

Section VI: Practical applications and use cases

Artificial Intelligence in UK Landscape Overview Q3/ 2018

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AI and GovTech (E-Governance)

Key Highlights

- GovTech denotes the application of IT systems and solutions to the problem of Governance. GovTech is one of the leading applications of AI.
- The UK Office for Artificial Intelligence is working with GovTech Catalyst as part of a £20 million initiative to ensure that the public sector can benefit from ongoing developments in the nation's AI Industry, aiming to speed the adoption of AI at scale, focused in cyber security, life sciences, construction, manufacturing, energy and agricultural technology. Part of the £20 million allocated to GovTech Catalyst will be used to host a series of company competitions whereby winning companies will receive £50,000 to develop their solutions to public sector challenges.
- The first GovTech Catalyst round focused on five key challenges, including (1) Identifying Daesh still imagery; (2) Tracking waste through the waste chain; (3) Tackling loneliness and rural isolation; (4) Cutting traffic congestion; and (5) Deploying smart sensors on council vehicles to improve services.
- The House of Lords Report "AI in the UK: Ready, Willing and Able?" encourages the Government to reform public procurement regulations to help UK companies provide AI solutions to public sector challenges through a variety of measures, including launching an online bulletin board to advertise public sector challenges identified by the UK Office for Artificial Intelligence and GovTech Catalyst, as well as a call for the UK Government to proactively review regulations and guidelines pertaining to data monopolization by large tech companies in coordination with the Competition and Markets Authority.

GovTech companies indicated in the report

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| <ul style="list-style-type: none">1. Prowler.io2. Humanising Autonomy3. ODIGA4. Cambridge Humanae5. Flexciton6. Neon Century Intelligence7. Terrabotics8. Thingful9. Archangel Imaging10. Focal Point Positioning11. VChain Technology12. Essencient | <ul style="list-style-type: none">13. SeeQuestor14. City AI15. Advizzo16. Solar winds msp17. Bunt Ltd18. Braintree19. Chorus Intelligence20. SCL21. MWR InfoSecurity22. 1Spatial23. AppyParking24. Sandtable |
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Case Studies of AI application in GovTech

Company Name	Website	Description	Number of Employees	Technology
SeeQuestor	seequestor.com	SeeQuestor is an integrated software and hardware toolset, designed to dramatically increase the speed at which police and security teams analyse video as part of investigations.	11 – 50	Computer vision
Advizzo	advizzo.com	Advizzo was founded in London in June 2015 with the idea of transforming the way customers think about their energy and water consumption as well as the way utility companies engage with their customers.	11 – 50	Predictive analytics
Braintree	braintree.com	Braintree is a research company specialising in providing data analysis and machine learning for large organisations. The company was founded in 2002 and is based in London, United Kingdom, next to UCL.	11 - 50	Intelligent data analysis
AppyParking	http://www.appyparking.com/	AppyParking has created a Content Management System called The Parking Platform™ that understands every possible rule, restriction and tariff from the fragmented world of the public and private parking sector.	11 - 50	Machine Learning
Chorus Intelligence	https://chorusintel.com/	Chorus Intelligence is an independent specialist provider of data-analytics solutions. Its clients include law enforcement agencies, central governments, defence agencies and businesses. Its lead product, Chorus Analyser, has been chosen by 90% of police forces. Chorus Intelligence is based in the UK but is committed to working internationally.	11 - 50	Data analysis

Advizzo Water Consumption Project

The Advizzo software platform enables and guides end customers towards more efficient water and energy usage while at the same time helping utilities to become more efficient in their own processes.

Advizzo uses Consumption Pattern Analysis (Big Data). Its software gets data from its B2B clients and then analyses these with external data such as weather forecasts, demographics and social media inputs. As a result, the end consumer receives personalised insights and tips to save water. At the same time, Water Utilities efficiently interact with their end customers, offering them dedicated programmes which fits their water usages.

Anglian Water with the help of Advizzo's behavioural science and data science platform has been able to reduce water consumption by 8% for Newmarket's measured customers over 12 months. Anglian Water selected Advizzo to support its customer engagement strategy as it was the most flexible and cost-effective behavioural science provider. Currently, by using Advizzo and smart metering installations, customers in Newmarket can measure their water use in near real-time, comparing it to similar households in their area. The project is ongoing, with activity ramping up in Norwich and Colchester.

Advizzo and Anglian Water developed a water consumption portal, which informs Newmarket residents in terms of their water consumption, and their rating use against similar households. The portal will soon provide personalised tips on how to lower water use, using data from an online consumer survey designed to understand each individual household and its habitual consumption. These insights will help residents to have a heightened social awareness of the average water consumption, as well as incentivise them to reduce their bills.



Source: http://www.advizzo.com/int/adv_02/wp-content/uploads/2018/06/anglian-cs-1-2.pdf

<https://www.water-technology.net/news/company-news/anglian-water-advizzo-reduce-water-consumption-behavioural-data-science/>

SeeQuestor: Video intelligence for law enforcement and security

SeeQuestor's Video Analytics Products, designed primarily for law enforcement and security teams, let you search through video more than 100 times faster than conventional methods. SeeQuestor can save hundreds of man hours a week.

The platform provides a full suite of capabilities at the video analyst's fingertips - including world-leading video analytics, format conversion, maps and viewing modules - that will significantly boost a team's productivity, regardless of the quality of the video footage (which is often very poor). SeeQuestor is a user-centric platform, with users applying human judgments to extract intelligence from the data and using computational power to enhance those decisions.

