unlocked in e-commerce, healthcare, agriculture and financial technology. Making informed decisions, having a real impact on some of the grand challenges posed to humanity, and the expansion of the field beyond current scientific and business applications are some of the factors that excite me about artificial intelligence.

Olu Akanmu
Executive Director of Retail Banking, First City Monument Bank

AI's Critical Role in Driving Financial Inclusion and Lifting Millions Out of Poverty

One of the key challenges of decision-making in banking is the management of uncertainty. This uncertainty is manifested in what we call risk, the certainty or uncertainly that borrowers will pay back their loans on the schedule of the lending contract. The capability to manage this uncertainty and take good lending decisions tend to be limited to the data that we have about the business, the individual borrower, and some macroeconomic data. Because data availability is limited and tends to be available disproportionately at the top end of industry and consumer markets relative to the lower ends, it implies that access to credit is largely limited. This limitation becomes compounded in a developing country where data availability is far less pervasive. Yet if we are to lift more of our people out of poverty, it is important that we create a financial intermediation system that enables more people to access their future income in the form of credit so they can meet their short-term funding needs, invest and create wealth for themselves for tomorrow.

The risk of uncertainty is further compounded when it is dynamic, driven by multiple and sometimes complex variables. Human judgment in taking risk decisions and managing these uncertainties become very limited. To play safe in dynamic uncertainty the financial services industry will typically narrow the scope of decisions, which further implies restricted access to credit.

With artificial intelligence, the financial service industry can use dynamic proxy data that are increasingly pervasive in the environment and the ecosystem, along with its own proprietary information, to take smarter decisions and manage the uncertainty of risk decisions sharply and smartly. That is the place of algorithms and dynamic rules-based decisions that humans on their own cannot take. Even if they can, they cannot do this in real time. The capacity of artificial intelligence to dynamically improve on decision-making as real-time data is generated, with all the potentials for real-time learning, cannot be matched by human experts.

The implications of these factors are two-fold. First, we can take decisions more smartly in real-time. Second, we can also scale up our decisions such as lending and investment more quickly while also taking smarter decisions. The application and implication of this is that artificial intelligence will enable more people to access credit than ever before. It will enable the financial services industry to price its risks more appropriately and by context, even in the micro context of individuals and in specific occasions. This will ensure that risk pricing is more targeted and that returns actually match the risk of lending and investment decisions.

A broader access to credit driven by the use of smart artificial intelligence technologies implies that we can lift more of our people out of poverty, make banking more socially relevant and ensuring a more inclusive society of shared prosperity.

Dr. Victor Odumuyiwa

Senior Lecturer, Computer Science Department, University of Lagos

I spent almost eight years working on models, methods and technologies to support explicit collaboration among humans, and I discovered that the knowledge expressed during explicit collaboration could be harnessed using AI to support implicit collaboration.

That was the beginning of my journey into text mining and natural language processing. Making machines to determine the meaning of text and making sense of it for automatic decision-making became my primary interest. I have been looking at this from different perspectives and for different applications. Together with my team, we have looked at using clustering algorithms for web usage mining, using model based approach for collaborative filtering in recommender systems, using classification algorithms for sentiment analysis of data generated on social media platforms, and visualizing single and multiple documents using topic modeling algorithms such as Latent Dirichlet Allocation. A lot of data generated either from sensors or from applications are in textual form.

Applying AI (machine learning) to natural language processing and to extract knowledge from textual document collections promises many opportunities for academia and industry.

Kathleen Siminyu

Head of Data Science, Africa's Talking,
Nairobi Women in Machine Learning &
Data Science, and Board Member of ADA-AI

For me, Artificial Intelligence (AI) presents an opportunity for Africa to take control of its future. Allow me to explain. My entry into the field of Data Science, and more generally AI, came about by chance. I studied Mathematics and Computer Science for my undergraduate degree, and while searching for a field within which to do a final year project I stumbled upon data science. After school, I secured an internship as a Data Scientist and never looked back. I was not particularly well prepared for the job, but as material is freely and readily available online, and I was constantly presented with questions and problems that Data Science could solve, I learned a lot on the job while practically implementing solutions. I haven't solved any major world issues using AI (yet), but I am well equipped to participate in the AI economy. I daresay there are many people like me who with a little direction and enough desire can prepare themselves to do the same.

My career thus far has presented opportunities to take part in local and international forums where AI is the overarching theme and I have noticed that the depth and quality of discussions greatly varies. Locally, we are excited about the new technology and the endless possibility it entails. We are eager to gain new skills and there are many initiatives, grassroots and otherwise, addressing this need. Internationally, widely discussed themes that are conspicuously absent in local discourses about AI are issues of ethics, inclusion and regulation.

Let us not forget, as we arm our people with technical skills, that the AI economy will affect our lives in varied aspects, possibly more than we can currently imagine, and be aware that although positive effects are widely spoken of and emphasized, adverse effects can be very damaging. We have a chance to "leapfrog" ahead of the typical growth patterns experienced and observed elsewhere in the world, but we can only do this by really examining our context, thinking out of the box, and empowering as many people as we can, first through education.

Dr. Sulaimon Afolabi
Lead Data Scientist, Argility, South Africa

What does artificial intelligence (AI) mean to someone coming from a multidisciplinary background spanning demography, statistics, mathematics, economics, geography, public health, research methods, data management and modelling with many years of practical experience in programming, database management, application and website development? And at the forefront of implementing machine and deep learning techniques, which are the integral components of AI?

To me, AI is having an edge in my field of study. For instance, in demography, I can leverage a vision-equipped AI drone to aerially count the number of people living in a geographically delimited area by simply asking them to come outside on a particular date, thereby minimising the costs and time that are associated with such a task and the inaccuracy due that often occurs due to inaccessibility of certain areas.

AI is also a proactive system of detecting anomaly in human behaviour and our world. The fact is that human ways of doing things are always changing. In banking, an AI equipped system is capable of raising an alarm when it notices an unusual pattern of transactions. Similarly, in the health sciences AI can detect new diseases or infections.

AI is taking risks without fear of injuries and loss of human life. An AI equipped robot can perform a task that would involve huge risks to humans, e.g. bomb detonation.

AI means averting the consequences of human error. Studies have shown that human error is a major cause of road accidents across the globe. The AI solution, which entails self-driving cars, will go a long way in averting the results of mistakes made by humans driving cars.

Celina Lee
Financial Inclusion Principal at Ixio Analytics and Lead at Zindi

Data science and AI are fast growing fields that impact almost every aspect of human endeavour. This includes banking, insurance, retailing, town planning, health care, poverty alleviation, energy, stock market trading, recruitment, transportation and election campaigns, to name a few.

The world's population of (currently) 7.3 billion people is expected to grow to 11.2 billion by the turn of the century. Of the population increase, 83% is expected to come from Africa. The demand for everything from water to food to clean air will increase exponentially. Without smart and innovative solutions to deal with such an unprecedented demand for resources and services, Africa's future is at risk.

In an increasingly digital and interconnected world, data science and AI are no longer 'nice to haves'. They are critical parts of any viable business or developmental strategy. This is particularly true in Africa, where the looming demographic explosion makes it imperative that governments, companies, and society at large embrace data-led solutions now. By leveraging AI smartly African businesses and governments can supplement, boost and improve our people's skills, make services and products more inclusive, and solve our continent's greatest large-scale challenges including poverty and access to resources and services. AI systems are built on the data supplied by humans, with their inherent biases and subjectivity. In building for the future, we need to actively ensure that we remove biases, improve diversity in AI, and create systems that are more inclusive.

We need African AI solutions for African problems. It's for this reason that I'm passionate about building a vibrant community of data scientists across Africa who will apply their skills to the region's most pressing problems.

Megan Yates
Founder and Chief Scientist of Ixio Analytics

The year 2012 was not too long ago. In the six years since then we have a seen a huge shift, globally, as well as in Africa, in companies using data science and AI to fundamentally change how they do business. Back in 2012, I was an Evolutionary Biologist armed with skills in applied maths, statistics and machine learning, and started a consulting business in data science (then a freshly coined job). At that time, tools and topics such as R, Python, data science and machine learning were unknowns to business leaders, and I spent much of my time in those early years educating clients on the work I did and its potential in their businesses.

Fast forward to 2018 and most corporations in Africa are now acutely aware that they need to leverage data science and AI or risk being left behind. Beyond that; AI has worked its way into being a hot household topic. Its increasing use and infiltration into our daily lives has led to questions and debates on the ethics of data usage and AI. This is unfamiliar to many people and has the potential for harm if used by players with ill intentions.

AI also brings much potential for innovation and excitement and holds the promise of shaping our future for the better if used wisely. The potential for good and improvement through AI in nearly every industry is overwhelming. From self-driving cars, translation services, virtual assistants, error detection in manufacturing, the early detection and diagnosis of illnesses, and detecting fraud to taking over risky or dangerous jobs, AI can make our lives easier and more fulfilling and help to solve some of society's most pressing problems. I'm excited to be part of this revolution and committed to building data science and AI excellence in Africa.

Emeka Okoye
Semantic Web Engineer and Architect, Cymantiks Limited, Nigeria

The World Wide Web (WWW), aka "the web", has lots of data and information which represents ideas, facts, research, experiences and answers from developed economies that could unlock solutions for most of Africa's problems. The thing about the Web is that it has developed the ability to harness knowledge from multiple sources, the collective input and intelligence of people online, thus enabling the sharing, discovery, reuse and integration of data economically. It also enables powerful economic ecosystems that can be domiciled in Africa. Knowledge often comes from multiple sources and must be integrated.

The problem with all this data is that it is now more complex and humans cannot keep up, resulting in too much information to be processed. Machines using Artificial Intelligence (AI) algorithms are needed to do most of the heavy lifting on behalf of humans. AI, Intelligence from computer programs which enables machines perform tasks like humans, can be trained with this data, thus allowing it to learn to get better and enabling them to handle increasingly sophisticated tasks.

The aggregated data and machines can produce insights that can improve social, political and economic intelligence for Africa's development. AI can accelerate innovation and productivity thereby transforming the African economies. Scientists from all fields will research, develop, test and accurately assess hypotheses in a fraction of the time consumed today using the identical process. Machine learning algorithms and mechanical simulations will automatically produce designs, optimize existing products and create entirely new inventions.

AI is a confluence of many technologies including Natural Language Processing (NLP), Machine Learning, Data Analytics and Probabilistic Reasoning, which combine to interact, learn, and make decisions in much the same way as a human does.

AI will play a growing role in helping Africa to find solutions to some of its most

pressing problems: finding cures for diseases, improving food security and access to water, and making cities safer.

Olumide Olayinka
Partner and Lead for Data & Analytics, KPMG Nigeria

Artificial Intelligence in the Business Enterprise

Artificial Intelligence (AI) is the next frontier of technology as it applies to business and many areas of everyday life. It is man and machine combined to drive efficiency to never before attained levels of performance in practically everything—business, government, social enterprises and even personal life. In business, AI requires an ecosystem that unlocks value by accelerating, automating, and augmenting decisions that drive the growth and profitability of the enterprise.

I believe that AI will enable humans to achieve and manage precise consistency, and to leverage the knowledge and insights of the most experienced subject matter specialists. Realizing the promise of AI requires more than just technology. Its power must be grounded on a foundation of trusted data and analytics, and deep-rooted domain knowledge.

There are a number of key lessons that can be learnt from the AI journey in the business environment. First, the power of good data should never be underestimated. Sufficient volumes of quality data must exist to train models properly. Ensuring the accessibility and availability of data can help scientists to build accurate solutions.

The second lesson is that businesses can produce more with the same number of people. AI can be leveraged to reduce the administrative task load of employees through automation, freeing them up to perform high-value tactical and strategic work. Equally as important, AI can be used to drive insights and detect issues and opportunities in data that is too large for traditional approaches to effectively accomplish meaningful results.

Notwithstanding the promise AI holds, enthusiasts need to understand that AI solutions are not plug and play. While many application programming interfaces and prebuilt platforms are great accelerators, most solutions also require custom programming and training to attain the target accuracy and results. Long-term efficient models need to be well trained and improved over time.
      Above all, to be fully relevant for business, AI needs to have a commercially-

inclined application. At the end of the day businesses are established for profit, so it is important that the cost to implement AI is balanced against the expected return on investment from the outset. For most businesses, prioritizing back-office computer-to-computer interaction use case studies; internet technology, finance, and accounting are particularly good places to start. These applications are currently driving high value and do not put customers at risk while organizations are developing their AI acumen and early solutions.

I believe the vision of AI expanding the spectrum of human cognition and capabilities can only be realized when the technology is paired with the ability to develop and train the algorithms to address specific problems. This ability also has to be grounded in domain expertise, industry insight, well-established AI frameworks, and uses technically skilled data scientist and engineering resources.

AI has numerous benefits. It has also created credible fears. A sizeable proportion of observers believe that AI will destroy jobs and render humans redundant. Forester Research predicted that AI will change almost every job category by at least 25 percent.

However, I believe that AI will not destroy jobs in the manner that has been predicted. As a matter of fact, it will create jobs for those who leverage their AI capability to replace current jobs, and more importantly AI will free up humans to focus on more value-adding roles in business enterprises. Come to think of it, the three eras of industrialization before now (the steam engine, the age of science and mass production, and the rise of internet technology) have created more jobs than they supposedly destroyed. I believe that the fourth industrial revolution, the age of data and artificial intelligence, will be no different. Humans should have nothing to fear!

In summary, I believe we have only barely touched on the mind-blowing capabilities that AI can deliver to business enterprises. In a matter of time, we will come to recognize this period in the annals of human history as the turning point in the rise of humans, with man and machine working together for enhanced productivity like never before.

Vukosi Marivate
and Nyalleng Moorosi

ABSA Chair of Data Science and Senior Lecturer,
University of Pretoria; Senior Researcher, Data Science, CSIR, South Africa

What Does AI Mean to Us?

Artificial Intelligence (AI) is more than just automation. It is a collaboration between man and machine. Through Machine Learning (ML), we aim to create algorithms that can teach machines to "think". At the same time, we learn from how machines learn, both the successes and the challenges. Artificial Intelligence enriches our understanding of ourselves, allowing us to delve deeper into concepts such as uncertainty. When a machine learns, it has to, in one way or another, encode when it is uncertain about information or actions it has to take. This highlights how, as humans, we should also find ways to deal with uncertainty in a systematic manner. AI as a tool is at its best at the intersection of subject matter experts (agriculture, sociology, economics etc.) and AI/ML experts. As such, many of us have a role to play in this multidisciplinary world. From an African perspective, we need to shape our AI development path. We need to encode our values, our thought processes and own measures of success in order for it to really make out dent and mark. Just looking at Machine Learning, there are many opportunities to look at societal challenges.

We might have started learning about AI to better understand how the world works, using it as a framework to recreate how we think and as such extend ourselves into machines. Whatever brought you to start this journey, know that there are many layers to AI and its connected subfields. It can be frustrating at first, but the reward in seeing your creations and innovations is immeasurable. There is still much to do, much to learn together, and lots of problems in society to tackle. AI/ML uses in Data Science highlight it as a way of using the abundant (and sometimes not so abundant) data in order to assist others in decision-making.

Uzoma Dozie
CEO, Diamond Bank

Artificial Intelligence and Banking 3.0

Artificial intelligence (AI) is entering the mainstream at different paces for different industries with the banking/financial services industry leading the end-to-end application, as indicated in a survey in Narrative Science that 32% of financial institutions are using AI technologies for multiple banking purposes, and more than half of non-adopters plan to embrace AI by the end of 2018.

Let's zero in on the operational and conceptual meaning of artificial intelligence. What springs to mind is two words: freedom and help. Artificial Intelligence is going to help us provide better service at a lower cost and create a higher level of customer experience. According to an Autonomous recent publication, AI adoption will save the industry as much as $1 trillion —that is a 22% cost reduction in operating expenses, with most of the savings coming from the front office.

Artificial Intelligence will help to process transactions faster than humans can, with a minimum of errors and a fraction of the cost. People that we couldn't provide financial services to, either because of cost or the level of service required, will now benefit from services that extend beyond banking. The combination of mobile phone technology and AI allows us to use structured and unstructured data to better profile and offer advice and suggestions to all customers irrespective of their income levels.

This will truly enhance customer experiences. Artificial intelligence also offers freedom, with all these resources that have been freed from mundane, repetitive but important activities that will always be better performed by machines—what will they do? They will do things that machines can't do better than humans yet. They will create new experiences and design content to enhance experience and learning. They will have time to lead, think and manage people and teams. AI will free us to reach more people and help to provide better service and experiences.

As a bank, we have launched an AI chatbot named Ada to provide a human-like interaction and personalised experience to our customers. Ada uses advanced machine learning to learn from past interactions, and thus the bank can offer more relevant and timely solutions that are really simple for customers to use. Ada enables transactions such as airtime purchases, bill payments, stock trading, and money transfers all via a social network platform.

Indeed, the future is AI and I believe that data and technology have the power to transform Nigeria's economy as we digitise the mobile banking process and create an increasingly customized mobile banking experience for millions of Nigerians, while deepening financial literacy and building trust and transparency in our ecosystem.

Sakinat Folorunso PhD

The Department of Mathematical Sciences,
Olabisi Onabanjo University, Nigeria

Intelligence is the ability to think and understand new ideas, to perceive new environments, to learn from the past (heuristics) and to reason conceptually. Artificial Intelligence (AI) refers to making machines adapt to human intelligence. AI makes machines do things that would otherwise require the intelligence of humans.

Machine Learning (ML) is a subfield of AI. It deals with pattern recognition and the discovery of hidden information in data to support decision-making and building intelligent machines. It simply turns data 'dust' to 'gold'. It draws inferences from known information (seen data) to unknown (unseen data) through algorithms and building models. Some of these models are designed after the natural ways of solving problems, like a tree with roots and branches (Decision Tree, Random Tree), a Forest which is an ensemble of Trees (Random Forest, Extra Trees, Bagging), the Brain Network (Artificial Neural Network).

Furthermore, ML modelling requires data in diverse forms, such as (images, text) and shapes (vectors, N-dimensional). For example, data collected through the Internet of Things could be used to build intelligent systems in homes, schools, healthcare and more via wearable devices using machine learning algorithms and models. There is, however, a serious challenge when building models to learn these massive datasets and trying to infer new knowledge from the system or phenomenon that created these data. Sometimes these models are adaptable or can be built from scratch to solve real life problems; human analysts cannot process and comprehend such datasets unless they have special computational tools at their disposal.

ML being interdisciplinary, it's application analysis is eating deep into many expert domains like sport, chemistry, lottery, medicine, pharmacy, agriculture and so on.

My research spans building some models for the classification of imbalance

datasets (diabetes, West African Education Council/National Examination Council results, contraceptive use and the tuberculosis dataset). These datasets were collected for research purposes, but the classification performances of these datasets were sub-optimal because they were imbalanced. In recent times, my research has focused on building deep learning models for image identification and classification (such as plant species identification and identification using plant leaves) and bird identification, and single- and multi-target models for social good.

Timnit Gebru PhD

Postdoctoral Researcher at Microsoft Research, USA
Co-Founder of Black-In-AI

My work involves using deep learning and Google Street View to estimate the demographic make-up of neighborhoods across the United States. Targeted socio-economic policies require an accurate understanding of a country's demographic make-up. To that end, the United States spends more than 1 billion dollars a year gathering census data such as race, gender, education, occupation and unemployment rates. Compared to the traditional method of collecting surveys over many years, which is costly and labor intensive, data-driven machine learning approaches are cheaper and faster with the potential ability to detect trends in close to real time.

In this work, we leverage the ubiquity of Google Street View images and develop a computer vision pipeline to predict incomes, per capita carbon emissions, crime rates and other city attributes from a single source of publicly available visual data. We first detect cars using 50 million images in 200 of the largest US cities and train a model to determine demographic attributes using the car images. To facilitate our work we used a graph-based algorithm to collect the largest and most challenging fine-grained dataset reported to date consisting of over 2,600 classes of cars comprised of images from Google Street View and other web sources.

Our prediction results correlate well with ground truth income, race, education, voting, sources that have investigated crime rates, income segregation, per capita carbon emissions, and other market research. Finally, we learn interesting relationships between cars and neighborhoods, allowing us to perform the first large scale sociological analysis of cities using computer vision techniques. One can imagine using multiple objects such as trees, clothes, houses or people themselves to further extend this analysis and improve its accuracy. In the developing world, where gathering census or other data is even more costly, an approach similar to ours could be used to gain valuable insights.