One example is a rape case in England, a review of almost 200 hours of video by SeeQuestor revealed that the accused was close to the victim's house just 30 minutes before the assault, thus breaking his alibi. The screen capture was achieved despite extremely poor quality light and corrupted footage. The video review would have taken three weeks with conventional methods, but was completed in 11 hours by a complete novice user of the platform.

The award-winning SeeQuestor platform combines the world's most sophisticated Deep Learning research with the processing power of a supercomputer. And the platform's entire functionality is available for every user. SeeQuestor is being used in real cases by police forces on three continents. It has proven time and again that it has dramatically increased the speed at which video has been analysed as part of investigations.



Source: <https://www.sequestor.com/#casestudies>
<https://www.sequestor.com/#home>

Braintree: intelligent computing solutions

Founded in 2002, Braintree is one of the most innovative and forward thinking companies in the AI space. Its solutions tackle the big challenges faced by major corporations, public service organisations, government, and individuals.

Braintree truly believes in the potential AI holds for the society, economy, and business. Its goal is to ensure that AI develops in the right way so that it benefits society as a whole – and Braintree is engaging with Government, Parliament, regulators and policy makers to ensure it does. Braintree is a supporting member of the APPG (All-Party Parliamentary Group on the 4th Industrial Revolution), providing technical advice to parliamentarians on the potential of AI.

Braintree brings together world-leading scientists from across a number of disciplines, including biological, computer sciences, psychology and software developers, to provide game changing technological solutions. It uses AI to clean, merge, analyse and visualise huge datasets at high speed. Its intelligent software identifies problems and automates solutions to help large organisations better manage their structures and operating procedures, providing revenue generating opportunities, efficiency gains, as well as the highest levels of security and safety.

Braintree's work ranges from providing an IT infrastructure for a major oil company resulting in increased profitability of millions, to automated analysis of sentiment in news articles for political campaigns, to research into higher order cognition by combining neural networks with graph databases.



Source: <http://braintree.com/#about>

AppyParking

In July 2015 AppyParking teamed up with Vodafone drivexone to create the world's first "One Click Parking" solution. Using a combination of M2M dongles and the mobile app enabled drivers to find available spaces quickly and easily, start a parking session with one click and only pay for the minutes parked. The solution reduced parking times from 20 minutes to 30 seconds.

Kerbside Restrictions, otherwise known as Traffic Regulation Orders, are currently represented as either Text Based or Mapped Based orders. Local Authorities use these as legal instruments to implement most traffic controls on their roads. Government bodies are putting increasing pressure on local authorities to expose good parking data in the effort to help reduce congestion and pollution. The Department of Transport have also highlighted the need for connected cars and autonomous vehicles to be connected to a digital infrastructure layer over the existing road network.

'Signs to Lines' Mapping is the latest patent pending technology that creates the world's most accurate HD kerbside maps of all the paint on the street related to traffic and parking management. The 'Signs to Lines' Mapping technology uses a combination of state of the art vehicle mounted LiDAR scanners, photography and machine learning. The revolutionary rapid data capture and processing techniques is faster, cheaper and more accurate than existing mapping methods and is key to delivering better data to local authorities. The machine learning process combines every restriction, rule type, tariff and exemption and creates the world's first standardised HD Kerbside maps accurate to 3 cm.

Standardised HD Kerbside Restriction Maps open up huge opportunities within the smart city and intelligent mobility sector.



Source: <https://appyparking.com/kerbside-data/>

Chorus Intelligence

Chorus Intelligence is an independent specialist provider of data-analytics solutions. Chorus Intelligence is dedicated to exploiting advances in technology for the benefit of our clients. Already, its lead product, Chorus Analyser, has been chosen by 90% of police forces.

Chorus Analyser is the number 1 data cleansing and analysis tool used by UK law enforcement. Clients can drag and drop all their digital data to be overlaid, analysed, and mapped to generate courtroom ready reports. Chorus eliminates the time spent unnecessarily formatting and preparing data to allow the practitioners to see the big picture and get straight to the answer.

A case involving the murder of an HGV driver. The investigation team at Greater Manchester Police used mapping in Chorus to help outline the series of events that took place around the time of the murder by combining handset and billing information to secure convictions for those involved.

In one of Hampshire Constabulary's largest-ever drugs cases, analysts used Chorus to help secure over 100 years of jail time for eight criminal gang members. Also, in one of East Midlands Special Operations Unit's (EMSOU) largest drugs cases, analysts used Chorus to help break a 15 handed national drugs conspiracy intending to supply the UK with over £1m worth of wholesale drugs.



Source: <https://chorusintel.com/brochures-case-studies/>

GovTech Catalyst for AI in public services

The new GovTech Catalyst is set to work with a Government backed Office for Artificial Intelligence (AI) to ensure the public sector can benefit from the development of the relevant technologies. It will be accompanied by efforts to speed up the adoption of AI at scale, focused in six priority business areas: cyber security, life sciences, construction, manufacturing, energy and agricultural technology.

The GovTech Catalyst is part of a £20 million initiative to support the development of new technologies in public services. It will act as a ‘front door’ for tech firms, giving them a point where they can present ideas for new digital solutions for public services. It expects to fund at least 15 phase 1 challenges. Its work with the Office for AI will be an element of the challenge to make the UK a world leader in AI and the “data revolution”, along with support for the Digital Catapult’s Machine Learning Garage programme, efforts to train professionals from different industries in how they could apply AI, and promoting awareness of advanced data analytic technologies. The strategy also points to the role of a new Centre for Data Ethics and Innovation in the field, and plans to work with industry to set up data trusts for the easy and secure sharing of data.