Kazeem Tewogbade

Managing Director/Co-Founder, Bluechip Technologies Limited

Artificial Intelligence Experts and Domain Subject Matter Experts

If we are to look at AI as a problem-solving discipline it means that problems and problem contexts are twin elements, and that understanding and modeling them are as important as AI itself. Using AI to solve a problem requires that the problem is first identified and analyzed. Sometimes problem analysis might reveal a do-nothing resolution. Who better identifies and analyses problems in a field than the subject matter experts in that field? AI is beyond simple applications. There exists a wide array of complex problems to which AI can be applied, areas such as language translation, advanced robotics, image processing, manufacturing, or even trying to determine faster ways to identify cancerous cells in humans.

These types of complex problems highlight the critical importance of understanding the problem before developing an AI application strategy, both to understand the potential risks and to be able to most effectively break the problem down into smaller, more manageable pieces. This is where the handshake between AI programmers/data scientists and the domain subject matter experts (SMEs) comes into play. An AI model can learn to solve each sub-concept before combining all of the trained sub-concepts to meet the end goal. The subject matter expert is able to break down a complicated problem and teach an AI model how to solve it just as a human would, piece by piece. No matter how experienced you are as an AI programmer/data scientist, without detailed insights and information of the intricacies, constraints, build-up, and technicalities of the problem you cannot develop a solution to the problem. Therefore, the importance of this interaction and handshake cannot be over-emphasized.

Interestingly, domain SMEs are also becoming AI professionals. I believe this path is easier as it is much less daunting for an ophthalmologist to be a data scientist than for the reverse to happen. Application domain knowledge areas such as AI tend to be more industrialized and commoditized, hence its lower barrier to understanding. Should domain SMEs with AI knowledge now go it

alone? No. Problem-solving is actually a project management endeavor centered on solving a particular problem, implying that there will be people with varied and specific skills making up the project team. Additionally, for specific problems, a great level of expertise is needed on the AI side that an SME may not possess. Therefore, AI experts and SMEs should always work together on a project with other relevant professionals adopting best practice project management approaches to solve real life problems.

Ade Bajomo

Executive Director for Information Technology/Operations, Access Bank Plc.

Africa largely did not participate in the science, engineering and technology that drove the first to third industrial revolutions and is now somewhat stuck, in development terms, between the three revolutions. The fourth industrial revolution presents a new opportunity for Africans to participate in driving and shaping cutting-edge science, technology and innovations using cloud computing, the Internet of Things, and the vast amount of data now available and still growing exponentially; and more excitingly, to find African solutions to African and global problems whilst contributing to the development of science, technology and humanity at large.

Artificial Intelligence (AI) will enable this to happen at the speed of the technologies available in the fourth industrial revolution, leveraged by Africans, and thereby facilitating agile, intelligent, competitive insights and solutions to solve socio-economic issues as well as drive entrepreneurship and development within the continent and across the world.

My dream is for Africans to commoditise AI applications, in the broadest sense, leveraging AI's large and growing population, and in particular the youths, to proffer solutions that will position the continent to not only reap the benefits of this revolution but to be positioned to lead the fifth Industrial revolution.

Rediet Abebe
Co-Founder, Black-In-AI

AI is a set of powerful techniques that can be used to solve problems that are of importance to us. The problems that I am most interested in addressing revolve around improving access to opportunity, especially for communities of people for whom opportunities have been historically limited. Such problems fall under various domains, including health, economic inequality, and issues common to the developing world. For instance, in work with researchers at Microsoft and Stony Brook [2], we use topic modeling and Bing search data to understand and quantify health information needs of individuals in all 54 African nations. We highlight needs including inquiries about malaria symptoms, concerns about HIV/AIDS stigma, and beliefs in natural cures and remedies. In other projects, I use algorithmic and computational techniques to model the role of financial shocks and social capital in economic welfare, while also proposing interventions to mitigate disparities.

AI is also an opportunity to work jointly with many other fields, learning from them as we address these challenges together. The above line of work requires not only computational expertise, but also a grounding in the social sciences and ongoing collaborations with non-academic stakeholders. These problems are not purely technical and AI researchers are uniquely positioned to engage deeply with our specific domains of interest, play an instrumental role in scientific advances, and impact the everyday lives of individuals. To create one such opportunity, Kira Goldner and I co-founded and co-organize the Mechanism Design for Social Good research group, an interdisciplinary network of researchers who work on algorithmic and mechanism design problems to improve societal welfare [3, 4]. This group fosters collaborations among researchers from various fields and facilitates conversations with various stakeholders including policy-makers, NGOs, and other institutions with a shared mission.

Last, but not least, AI is a group of individuals with enormous impact on many technological advances -- individuals who determine what the AI community should focus on and how. It is therefore crucial that this group is representative

of all of society. Black in AI, which I have had the privilege of co-founding and co-organizing with colleagues including Moustapha Cisse and Timnit Gebru [1], is an initiative aimed at ensuring the representation of Black and African individuals in the field. Groups like Black in AI and Data Science Nigeria will go a long way towards increasing the presence and inclusion of Black and African researchers and practitioners in the field.

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Moses & John Olafenwa
Creator of ImageAI, Computer Vision and Deep Learning Researcher and Developer, Co-Founder and Chief Executive Officer of AI Commons Global Limited

Creator of TorchFusion, Machine Learning Engineer and Deep Learning Researcher, Co-Founder and Chief Technical Officer of AI Commons Global Limited.

Artificial Intelligence (AI) is an assistive technology that, when combined with human skills, can enable us to solve large scale problems that were previously impossible to solve.

Throughout history, technological innovations have led to significant advances and industrialization. Great inventions have led to rapid advances in the ways we live, communicate and work.

However, all previous inventions lacked automation. On the other hand, artificial intelligence has enabled the creation of systems that can combine the computational power of machines with near human intelligence, enabling for the first time, the creation of driverless cars and fully automated factories.

This holds incredible promise, for a number of reasons. First, computers are excellent at computation at scales that are not feasible for humans to operate. Computers are capable of solving extraordinarily complex logic problems and processing very large information sets in ways humans cannot. Humans, on the other hand, can perceive with extraordinary intelligence. We can interpret very ambiguous and diverse signals that cannot be directly expressed through computer algorithms. Humans are also very able to imagine and create new things in ways that classical-machine systems cannot. Artificial Intelligence seeks to combine the best of the computation powers of machines with the perception and creativity of human intelligence. This enables us to solve problems with systems that are neither bounded with the inability of humans to process information at large scales nor the inability of machines to

perceive and anticipate the future.

The end results of this will be: incredible advances in transportation systems, healthcare, public administration, methods of delivering of education, agriculture, manufacturing, and virtually every single aspect of human life.

At AI Commons, our team is poised to advance and democratise artificial intelligence by developing AI tools, and publishing books and tutorials that will empower people in all walks of life to use and benefit from artificial intelligence.

Robert John
Machine Learning Google Developer Expert ,
CTO CoLab, Kaduna

The field of Artificial Intelligence (AI) is characterized by the quest to make computers attain a certain cognition that is distinctly different from that of humans. My focus is on a sub-field called Machine Learning (ML), which is concerned with making computers take decisions based on historical data. ML is made possible today because we have been able to collect a lot of examples of the information that we are interested in, coupled with the fact that computers have become very powerful at processing the collected data. As a result, we are able to extract patterns from the data that was collected, and consequently build mathematical models that are able to make decisions without our having to write a long list of explicit rules for the computer programs to follow.

The field of AI has made it easier for automotive and aerospace manufacturers to detect when components are about to fail, and for financial institutions to detect fraud in transactions. It has made it possible for retailers to forecast demand, and for individuals to upload images of items they would like to purchase or sell, and to get indicative pricing. But Artificial Intelligence is not a silver bullet. Not everything is an AI problem. However, anyone who is fascinated by data, and has access to really large amounts of data, will almost always be led in that direction. The need for predictive and prescriptive analytics inevitably leads to us wanting to utilize that data to build solutions to problems that lend themselves to the AI approach. It's important to highlight the role that data plays in all of this.

For AI to have a stronghold in our communities, we must develop the culture of storing and sharing data openly after removing any identifying data.

Karim Beguir
Co-founder and CEO, InstaDeep

I grew up in a small town at the limits of the Sahara. Like so many cities in Africa, there were few opportunities. For that reason, books and knowledge became everything for me. As a teenager, I cherished the wartime stories of Alan Turing. How a few inspired mathematicians and engineers invented the first computer, broke Enigma codes during the war and made such a huge difference in history, convinced me to follow my heart and focus on applied mathematics.

Artificial Intelligence to me is the ultimate invention of applied mathematics, a fascinating scientific adventure and an immensely powerful, history-shaping technology.
If Alan Turing were alive today, he would be amazed that Chess, for which he wrote the first playing program, could be mastered by a self-learning AI starting from scratch in just four hours! Yet this is just the beginning: Artificial Intelligence is powered by a triple exponential as available compute (doubling every 4 months), data (doubling every 2 years) and algorithms (improving constantly) boost each other. And we're still far from the fundamental physical limits of computing: many more breakthroughs are a certainty.

What is less certain is its impact. For Africa, AI is both a big threat and a big opportunity. AI is a threat because intelligent machines and clean energy will make our existing economic models, built on cheap human labour and natural resources like oil and gas, obsolete. AI is an opportunity because in our connected world all it takes to start acquiring AI superpowers is an internet connection and unlimited thirst for knowledge.

Can we rise up to this historical occasion? I strongly believe that we can and I dropped everything to co-found InstaDeep, an African AI start-up designed to enable Africans to develop world-class AI by themselves, and make its tremendous benefits more widely shared in our communities.

Prosper Otemuyiwa

Author, Speaker, Developer and Community building at
@apollographql @meteorjs.
Leading @forLoopAfrica, @laravelnigeria & @ngnigeria

Mimicking human intelligence by putting machine learning to work is Artificial Intelligence. Google, Facebook, Microsoft, Apple and several other companies now employ AI in ways that make day-to-day work easier for users. I'll highlight core examples that we come across daily but downplay how immensely integrated it is in our lives.

Apple is using AI to make Siri smarter. Siri is the voice personal assistant that ships with iPhones. You can communicate with Siri like you do your fellow humans, request for any action on your phone and also ask it to provide you answers to certain questions. Google prides itself now as an AI-first company and this reflects strongly in virtually all their products. Google Self-driving cars are powered by AI. Google Home that allows you talk to it to power your home, and provide answers to whatever questions you ask it is also powered by AI. Google Assistant uses AI to support over 20 languages, book appointments on your behalf, talk to the person on the other end, and add it to your calendar automatically!

I've used Gmail Smart Reply too many times to save me time and keystrokes. The power of AI makes it possible to suggest smart replies based on the content of an email. In my experience, Artificial Intelligence creates an enabling platform that powers processes that would require intense Human Resources and efforts to accomplish. In the startup world, AI-powered chatbots have proven useful in replacing a plethora of customer/sales support personnel, which in turn lowers business running costs and allows founders to run a lean startup.

As positive and glamorous AI is, the negative sides can't be ignored. In the wrong hands, AI can do a lot of damage. I hope we can keep solving tomorrow's problems today!

Darlington Ahiale Akogo

Founder, Director of AI,
Deep Learning-Machine Learning Technologist
minoHealth, minoHealth AI Labs, GUDRA

I got excited about Artificial Intelligence very early on and by age 17, I was reading AI research papers like "Computing Machinery and Intelligence" by Alan Turing. The ideas presented in these papers and books made me obsessed about developing Artificial Intelligence. Right around then, I got frustrated about the many inefficiencies, lack of quality, affordability and accessibility in African Healthcare. Being someone driven by problem-solving, I started thinking about technological solutions to solve African healthcare. Living in Europe soon after made me more aware of how bad and unfair Healthcare in Africa was. Years later, this idea and passion evolved into minoHealth. Seeing the power of Deep Learning, I developed a multifaceted system that stores patient medical data in the cloud, uses Data Analysis to discover important health statistics and then uses Deep Learning and Machine Learning for Medical Forecasts, Diagnoses and Prognoses. This is what Artificial Intelligence means to me, that we can use it in addition with other complementary technologies to fix Healthcare in Africa. I founded minoHealth AI Labs so my team and I can research how AI can be used to save and improve lives, and also ensure Africa is contributing to AI Research. We explore AI applied to domains like Biotechnology, Nutrition/Dietetics, Optometry and Epidemiology. And with Gudra AI Studio, we've started exploring AI applied to areas like Agriculture, Education, Energy, Linguistics and Art.

As Western and Eastern countries are heavily invested in AI and the 4th Industrial Revolution because of the power of AI to solve large array of problems, and improve economies and the standard of living. I strongly believe we should be more invested in AI since Africa has some of the worst problems across multiple areas. My passionate mission is for us to solve African problems with AI, create advanced societies and make Africa one of the global powerhouses of AI. To achieve this, we'll have to be proactive and informed from Governments to the Private Sector, Academia and the General Public. So I advocate and educate on AI through seminars, lectures, mentorships, interviews and writings.

Taiwo A. Togun, PhD
Founder, SeqHub Analytics LLC, USA

There is an ever-growing and well-deserved hype about Artificial Intelligence. Everyday, and in all kinds of businesses, there is the promise and news of some new and fascinating innovation or application of AI. We enjoy and even take for granted e-mail spam filters; and virtual assistants like Apple's Siri, Amazon's Alexa, Microsoft's Cortana and Google's Duplex are becoming commonplace. AI is shaping our lives in ways that we have not seen before, and it is just the beginning!

I remember, as a graduate student at Yale, I was fascinated by the applications of machine learning algorithms to biological data, specifically high dimensional data from high-throughput genome sequencing (whole genome seq, RNA seq, exome seq, etc.). I was particularly interested in survival analysis and risk stratification of cancer patients as well as elucidation of key genomic drivers (be it single nucleotide polymorsphisms, genes, proteins, regions of the DNA, or even entire pathways of genes) of the disease. Oh how gratifying and powerful it felt to not only understand but be able to combine traditional statistical methods with machine learning techniques adapted for survival analysis (in which the goal is to analyze and model vast amounts of data where the outcome is the time until the occurrence of an event of interest - often disease progression or death!) I remember studying Random Survival Forests and other Ensemble survival methods; and probing minimal depths of maximal subtrees as measures of predictiveness of a gene or genomic variable for survival.

Indeed, I have believed in the promise of machine learning techniques to revolutionize medicine since my graduate school days. However, my experience was only the tip of the iceberg, especially with the rapid growth that we have enjoyed and continue to enjoy in the field of AI, which encompasses much more than the machine learning tasks of perception from data and acting to achieve goals (often of prediction). Today, through remarkable dedication and relentless effort of exceptional minds in the field of AI, knowledge representation as sets of objects and relations, automated reasoning mimicking

human reasoning for logical deductions, natural language processing, autonomous learning and acting to solve intellectual tasks, and artificial general intelligence are goals that have been realized, or that are confidently within reach.

As a data scientist and entrepreneur leveraging machine learning techniques to help clients make the most of, and derive insight from data, it is exciting to be right at the center of the AI boom! Data and sources of data continue to grow and get richer, presenting an ever more fertile ground for machine learning and AI as a whole to thrive. We are able to integrate several sources of data to help clients in the hospitality industry forecast pertinent business outcomes such as occupancy and rates; we can detect fraudulent transactions and predict bad loans that are likely to default for banks; we can determine optimal portfolio of assets for wealth managers as well as predict/recommend optimal trading strategies; and, closer to where it started from for me, we can predict renal failure or kidney diseases from smart urinary catheters.

In many ways AI is indeed be the fourth industrial revolution, and it is exciting to be a part of it.

Dr Johnson Iyilade

CEO and Principal Data Science and Analytics Consultant,
Glomacs IT Solutions and Services, Canada

I believe we are living in exciting times, that technology is making it possible for us to solve many complex problems and challenges in many domains and to improve the quality of experience of users. The key driver of most of the recent technological breakthroughs is the availability of a massive volume of data. Besides, new tools and technologies are making it easier to store, process and analyze those data in order to gain valuable insights.

I have been a Computer Scientist all of my professional life. I have taken several courses in AI and Machine Learning. My first foray into AI begins with my undergraduate, masters, and doctoral research in the areas of Intelligent Software Agents. In Artificial Intelligence, an Intelligent Agent (IA) is an autonomous (software) entity that can observe through sensors and act upon an environment using actuators. An agent directs its activity towards achieving a predefined goal, which means, it is "rational" in its decision.

One of the challenges of training Intelligent Agents in those early days was a lack of enough data to train the agent. The system relies on ad-hoc, formulated sets of rules to determine the course of action to take. With the recent development of capability to collect, store, and process data about the environment the agent resides, it is now possible to train the agent to make sense of the environment and take data-driven actions autonomously.

With recent advances in Artificial Intelligence, it is now possible to harness software agents for natural language processing, computer vision, speech recognition, image and handwriting recognition, and robotics. The potential impacts and applications of all of these in diverse sectors and domains are enormous.

My company is based in Canada and we offer AI and data-driven solutions and services to corporations and governments. We help organizations drive their AI

and Data Analytics strategy. We have offered AI/Data Science trainings, thought-leadership and consultancy services to companies in Africa and North America. We have worked on AI and Data Science projects such as: an AI-based Question and Answer system, which helps users find information during a search; video content analytics for educational videos in order to determine the relevance of a video to different viewers; Deep Learning for Financial Risk and Loss Analysis/Forecasting; Facial Expression Analysis for digital assistance.

 Finally, I believe we have only scratched the surface of what is possible with AI and Data Science yet. However, all of these possibilities are not achievable without the required skillset and manpower. It is, therefore, important to invest in equipping and training the required manpower in our universities and corporations today so as to reap the full benefits and possibilities of AI tomorrow.

Shingai Manjengwa
Founder & CEO,
Fireside Analytics and Fireside Analytics Academy

Time to rethink education and build a pipeline of talent with future-proof skills

What do you want to be when you grow up? It's a question every child is asked to answer. Young children may likely respond with traditional jobs – firefighter, doctor, nurse, teacher or pilot. The emphasis on these job roles abounds, from literature to media and anecdotal experience. Indeed, even party costumes comply with tradition and provide tangible aspirations for children. But as students navigate years of schooling, few are exposed to the vast array of new jobs that the future may hold, or the skillsets they will need to be successful in traditional roles, given a new world with widely accessible connected technologies and Artificial Intelligence. We haven't yet figured out how to represent technology jobs in our daily life, nor in our conversations, our policies, or alas, even in our education systems.

Take this list of future jobs highlighted by Cindi Howson, Research VP for Data & Analytics at Gartner.

AI Expert
Chief Privacy Officer
Cyber Security Expert
Data Scientist
Ethicist

Presented at the Gartner CIO & IT Executive Summit in Toronto, 2018.

Not long ago, these jobs didn't exist, and they are just a few among many roles in modern organizations that are gaining in popularity as a direct result of an explosion in data from mobile technology, cloud computing, social media and advancements in artificial intelligence. These fields represent dramatic changes in the labour market, happening at an unprecedented rate. Our schools, our institutions, and our businesses must begin to answer the question: What job market will today's teenager face in 20 years? Our answers must account for

young people from all backgrounds and with diverse academic interests. In particular, we must account for the wave of young people from Africa in the next decade for Africa's social and economic prosperity and, stability. We must adopt a strategy to equip young people with tools to make them adaptable, entrepreneurial, creative and hopefully 'future-proof' in a more digital, automated and uncertain world.

Fireside Analytics is a Toronto-based Ed-Tech start-up that develops customized curricula and online courses in data science, analytics and, computer programming. We analyze data for clients and we work with schools, colleges, and private companies to make learning technology skills accessible to a variety of audiences. Our open courses on IBM's CognitiveClass.ai have over 250,000 registered learners and we have developed a data science program for high school students. High school learners from all over the world can start to learn future-proof skills online through our private high school in Canada, Fireside Analytics Academy.

Emmanuel Doro **PhD**

Principal Data Scientist, Jet.com, New York

With a background in computational engineering science, I spent the early years of my career implementing high performance solver algorithms for problems defined by deterministic laws. These were challenging problems that required copious domain knowledge in Applied Mathematics, Physics and numerics. For this, I was exposed to models describing different interesting phenomena in our physical world. I worked on real life problems that utilized these models as basis for approximate solutions. It was evident to me that my work contributed towards making a difference. But as I strove to engage in more advanced problem areas, I felt the outcome of my efforts became increasingly removed from practical real-world challenges – the reason work was gratifying in the first place. I was conflicted. It was against this backdrop that I embarked on my Machine Learning journey. I was fortunate to be in Silicon Valley at the outset of the latest AI revolution. This offered me a frontal view of the mammoth tech transformation ushering in a "new" programing paradigm.

Though my computation-heavy background made me a ready candidate for adoption, it was really my desire to work on impactful everyday challenges that planted me squarely in the AI space. As I quickly realized, AI problems are vast – from predictive search to applications in oncology research. They can be fun and extremely complex at the same time. They capture the uncertainties and biases inherent in our actions and interactions. They are typically governed by probabilistic laws. And their numerical solutions oftentimes involve elaborate engineering architectures that allow for extensive transformation of large datasets. It was a renaissance for me to discover this enchanting domain of applied science. Research and work became fun and fulfilling again. And I have not looked back since. Over the years, I have had the good fortune to work in Biotech, Social Media/Internet and currently E-commerce. And each passing day, I still marvel at the near limitless potentials of tech and AI to transform our world. For those driven to make a difference, we cannot ask for a better time.

10 REASONS WHY YOU SHOULD BE INTERESTED IN ARTIFICIAL INTELLIGENCE

1. China has published its first AI textbook for high school students as the country looks to an even younger generation than its current huge pool of college graduates to close the gap in the global AI talent war. The textbook, released in April and named "Fundamentals of Artificial Intelligence", was released about six months after China's State Council called for the inclusion of AI-related courses in primary and secondary education.

2. Deep Knowledge Venture (DKV), a Hong Kong-based venture capital company appointed its sixth board member, VITAL (Validating Investment Tool for Advancing Life sciences) to take on the role of analysing data about the companies in which the company invests. VITAL's data is essential to the company's decision-making process and its opinions will have the same value as the opinions of the other five board members.

3. Saudi Arabia, on October 2017, became the first country to grant citizenship to a robot named Sophia, which was designed around human values.

4. The United Arab Emirates became the first country to formally appoint a Minister of State for Artificial Intelligence, with a mandate to drive futuristic projects like "Mars Science City", renewable energy, electric vehicles, flying taxis and even flying jetpacks. Dubai even has an accelerator program aimed at expediting the creation of these various futuristic technologies.

5. There is an 85% reduction in errors among physicians who have incorporated machine learning algorithms in their diagnoses of metastatic breast cancer. In addition, the opportunity to use intelligent systems is enabling doctors to make better diagnoses and deliver more individualized treatments.

6. Fifty-four percent of business executives say the AI solutions implemented in their businesses have already increased productivity.

7. According to Professor Moshe Vardi of Rice University, most jobs will be done by robots within the next 30 years, leading to unemployment rates greater than 50%. This may sound bad, but experts believe that unemployment as a result of improved technology will open the door to a future where work is something people do for pleasure, not out of necessity.

8. Ten percent of the world's population will be wearing clothes connected to the internet by 2022.

9. By 2025, the Internet of Things will take its next step as the first implantable mobile phone becomes commercially available.

10. By 2025, more than 30% of corporate audits will be performed by artificial intelligence.

ARTIFICIAL INTELLIGENCE SIMPLIFIED

Artificial intelligence is the ability of a machine to learn on its own and act like humans. It is like a technological brain developed by humans to work and function with minimum manual intervention, and thus can think, act, solve problems and achieve set objectives.

In essence, artificial intelligence allows any inanimate object to have the ability to perceive (vision, speech, hearing, touch), understanding, and having some form of common sense, such as understanding what is right or wrong within the context of what is commonly shared by other humans in a given circumstance.

It is like putting the brain of a million smart people in a machine to act on your behalf!
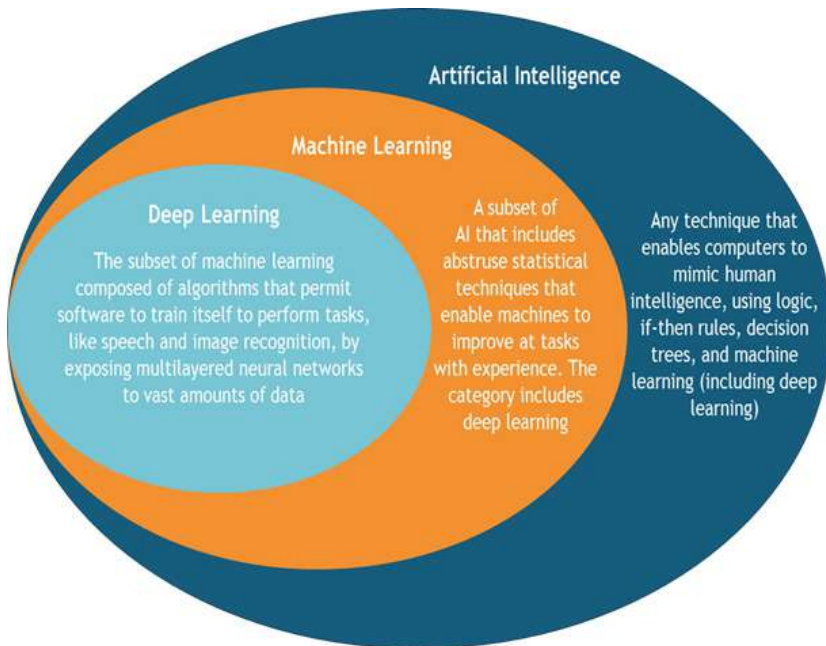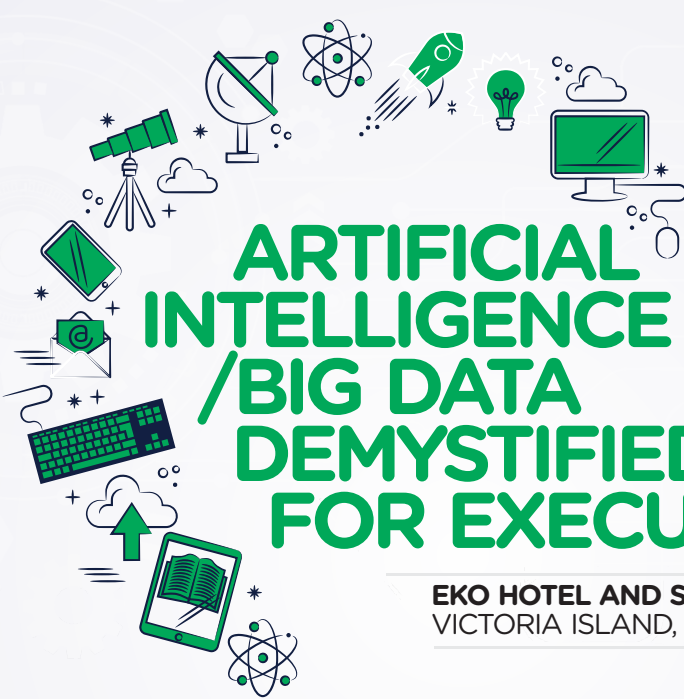
Artificial Intelligence

Machine Learning

Deep Learning

The subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural networks to vast amounts of data

A subset of AI that includes abstruse statistical techniques that enable machines to improve at tasks with experience. The category includes deep learning

Any technique that enables computers to mimic human intelligence, using logic, if-then rules, decision trees, and machine learning (including deep learning)

Agriculture

IDENTIFYING TYPES OF RICE

Until recently, rice classification has been done manually, which was time consuming and prone to error. A team of researchers from DA-IICT India developed an interesting application of a convolutional neural network (a popular machine learning artificial intelligence framework) that can classify types of rice with 94% accuracy.

To find the adulteration in the rice sample, they put a random selection of rice grains on a scanner and the algorithm does the job of separating them and classifying them into one of the types.
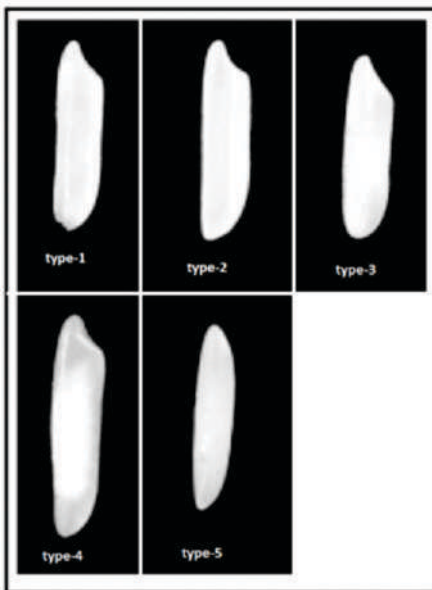
As you can see, the types of rice are closely related in their structure. A human uses three dimensions to identify the rice, while the algorithm does the task in only two dimensions, which is quite a feat. The algorithm has been further refined to assess the "grades" of the rice (premium, grade A, grade B, grade C), and to calculate the number of broken rice grains in the sample. The algorithm used here is a special version of a neural network that works on signals, where the spatial property of the signal is very important, i.e. the algorithm is primarily used on image videos where neighbouring pixels have nearly identical properties.

Reference:
https://www.researchgate.net/publication/321062000_Convolutional_neural_network_with_transfer_learning_for_rice_type_classification

Crop and Weed Identification Using Machine Learning
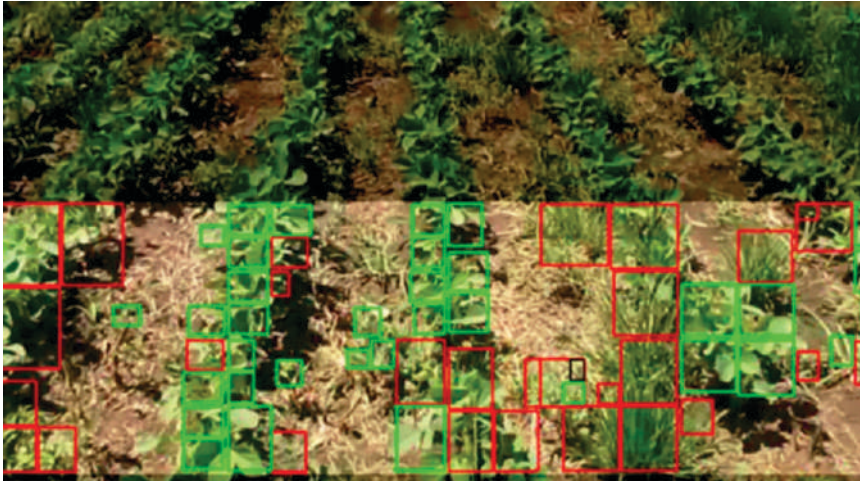
A team of researchers from Sapienza University, Rome, has found a novel application of machine learning and artificial intelligence that can identify crops and weeds in real-time. They developed an unmanned ground vehicle that carries a multispectral camera that identifies any disease on the crops. As in any modern image classification task, the core algorithm used is also a convolutional neural network (CNN) that can exploit the spatial properties of the raw input data. In this case, two CNNs are applied: one is applied to three-channel RGB images and the other CNN is applied to near infrared images. The infrared channel is helpful for performing the classification task. To perform the testing at run-time, they used lightweight CNNs that perform the classification in real-time. They used these to perform a fast and robust, pixel wise, binary image segmentation. A deeper CNN is then used to classify the crops and weeds using the extracted pixels The team validated their robot and algorithm on a real dataset taken from a farm robot moving within a sugar beet field. The results are very promising and show the effectiveness of the algorithm.

Reference:
http://www.dis.uniroma1.it/~pretto/papers/pnp_ias2016.pdf

Zenvus – AI-Based Solutions for Farms

Most African farmers rely on guesswork in their farming practices. Many make decisions based on beliefs that have been passed down from one generation to another over centuries, with little scientific scrutiny. Yet a number of factors, including variations in climate and population growth have altered needs and ecosystem dynamics, including soil fertility. Often unaware of the complexity of this change, farmers have limited knowledge of the nutritional requirements of their crops as factors such as rainfall, temperature, moisture, nutrients and other pertinent data are rarely measured and tracked. This lack of deep insight results in poor decision-making and low yields.

Zenvus uses electronic sensors to measure soil nutrients, temperature, and moisture, etc. It uses special cameras to build a farm vegetation index to detect drought stress, nutrient deficiency, crop diseases, the onset of pests, etc. in crops beyond what any human eye can see. Both sets of data are sent wirelessly to a cloud server where advanced algorithms are applied to tell a farmer precisely when to water a farm, among other things. Linked to weather stations, the farmers know when to wait for rain instead of using irrigation. Zenvus reduces water usage by 70%.

There are some companies selling Internet of Things devices to large farms in Africa. So far, they have no solution targeted to help small African farmers. Zenvus is pioneering this field of building sensors (IOT devices) for small farmers.

References:
https://www.tekedia.com/zenvus-ai-camera-agriculture/
https://startup.info/zenvus/
https://www.thehindubusinessline.com/opinion/some-smart-solutions-to-farm-distress/article9993864.ece

AI Used for Identifiying Plant Diseases and Pests

Over the years, agricultural productivity has been negatively impacted by plant diseases and pests. These have been identified as major challenges in the agricultural sector. It is believed that early detection and treatment can significantly reduce crop losses.

In this work, a deep learning-based approach to detecting diseases and pests in tomato plants was applied. This deep learning-based approach introduces a practical and applicable solution for detecting the class and location of diseases in tomato plants. The approach involves processing camera images in a real-time using graphical processing units ; it replaces traditional methods of physical collection and lab analysis. It is aimed at identifying nine classes of diseases and pests that affect tomato plants.

Reference:
https://arxiv.org/pdf/1604.03169.pdf
https://ensia.com/features/deep-learning/

Imagery

GEOLOCATION PHOTOS USING ARTIFICIAL INTELLIGENCE

Google's system, PlaNet, draws upon a large database of geotagged images and seeks recognizable clues in the environment to determine the probability that a photo was taken in any specific area. These clues range from recognizable landmarks to landscapes, flora, fauna, and even styles of architecture. In this way, the system operates similarly to a person hoping to identify the location of a photo. In fact, PlaNet competed against ten people in games of GeoGuesser and used similar methods. The game showed both the human player and the PlaNet system the same ten panorama Google Street View shots, and the people marked the map with their guesses. PlaNet outperforms previous approaches and even attains superhuman levels of accuracy in some cases. A major reason that PlaNet performs more successfully than other systems is that it divides the earth into cells and assigns a probability that any given image was taken in each of the many cells. This use of varying certainty rather than a single guess offers more information about how the system works and what it has learned from the image.

The PlaNet system is a breakthrough in AI that may prove to be useful in ways that are unimaginable right now.

References:
https://www.gislounge.com/google-planet-geolocating/
https://arxiv.org/abs/1602.05314?from=litvz

AI for Searching Through Images

Clarifai specializes in using deep learning algorithms for visual searches. In short, it is building a software that will help you to locate photos, whether they are on your mobile phone, a dating website, or on a corporate network.

Clarifai gives its customers access to cutting-edge AI techniques that would cost millions to replicate. Companies like Unilever, BuzzFeed, Ubisoft and Staples U.K., as well as makers of medical devices and drones, use Clarifai to automatically analyse millions of images and videos.

Reference: https://www.clarifai.com/

Generating Celebrity Photos with Generative Adversarial Networks : Nvidia

The latest example comes from chipmaker Nvidia. The company has published a paper showing how AI can create photorealistic pictures of fake celebrities. Generating fake celebrities is not new, but researchers say these are the most convincing and detailed pictures of their type ever made. The video below shows the process in full starting with the database of celebrity images the system was trained on. The researchers used what's known as a generative adversarial network, or GAN, to create the pictures. GANs are actually comprised of two separate networks: one that generates the image based on the data it's given, and a second discriminator network (the adversary) that checks whether the images are real. By working together these two networks can produce some startlingly good fakes. And not just faces either—everyday objects and landscapes can also be created. The generator network produces the images, the discriminator checks them, and then the generator improves its output accordingly. Essentially, the system is teaching itself.

References:
https://www.theverge.com/2017/10/30/16569402/ai-generate-fake-faces-celebs-nvidia-gan
https://www.youtube.com/watch?v=XOxxPcy5Gr4

DeepFace: Human-Level Performance in Face Verification

The DeepFace model was developed by Facebook. Its purpose is to encourage Facebook users to tag people in the photos they upload by showing suggestions from the uploader's list of friends.
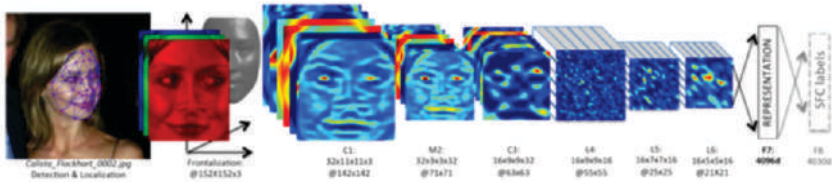
DeepFace has virtually closed the gap in the most popular benchmark in unconstrained face recognition and is now on the brink of human-level accuracy. It was trained on the largest database available and it used faces acquired from a population vastly different than the one used to construct the evaluation benchmarks, and it is able to outperform existing systems with only very minimal adaptation. The DeepFace system differs from the generic approach in that it uses the deep learning frameworks in lieu of well-engineered features which is especially suitable for dealing with large training sets. The conventional modern pipeline consists of four stages: detect $\Rightarrow$ align $\Rightarrow$ represent $\Rightarrow$ classify. Authors revisit both the alignment step and the representation step by employing explicit 3-D face modelling, and finally use a nine-layer deep neural network. Achieving human level performance on labelled images was a far-fetched goal for traditional computer vision systems, which Facebook achieved using AI.

Reference:
https://research.fb.com/publications/deepface-closing-the-gap-to-human-level-performance-in-face-verification/

Image to Description to Photo-Realistic Image
A team of researchers from Rutgers University and Baidu Research worked on the very hard task of computer vision-that generates high-quality images from text descriptions. The problem involved a lot of challenging inter-domain tasks. To understand text descriptions one needs to apply natural language

processing, and to generate images from these texts one needs a very powerful generator that creates novel yet meaningful synthesized images. Previous methods to do this were not efficient enough to cover all the aspect of the text descriptors.

A large bird has large thighs and large wings that have white wingbars

To generate photo-realistic images conditioned on the text descriptions requires the use of conditional generative adversarial networks which can generate novel images while preserving the naturalness of the image. The team assessed their method against previous state-of-the-art methods on benchmark datasets, and they clearly achieved significant improvements on generating photo-realistic images conditioned on text descriptions. Generative adversarial networks have two different types of neural networks competing against each other: one is a generator and the other is a discriminator (like a forger and the police). These two networks train on the data supplied to them and then, using game theory, eventually generates lifelike images.

Reference: https://arxiv.org/pdf/1612.03242.pdf

Photo-Realistic Single Image Super-Resolution Using a Generative Adversarial Network

In this time when the quantity of information and data growing explosively, images and videos has also become high-quality. To store and preserve low-quality images after converting them to a higher quality requires techniques of image super-resolution. In image super-resolution, methods are applied using prior information about the data. Previously, images were resized using bilinear interpolation, which is a simple method of filling up data; i.e. if 5 and 15 is given, 10 can be filled in between.

However, this assumption is not as accurate in image data. As you can see in the image below and to the left, the bilinear interpolation blurs the image.
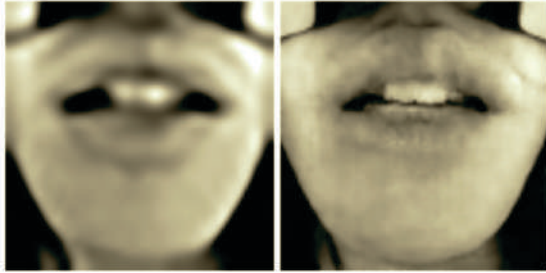
Previous super-resolution methods tried to minimize the absolute difference or the square difference, which are not accurate measures of correctness. Researchers from Twitter use the discriminator in generative adversarial networks (GANs) as the new loss function, which can then generate visually pleasing images. The images, as shown in the above-right image, have a 4x upscale factor. The new method tries to minimize this new loss function and as a result the final images generated have a very high peak-signal-to-noise ratio.

Reference: https://arxiv.org/pdf/1609.04802.pdf

3D Printing Arm Control Using Reinforcement Learning

AI Build is a London-based start-up that aims at using 3-D printing for building astonishing constructions. They have unveiled the Daedalus Pavilion, a 3D printed structure that uses techniques such as robotics and algorithms. The technology used can be reinforcement learning (RL), which is an area of machine learning, where an agent learns by interacting with its environment to achieve a goaSince RL techniques are reward-based; whether or not the artificial intelligence agent chooses the correct path has some reward and penalty function allocated to it. Then the agent is let loose and given total control, but the cost function ensures a learning experience and the agent can then learn the model. Using this exploitation and exploration paradigm, the network is then able to learn the final optimized parameters.