The GovTech Catalyst accepts challenges from public sector bodies, including: UK central government organisations; devolved administrations; local public sector organisations.

Business Secretary **Greg Clark** said:

“The way we earn and live our lives as workers, citizens and consumers is being transformed by new technologies. The UK is well placed to benefit from this new industrial revolution and we start from a position of significant strength. We have a thriving research and science base and are home to a wide range of innovative sectors, from advanced manufacturing and life sciences, to fintech and creative industries. The Industrial Strategy is an unashamedly ambitious vision for the future of our country, laying out how we tackle our productivity challenge, earn our way in the future, and improve living standards across the country.”

Source: <https://www.ukauthority.com/articles/govtech-catalyst-to-promote-ai-in-public-sector/>
<https://www.gov.uk/guidance/the-govtech-catalyst-challenge-process>

GovTech Catalyst Fund

Part of the £20m Govtech Fund will go towards a series of competitions which identify specific public sector challenges and invite startups to offer smart solutions. Winning companies (4 or 5 for each challenge) will receive up to £50,000 to develop their ideas, with some companies receiving an extra £200,000 to build their proof of concept. A further £500,000 will be available to exceptional companies to continue product development, and to pilot their solutions in the public sector.

The first GovTech Catalyst round was kicked-off with the announcement of five challenges:

- Identifying Daesh still imagery (open 14 May to 27 June 2018)
- Tracking waste through the waste chain (opening June 2018)
- Tackling loneliness and rural isolation (opening July 2018)
- Cutting traffic congestion (opening August 2018)
- Deploying smart sensors on council vehicles to improve services (opening September 2018)

Home Office research shows that more than two-thirds of terrorist propaganda disseminated online is still imagery. This project will support both Government analysis of, and broader efforts to remove, this harmful material.

Another project implies a new technological approach that could help record, check and track waste, helping boost productivity, reduce costs, and protect both human health and the environment.

The government recognises that rural transport is vital to local communities, and businesses. A technological solution, exploiting vehicles with spare capacity could support rural economies. ‘The Cost of Loneliness to the UK’ puts the cost of loneliness to employers at £2.5bn per annum, and over 9 million people always or often feel lonely.

The fund demonstrates the Government’s commitment to “*providing more opportunities for tech businesses – including small firms – to access public procurement contracts*”.

Source: <http://www.public.io/the-govtech-catalyst-fund-supporting-accelerating-innovation/>

Lords highlight need to boost public sector AI

According to “AI in the UK: Ready, Willing and Able?” from the House of Lords, public procurement regulations should be changed to give UK based companies a better chance to provide artificial intelligence (AI) solutions to the public sector. The report urges the Government to “be bold” in its approach to the procurement of AI, encouraging the development of possible solutions to public policy challenges through limited speculative investment. This should be accompanied by support for businesses that convert ideas to prototypes and help determine which ideas are viable.

It also recommends the setting up of an online bulletin board to advertise challenges that the Government Office for AI and GovTech Catalyst have identified across the public sector. The recent announcement of the creation of the catalyst also wins approval for its potential to improve the development of AI in the UK.

The report proposed five principles that: AI should be developed for the common good and benefit of humanity; operate on principles of intelligibility and fairness; should not be used to diminish data rights or privacy; all citizens should have the right to be educated alongside AI; and it should never be given the autonomous power to hurt, destroy or deceive human beings.

Other notable elements of the report include a call on the Government, with the Competition and Markets Authority, to review proactively the use and potential monopolisation of data by big technology companies; and that people should be informed when AI is being used to make significant or sensitive decisions that could affect them.

Chair of the committee **Lord Clement-Jones** said:

“The UK contains leading AI companies, a dynamic academic research culture, and a vigorous start-up ecosystem as well as a host of legal, ethical, financial and linguistic strengths. We should make the most of this environment, but it is essential that ethics take centre stage in AI’s development and use.”

Source: <https://www.ukauthority.com/articles/lords-highlight-need-to-boost-public-sector-ai/>

AI and Blockchain

Key Highlights

- The convergence of AI with Blockchain is one of the central trends to keep an eye on in the next few years.
- Investments in blockchain increased from 3% to 6% in 2018, while that same year investments in AI increased from 8% - 18%.
- AI and Blockchain can be combined in synergetic ways that create results greater than the sum of their parts. Blockchain can, for instance, be used to track, understand and explain decisions made by AI, and AI can manage blockchains faster and more effectively than humans.
- As AI becomes more predominant in society, the issue of data and cyber security becomes ever more pressing. Blockchain's transparency, accessibility and immutability are key features that can help improve security as AI systems and solutions become more powerful and more pervasive.
- One of the most near-term intersections of AI and Blockchain to keep an eye on is AI and Blockchain in healthcare. The rise of blockchain in healthcare reached new heights in 2017, where a variety of companies sought to apply blockchain to healthcare according to three major use-cases:
 - (1) identifying and tracking prescription drugs;
 - (2) audit trials to provider networks, and
 - (3) value-based care.
- A 2017 survey by IMB found that 16% of healthcare executives expected to deploy commercial blockchain solutions by the end of 2017.

Introduction

Bernard Marr, the best-selling author and keynote speaker on business, technology and big data, wrote an article for Forbes in March 2018 stating that Artificial Intelligence and Blockchain combined together can bring major benefits. The author highlighted two main ideas regarding the correlation between the two mega trends:

1. **Blockchain can help us track, understand and explain decisions made by AI;**
2. **AI can manage Blockchains more efficiently than humans.**

In addition, Marr mentioned that Blockchain is ideal for storing extremely sensitive personal data because it is highly secure, thanks to the cryptography which is inherent in its filing system. AI has plenty to bring to the table in terms of security too. An emerging field of AI is focused on building algorithms which are capable of working with data while it is still in an encrypted state.