The Pavilion is an impressive 5 m x 5 m x 4.5 m structure, and big enough to accommodate several coffee tables. However, it looks like a mesh butterfly or a dragon fairy. It was built with more than 160 kg of a biodegradable filament that was sourced from Formfutura. It was constructed in 48 separate pieces and was 3D printed in just three weeks using a KUKA industrial robot 3-D printer.

Reference:
https://www.engineering.com/3DPrinting/3DPrintingArticles/ArticleID/13512/Ai-Build-to-Bring-Artificial-Intelligence-to-Additive-Construction.aspx

Transportation

DSN
Data Science Nigeria

Predicting Traffic Density Using AI

Traffic flow prediction is an important research issue for solving the traffic congestion problems in an Intelligent Transportation System (ITS). Traffic congestion is one of the most serious problems in any city, and can be predicted in advance by analysing traffic flow patterns. Such predictions are possible by analysing the real-time transportation data from correlative roads and vehicles. This work uses artificial neural networks (ANNs) to estimate traffic conditions 15 minutes into the future given current/historical traffic information.

For this study, data from the Highways England Motorway Incident Detection and Automatic Signalling (MIDAS) system for approximately 20 km of the M60, M62 and M602 motorways near Manchester, UK was used to build a short-term prediction model. To reduce the complexity of the problem, the number of input dimensions to the model was successfully reduced using an auto encoder. The final model exhibits very good predictive power with 90% of all predictions being correct within 2.6 veh/km/lane of observed values.

Reference: https://www.sciencedirect.com/science/article/pii/S23521465163 00199

Lane Detection Using Deep Learning

People can find lane separation/demarcation lines on the road fairly easily even in a wide variety of road and weather conditions. Unless conditions are extreme, we can mostly tell where we are supposed to go, assuming the lines are actually marked.
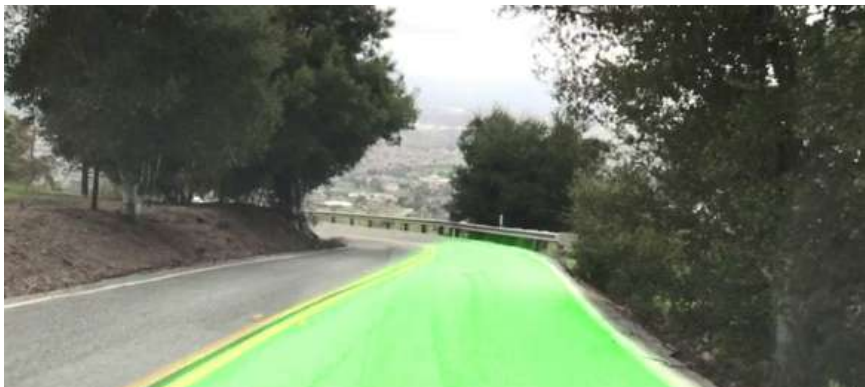
Computers, on the other hand, do not find this easy. Shadows, glare, small changes in the colour of the road, slight obstructions of the line, etc. are all things that people can generally still handle, but a computer may struggle with them. This work uses a Perspective Transformed Model, a computer vision-based projection technique, to project lanes onto the photo. The work trialled between three and four systems to project the lanes onto the roads, but the model that worked best for detecting lanes used convolutional deep learning models.

This system can be further curated and used in self-driving cars, especially because it used the derived model to detect lanes with real--time application of the model on a video with 29-30 frames per second.

Reference:
https://towardsdatascience.com/lane-detection-with-deep-learning-part-1-9e096f3320b7

Step-by-Step Public Transportation Directions to Any Destination
Lara is an AI chatbot that supplies public transportation directions in developing countries. In developing countries, public transportation data is not freely available due to the fragmented system of public transit within these regions. Popular mapping services such as Google maps lack critical features such as accurate fare estimates because they do not have a locally relatable approach to delivering public transit data.

To make Lara, a systematic approach was created to collect, sort and deliver data to users in an easily accessible and interactive format. With a user interface similar to WhatsApp, Lara encourages her users to chat as they would with humans. Lara speaks in the local nuances of the target audience who will not use Google map.

Reference: https://techpoint.ng/2017/04/17/lara-profile/

Maritime Use of AI
Using artificial intelligence (AI), data on all voyage-impacting factors both on and off a ship is constantly collected to make operational decisions that keep vessels travelling the most cost-effective ways.

Using predictive analysis, insights are obtained that can help captains to save fuel by optimally maintaining and varying their vessels' speed to port.

Every year, thousands of cargo ships ply the oceans to maintain international trade. However, poor weather conditions, congested ports, and equipment breakdowns cause all sorts of hindrances to smooth sailing. A delay caused by just one vessel can affect the logistical schedule for an entire fleet.

Shipping giant Overseas Container Line Limited (OOCL), has partnered with Microsoft Research Asiato develop technology enabled by AI that will avoid logjams. The two firms recently spent 15 weeks together optimizing OOCL's existing shipping network operations; it will save the shipping company around $10 million in costs annually.
Reference: news.microsoft.com/apac/features/ai-and-cargo-shipping-for-global-maritime-trade/

AI for Self-Driving Cars
Among all of the self-driving start-ups working toward Level 4 autonomy (a self-driving system that does not require human intervention in most scenarios), Mountain View Drive's .artificial intelligence system, Drive includes a scalable deep-learning approach and aggressive pace make it unique. Drive sees deep learning as the only viable way to make a truly useful autonomous car in the near future. .

It has only been about a year since Drive went public, but already the company has a fleet of four vehicles navigating (mostly) autonomously around the San Francisco Bay Area—even in situations (such as darkness, rain, or hail) that are notoriously difficult for self-driving cars.

Drive.ai is launching the state's first autonomous ride-hailing service in San Francisco July 2018 using a pilot programme with support from both the city

and the Hall Group. The company's vans will drive on public roads between the Hall Park offices and The Star to help workers get to dining and shopping facilities that are located too far away to walk, but which waste too much time when having to drive to them.

This is not the go-anywhere service you might like. However, it's a big step forward for Drive.ai, which has yet to launch its Lyft partnership in San Francisco. It also reflects a gradual transition for self-driving technology from closed-off testing to real-world services, even if those services tend to be very limited.

References:
https://www.wired.com/story/self-driving-cars-texas-frisco-driveai/
https://www.drive.ai/
https://www.engadget.com/2018/05/07/drive-ai-self-driving-ride-hailing-in-texas/

Vehicular Object Detection Using AI

With the work of Dalal & Triggs (2005) linear Support Vector Machines (SVMs), that maximize the margin of all samples from a linear decision boundary in combination with histogram of orientation (HOG) features have become popular tools for classification. However, all previous methods rely on hand-crafted features that are difficult to design. With the renaissance of deep learning, convolutional neural networks have automated this task while significantly boosting performance. Now, all these algorithms have become obsolete and the new generative adversarial networks proposed by Ian Goodfellow have become popular. The GAN architecture used here can help to segment and localise cars and other objects from an image.

There are region-specific algorithms working on these tasks as single-shot detection, you only look once, RCNN, fast RCNN, Faster RCNN, etc. There are different general-purpose multi-image-to-multi-image translation networks which can also work on these type of data to generate the desired output image.

https://towardsdatascience.com/detecting-vehicles-using-machine-learning-and-computer-vision-e319ee149e10

Security

DSN
Data Science Nigeria

Identifying Potential Criminals in China

According to a report from the [Financial Times](#), authorities in China are using facial recognition technology and combining it with predictive intelligence to notify police of potential criminals, based on their behaviour patterns.

Guangzhou-headquartered Cloud Walk has been trialling its facial recognition system, which tracks a person's movements. Based on where someone goes, and when, it can rate individual likelihood to commit a crime. For instance, someone buying a kitchen knife is not suspicious. But if the same person goes and gets a hammer and a sack later on, that person's suspicion rating goes up.

The company's software has tapped into the police databases in over 50 cities and provinces, and can flag suspicious characters, live. China is also using "personal re-identification" in crime prediction: identifying the same person in different places, even if they're wearing different clothes. With re-ID, it's also possible to recreate someone's trail across a large area.

According to Li Meng, vice-minister of science and technology, crime prediction would become an important use for AI technology in the government sphere. Although Chinese law does not allow charges to be brought against someone for a crime they have yet to commit, suspects can be charged with attempting to commit crimes.

References:
https://www.indiatimes.com/news/world/china-planning-to-use-ai-to-help-identify-possible-suspects-before-they-even-commit-the-crime-326485.html
https://futurism.com/chinas-minority-report-style-plans-will-use-ai-to-predict-who-will-commit-crimes/

Agent-Based Modelling in Defence

Agent-based machine learning models and warfare have many features that are very similar to each other. One can model war and, using agent-based methods, one can get insights into warfare. Researchers from the Institute for Systems Studies & Analyses have made a novel application using these agent-

based models. They simulated very high resolution simulation experiments worldwide. Decision-makers need capabilities to quickly model and effectively assess consequences of actions. The creation and 'what-if?' exercising of such models has traditionally had onerous resource requirements; agent-based modelling and simulation is a maturing approach which can overcome this extra work with computational power. This technique can be used to model combat scenarios where multiple entities sense and stochastically respond to conditions in their local environments, mimicking complex large-scale combat system behaviours. They showed battlefield combat as a complex, non-linear adaptive system. Reinforcement learning, which is a type of semi-supervised learning, is also an agent-based method, where rewards and punishment for the agents exist.

Reference:
https://pdfs.semanticscholar.org/a2bb/2a40591fda6d148c139e215f59f4b1fe80c3.pdf

Detecting Fraud Using Machine Learning
PayPal uses a home-grown artificial intelligence engine to detect suspicious activity and, more importantly, to separate false alarms from true fraud, built with open-source tools.
Fraud detection is one of the immediate paybacks of machine learning (ML) technology, because it addresses an urgent problem that would be impractical to solve if machine learning didn't exist.

PayPal is a pioneer in using ML techniques for risk management. PayPal uses three types of machine learning algorithms: linear, neural network, and deep learning. Experience has shown PayPal that in many cases the most effective approach is to use all three at once.

PayPal uses multiple ML techniques, from linear predictions to deep learning because, according to the Data Science team at PayPal, although linear techniques might be outdated there may be some tasks at which the linear algorithms work better than the more complex deep learning techniques. So applying all three at same time has significantly improved the accuracy of the fraud detection system at PayPal. They believe with increasing data, these

techniques will be inevitable in the security measures in the future.

References: https://developer.paypal.com/docs/classic/fmf/integration-guide/FMFIntro/

https://www.infoworld.com/article/2907877/machine-learning/how-paypal-reduces-fraud-with-machine-learning.html

Using Machine Learning to Spot Counterfeit Products

A team of researchers led by New York University Professor Lakshminarayanan Subramanian has developed a new mechanism that uses machine learning algorithms to distinguish between genuine and counterfeit versions of the same product.

It does so by deploying a dataset of three million images across various objects and materials such as fabrics, leather, pills, electronics, toys and shoes.

The classification accuracy is more than 98 per cent, and the system works with a smartphone to verify the authenticity of everyday objects. One has to place the device directly on the item, open the Entrupy app on smartphone or tablet (iOS), and follow the onscreen prompts in the app to take images. The artificial intelligence algorithms then analyse the images to determine authenticity and provide results in real-time.

This system also works for super-fake counterfeits observed in the marketplace that are not easily discernible to the human eye.

References:https://phys.org/news/2017-08-machine-counterfeit-consumer-products.htmlhttp://www.financialexpress.com/industry/technology/new-system-uses-artificial-intelligence-to-spot-fake-products-indian-research/805506/

Adaptive Fraud Prevention

Founded in 2014, Palo Alto-based Simility is one of a number of companies using machine learning to help those working in fraud detection to collect and analyse data. Simility's software is aimed at companies of all sizes from major enterprises to small and medium size businesses and is designed to prevent various kinds of fraud. This includes account takeover fraud, whereby someone tries to gain access to another person's online account. In this case, Simility looks at various session, device, and behavioural biometrics and builds a profile for what constitutes "normal" user login behaviour.

Simility can also help to prevent account origination fraud, where a bad actor tries to set up new accounts using stolen or fake identities. For example, the company's software analyses various session-related indicators, including time spent across pages, keyboard patterns, and so on, and it may also use data garnered from third-party sources to establish the credibility of information provided during setup.

Simility claims "multiple global Fortune 500 financial services organizations" as clients, including major U.S. banks.

References:
https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/simility-raises-rs-113-crore-in-accel-led-series-b-round/articleshow/62031159.cms

https://entrackr.com/2017/12/fraud-detection-simility-17-5-mn-accel/

AI-Powered Cybersecurity

Darktrace is the world's leading machine learning company for cybersecurity. Created by mathematicians from the University of Cambridge, Darktrace's Enterprise Immune System uses artificial intelligence (AI) algorithms that mimic the human immune system to defend enterprise networks of all types and sizes.

Darktrace's AI and machine learning algorithms are designed to detect threats without any pre-existing knowledge of attacker targets, tools, or capabilities. While traditional security tools depend on specific indicators of compromise to identify malicious activity, Darktrace's technology embeds in a

network, learns what behaviours are normal, and flags anomalies. For example, a few months ago, Darktrace detected two rogue devices on the network of a major healthcare provider that were brought onto the network by an employee. The devices attempted to redirect users to a fake security survey that was identical to an internal website being used to host a real security survey. Before accessing the survey the employees needed to enter their user credentials.

In addition to harvesting user credentials, the fake survey asked a series of questions that would have been useful for an attacker, such as the status of their anti-virus and firewalls, and whether users were using the same passwords across multiple services. Darktrace's AI algorithms, which had built a detailed understanding of the organization's normal network activity and digital infrastructure, sent an alert in real-time, ensuring that no one inside the company fell victim to the ruse, according to a case study outlined on Darktrace blog. Darktrace is one among many cybersecurity start-ups now vying, alongside more established tech companies, to protect businesses from an onslaught of escalating computer threats. In order to succeed, the company must stay one step ahead of attackers and continue to gain adoption while displacing incumbents.

References:
https://www.darktrace.com/
http://fortune.com/2017/07/10/cyber-darktrace-fund-raise/

ARTIFICIAL INTELLIGENCE SIMPLIFIED: 99 USE CASES AND EXPERT THOUGHTS FOR STARTERS

Science

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NASA Discovers New Planets Using AI

NASA and [Google](#) have discovered two new planets in a faraway solar system using cutting-edge artificial intelligence, or AI, technologies. The newly discovered exoplanets, or planets outside of the earth's solar system, were found after researchers applied the same [AI techniques](#) that help computers to recognize images such as cats in photos to data gathered from the Kepler space telescope.

To discover exoplanets astronomers must comb through data collected by Kepler and identify 'signals' that could indicate possible planets. Although researchers currently have software that helps to spot strong signals so that humans can then investigate, there are many weak signals that are not followed up. NASA applied neural networks to help parse through the Kepler data and spot possible exoplanets that humans may have overlooked.

The researchers at NASA fed the neural network with 15,000 signals taken from the Kepler data that scientists confirmed were from exoplanets. This so-called training period, which took two hours, helped the neural network discover unseen patterns that it then used to discover exoplanets when the researchers fed it new Kepler data. The researchers used the neural network to parse Kepler image data taken from 670 stars, and the neural network then indicated that two weak signals were likely to be planets.

This is a promising example of how neural networks can leverage even some of the weakest signs of distant worlds. Thanks to AI, NASA discovered a whole new planetary system.

References:
https://www.futuristspeaker.com/job-opportunities/12-mind-blowing-ai-advances-and-12-critical-takeaways-to-put-ai-in-perspective/https://www.cnbc.com/2017/12/20/nasa-and-google-are-using-ai-to-find-new-planets.html
https://venturebeat.com/2017/12/14/google-and-nasa-use-ai-to-find-two-new-planets-in-old-data/

On the Moon, AI is Taking One Small Step for Mankind

Astronomers made their first major AI breakthrough in March 2018 when a team of researchers announced that they had used a neural network to find 6,000 new moon craters.

The University of Toronto-Scarborough team led by Mohamad Ali-Dib, a postdoctoral fellow in the Centre for Planetary Sciences (CPS), took data from elevation maps of the moon gathered from orbiting satellites and fed it into their "convolutional neural network," which is the same kind of machine learning system popular with self-driving cars. After training the neural network on a data set that covered two-thirds of the moon, they tasked the network with counting craters on the remaining third. The strategy worked well, revealing 6,000 previously unidentified craters. While counting craters might sound like mind-numbingly dull work (even for AI), the payoff is substantial: craters offer important clues about the history of the solar system and the rocks that zip around it. What's next for this neural network? Counting craters on Mercury, and then maybe Mars, Ceres, and the icy moons of Jupiter and Saturn.
Reference: https://www.fastcompany.com/40551613/on-the-moon-ai-is-taking-a-small-step-for-mankind

Identifying Objects and Patterns from Satellite Images

Digital Globe and Airbus Defence and Space are using artificial intelligence to process the large volume of data that satellites produce. Artificial intelligence is used to identify objects, classify objects, and localize some specific classes from an image segment at the pixel level to determine which class it is. For such a task a popular deep-learning architecture (CNN) is used. For segmentation in each pixel, a newer method, a Generative Adversarial Network, is used. These kinds of networks are computationally very expensive and generally require huge amounts of data. The images are passed into a CNN, which then tries to classify the image as a road, house, vegetation, etc. At the beginning all the parameters of the CNN are randomly initialised, and the prediction accuracy is close to a coin toss. Then, eventually, using the chain rule of differentiation the error is back propagated and the updates are made deep into the network up to the input image itself.

Digital Globe's Geospatial Big Data platform, GBDX, provides the computational power to apply deep learning to observation of the Earth. By using crowdsourcing capabilities the data is annotated and labelled and then the algorithm can be validated and can become better at training.
Reference: https://arxiv.org/pdf/1704.02965.pdf

Computing

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News Drones, Machine Learning, and Swarm Intelligence

Current drones have, at most, about 30 minutes of flight time. However, a company named Andrews UK is working on drones with a flight time of at least 12 hours. A team of researchers at the University of Bedfordshire have explored the technical feasibility of ultra-long flight time drones. The team researched the benefits of a swarm of drones that can coordinate among themselves and thus, using this enhanced autonomy and a cloud-based form of artificial intelligence particularly adapted to the communication domain, to assist them. The drones are enhanced with search and rescue mission capabilities using intelligence gathering. A swarm of drones also overcomes the limitations of current battery technology, making the battery requirements obsolete as one drone can take the place of another drone.

Nature gives us many examples of swarm intelligence, e.g. a beehive. This swarm intelligence is also adopted in an optimization algorithm named Particle Swarm Optimization. After extensively reviewing the existing literature on swarm intelligence, machine learning and cloud systems, the researchers came up with an algorithm blueprint of what things to consider in real-life swarm intelligence.

Reference: https://www.beds.ac.uk/ies/partnerships/case-studies/drones-machine-learning-swarm-intelligence

Drone Learns How to Fly by Itself Using Reinforcement Learning

When a baby starts learning how to walk it generally starts with small steps, it falls, and it tries again. New artificial intelligence-powered bots are trying to learn exactly the same way. A research lab at Carnegie Mellon University (CMU) has made a contribution named 'Learning to fly by crashing', that helps drones learn approximately the same way a baby learns. The most effective way of learning how to fly is by getting a lot of experience crashing so that you know exactly what to avoid, and once you can reliably avoid crashing, by definition you then know how to fly.

The CMU roboticists wanted to see if there are any benefits to using the crash approach instead of the not crash approach, so they used 20 AR drones 2.0 in indoor environments, producing a total of 11,500 collisions to learn

from. The algorithm used reinforcement learning (RL). This is a type of learning where there is no label required. In this method there is a Q function, which in simple terms is a reward function. So, whenever a drone makes a mistake and crashes, the RL algorithm instructs it to not to that again and instructs it to try something new from the previous information. Each collision is random, with the drone starting at a random location in the space and then flying slowly forward until it runs into something. After it does, it goes back to its starting point and then chooses a new direction. These methods can be used to learn many novel applications.

Reference: https://spectrum.ieee.org/automaton/robotics/drones/drone-uses-ai-and-11500-crashes-to-learn-how-to-fly

Attention and Memory in Deep Learning and NLP

A recent trend in deep learning involves attention mechanisms, especially for natural language processing. Traditional machine translation systems typically rely on sophisticated feature engineering based on the statistical properties of text. In short, these systems are complex, and a lot of engineering effort goes into building them.

Neural machine translation (NMT) systems work a bit differently. In NMT, we map the meaning of a sentence into a fixed-length vector representation and then generate a translation based on that vector. By not relying on things like n-gram counts and instead trying to capture the higher-level meaning of a text NMT systems generalize the meaning to new sentences better than many other approaches. Perhaps more importantly, NMT systems are much easier to build and train, and they don't require any manual feature engineering. In fact, a simple implementation in Tensor flow is no more than a few hundred lines of code. Most NMT systems work by encoding the source sentence (e.g. a German sentence) into a vector using a recurrent neural network and then decoding an English sentence based on that vector, also using an RNN.

Reference: http://www.wildml.com/2016/01/attention-and-memory-in-deep-learning-and-nlp/

## Fake Start-up Names Generated by Neural Network

Brands' creative staffs are constantly pressured to come up with great names for new products, campaigns and companies. Now they can use generative models, such as recurrent neural networks to serve up loads of plausible-sounding names—some catchy, some weird, and a few, surprisingly, on the spot.

People at MetaMaven have come up with an AI solution that can generate some fancy names, but they do not recommend replacing experienced human branding strategists with this new AI. Still, this AI can provide many ideas, including that exceptionally bizarre one that may inspire new names people would not have considered before. They tried something new and came up with some random, creative start-up names and challenged everyone who worked there to come up with some plausible taglines and logos to accompany these start-up names. The combination of both human and AI (computational) creativity brought some great ideas. Example start-up names they suggested: FOWO - Portable nap pods for exhausted employees, Snppix - The Action Camera for Homebodies, and The SysaPop—Juicero for popsicles. Not a Scam.

Reference: https://www.metamaven.com/neural-network-generates-fake-startups-hilarity-ensues/

Multi-Arm Contextual Bandits for Content Optimization
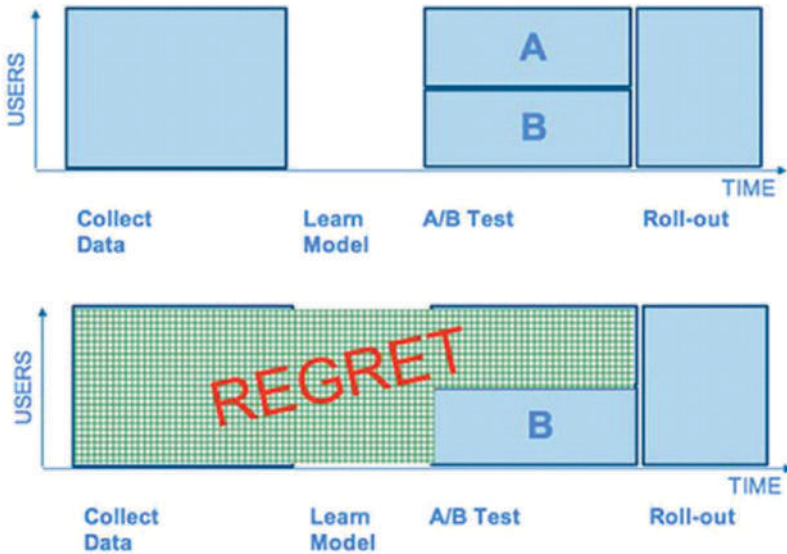
Over the past decade or two, our ability to integrate, analyse and manipulate data has vastly improved. Conversion optimization continues to be key to digital strategy, and experimentation has become an essential methodology for companies trying to optimize their sites and maximize performance. However, although 67% of companies currently perform A/B testing, many are not satisfied with the results, according to a RedEye and E-consultancy study. A/B tests are effective ways of finding out which content option (e-mail tone, web page layout, visual elements in an ad, article headlines, etc.) resonates better with their audience. However, A/B testing involves a period of "regret" where you lose revenue while using the less optimal option. It is necessary to wait and finish the testing before learning which option is better. In contrast, bandit tests mitigate regret (lost opportunity) through dynamic optimization by simultaneously exploring and exploiting options, gradually and automatically moving towards the better option.

Reference: https://www.dynamicyield.com/2015/02/contextual-bandit-optimization/

Google Improves Voice Search with Deep Learning

In 2015 Google announced that it had a better voice search on its Android and iOS mobile apps, thanks to a new approach to the artificial intelligence technique the company uses to power that capability. A blog post authored by a handful of Google researchers explains that Google voice search has taken a new turn by adopting deep neural networks (DNNs) as the core technology used to model the sounds of a language. The DNNs replaced the 30-year-old standard in the industry, the Gaussian Mixture Model. DNNs are better able to assess which sound a user is producing at every instant in time, and this delivers greatly increased speech recognition accuracy. Then, at the time the blog was published, they announced that they had built even better neural network acoustic models using connectionist temporal classification and sequence discriminative training techniques. Those models were a special extension of recurrent neural networks that are more accurate, especially in noisy environments, and they are blazingly fast too. Even after that, Google has continued to improve its AI for speech recognition, and today it is the world's best speech recognition technology.

References: https://research.googleblog.com/2015/09/google-voice-search-faster-and-more.html
http://fortune.com/2015/09/24/google-voice-recognition/

Generating Linux Kernel Codes Using Recurrent Neural Networks

Computer programming is the process of constructing executable code from fragmentary information describing some functionalities of a program. When performed by a machine, the process is called automatic programming. In this case, the only thing that the users have to do is to provide the description of the problem with natural language, starting from the specifications for the input and the output, as well as their constraints. Then the machine will provide the desired source code as the solution.

A researcher named Andrej Karpathy has created a simple recurrent neural network (RNN) that trains itself to generate sequences of Linux kernel code. Recurrent neural networks (RNNs) are a popular algorithm used in a deep learning sub-field. RNNs are very large networks, and they are capable of

approximating more complex functions compared to normal neural networks by using their memory block. An RNN can take a huge chunk of memory and takes more time to train as sometimes the sequence length varies. The generated code here is able to spit out code that looks like Linux kernel code, but the variables are initialized very randomly in the network. This is due to not being able to learn long-term sequences using RNN.

Source: http://karpathy.github.io/2015/05/21/rnn-effectiveness/

Software Code Error Checking and Bug Solving Using AI

A new system from MIT's Computer Science and Artificial Intelligence Laboratory has developed a product that can fix bugs encountered in computer code using artificial intelligence. It borrows healthy code from other applications and then fixes the bug without ever accessing the original source code.

The algorithm is designed in such a way that it represents the code based as a problem solver. So, if some code contains a bug, the algorithm can access other code with the same functionality, it copies the working code and uses cross-language platforms to fix the software bug.

What's really cool about this system is that it can fix bugs using solutions that might not even be written in the same language, creating a kind of patchwork of good ideas from a broad range of sources.

According to Martin Rinard, "The longer-term vision is that you never have to write a piece of code that somebody else has written before. The system finds that piece of code and automatically puts it together with whatever pieces of code you need to make your program work." The software finds the bug, then it finds the solution in all the computer languages available, bypassing the need for a programmer to manually fix the bug. The pattern-matching algorithm matches patterns among codes and finds the best solution, even from different programming languages.

Source:https://gizmodo.com/mit-invented-a-way-to-fix-software-bugs-autonomously-wi-1714669000

Turning Design Mock-ups into Code with Deep Learning

Within three years, deep learning will change the front-end development of websites. It will increase prototyping speed and lower the barrier for building software. The idea of the product made by Floyd Hub is quite simple. The algorithm will receive a design mock-up of a website as the input and then the deep neural network will generate the actual runnable source code for the website.

Currently, the largest barrier to automating front-end development is computing power. However, deep learning algorithms can be used now along with synthesized training data to start exploring artificial front-end automation. The algorithm uses a convolutional neural network and generative adversarial networks.

Source: https://blog.floydhub.com/turning-design-mockups-into-code-with-deep-learning/

Converting Paperwork into Digital Data Using Deep Learning

Identifying words or characters contained in images of text is quite easy using machine learning.. In order to recognize a full page of text, most people detect words using some machine learning techniques, which use a threshold in order to obtain just the written part separated from the background, But in a lot of these methods there are some files that fail to be accurately detected. The main reason for this is the variation in people's writing styles. A rigid threshold can never do justice to all the paperwork present in this world.

Researchers from the Machine Learning and Computer Vision Laboratory, Faculty of Computer Science, University of Indonesia and the Machine Learning and Computer Vision Laboratory, Faculty of Computer Science, University of Indonesia used a learning model to construct a handwriting recognition system to automatically recognize the more challenging data on formal documents. The pre-processing, segmentation and character recognition are integrated into one system. The output of the system is converted into an editable text. The learning model is based on a convolutional neural network (CNN) as a powerful feature extraction and support vector

machines (SVM) as high-end classifiers. The proposed method is more efficient than modifying the CNN with complex architecture.

Source: https://ieeexplore.ieee.org/document/8074699/

AI-Powered Decision-Making via API

While there may be millions of developers, there simply are not enough data scientists to go around. Companies like Montreal-based Fuzzy.io are filling in the talent gap by offering an application programming interface (API) to a set of artificial intelligence (AI) services that allows web and mobile developers to easily incorporate AI-based decision-making into their projects ranging from recommendations to dynamic pricing decision, and matching users in marketplaces.

Underpinning the service is 'fuzzy logic', a heuristic model that does not need large amounts of data and instead uses so-called fuzzy agents. These virtual intelligent machines use an adaptive rule to translate pre-set, intuitive and vague business rules into a framework that can generate precise results. It could be as vague as "new", "old", "warm" and "good" .In its description, a fuzzy agent accepts some input variables and maps them onto fuzzy sets. It then uses a set of fuzzy rules to reason about the input variables and produce output fuzzy [values]. The output fuzzy values are then defuzzified into a single crisp score.

Ultimately, Fuzzy.io makes dynamic AI-based decision-making accessible to any developer who wants to make good use of complex data in their projects.

References:
https://fuzzy.ai/how-it-works
https://www.techemergence.com/the-state-of-ai-in-montreal/

Graphcore - AI Chip Start-Up

Artificial Intelligence (AI) chip start-up Graphcore has raised a $50 million in order to take on chip giants Intel, AMD and Nvidia.

Companies in many industries have been investing heavily in hardware to run deep learning systems. Many of those processors come from Nvidia, whose graphics chips are widely used to power games and graphic production.

The processors have thousands of tiny computers operating in parallel to render pixels. With some tweaks they have been adapted to run deep learning algorithms, which also involve very large numbers of parallel computations.

Graphcore is planning to produce more power-efficient processors and combine multiple processing functions into a single step whereas graphics processors take multiple steps to achieve the same result. The functions are typically bundled to optimize specific-use cases, such as training algorithms to help a self-driving car see potential obstacles ahead of it.

Graphcore is developing Intelligence Processing Units (IPUs) made for machine learning applications. These outgun current hardware by up to "10x to 100x" IPUs can be combined to form massively powerful architectures which can crunch numbers and algorithms at unprecedented speed.
References:https://www.graphcore.ai/
https://www.darktrace.com/

Smart Data Warehouse

Panoply runs an autonomous Smart Cloud Data Warehouse, which essentially provides data management-as-a-service capabilities that do not require any human input to turn data into actual insights. The company's smart data warehouse can receive, maintain and optimize up to a petabyte of data without any intervention.
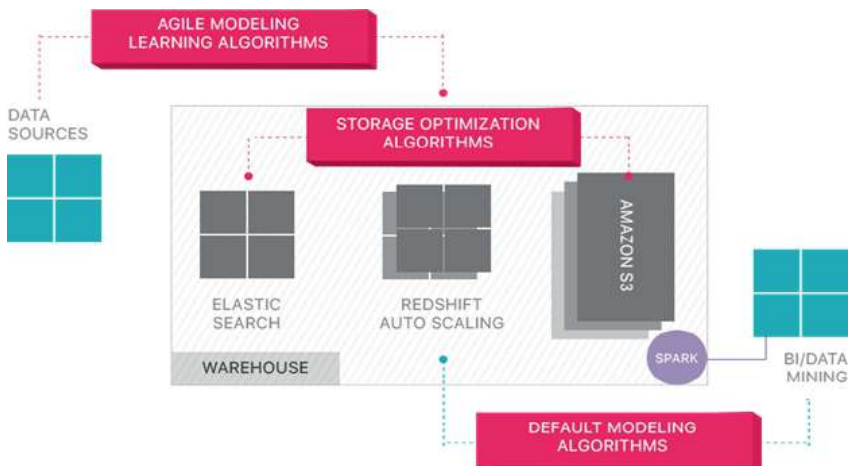
Panoply sits on the single point of convergence between machine learning and traditional data management and storage technologies. The company's ability to automate data warehouses and data lakes enables enterprises to focus on business concerns without having to invest enormous amounts of time and capital on expensive DevOps resources traditionally required for data management. The Panoply Smart Data Warehouse leverages natural language processing, machine learning query optimization, automated elastic storage, and CPU scaling to accelerate and simplify the entire data journey.

References:https://siliconangle.com/blog/2017/11/14/panoply-accelerates-data-integration-smart-data-warehouse/http://www.globes.co.il/en/article-big-data-co-panoply-raises-5m-1001205710

Marketing

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Reinforcement Learning for Sequential Marketing Decisions

Some of the most complex decisions we make are not single predictions, but rather a series of decisions made over a long time horizon. Balancing short-term trade-offs versus long-term gains is challenging even for the smartest humans. Reinforcement learning has been used successfully in cases like DeepMind's AlphaGo to beat human decision-making, but business cases are usually far more complex than games, although the success in narrow domains suggests promises for larger ones. A notable study (the reference) by IBM researchers explores how reinforcement learning could be used to optimize targeted marketing.

Cost-sensitive learning methods learn policies that attempt to minimize the cost of making a single decision. However, in many applications sequences of decisions must be made over time. In these cases, the optimal policy must consider the interactions between decisions. Current approaches to targeted marketing attempt to maximize the expected profit by considering each campaign in isolation. This is a greedy approach and a better approach is to maximize profit over a series of campaigns.

Reference: http://cseweb.ucsd.edu/~elkan/254spring02/sequential.pdf

Ebay's Shopbot: Chatbot and Customer Experience Automation
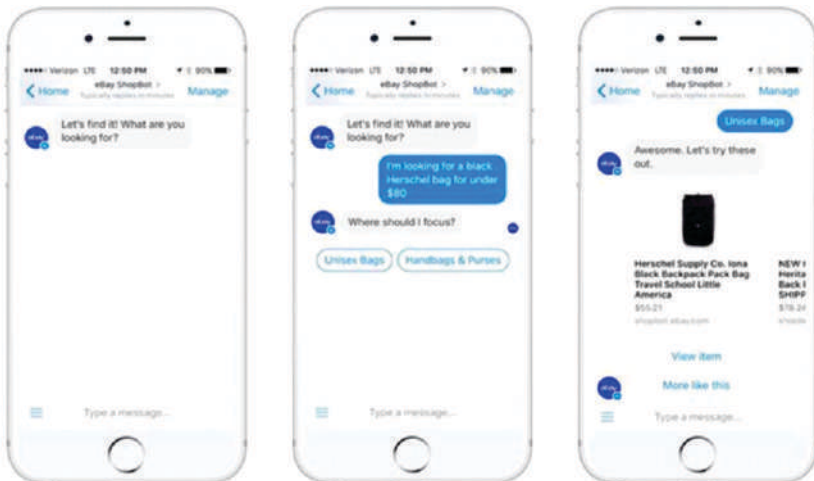
Bots and Chatbots represent one of the most ubiquitous applications of AI, are completely scripted, and use minimal natural language processing and machine learning. Quite a number of companies have already adopted chatbots to engage with customers throughout their lifecycle; eBay launched their chatbot back in October, 2016 on Facebook Messenger. This bot was aimed at helping consumers to narrow down the best deals from eBay's over a billion listings, the company says. At the time, RJ Pittman, chief product officer at eBay, said: "Combining AI with eBay's breadth of inventory and unique selection will enable us to create a radically better and more personal shopping experience for virtually anyone that owns a mobile phone. He also remarked that "eBay Shopbot uses deep learning algorithms paired with natural language understanding and computer vision to help users express their shopping needs naturally. eBay's Shopbot can even create a size profile so that all of our curated collections and browsable inventory is presented in just the right size."

Reference:ttps://www.forbes.com/sites/rachelarthur/2017/07/19/conversational-commerce-ebay-ai-chatbot/#6bdaeca31efb

### *Text Classification for User Insight and Personalization*

Understanding user feedback is a necessity for any business to change a product or service. As the number of reviews increases, it becomes more difficult to manually classify the reviews and feedback, and extra human resources are required. Using natural language processing a machine learning system that can

probe text- or voice-based content and classify each piece of content based on variables such as tone, sentiment or topic to generate consumer insight or curate relevant materials. IBM's Watson Tone Analyzer, for example, can parse through online customer feedback and determine the general tone of the users reviewing a product. By using this analyser one can determine whether customers are happy, sad, confident, and more. One can also monitor customer service and support conversations so the business can respond to customers appropriately and at scale, and also determine whether customers are satisfied or frustrated. And finally, one can enable a chatbot to detect customer's tones and build dialog strategies to adjust the conversation accordingly.

Reference: https://www.ibm.com/watson/services/tone-analyzer/

Clustering for Customer Segmentation and Discovery
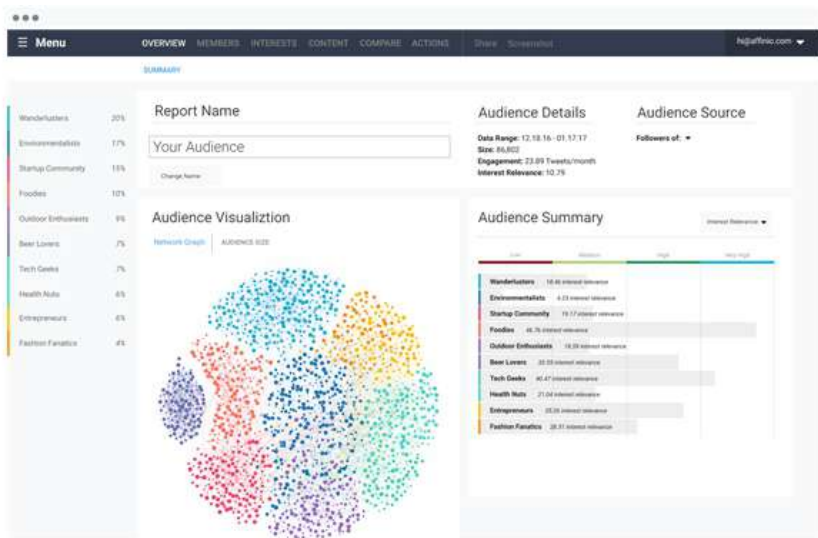
Not all customers are the same. Unsupervised machine learning and custom graph engines can help marketers segment their audience into dynamic groups for targeted engagement.

Affinio is a platform that analyses billions of consumer interest variables, identifies specific customer's interests based on their social media activities, and generates a visual report grouping people with similar interests. Marketers can therefore gain insight into which customers are die-hard foodies, who follows which series on Netflix, or who have similar travel plans. These can be translated into dynamic segmentations and insights into visual reports which provide historical and real-time analyses. The platform provides: Scale - huge amount of data, speed - understand something as it happens, and simplicity - massive datasets boiled down to simple visual reports.

Reference: http://www.affinio.com/product/

ARTIFICIAL INTELLIGENCE SIMPLIFIED: 99 USE CASES AND EXPERT THOUGHTS FOR STARTERS

Medicine

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Qure.ai: AI to Identify TB Patients from X-rays, MRIs and CT Scans

A Mumbai-based health-tech start-up, Qure.ai, has developed an artificial intelligence (AI)-powered technology that can examine X-rays, MRIs and CT scans, and identify patients with diseases including tuberculosis (TB) or a stroke and prepare accurate reports in no time.

The AI technology involves the application of deep learning algorithms to detect and highlight abnormalities in medical imaging including chest X-rays, MRIs and CT scans. The technology trained on 1.5 million X-rays, some normal and others abnormal, and trained them to understand what an abnormality would look like. The technology can make TB screening faster, more effective and economical and address the skewness of radiologist-to-population ratio. It may also help prevent a large number of non-TB patients from having to go through the confirmatory GeneXpert test which is very expensive for an average citizen.

Reference:https://www.livemint.com/Companies/QhQZ4yr6vf5kVF8EAw3YsI/AI-technology-to-examine-XRays-MRIs-CT-scans-identify-TB.html

Machine Learning in Clinical Trials Research

One of the key areas for clinical trials is recruitment and the identification of suitable and willing patients to participate and complete a trial. The Cincinnati Children's Hospital Medical Centre is using machine learning to understand why people accept or decline an invitation to participate in a clinical trial. Recruiting sufficient numbers of participants to answer the research question is a challenge in medical research. In the hospital's study 60% of the patients approached with traditional recruitment methods agreed to participate. Researchers are predicting that their new automated algorithm could help push acceptance levels up to about 72%.