An important point highlighted in the article is that even though AI offers huge advantages in many fields, it is not trusted by the public, therefore its efficacy at this stage will be severely limited. Recording the decision-making process on Blockchains could be a step towards achieving the level of transparency and insight into robot minds that is needed in order to gain public trust. Blockchain and AI are two technological trends which, while groundbreaking in their own right, have the potential to become even more revolutionary when put together.

Another opinion is presented by Sherman Lee, the founder of Raven Protocol, and a partner at Zer0th.AI, where he focuses on funding AI and Blockchain companies. Lee pointed out that “*Throwing ‘AI’ plus ‘Blockchain’ together means absolutely nothing. There should be no discussion on whether AI needs Blockchain or does not need Blockchain. In five to ten years, the whole world is simply going to move on to a decentralized infrastructure. AI and ML [Machine Learning] will be fundamental in the creation of deep tech companies in this new world. We need to build out a ton of fundamental infrastructure and protocol layers. Projects working on increasing the amount of training data, improving the latest research algorithms, and providing a massive amount of computing resources will be huge in 2018.*”

Sources: <https://www.forbes.com/sites/bernardmarr/2018/03/02/artificial-intelligence-and-Blockchain-3-major-benefits-of-combining-these-two-mega-trends/#6d5e71aa4b44>
<https://www.forbes.com/sites/shermanlee/2018/03/19/ai-will-take-over-Blockchain-in-2018-but-it-wont-happen-without-these-3-key-areas/#7a3e221a48fd>

The impact of AI and Blockchain

According to PwC, “*Artificial Intelligence industry can contribute up to \$15.7 trillion to the world economy by 2030. This means that the global GDP will be up to 14% higher as a result of the accelerating development of AI.*” According to Gartner “*by 2030, the business value added by Blockchain will grow to \$3.1 trillion.*”

In April 2018 Dmitry Matskevich, the co-founder and CEO of Dbrain, presented his perspective on AI and Blockchain synergy. He mentioned that together they are moving towards a secure environment, helping to create a world without borders and represent a huge step to accessibility.

Blockchain’s transparency and accessibility to all participants of a peer-to-peer network significantly increases security. Meanwhile the progress made by machine learning in the past few years makes AI a great companion for the Blockchain to guarantee a secure applications deployment. An important point is that in comparison with fiat payments which cause legal and bank difficulties, wages in crypto do not depend on local laws and therefore protect workers from volatile exchange rates. On Blockchain-based platforms, developers can simply request a task, set a price, and any available worker around the world can perform it to earn money. Additionally, in many developing countries it is difficult to open a bank account, and therefore making a fiat payment is not easy therefore earning in cryptocurrencies could be a solution.

Data sharing is the first benefit of Blockchain for AI. As AI is associated with data, Blockchain becomes a gateway that leads to secure data transfer over the internet, thus saving considerable processing time between the points where the data is evolved and evaluated. Blockchain technology cannot be changed and is available publicly. It is therefore more relevant than data that is delivered on unproven platforms with embedded errors. Blockchain offers a trustworthy information source to retailers, governments, businesses, financial institutions, non-profits, health and educational organizations, scientific researchers thus enabling informed decision making. Due to its decentralized nature, Blockchain can potentially neutralize the risk of one party’s monopoly of AI and their ability to control one of the most powerful and dangerous technologies known to man. The combination of Blockchain technology and Artificial Intelligence is still a largely undiscovered area. Even though the convergence of the two technologies has received its fair share of scholarly attention, projects devoted to this groundbreaking combination are still scarce.

Sources: <https://hackernoon.com/when-ai-meets-Blockchain-the-power-of-synergy-661de3e32976>
<https://www.investinBlockchain.com/Blockchain-artificial-intelligence/>

AI and Blockchain in healthcare

By utilizing the latest advancements in Blockchain and artificial intelligence, the medical industry can improve quality, bring down cost, and democratize healthcare. Interdisciplinary innovation and collaboration is the key to applying AI and Blockchain to solve meaningful problems in life sciences.

In 2017, Blockchain was designed for use in three applications in healthcare: identifying and tracking selected prescription drugs, audit trails for provider networks, and value-based care. A 2017 IBM survey of 200 healthcare executives in 16 countries found that 16% expected to have a commercial Blockchain solution at scale in 2017, while 9 out of 10 institutions planned to invest in pilots by 2018. Executives are primarily interested in Blockchain in three core areas: clinical trial records, regulatory compliance, and medical/health records.

The UK excels in bringing together multidisciplinary teams across academia, the National Health Service and industry. BenevolentAI is just one of the UK companies developing advanced AI life sciences platforms that will support scientists in making new discoveries and redefine how the research community accesses and uses data.

In 2017 DeepMind, Google's AI-powered health tech subsidiary, had been working in partnership with London's Royal Free Hospital to develop kidney monitoring software called Streams and had faced criticism from patient groups for what they claimed are overly broad data sharing agreements. Critics feared that the data sharing had the potential to give DeepMind, and in turn, Google, too much power over the NHS. Therefore, as a solution DeepMind Health planned to use the Blockchain technology to allow hospitals, the NHS and patients track what happens to personal data in real-time. DeepMind co-founder Mustafa Suleyman and Ben Laurie, the company's Head of Security and Transparency stated: "*With Verifiable Data Audit, we'll build on this further. Each time there's any interaction with data, we'll begin to add an entry to a special digital ledger.*"

In March 2018, Medicalchain, a Blockchain platform that enables the transparent exchange of medical records by patients and doctors, has partnered with the London-based Groves Medical Group to pilot a Blockchain programme in its four medical centres. As well in June 2018 Medicalchain has signed a joint work agreement with Mayo Clinic to improve Blockchain technology utilization in healthcare.