According to the McKinsey Global Institute, machine learning (ML) has several useful potential applications in helping shape and direct clinical trial research. Applying advanced predictive analytics to identifying candidates for clinical trials could draw on a much wider range of data than at present, including social media and doctor visits, for example, as well as genetic information when

looking to target specific populations; this would result in smaller, quicker, and less expensive trials overall.

In addition, ML can also be used for remote monitoring and real-time data access for increased safety, for example, monitoring biological and other signals for any sign of harm or death to participants. There are many other ML applications for helping to increase clinical trial efficiency, including finding the best sample sizes for increased efficiency, addressing and adapting to differences in sites for patient recruitment and using electronic medical records to reduce data errors (duplicate entries, for example).

References:
http://www.bcs.org/content/ConBlogPost/2702
https://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/how-big-data-can-revolutionize-pharmaceutical-r-and-d

Virtual Assistant for Doctors

Dragon uses the AI conversational capabilities to optimize the experience of health-care providers. This virtual assistant solution by Nuance combines voice biometrics as well as text-to-speech voice-recognition technology specially designed for healthcare. Dragon captures and communicates more than 300 million patient's stories annually and is assisting more than 500,000 clinicians in about 10,000 healthcare organizations This new product will give clinicians' sufficient time to focus on their patients, which in turn translates to better healthcare delivery as well as less burden on physicians.

Reference:
 https://www.nuance.com/en-gb/about-us/newsroom/press-releases/nuance-unveils-AI-Powered-solution-for-healthcare.html

Machine Learning in Drug Discovery/Manufacturing

The use of machine learning (ML) in preliminary (early-stage) drug discovery has the potential for various uses from the initial screening of drug compounds to predicted success rate based on biological factors. This includes R&D discovery technologies such as next-generation sequencing.

Precision medicine, which involves identifying mechanisms for "multifactorial" diseases and in turn alternative paths for therapy, seems to be the frontier in this space. Much of this research involves unsupervised learning, which is largely still confined to identifying patterns in data without predictions. The latter is still in the realm of supervised learning.

Key players in this domain include the MIT Clinical Machine Learning Group, whose precision medicine research is focused on the development of algorithms to better understand disease processes and design effective treatments for diseases like Type 2 diabetes. 'Microsofts Project Hanover is using ML technologies in multiple initiatives, including a collaboration with the Knight Cancer Institute to develop AI technology for cancer precision treatment with a current focus on developing an approach to personalize drug combinations for Acute Myeloid Leukaemia (AML).
Reference:
https://youtu.be/ol2OsW3EEn4

Google AI Uses Retinal Scans to Estimate Heart Disease
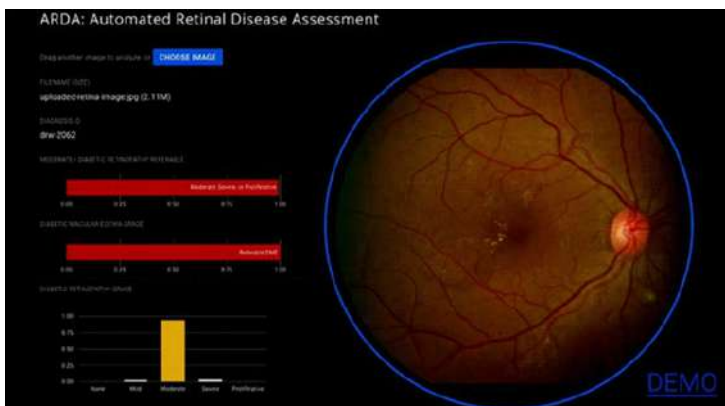
Researchers at Google have developed a new artificial intelligence system that can accurately predict the risk of heart diseases by scanning images of people's retinas. The discovery may point to more ways to diagnose health issues from retinal images, researchers said.

Using deep learning algorithms trained on data from 284,335 patients, they were able to predict cardiovascular risk factors from retinal images with surprisingly high accuracy for patients from two independent datasets of 12,026 and 999 patients. The algorithm also distinguished the retinal images of a smoker from that of a non-smoker 71 per cent of the time. While doctors can typically distinguish between the retinal images of patients with severe high blood pressure and normal patients, the algorithm can go further and predict the systolic blood pressure within 11 mm Hg on average for patients overall, including those with and without high blood pressure. The algorithm was fairly accurate at predicting the risk of a cardiovascular event. The approach uses deep learning to draw connections between changes in the human anatomy and disease, akin to how doctors learn to associate signs and symptoms with the diagnosis of a new disease.

Reference:
http://indianexpress.com/article/technology/science/google-ai-uses-retinal-scans-to-estimate-heart-disease-risk-5071517

Epidemic Outbreak Prediction Using Machine Learning
The medical start-up AIME has successfully combined public health data and artificial intelligence to come up with a method of predicting the outbreak of epidemics before they even happen.

The artificial intelligence and medical epidemiology platform (otherwise known as AIME Inc.) aims to aid in the prevention of diseases by using artificial intelligence to predict the outbreak of epidemics. Set up in Malaysia by the epidemiologist Dr Dhesi Raja in collaboration with two computer scientists, Dr Peter Ho and Dr Choo-Yee Ting, their algorithm analyses a large set of data from different sources to determine the site of new outbreaks of dengue fever.

The system developed by AIME analyses not only public health data, but other data from other sources, such as weather, wind speed, previous outbreaks, and a location's proximity to large bodies of water—anything that might influence the behaviour of the mosquitoes that carry the disease, including population density in the area, people's health records and their income levels.

AIME claims to be able to provide the exact geographical location and date of the next dengue outbreak up to three months in advance and can recommend anti-dengue measures for the area within a 400-metre radius including genetically modified mosquitoes and so-called fogging.

References: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3445421/ http://ambitioustracks.com/en/aime-epidemiology-startup-dengue-zika/ https://reliefweb.int/report/world/could-artificial-intelligence-help-us-predict-next-epidemic

Combating Aging and Disease with Deep Learning

Insilico Medicine is focusing on next-generation artificial intelligence (AI) and blockchain technologies for drug discovery, biomarker development, and aging research. Insilico aspires to extend healthy longevity through innovative AI solutions for drug discovery, aging research and preventing and/or curing disease. The company developed deep neural networks (DNNs) on millions of molecular structures, and then asked those DNNs to produce new molecules with certain characteristics, such as having a certain solubility or interaction with other molecules or bio viability. This way, minimized the side effects of a drug. The same technique can be used to find drugs for particular diseases. Within three years, Insilico hopes to have discovered the first molecule using AI into human patients, specifically targeting rare diseases, as the company continues to focus on musculoskeletal disorders such as ALS and accelerated aging in kids through progeria.

Reference: https://www.forbes.com/sites/robinseatonjefferson/2018/02/14/company-seeks-to-combat-aging-and-disease-with-ai-and-deep-learning/#62d79aca3e7c

AI-Based Virtual Nurse

Sense.ly's virtual nurse, Molly, engages patients with natural conversation through a wide variety of circumstances, from simple administrative needs through complex chronic conditions requiring medical assistance. Aided by Molly, patients can take their vital measurements; chat about their pain, sleep, stress, and diet; or be connected to an attending physician via a video call if the patient shows elevated risks.

Molly interacts with patients using voice recognition technology and can ask relatively simple questions of the patient whilst guiding them through exercise plans and collecting medical data from them. This data can then be analysed by a doctor whilst the patient can also use Molly as a sort of health PA and book appointments with their doctor.

Sense.ly technology will help patients navigate services better, help clinicians manage demand more efficiently and provide invaluable support to doctors in helping to monitor and manage many medical conditions in a far more convenient way for patients, doctors and nurses alike.

References:
https://www.youtube.com/watch?v=AU1nGpOmZpQ
https://techcrunch.com/2017/02/14/virtual-nurse-app-sense-ly-raises-8-million-from-investors-including-the-mayo-clinic/

A Smart Tool to Help People with Speaking Disabilities

Recently, MIT researchers developed a tool that helps people with speaking disabilities who cannot speak out loud but who can verbalize internally using their jaws.

The system is comprised of a wearable device to be placed around the ear and on the jaw, as shown in the image above. The wearable electrodes are designed to pick up signals that are much attenuated and are of very low power, which one cannot normally hear. The work is done by the motion of the muscle movements triggered by the internal verbalization of the words. So, when someone speaks something in their mind, it creates internal muscle movements, which are then sent to an artificial intelligence platform which recognizes the underlying pattern and accurately predicts the words' "thought". The raw signal data is sent to a feed forward neural network which finds patterns by mimicking the brain neurons of human systems. When a particular type of signal arrives a corresponding particular type of neuron fires up and sends a signal to the next level, which in turn gives a signal to the next level, and then identifies the speech accordingly.

Reference: http://news.mit.edu/2018/computer-system-transcribes-words-users-speak-silently-0404

AI-Powered Virtual Heart

A unique computer program that analyses a magnetic-resonance imaging (MRI) scan, measure the motion of a patient's heart and compares it to that of a "healthy" virtual heart has been constructed, not of blood and tissue but from mathematical equations.

To diagnose, surgeons would normally have to crack open the patient's chest, but this equation-based algorithm has accurately identified the problem in about 15 minutes. It helps point out where the heart wall may be failing," says Peter Hunter, the University of Auckland bioengineer whose team developed the software in collaboration with the German company Siemens.

The MRI analysis programme is just one of a rapidly growing number of medical applications emerging from an ambitious global effort known as the Cardiome Project. The goal of this multi-lab endeavour is to build a virtual heart: a computer model that accurately depicts everything from a single cardiac cell up to the whole organ from the interwoven electrochemical activities of millions of cells to the delicately synchronized pumping of blood. Reference: https://www.technologyreview.com/s/402529/the-virtual-heart/

Artificial Intelligence Bot for Children Suffering from Autism

A team from the Imperial College London and their partners in Europe have developed technology that enables an off-the-shelf robot called Zeno to interact in real-time with children who have autism. The researchers, who are currently trialling the technology in Serbia and the UK, believe that robots may provide an alternative approach for teaching children how to understand and convey their emotions.

Zeno can improve learning and emotional understanding in children with autism. Zeno combines audio, visual, facial recognition and artificial intelligence technologies to detect and decipher sound and visual cues from children, allowing it to spontaneously interact in real-time and conduct a simple lesson.

The ultimate aim of the project is to roll Zeno-like robots out to specialist schools to help teach children with autism. With this, a faster progress can be made to understand more about the condition in children and how it affects their development.

References:https://www.theguardian.com/lifeandstyle/2015/feb/01/how-robots-helping-children-with-autism
https://www.thenational.ae/business/technology/meet-zeno-the-robot-that-s-helping-autistic-children-1.246658

AI for Heart Attack Diagnosis

Nearly 7.5 million people die every year from heart disease. About 1.5-3 million of them are in India and half of them can be saved by early diagnosis. Electrocardiography (ECG), a heart health test is conducted through a machine which records the heart's electrical movement. These machines are not widely available in India, nor are there enough cardiologists to interpret ECG data. And it can take up to 6 hours before a patient is diagnosed and sent for treatment

While the Tricog company sources ECG machines from General Electric Healthcare it has also built its own sensory device and fits it on the machines. It rents these devices to general physicians, clinics and nursing homes on a subscription basis. Through the Internet, this device sends the ECG or

recorded heart movement to a set of algorithms, which then generate a report. Before the report is sent, a specialist doctor verifies it.

In 2016, Tricog processed the ECG reports of 200,000 patients; about 11,000 of them were diagnosed with a heart attack. The company claims it has never reported false results.

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https://tricog.com/news-media.html

AI Bringing a Revolution in Cardiology
Atrial fibrillation (AFib) is the most common human arrhythmia, affecting about 33 million patients worldwide. AFib is a growing problem in cardiovascular disease and is associated with an increased risk of severe stroke, heart failure and death. AFib is often asymptomatic with a stroke as the first manifestation.

Current R-R interval-based methods to detect AFib are characterized by an inferior positive predictive value (PPV) of under 59%, leading to misdiagnosis, mostly false positives that add significant costs to the healthcare system while burdening healthcare resources and placing unnecessary stress on misdiagnosed patients or putting undiagnosed patients in harm's way.
Cardiologs, AI-powered algorithm for ECG analysis team can recognize patterns in a cardiac signal for fast and precise analysis of heart diseases in a similar intuitive manner as expert cardiologists because its neural network was developed using more than 500,000 recordings, and the training dataset continues to grow.

In the same vein, Apple in September 2017 announced it would be using new functionality of the Apple Watch to amass clinical data through a research project called the Apple Heart Study in conjunction with Stanford University researchers. Apple will use the sensors built into Apple Watches to observe and analyse arrhythmias.

References:http://www.mobihealthnews.com/content/cardiologs-raises-65m-ai-powered-ecg-analysis
https://venturebeat.com/2017/10/05/cardiologs-raises-6-4-million-to-lead-the-ai-revolution-in-cardiology/

Artificial Intelligence Creates Cancer-Curing Synthetic Drugs Using AI

In 2014, Romesberg and colleagues created a strain of E. coli bacteria that contained two unnatural letters, X and Y. In a major step toward creating artificial life, U.S. researchers have developed a living organism that incorporates both natural and artificial DNA—and is capable of creating entirely new, synthetic proteins. A researcher in DA-IICT, India is working on creating synthetic drugs using artificial intelligence to eradicate cancer. Cancer drugs are very complex and are made of 50-200 different molecular structures.

Using artificial intelligence, generative adversarial networks to be specific, one can construct a new and sustainable molecular combination which can then find the drugs and possibly solve the problem of cancer. These molecular structures are very unstable and thus require a lot of hand-engineering to make the drug stable. So, the researchers put the molecular structures as input and then the generative network tries to generate structures which minimizes the energy of the whole structure, and it can then be synthesized in the wet lab and then tested on the patient.

Reference:
https://neuromation.io/en/creating-molecules-scratch-drug-discovery-generative-adversarial-networks/
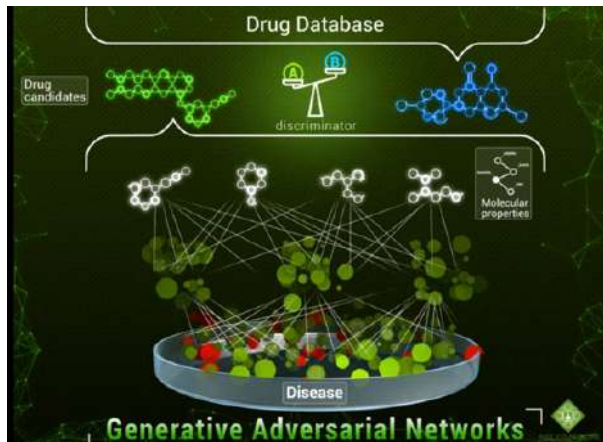
Patient Data Processing - Disease Identification/Diagnosis

When it comes to the effectiveness of machine learning, more data almost always yields better results, and the healthcare sector is sitting on a data goldmine. Where does all this data come from? If we could look at labelled data streams, we might see research and development (R&D); physicians and clinics; patients; and caregivers, etc. Hence, the present-day core issue at the intersection of machine learning and healthcare is: finding ways to effectively collect and use different types of data for better analysis, prevention, and treatment of individuals.

The Boston-based biopharma company Berg is using AI to research and develop diagnostics and therapeutic treatments in multiple areas, including oncology. Current research projects underway include dosage trials for intravenous tumour treatment and the detection and management of prostate cancer. The classification of disease identification can be done using support vector machines (SVMs) as well as multi-layer perceptions. The SVM approach is quite old and thus it has gone through a lot of different tweaks and turns. The data is first collected and labelled into the sets of diseases that can happen from these features, and these features are then fed into the classification networks.

Reference:
https://www.techemergence.com/machine-learning-in-pharma-medicine/

Personalized Treatment/Behavioural Modification Using Artificial Intelligence

Personalized medicine, or more effective treatment based on individual health data paired with predictive analytics, is also a hot research area and closely related to better disease assessment. The domain is presently ruled by supervised learning, which allows physicians to select from more limited sets of diagnoses, for example, or estimate a patient's risk based on symptoms and genetic information.

Over the next decade, the increased use of micro biosensors and devices, as well as mobile apps with more sophisticated health-measurement and remote monitoring capabilities, will provide another deluge of data that can be

used to help facilitate R&D and treatment efficacy.

There is one a software product named Skin Vision that is doing amazing work on this front. The images are collected of the skin disease and then images are annotated and the network is then able to train on the data collected and labelled. Here convolutional neural networks are used to classify the disease from these features extracted from these images. A convolutional neural network has convolutional layers and maximum pooling layers. Convolutional layers are the eyes of the network and maximum pooling layers are a zooming function of the network. Together they can "see" all the things a human expert can see.
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Source: https://skinvision.com/

Drug Discovery/Manufacturing Using Machine Learning

The use of machine learning in preliminary drug discovery has the potential for various use cases. The early drug discovery can do initial screening of drug compounds to predict the success rate of such biological molecular structures. Another use cases is the initial screening of drug compounds to predicted success rates based on biological factors. The algorithms described here can also generate new DNA sequences which can then be synthesized and used as a cure for cancer.
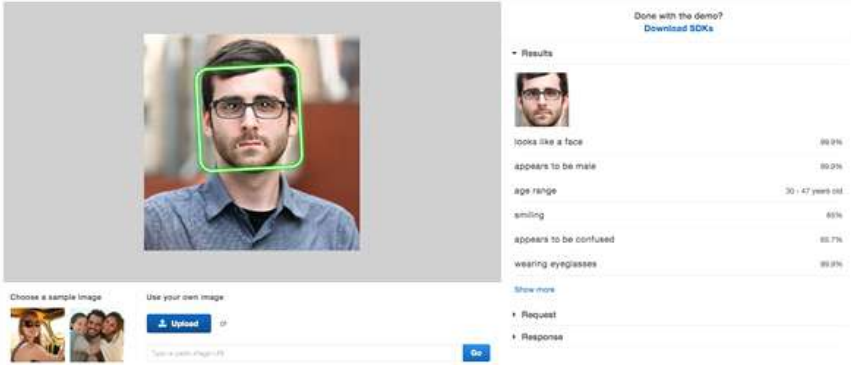
However, progress in precision medicine is difficult, as genome-scale knowledge and reasoning has become the ultimate bottleneck in deciphering cancer and other complex diseases. Manual hand-feature engineering of patients' omics data and treatment decisions take a lot of time. And manual feature engineering requires many highly trained specialists who devote their time to such tasks, which is very costly. This method is not scalable enough and thus machine learning comes into the picture. Using machine reading and natural language processing technology for converting text into structured databases helps in building genome-scale knowledge bases because these algorithms can "read" millions of biomedical articles.

Reference: http://hanover.azurewebsites.net/

Guessing Age Using Facial Recognition

Amazon's latest artificial intelligence tool is a piece of image recognition software that can learn to guess the age of a human from the provided image. The feature is powered by Amazon's Recognition platform, which is a developer toolkit that exists as part of the company's Amazon Web Services cloud computing service. As generally happens, convolutional neural networks are used with a combination of the pre-processing of a training image set and pre-trained models. The tool gives a wide age range instead of trying to pinpoint a specific number.

Reference:: https://www.theverge.com/2017/2/10/14582192/amazon-ai-rekognition-age-guess-software

AI for Crying Babies

Nigeria's Charles Onu is the founder of Ubenwa, a company that has created an artificial intelligence system that analyses a baby's crying to give warning signs of Asphyxia disease,, which is the third leading killer of infants worldwide. The detection of birth asphyxia takes only 10 seconds with the Ubenwa application.

Ubenwa is an Igbo word which means 'the cry of a child' and was built as a machine-learning system that can take an infant's cry as input and, analyse the amplitude and frequency patterns in the cry, to provide instant diagnosis of birth asphyxia. According to reports, 95% accuracy has been achieved in trials involving over 1,400 pre-recorded baby cries. The United Nations stated, "If newborns who have asphyxia can be detected early enough, we may be able to save their lives".

From reports, 900,000 babies die every year from perinatal asphyxia. Because the detection of baby birth asphyxia takes only 10 seconds with the Ubenwa application, this is appreciably and critically faster compared to blood test-based detection. Ubenwa is non-invasive (requiring only the sound of a cry rather than blood), has a lower operating cost (about 95% cheaper than any clinical alternative), and requires little or no skill to operate.
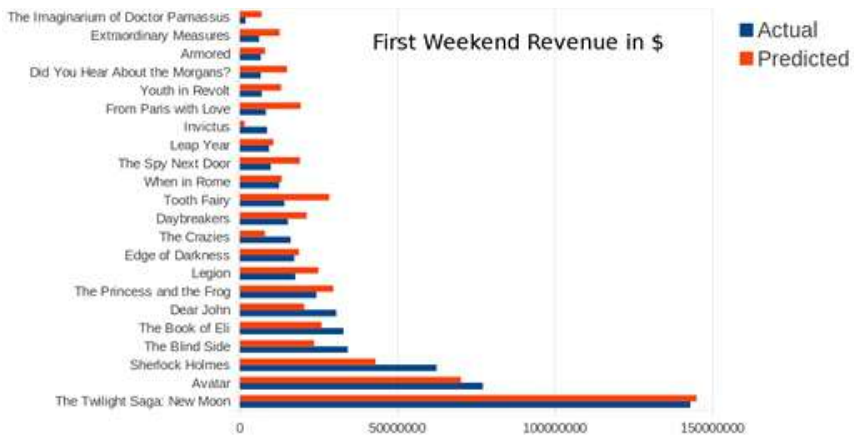
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http://ubenwa.com/

Lifestyle

Fashion

Art

Machine Learning: Predicts Gross Box Office Revenues

Hollywood generates billions of dollars of revenue annually. The question of what makes a film successful has been asked by production houses and movie makers over the years. Though a few people have tried predicting the box office success of a movie based on various factors, it is now more likely that machine learning can bring some insight into providing an answer. The team at Stanford tries to predict how much a movie will earn based on factors such as star power, the number of theatres the movie opens in, YouTube trailer views, IMDB rating and budget.

The factors affecting the movie's success is itself a big question, but how each factor should be measured and fed into any machine learning algorithm is a more important one. For example, the star power of the actors/actresses was calculated by the number of people following the actors/actresses on Twitter and Facebook. Then a dataset was created, which is then passed on to a machine learning algorithm, a support vector machine classifier, and movies are classified into ten different categories. As of now, there is no application that can predict the success of a movie, but various research papers try to predict the box office success using various features and methods.

Reference: http://cs229.stanford.edu/proj2016/report/PengdaLiu-MachineLearningOnPredictingGrossBoxOffice-report.pdf

IMDB User Ratings Prediction for Movies

In this work, the authors investigate the extent to which average user ratings of a movie can be predicted after learning the relationship between the rating and various attributes of movies from a selected set of data. The authors used machine-learning techniques for estimating various features of a movie such as the top-four actors, directors, writers, and combine the results to find predictions of IMDB user ratings. A ranking algorithm is used to rank the cast of those movies, then the data is sent to a neural network which estimates the parameters of the model and then predicts the movies' ratings based on the optimized model formed using the dataset. To complete the database, a missing value replacement algorithm is used which estimates missing data elements. Although it is difficult to predict ratings for the movies with a totally unknown or less-popular cast, authors have employed certain heuristics to minimise the errors. Thus, the authors show how important the cast is for a movie's ratings, not only for the box office performance of a movie, but even for IMDB ratings that depend a lot on the content, story, direction and other factors.

Reference:https://pdfs.semanticscholar.org/e7ae/2379489570302b28f39608 4b368be64db4ca.pdf

AI Converts Food Images to a List of Ingredients
Researchers from MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) believe that analysing photos of food could help learn recipes and better understand people's eating habits. In a new paper with the Qatar Computing Research Institute (QCRI), the team trained an artificial intelligence system called Pic2Recipe to look at a photo of food in order to predict the ingredients and suggest similar recipes.

The Researchers at CSAIL combed websites like All Recipes and Food.com to develop "Recipe1M," a database of over one million recipes that were annotated with information about the ingredients in a wide range of dishes. They then used that data to train a neural network to find patterns and make connections between food images and the corresponding ingredients and recipes.

Given a photo of a food item, Pic2Recipe could identify ingredients like flour, eggs, and butter, and then suggest several recipes that it determined to be similar to images from the database. (The team has an online demo where people can upload their own food photos to test it out.)

In the future, the team hopes to be able to improve the system so that it can understand food in even more detail. This could mean being able to infer how a food is prepared (i.e. stewed versus diced) or distinguish different variations of foods, like mushrooms or onions.

This could potentially help people figure out what's in their food when they don't have explicit nutritional information.

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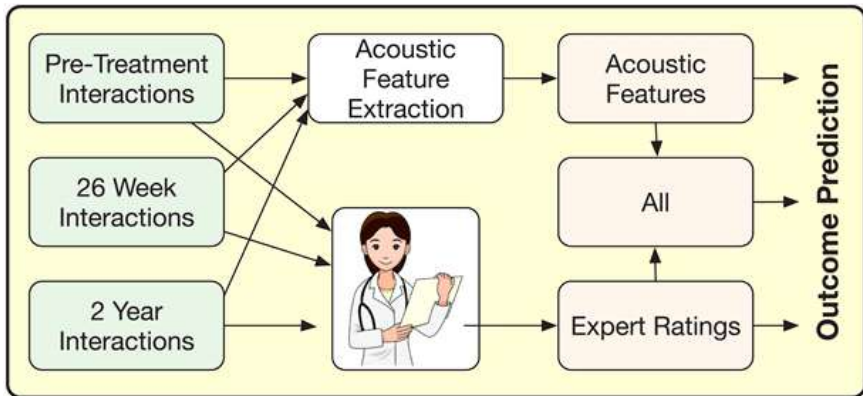
AI in Marriage/Relationship Survival
Researchers from the University of Southern California have trained a relationship predictor to give troubled relationships an expiry date.

They used computers to extract standard speech analysis features from recordings of therapy session participants over a period of two years. The features, including pitch, variation in pitch and intonation all relate to voice aspects such as tone and intensity.

A machine-learning algorithm was then trained to learn the relationship between those vocal features and the eventual outcome of therapy. This was not as simple as detecting shouting or raised voices; it included the interplay of conversation, who spoke when, and for how long, as well as the sound of the voices. It turned out that ignoring what was being said and considering only these patterns of speaking was sufficient to predict whether or not couples would stay together. This was purely data driven, so it did not relate outcomes to specific voice attributes. Interestingly, the predictions based on the same data by experts (75.6%) turned out to be inferior to predictions made by the AI-based system only on vocal characteristics (79.3%).

The significance of this is not so much about involving AI in marriage counselling or getting couples to speak more pleasantly to each other (however commendable that would be), it is about how much information about our underlying feelings is encoded in the way we speak—and some of it completely unknown to us.

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AI for Personalised Spam Filters

The Gmail team is always working to make sure that every spam message stays out of sight of its e-mail users and that genuine messages are not mistakenly classified as spam. In fact, less than 0.1% of the emails in an average Gmail inbox is spam, and the amount of unwanted mail landing in the spam folder is even lower, at under 0.05%. Even so, Gmail spam detection is not perfect. Today machine learning provides a great opportunity to fight spam and the Gmail team plans to take full advantage of this emerging technology.

Since its arrival, machine learning has helped make the Gmail spam filter more effective. When you click the 'Report spam' and 'Not spam' buttons you're not only improving your Gmail experience right then and there, you're also training Gmail's filters to identify spam vs. wanted mail for the future.

The spam filter uses an artificial neural network to detect and block the especially sneaky spam—the kind that could actually pass for wanted mail. It also takes into account the fact that not all inboxes are alike. So while your neighbour may love weekly email newsletters, you may detest them. With advances in machine learning the spam filter can now reflect these individual preferences.

Finally, the spam filter is better than ever at rooting out email impersonation—that nasty source of most phishing scams. Thanks to new machine-learning signals, Gmail can now figure out whether a message actually came from its sender and keep bogus email at bay.

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AI Fashion Designer

Amazon's fashion assistant uses artificial Intelligence to create brand new designs. Amazon has developed technology that learns about certain fashion styles by viewing images from which it automatically creates similar styles. MIT Technology Review reports that it works by analysing images of clothing that already exist to design similar pieces. Instead of human designers, Amazon's algorithm becomes the creative genius.

The tool that accomplishes this task is called a generative adversarial network. It uses deep neural networks to remember properties of specific styles by looking at a host of examples. Once it has learned the style, it can transform an existing piece of clothing to fit that style. The system will be able to identify rising fashion trends and start creating its own unique pieces for Amazon customers to purchase. One way Amazon might be able to spot trends ahead of the game is by identifying new looks that start to appear in social media posts.

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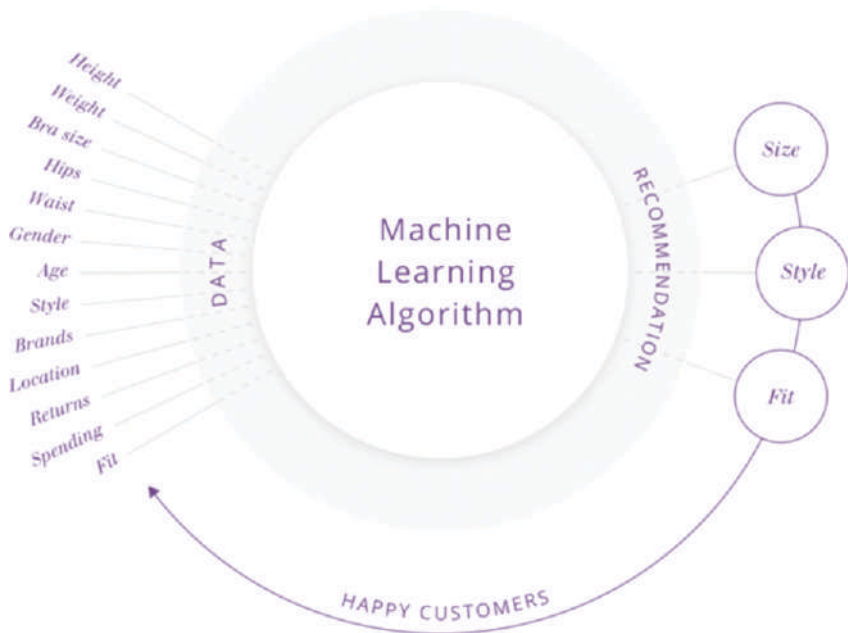
Clothes Sizing and Fitting Using Machine Learning

Despite the incredible convenience of online shopping, including saved time and effort, the wide range of products to be compared and purchased, discounts, and detailed product information, clothing e-commerce has not yet completely replaced traditional in-person shopping. This is further proven by the average return rate for apparel stores, which is between 20-30%. This is much higher than the 10% rate for gifts, toys, and home products.

Bold Metrics uses data science and machine learning to predict body measurements using its Insights (BMI AI), which enables brands to leverage AI technology to take a data-driven approach to clothing design and ready-to-wear sizing.

Another example is Metail, which has developed a virtual fitting room technology that allows consumers to generate a 3D model of themselves (MeModel) by uploading a photo and entering just a few key body measurements (height, weight, age, bra size, bust, waist and hips). Both uses machine learning and augmented reality to support an intelligent algorithm that provides   personalized size and style advice based on "MeModel" data, previous purchasing behaviour and dataReference:

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https://metail.com/memodel-experience/how-it-works/ of other customers.

Writing in Chinese Calligraphy Using Deep Learning

Researchers have developed a novel application for Conditional Generative Adversarial Networks (GANs), a popular deep learning architecture that can make you a master of Chinese calligraphy. Creating beautiful characters is a hard and time-consuming activity The researchers made use of conditional GANs to create characters that look different, yet beautiful. A conditional word is used to obtain a character for the same type of character the user wants. This novel application bypasses the many excruciating hours of hard work that designers and coders have to go through to make a single font library.

The designers have made a subset of a very small number of the total Chinese characters available (around 25,000 options). The fonts contain fine curve and edge-width details. The network was able to store the fuzzy/style details from the small subset and can apply these details to all the remaining fonts to create the stylized fonts. A neural network is trained to approximate the transformation between two fonts given a subset of pairs of examples. Once the learning is completed, it can be used to infer the shapes for the rest of the characters.

Reference:
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https://kaonashi-tyc.github.io/2017/04/06/zi2zi.html
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AI for Scriptwriting

A long short-term memory (LSTM) recurrent neural network, a type of AI that is often used for text recognition, was fed the scripts of dozens of science fiction movies including such classics as Highlander, Endgame, Ghostbusters, Interstellar and The Fifth Element to create an AI script

The network, which named itself Benjamin, dissected the scripts down to the letter, learning to predict which letters tended to follow each other, and which words and phrases tended to occur together. The advantage of an LSTM algorithm over a Markov chain is that it can sample much longer strings of letters; as a result it is better at predicting whole paragraphs rather than just a few words. It is also good at generating original sentences rather than cutting and pasting sentences together from its corpus. Over time, Benjamin learned to imitate the structure of a screenplay, producing stage directions and well-formatted character lines. The only thing the AI could not learn were proper names because they are not used like other words and are very unpredictable. After training, Benjamin was asked to create a screenplay, including directions for the actors using a set of prompts required by the Sci-Fi London Film Festival's 48-hour Challenge.

The result is a weirdly entertaining, strangely moving, dark sci-fi story of love and despair. The sentences make sense in isolation, although the dialogue is not very cohesive when taken together. It is an initial effort at teaching machines the creativity of human brains. Though, not a great success, it's a start!

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AI for Painting

A study published by researchers from the University of Tubingen in Germany describes an artificial intelligence neural network capable of discerning style of an image and using that style to copy another image.

This artificial system is based on a deep neural network that creates artistic images of high perceptual quality. The system uses neural representations to separate and recombine content and style of arbitrary images, providing a neural algorithm for the creation of artistic images. The neural network basically does two jobs: One layer analyses the content of an image while another analyses its texture, or style. These functions can also be split to work across

two images.

The researchers suggest that it may be possible to use the algorithm to create new types of images that can be used to study how humans interpret and perceive images by designing novel stimuli that introduce two independent, perceptually meaningful sources of variation: the appearance and the content of an image.

It is possible that human creativity will one day be replaced by computer programs that can produce art the way we buy our fast-food. But creating a computer as powerful and complex as the human brain is a daunting task that we're still far away from completing!

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AI for Lip-Reading

A team from the University of Oxford's Department of Computer Science has developed a new artificial intelligence system called LipNet, built on a data set known as GRID that is made up of well-lit, face-forward clips of people reading three-second sentences. Each sentence is based on a string of words that follow the same pattern.

The team used that data set to train a neural network that is similar to the kind often used to perform speech recognition. In this case, though, the neural network learnt to identify the variations in mouth shape over time, and also learnt to link that information to an explanation of what was being said. The AI does not analyse the footage in snippets but considers the whole sentence, enabling it to gain an understanding of context. That's important because there are fewer mouth shapes than there are sounds produced by the human voice.

The system was able to identify 93.4% of the words correctly. Human lip-reading volunteers asked to perform the same tasks identified only 52.3% of the words correctly.

In the future, Skype could fill in the gaps when a caller is in a noisy environment, or people with hearing difficulties could hold their smartphone up to "hear" what someone is saying.

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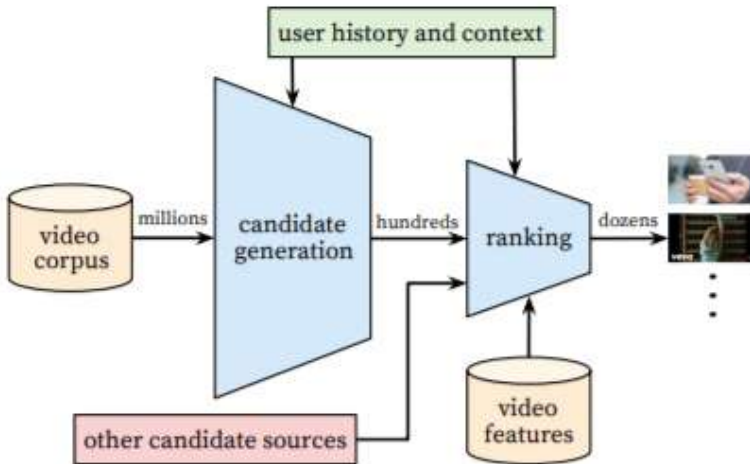
99 USE CASES
AND EXPERT THOUGHTS
FOR STARTERS

Social
Media

Deep Neural Networks for YouTube Recommendations

Recommendation systems are certainly one of the most commonly asked-for features of the entertainment industry. Netflix, YouTube, Facebook and Amazon spend huge amounts of money developing the best and most efficient recommendation systems. YouTube represents one of the largest scale and most sophisticated industrial recommendation systems in existence. In the referenced article below, the authors describe the system at a high level and focus on the dramatic performance improvements brought by deep learning, which has a massive user-facing impact. The biggest factors affecting existing traditional systems were scale and freshness. The scale of YouTube is undoubtedly so large that highly specialized distributed learning algorithms are the only way to achieve the goal.

The dynamic corpus, having thousands of videos uploaded on an hourly basis, needs a responsive algorithm. The basic steps for the recommendation system are the candidate generation model, which narrows down the scope of related videos, and the ranking model, which ranks videos on the basis of the probability of a user clicking on a video. This system uses deep learning in both

of these models and has achieved state-of-the-art performance.

Reference:
https://static.googleusercontent.com/media/research.google.com/ru//pubs/archive/45530.pdf

How Instagram Uses Machine Learning and Big Data

There are 70 million photos uploaded to Instagram every day. People interact with each of those posts by showing their love/liking with a heart, making comments and using hashtags. All these activities create an enormous amount of data. Once analysed, by humans as well as increasingly through artificial intelligence algorithms, it can provide incredible business intelligence and insights into human behaviour.

The areas where Instagram uses AI include: an 'explore' page and 'search' function; targeted advertising: used with the powerful data network of Facebook and combining with AI; and enhancing the user experience. As the content increases rapidly, it's tough to show what the users really like and, failing that decreases the value of the platform. Machine learning algorithms are used to better determine what users will like and filtering out spam. Instagram uses Facebook's artificial Intelligence platform called Deep Text to remove fake messages, fight cyberbullying and delete offensive comments. In one study, 100 million Instagram photos were used to learn global clothing patterns.

Reference:
https://www.forbes.com/sites/bernardmarr/2018/03/16/the-amazing-ways-instagram-uses-big-data-and-artificial-intelligence/#323591a35ca6

Social Welfare

Psychology

Machine Learning for Detecting Poverty

One of the biggest challenges of providing relief to people living in poverty is locating them. The availability of accurate and reliable information on the location of impoverished zones is surprisingly lacking for much of the world, particularly on the African continent.

Stanford researchers have proposed an accurate way to identify poverty in areas previously void of valuable survey information. The researchers used machine learning—to extract information about poverty from high-resolution satellite imagery.

Because areas that are brighter at night are usually more developed, the solution combines high-resolution daytime imagery with images of the Earth at night. The researchers used the "night light" data to identify features in the higher-resolution daytime imagery that are correlated with economic development.

These improved poverty maps could help aid organizations and policymakers distribute funds more efficiently and enact and evaluate policies more effectively.
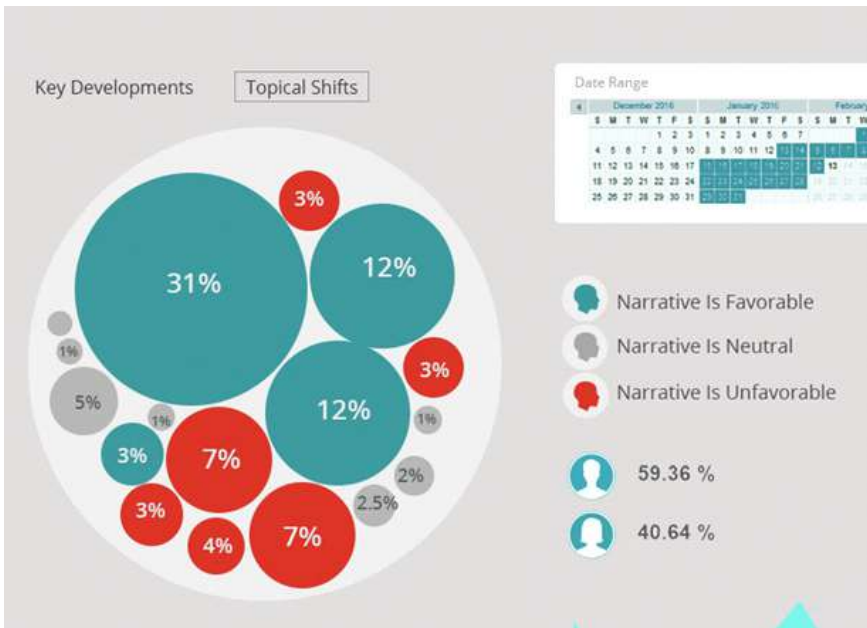
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https://engineering.stanford.edu/magazine/article/machine-learning-uses-satellite-data-zero-poverty-pockets
https://www.theverge.com/2016/8/18/12522764/poverty-measurement-satellite-algorithms-night-vs-day-imaging

Protagonist: Narrative Analytics Explained

A new narrative analytics platform has been launched to help brands figure out the stories that are actually being told about them. The platform is called Protagonist, from a company by the same name. Formerly called Monitor 360, Protagonist's newly released platform is the first specifically designed to analyse complex, cross-platform data to reveal the underlying beliefs and motivations of consumers. Protagonists' customers include General Mills, MetLife, Warner Brothers and Microsoft.