Sources: https://www.events.trade.gov.uk/media.viewer/uploads/pdf/ekp_aiBlockchain-directory_1527863734.pdf

<https://www.telegraph.co.uk/business/business-reporter/Blockchain-trial-in-healthcare/>

<https://www.theguardian.com/technology/2017/mar/09/google-deepmind-health-records-tracking-Blockchain-nhs-hospitals>

Disrupting the Future in the UK

The “*Disrupting the future how businesses can embrace Artificial Intelligence, Blockchain and the Internet of Things*” (2017) report published by the CBI explained that the United Kingdom “*with leading entrepreneurial talent, a competitive financial ecosystem and world-class research and development, the country has a golden opportunity to lead the way in unlocking the potential of new technologies and build upon its reputation as a renowned hub for disruptive innovation.*”

Artificial intelligence and Blockchain each became priority areas in the UK. In 2018 AI leapt from 8% to 18% as a priority area and Blockchain went from 3% to 6% as an investment priority area in the UK.

Studies show that businesses recognise the importance of both emerging technologies, but do not know how to respond to this trend. Blockchain has revolutionized the financial industry globally and AI can help when it comes to the decision of whether a bank can lend to customers or the decision of where to invest. AI is also catapulting robo-advice to a new level. In media and entertainment, Blockchain technology promises to solve the issues around rights management and micro-payments and AI can be used to identify actors who break copyright law.

In March 2017, it was announced that the Bank of England had paired up with Artificial Intelligence and Blockchain specialists in a bid to keep up to date with the fast-growing financial technology sector. It has also partnered with Ripple to trial a Blockchain-based technology that would make cross-border payments and the movement of currencies more immediate.

The CBI’s report highlighted that only a “*quarter of UK businesses see themselves as followers in the digital revolution. These firms wait for technologies to go completely mainstream before testing them and many do not have a digital strategy that looks more than three years ahead. Low awareness and understanding of technologies hold businesses back and with the pace of change accelerating there is a clear need to showcase what is possible.*”

To adapt to changing technology, to create jobs, and to solve the pressing challenges society faces it is crucial a strong partnership between government, business and people.

Sources: http://www.cbi.org.uk/index.cfm/_api/render/file/?method=inline&fileID=9548E491-9223-4AD2-8611F08808A03A57

AI & Blockchain partnerships

The Computer Weekly/TechTarget IT Priorities survey for 2018 found that Artificial intelligence and blockchain initiatives earmarked for a doubling of investment. Blockchain went from 3% to 6% as an investment priority area in the UK, and from 5% to 10% in the Emea region as a whole. AI leapt from 8% to 18% as a priority area in the UK, and from 8% to 16% in Emea.

In June 2018 a joint partnership between the University of Edinburgh and Wayra UK was announced that will support a new accelerator programme for start-up companies working in artificial intelligence and blockchain technologies. The joint programme, supported by Scottish Enterprise, will be starting in September 2018 and is expected to welcome 20 start-ups a year and bring around 400 jobs to Edinburgh.

Also, the Bank of England has paired up with artificial intelligence and blockchain specialists in a bid to keep up to date with the fast-growing financial technology sector. The central bank is testing an artificial intelligence system with Canadian startup MindBridge AI to allow it to spot abnormalities in financial transactions and "explore the benefit of machine learning technology for analysing the quality of regulatory data input." It has also partnered with San Francisco-based startup Ripple to trial a blockchain-based technology that would make cross-border payments and the movement of currencies more immediate.

Source: <https://www.thedatalab.com/news/2018/university-of-edinburgh-wayra-uk-launch-ai-blockchain-accelerator>
<https://www.telegraph.co.uk/business/2017/03/17/bank-england-trials-artificial-intelligence-blockchain-bid-stay/>
<https://www.computerweekly.com/news/450433458/2018-UK-software-budgets-double-for-AI-and-blockchain>

AI and Healthcare

Key Highlights

- AI in healthcare is one of the fastest-growing AI subsectors in 2017-2018.
- The number of startups entering the healthcare AI space has increased in recent years, with over 50 companies raising their first investment rounds since January 2015. Deals to healthcare-focused AI startups went up from less than 20 in 2012 to nearly 70 in 2016.
- A recent NHS report titled “Accelerating Artificial Intelligence in health and care: results from a state of the nation survey” highlighted the pressing need for the NHS to adopt AI solutions in order to optimize their internal operations
- In September 2018 the UK Government published a code of conduct on AI and data-driven technologies in healthcare with the aim of creating a "safe and trusted environment in which innovation can flourish".
- The code details 10 principles by which entities working on the intersection of healthcare at AI should adhere. Health Minister Lord O'Shaughnessy has stated that core aims of the code include the acceleration of proven AI and data-driven technologies, to set clear guidelines on how patient data is protected, and to put the NSH on fair grounds for future partnerships.
- The UK Government's strong focus on preventive and precision medicine and their strong standing in the global healthtech industry makes the nation well positioned to become an international leader in the specific application of AI to healthcare.

AI in UK / Healthcare

Healthcare was the only industry presented in the report “AI in the UK: ready, willing and able?” as successful in AI implementation:

- Opportunities. The application of artificial intelligence in the delivery of healthcare in the UK offers significant opportunities to improve the diagnosis and treatment of the unwell, as well as to help the NHS and other healthcare providers be more efficient
- The value of data and its safety. Maintaining public trust over the safe and secure use of their data is paramount to the successful widespread deployment of AI and there is no better exemplar of this than personal health data.