The Protagonist platform gathers unstructured data about its clients from relevant social media, blogs, websites, traditional news and other media. The custom-built artificial intelligence specifies the narrative threads about the client and its competitors, clusters them into related groups, scores them according to their relative level of influence for such metrics as buying patterns, and maps how they've changed over time. Then human experts take that clustering and, working with platform tools, determine strategic actions, channels, content and influencers that can emphasise supportive narratives or counter-destructive ones.

Reference: https://www.protagonist.io/

Artificial Intelligence is Learning What Makes You Cry at the Movies
Scientists at the MIT Media Lab announced that they have taught a machine how to manipulate our emotions. This is a technology that they believe can help filmmakers to create more engrossing movies and TV shows.

The researchers said that In collaboration with the strategic consulting firm McKinsey & Company they used a deep neural network to watch thousands of small slices of video, movies, TV, and short online features. For each slice the neural network guessed which different elements made a moment emotionally special, constructing an emotional arc. To test their accuracy, the team got human volunteers to watch the same clips, tagged their reactions and labelled which elements including the music, the dialogue, and the type of imagery shown on screen had a stronger effect on their emotional responses. This information helped the researchers to fine-tune the resulting model until it became really accurate at guessing what triggers human emotions.

The emotional arc in _Up_'s opening sequence, as scored by a machine, still shows highs and lows in line with positive or negative moments.

Visual valence[1] over time, scored 0 to 1
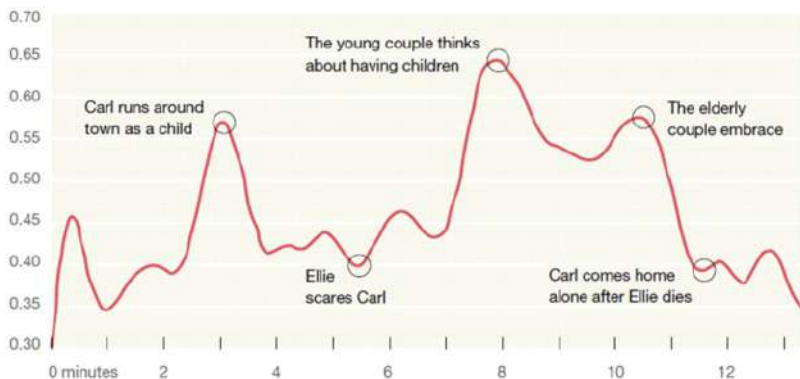
[1]Visual valence is scored by machine on a scale of 0 to 1. The higher the score, the more positive the emotional response.

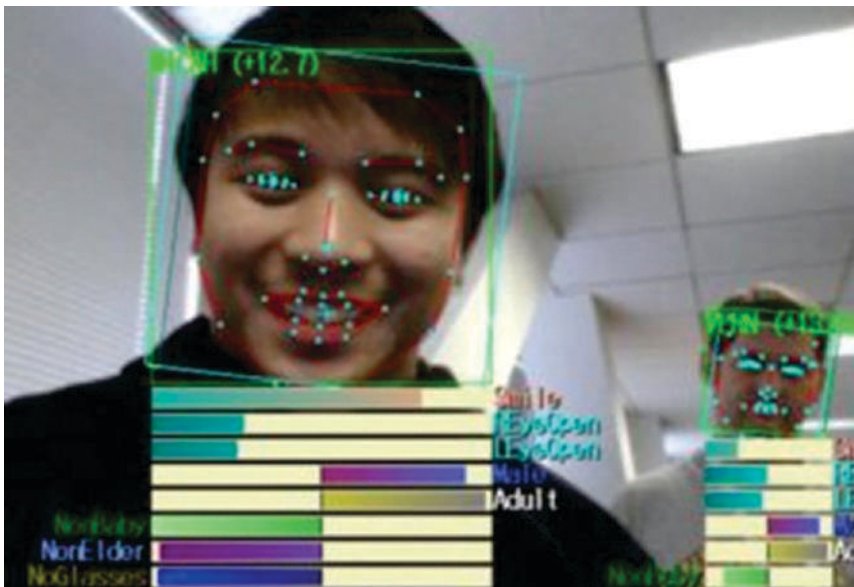**Source:** Massachusetts Institute of Technology, Lab for Social Machines

The researchers believe that use of AI to enhance [the work of film makers] by providing insights that increase a story's emotional pull—for instance, identifying a musical score or visual image that helps to engender feelings of hope—can really help storytellers to thrive in a world of seemingly infinite audience demand.

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https://www.media.mit.edu/articles/ai-is-learning-how-to-make-you-cry-at-the-movies/https://www.disclose.tv/ai-is-learning-how-to-make-you-cry-at-the-movies-316335

Emotion Detection and Recognition from Text Using Deep Learning

As mentioned in the title, emotion detection and recognition can also be done from text. What does that mean? It means that deep learning algorithms can help us to analyse the sentiments evoked by text, such as disgust, fear, happiness, sadness, or surprise. It could be very useful for a government to know the level of happiness among its citizens by analysing their posts on

different social media channels, or it could also be helpful in giving appropriate suggestions if anxiety is detected through the type of speech, checking the tone of emails and getting the chance to edit it before sending it.

Facial expression and voice intonation convey over 70% of the intended feelings in spoken language. Understanding contextual emotion has widespread consequences for society and business. In the public sphere, governmental organisations could make good use of the ability to detect emotions like guilt, fear, and uncertainty. It is not hard to imagine the TSA auto-scanning airline passengers for signs of terrorism, and in the process making the world a safer place. This also explains Apple's new feature on the iPhone X called Animoji, where you can get a computer simulated emoji to mimic your facial expressions

Emotion Detection and Recognition from text is a progression of Sentiment Analysis.

Reference:
https://www.microsoft.com/developerblog/2015/11/29/emotion-detection-and-recognition-from-text-using-deep-learning/
https://blog.algorithmia.com/introduction-to-emotion-recognition/

AI Predicts Outcomes of Human Rights Trials
An artificial intelligence (AI) method developed by researchers at University College London, the University of Sheffield and the University of Pennsylvania has predicted the judicial decisions of the European Court of Human Rights (ECtHR) with 79% accuracy.

The team of computer and legal scientists, extracted case information published by the ECtHR in its publicly accessible database. They identified English language datasets for 584 cases relating to Articles 3, 6 and 8 of the Convention and applied an AI algorithm to find patterns in the text of the Court's decisions. To prevent bias and misalignment, they selected an equal number of violation and non-violation cases.

The most reliable factors for predicting the court's decision were found to

be the language used as well as the topics and circumstances mentioned in the case text. The 'circumstances' section of the text includes information about the factual background of the case. By combining the information extracted from the 'abstract topic' that the cases cover and circumstances of the data for all three articles an accuracy of 79% was achieved.

This effort is not aimed at AI replacing judges or lawyers, but it can help them by rapidly identifying patterns in cases that lead to certain outcomes. It could prove to be a really useful tool in the judiciary system!

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https://www.ucl.ac.uk/news/news-articles/1016/241016-AI-predicts-outcomes-human-rights-trials
http://www.wired.co.uk/article/ai-human-rights-court-cases

ARTIFICIAL INTELLIGENCE SIMPLIFIED: 99 USE CASES AND EXPERT THOUGHTS FOR STARTERS

Education

AI for Grading Academic Papers

A UC Berkeley professor and three former graduate students are putting the finishing touches on an artificial intelligence technology that groups answers to questions and allows them to be graded.

The AI is not used to directly grade the papers; rather, it turns grading into an automated, highly repeatable exercise by learning to identify and group answers and thus treat them as batches.

Using an interface similar to a photo manager, instructors ensure that the automatically suggested answer groups are correct and then score each answer with a rubric. In this way, input from users lets the AI continually improve its future predictions.

According to Sergey Karayev, a Gradescope co-founder, the use of AI promises to slash grading times by as much as 90%.

References:
https://www.edsurge.com/news/2016-04-18-gradescope-raises-2-6m-to-apply-artificial-intelligence-to-grading-exams
https://blogs.nvidia.com/blog/2016/09/02/gradescope-brings-ai-to-grading/

Sports

DSN
Data Science Nigeria

Athlete Fitness, Sleep Monitoring, and Performance Optimization Using AI

When we think of professional sports, we think of strong athletes with strict diets and hard-core training routines who happen to be extremely good at what they do. Compared to average people, athletes typically have longer life expectancies and overall higher levels of positivity through the help of their everyday regimens.

With the help of artificial intelligence (AI), athletic performance can be tailored to any individual, promoting both training efficiency and preventive care. Neurotracker, a company specialising in cognitive training across athletic, educational, medical and scientific use, provides a mind exercise program that tests athletes' abilities to recognise and identify objects and improve their overall situational awareness. By combining powerful sensors and AI to create an automatic health assessment, the user can pinpoint which parts of their bodies are working efficiently and which parts need more work.

Using AI provides increased scalability and accuracy exceeding the capability of humans. Automated training assessment allow these insights to be accessed by everyone, not just those who can afford expensive personal trainers. Using powerful recurrent neural networks with memory, one can have large amounts of data of human training and the AI would be better than expensive trainers.

Reference:
http://whoop.com/

Betting Game Outcome Predictions Using AI

One of the vital applications in sport that requires good predictive accuracy is that of predicting match results. Traditionally, the results of sports matches are predicted using mathematical and statistical models that are often verified by a domain expert. Sport practitioners are striving for classification models so that they can understand and formulate strategies needed to win matches; with growing focus on the application of artificial neural networks (ANNs) to predict the results of sports matches.

The ANNs identify the learning methodologies utilised, data sources, appropriate means of model evaluation, and specific challenges of predicting sport results. An ANN usually contains interconnected components (neurons) that transform a set of inputs into a desired output.

Source:
https://www.sciencedirect.com/science/article/pii/S2210832717301485

Chatbot for Sports/Sports Teams Using Reinforcement Learning
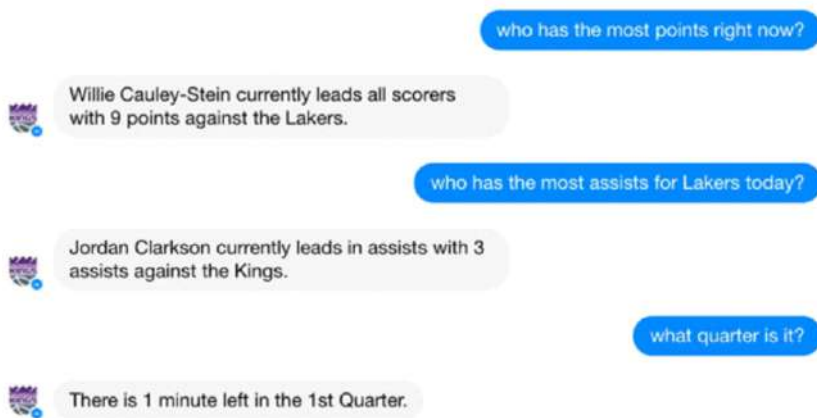
In June 2016, in partnership with Sapien, a custom bot developer (formerly known as JiffyBots), the Sacramento Kings introduced a chatbot called KAI, an acronym for Kings' Artificial Intelligence. The chatbot operates through the Facebook Messenger platform for the purpose of answering fan inquiries including info about franchise history, current team stats, the team roster, franchise history and details about the Golden 1 Centre, the home arena of the Sacramento Kings. Using natural language processing (what happens when computers read language). NLP processes turn text into structured data and the machine converts the plain text request into codified commands for itself.

Reference:https://www.techemergence.com/artificial-intelligence-in-sports/

Finance

Using Artificial Intelligence for Financial Advice

For many people, making personal finance decisions are necessary and a major source of stress. Pefin aims to use machine learning to deliver a range of financial planning and investment advice via a chat interface.

At the core of Pefin's artificial intelligence is a feed-forward neural network. The best way to picture this network is like a web which captures the relationships among the many variables describing a user's financial life and their environment at one point in time. The neural network understands financial rules and relationships and them forward in time—up to 80 years, depending on the age of the client.

The network starts with a user's current finances and projects how they change over time with market conditions, inflation, taxes, government rules, and their plans. Among all these factors, the network makes hundreds of connections. For example, if the user has a child, are they eligible for a tax credit in the future? If they take time off from work today, how does that change their Social Security benefits when they retire? Any time the data input to the network changes (such as market conditions, tax rules, a user's account balances or their monthly spending) the financial projections and plans are automatically updated to reflect the most current and accurate information. For any given user the network evaluates anywhere from 2,000,000 to 5,000,000 data points depending on the complexity of their financial situation. The financial plans are available 24/7.

Reinforcement learning is an additional layer added in the Pefin artificial intelligence methods to truly provide individualistic advice to each user. Rooted in behavioural psychology, this aspect of machine learning is very important in moving away from generic advice and into more-complex problem-solving with unique outcomes. Reinforcement learning takes the details of an individual's financial behaviour and feeds that into learning algorithms, creating a growing insight into the objectives of that individual user. These tools are also able to consider things such as short-term vs. long-term trade-offs, which are inherent in financial decision-making.

Leveraging this technology enables Pefin to provide comprehensive, tailored advice at an affordable price. That's the power of AI.

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https://medium.com/wharton-fintech/podcast-with-catherine-flax-ceo-of-pefin-with-full-transcript-bae2c453a04chttps://news.efinancialcareers.com/us-en/296587/transitioning-from-jpmorgan-to-fintech-startup-pefin

A Financial Search Engine Uses AI

Google is a general purpose search engine. It finds information very quickly and easily But if one wants to get detailed or specific information which Google has not indexed, one may find it necessary to go through a mountain of usually irrelevant information by scrolling through the most popular and most visited listings and bypassing promoted results. Pinpointing complex data can be a difficult task.

Bitvore is a search engine that uses artificial intelligence to deliver personalised data to businesses in real-time. This artificial intelligence is truly precision intelligence; Bitvore frequently sources and filters through information, helping businesses spot untapped sales opportunities, trace valuable trends, and identify potential risk factors. The company claims that it uses more than 200 different machine learning algorithms to complete a task. These algorithms include a recurrent neural network which can work on sequential data through its memory block compared to a vanilla neural network. It also uses elastic searches and other search-and-find pattern algorithms to do the task.

Reference:
https://www.forbes.com/sites/julianmitchell/2017/05/11/this-a-i-search-engine-gives-companies-tailored-insights-in-real-time/#4ab10a9173fc

Automated Report Generation Using AI

Artificial Intelligence can generate natural language and the sentences it generates preserve context through long-term dependencies and thus are better suited for writing summaries. The YSEOP software company has created an artificial intelligence product (also called YSEOP) that automatically summarises data, explain its analysis, and write the data-driven sections of reports. Using a customer relationship management plug in, YSEOP can write a memo before a salesperson takes a meeting. The software explains who you are meeting, the company's history with the client, what the salesperson need

to know, what the salesperson needs to sell, and with what sales pitch. All of this is done automatically. Some clients take this to the next step, using a software like Alexa to "read" the report written by YSEOP.

Recurrent neural networks can generate these kinds of data by learning a long-term sequence of context. Long short-term memory is an advanced version of recurring neural networks which can save even larger context to make the text seem even more realistic.

Reference: https://yseop.com

Law

DSN
Data Science Nigeria

Contract Analysis Using AI

Due diligence is an integral and essential part of corporate transactions, yet, it can be a painful process for lawyers and their clients. In mergers and acquisitions, and other dynamic and time-sensitive transactions, due diligence often becomes a bottleneck that slows down deals, a frustration to attorneys and their clients alike.

eBrevia's diligence review tool, the Diligence Accelerator, allows attorneys to select key provisions for extraction from an extensive list of concepts typically relevant in due diligence for mergers and acquisitions (M&As).

The remarkable and game-changing aspect of eBrevia's technology is that it searches for concepts rather than just keywords and then extracts the relevant concept no matter where it is located in the document and regardless of the vocabulary used to express it. For example, an important provision in M&As such as Change of Control can be expressed using language such as "change of control", "assignment by operation of law", or "merger".

In a merger agreement the word "merger" could be used a hundred times with just one instance applicable to the change of control concept. This is where eBrevia's artificial intelligence provides substantial advantages over a simple keyword search, essentially by knowing what to extract for a given concept and what to ignore.

This all can be done using Recurrent Neural Networks, preserving the context of the language and searching through a hyper-dimensional space where the text can be represented, through Recurrent Neural Networks.

Reference: https://ebrevia.com/

Legal Document Review and research using AI

Artificial intelligence (AI) is on the brink of revolutionising the legal profession. AI is now being used in document reviews to sort through large chunks of data and identify the relevant sections of that data. However, finding relevant needles in a data haystack is not the same as providing nuanced understanding and analysis of those findings. For that, the legal profession still needs people like experts to provide high-level analysis and strategy, and train AI to find relevant passages.

The current thinking is that when it comes to document review it would not make sense to let AI software loose unsupervised into a mountain of data and documents.

Legal professionals are needed to train the software to find useful patterns so that the AI software is a help rather than a hindrance. About 20 to 30 years ago, lawyers had to manually red-line documents, but that is not needed anymore with AI-augmented, lawyer-supervised document review that provides efficient and cost-effective service for their clients.

Source: https://mplace.io/e-discovery

Construction

AI-Powered Application and Infrastructure Monitoring

The challenges of infrastructure and application monitoring have become a common theme in the age of micro-services. German start-up Instana takes a holistic view of the challenge of micro-service monitoring, combining views at the server level, the application level, and the network level.

Instana uses agents installed in each host for local discovery of the infrastructure and its dependencies. It collects data in one-second increments then uses that data to build a 3-D model, which it calls a Dynamic Graph, of all the components to establish what a healthy infrastructure should look like. Instana took its cue from Google by using a standardised key performance indicator (KPI) model to determine the system's health.

For each of the services, it calculates the load, latency, error rate, saturation and number of instances. When there's a dramatic shift in any of the KPIs that is seen as a quality of service issue that triggers an incident alert. When an incident alert is triggered it collects all the data connected to all the changes related to it.

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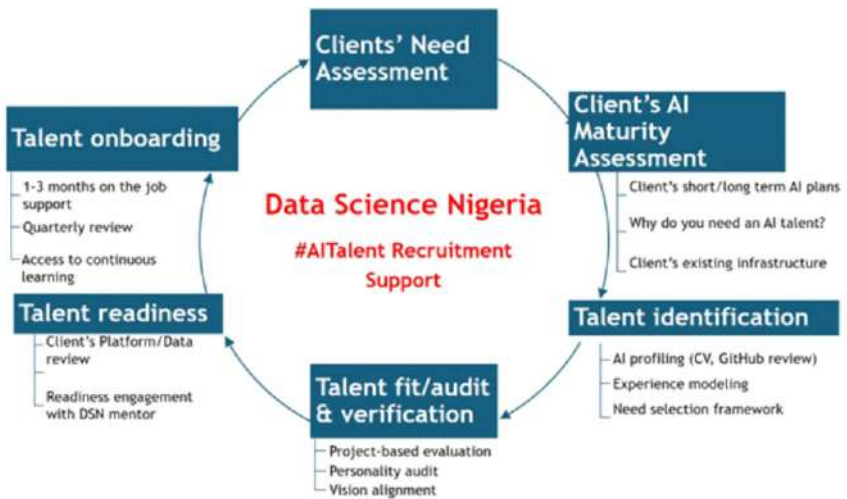
CONTRIBUTE TO THE USE CASES

We know that the 99 use cases listed here are only a tip of the iceberg when it comes to multiple of AI application in various industries today.

You can update the collection repository by clicking https://goo.gl/r7rSrG

AI Talent Recruitment Support Programme

Let us help your company recruit, on-board and support high-class AI/Data Science talent pool

Clients' Need Assessment

Client's AI Maturity Assessment
- Client's short/long term AI plans
- Why do you need an AI talent?
- Client's existing infrastructure

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#AITalent Recruitment Support

Talent identification
- AI profiling (CV, GitHub review)
- Experience modeling
- Need selection framework

Talent fit/audit & verification
- Project-based evaluation
- Personality audit
- Vision alignment

Talent readiness
- Client's Platform/Data review
- Readiness engagement with DSN mentor

Talent onboarding
- 1-3 months on the job support
- Quarterly review
- Access to continuous learning

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