Deep Knowledge Analytics published in February 2018 the report “AI in healthcare in UK”.

The authors highlights following advantages of AI in UK Healthcare:

- Good implementation of digital health and big data analysis.
- Computer vision in Healthcare have multiple startups and implementations.
- Many conferences on AI in Healthcare, and almost all AI conferences includes healthcare sections.
- Number AI in healthcare companies and investors holds significant portion in the entire AI in UK industry.
- AI in healthcare topic is recognised by government as important.



Source: <https://publications.parliament.uk/pa/l201719/lselect/l dai/100/100.pdf>

AI for Advanced R&D in Healthcare



The most crucial and important sectors of application **AI in Healthcare**:

- Advanced R&D
- Drug Discovery
- *in silico* Clinical Trials
- Diagnostics and Biomarker development
- NeuroTech
- Surgery

- The broad field of AI in Healthcare has already experienced a significant rise during 2016, especially in the application of computer vision, text analysis and chatbot technologies. Since all these techniques were first developed in the IT-sector, it was possible to easily repurpose them for the healthcare sector.
- However, the segment of applying AI for advanced R&D is limited to companies and researchers with very high levels of expertise. This creates a specific scarcity for AI specialists in this niche.
- 2018 is expected to become the year in which AI will be recognized as the most powerful driver of progress in solving the crucial challenges in the most advanced sectors of science and R&D in the healthcare and Biotech industries.
- Applying AI for advanced R&D, biomarker development and drug discovery will bring the most disruptive impact on the business model of the Pharma and entire Biotech industry.
- This is why the players from the AI for drug discovery market can become new game changers and significantly influence the capitalization of pharma companies.

AI in Healthcare

Artificial intelligence will revolutionize the healthcare industry. Indeed healthcare will be leading the Fourth Industrial Revolution, and a major catalyst for change is going to be artificial intelligence (AI).

AI in health represents a collection of multiple technologies enabling machines to sense, comprehend, act and learn so they can perform administrative and clinical healthcare functions. Unlike legacy technologies that are only algorithms and tools that complement a human, health AI today can truly augment human activity.

AI has already found several areas in healthcare to revolutionize, starting from the design of treatment plans through the assistance in repetitive jobs to medication management or drug creation. And it is only the beginning.

The number of startups entering the healthcare AI space has increased in recent years, with over 50 companies raising their first investment rounds since January 2015. Deals to healthcare-focused AI startups went up from less than 20 in 2012 to nearly 70 in 2016.

The field of AI has been actively growing since 2015. But 2017 became year of the ‘cambrian explosion’ of AI in healthcare.

This market is primarily being driven by factors like the rise of personalized medicine in tests for clinical decision-making, big data in the healthcare industry, and the growing adoption of AI in genetics. Also, AI created a real-time monitoring system, and wearables are playing a crucial role in digital healthcare monitoring.

AI in Healthcare:

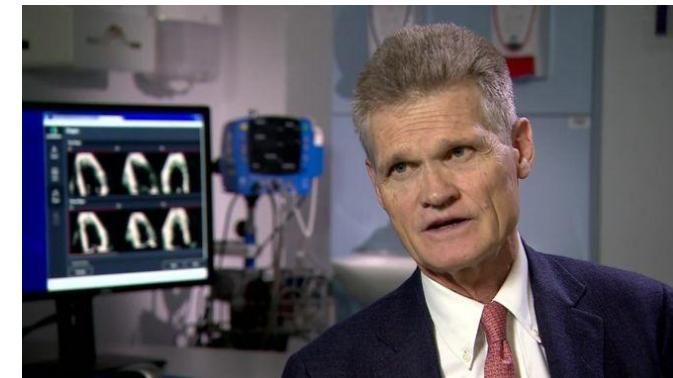
- Drug Discovery
- Wearables
- Medical Imaging and Diagnostics
- Research
- Mental Health
- Lifestyle Management
- Digital Health Monitoring
- Patient Data and Risk Analytics
- Virtual Assistants
- Surgery
- Hospital Management

AI in Healthcare is Supported by the UK Government

The UK government's healthcare tsar, Sir John Bell, has told BBC News that AI could "save the NHS".

John Bell said that NHS patient records are uniquely suited for driving the development of powerful algorithms that could transform healthcare and seed an “entirely new industry” in AI-based diagnostics.

“What Google’s doing in other sectors, we’ve got an equivalent unique position in the health space” he said. “Most of the value is the data. The worst thing we could do is give it away for free.”



Researchers at an Oxford hospital have developed artificial intelligence (AI) that can diagnose scans for heart disease and lung cancer. This heart disease technology will start to be available to NHS hospitals for free this summer.

“There is about £2.2bn spent on pathology services in the NHS. You may be able to reduce that by 50%. AI may be the thing that saves the NHS,” he said.

The system will save billions of pounds by enabling the diseases to be picked up much earlier.

Taking this example and applying it more generally to a wider array of diseases, the NHS could create significant cost savings by better diagnosing and treating patients with the assistance of machine vision of X-rays, MRIs, cell culture results, epidemiological data crunching, and so forth.

A lot of work is currently done by expensive, error-prone humans that need not be.

Source: bbc.co.uk

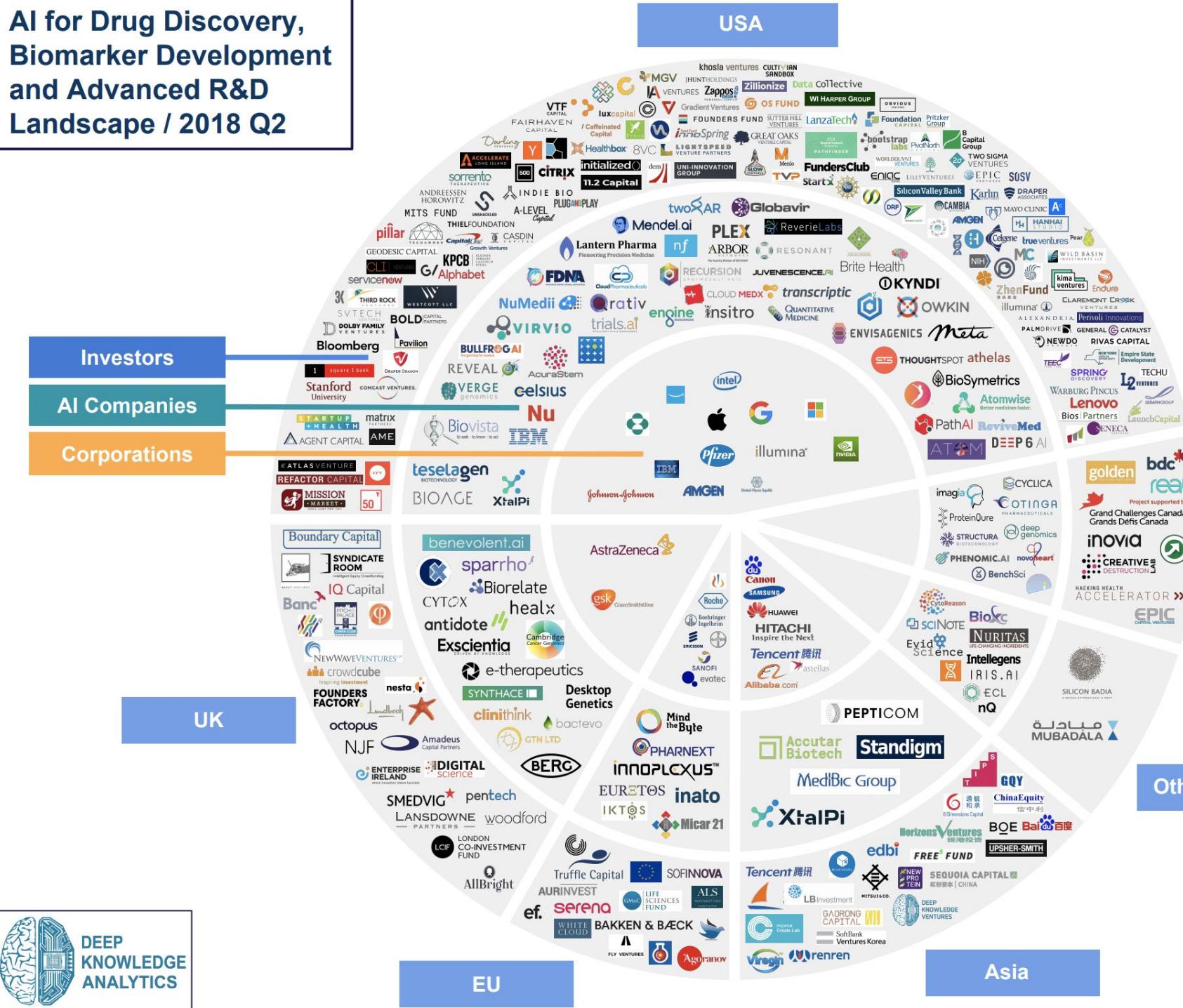
AI for Drug Discovery, Biomarker Development and Advanced R&D Landscape / 2018 Q2

Investors
AI Companies
Corporations



UK

EU



Companies - 100
Investors - 220
Corporations - 30

Regional Position

You can download high resolution version of this Mindmap via this link: <https://www.dkv.global/ai-for-drug-discovery>

Diversification of AI for R&D and Drug Discovery process

Companies - 100
Investors - 220

Companies



You can download high resolution version of this Mindmap via this link: <https://www.dkv.global/ai-for-drug-discovery>

AI for Drug Discovery, Biomarker Development and Advanced R&D Landscape / 2018 Q2

Companies - 100
Investors - 220
Corporations - 30

Drug Discovery

Advanced R&D

Investors

AI Companies

Corporations

Biomarker
Development



You can download high resolution version of this Mindmap via this link: <https://www.dkv.global/ai-for-drug-discovery>

AI in Healthcare companies indicated in the report

- | | | |
|---|--|--|
| 1. 11derma
2. Aerobit Health
3. AHA Health
4. Aigenpulse
5. AutonoMe
6. Avalon AI
7. BABYLON HEALTH
8. BENEVOLENT
9. BIOBEATS
10. Biorelate
11. Bounce
12. Cambridge Bio-Augmentation Systems
13. Center Health
14. Circadia
15. Clinical Insights
16. CLINITHINK
17. Creavision Technologies
18. Cydar Medical
19. Cytosystems
20. DEEPMIND
21. Deontics
22. DESKTOP GENETICS
23. Draper and Dash
24. Drayson Technologies Group
25. Edge Health
26. Elucidata
27. Emteq.net
28. EnigmaMS
29. Exscientia | 30. Farmatrust
31. Feebris
32. Felcana
33. Fitwell
34. Geneix
35. GPrX Data
36. Grocerwise
37. GTN Limited
38. Harley Therapy
39. Insilico Medicine
40. InnersightLabs
41. InsideDNA
42. IXICO
43. Kheiron
44. Kiroku Limited
45. Kokoon Technology
46. LabGenius
47. Linguamatics
48. Lysa Health
49. MABLE Care
50. Machine Medicine
51. Manchester Imaging
52. MedCircuit
53. MedimSight
54. Medopad
55. Meniga
56. Mujo Mechanics
57. Musemantik
58. Nuritas | 59. OME Health
60. Onaria Technologies
61. Outcomes Based Healthcare
62. Pangaea Group
63. Peptone - The Protein Intelligence Company
64. Perfect Ward
65. pillar
66. Repositive Ltd
67. Resurgo Genetics
68. Scalpel
69. Sensio Air
70. Sime Diagnostics
71. Skin Analytics
72. snap40
73. Spoon Guru
74. Suisse Life Science
75. Synthace
76. ThinkSono
77. Tictrac
78. Tiddall
79. Touch Surgery
80. TrainAsONE
81. Transformative AI
82. Visulytix
83. VITL
84. YOUR.MD |
|---|--|--|

AI companies in Healthcare

Company Name	Website	Description	Number of Employees	Technology
DeepMind	deepmind.com	DeepMind Technologies Ltd. operates as an artificial intelligence company. They builds general-purpose algorithms for use in simulations, e-commerce applications, and games. DeepMind markets its products and services internationally.	51-100	Machine Learning
Ixico	ixico.com	Ixico is a UK based company that provides clinical trial services worldwide. Ixico offers technology developing solutions for the treatment of diseases, including predominantly dementia and other neuro degeneration diseases.	51-100	Computer vision
Tictrac	tictrac.com	Tictrac is a leading connected health platform that empowers people in their health, through their data. Tictrac works with leading Health Plans, General Insurers, Government Health Systems and Mobile Operators to help solve the key and costliest problems in healthcare by focusing on engaging users.	11-50	Intelligent data analysis
Avalon AI	avalonai.strikingly.com	Avalon AI builds Deep Learning-based Computer Aided Diagnosis tools to facilitate the detection of brain degenerative diseases like Alzheimer's and enable better patient stratification in clinical trials.	51-100	Intelligent data analysis
BenevolentAI	benevolent.ai	BenevolentAI is the global leader in the development and application of artificial intelligence for scientific innovation. It aims to accelerate the journey from inventive ideas to medicines for patients by developing AI to generate new treatments for some of the world's 8,000 untreated diseases.	101-250	Machine Learning
Linguamatics	linguamatics.com	Linguamatics is a software company providing high performance natural language processing (NLP) based text mining software. Linguamatics' text mining software can be used for business and competitive intelligence, life sciences research, and mining social media such as twitter.	51-100	Intelligent data analysis
Insilico Medicine	insilico.com	Insilico Medicine is a company dedicated to finding novel solutions for aging and age-related diseases using advances in genomics and big data analysis.	11-50	AI

IXICO and AI: drug discovery and more

IXICO is partnering with biopharma companies to develop and operationalize digital technologies in both drug development and clinical decision support to provide precise real-time monitoring of patients living with neurological conditions.

Technologies such as wearable biosensors and mobile devices that enable the passive measurement of parameters such as sleep, activity and heart rate outside of the clinic, present the opportunity to collect data from clinical trial participants continuously and extract from the data new digital biomarkers of disease signs and symptoms that are more precise and objective. IXICO is partnering with biopharma companies to discover and clinically validate new digital biomarkers and to deploy them in a clinical trial that is regulatory compliant, operationally manageable and is fit for use in the specific patient population. Such digital biomarkers ultimately have the potential to enable faster, more cost effective and more patient centric clinical trials.

Pharma companies are seeking to provide more holistic healthcare solutions which include providing clinicians with digital technologies as companions to their treatments to support the targeting of treatments to the right patients and the monitoring of drug safety and individual efficacy. IXICO is partnering with pharma companies to develop digital clinical decision support technologies based on its Assessa® platform technology to improve the targeting and the safety and effectiveness of their therapeutics.



Source: <https://ixico.com/neuroscience-expertise/innovations/>

Tictrac and AI customer analytics

In 2017 Tictrac unveiled a new partnership with global reinsurer Munich Re that will utilise customer analytics to help insurer improve their products and underwriting. The pair's Wellgage initiative, which Munich Re will begin offering to its partners around the world, will take data from customer's apps and wearables to develop insights about customer behaviours and provide lifestyle advice to alleviate and combat health problems such as stress or diabetes.

According to Tictrac, the health engagement platform utilises artificial intelligence (AI) alongside customer data to fuel health insights, providing users with targeted and relevant goals and health insights which the firm claims can help to improve health and wellbeing. The platform itself is compatible with the vast array of smart wearable devices on the market, including Fitbit, the Apple Watch and Garmin devices, and will allow insurers to provide health services which in turn will provide them with valuable data to inform their products and pricing.

Tictrac's core function - helping people monitor and improve health habits through data tracking - is replicated by countless other apps. But it says that it differentiates itself by offering to aggregate the information collected by those separate gadgets and turning it all into one big data dashboard. Tictrac differentiates from competitors by offering a solution that's deeply rooted in research and experimentation, as well as expertise and resources to maximise end-user engagement.



Source: <https://bdaily.co.uk/articles/2017/04/27/tictrac-is-launching-its-ai-powered-health-platform-worldwide-following-munich-re-partnership>

Avalon AI and Computer Vision in Healthcare

Founded in 2015, London-based Avalon AI claims that it uses machine learning to identify potential signs of brain degeneration from brain (MRI) scans. Specifically, algorithms were trained on 70,000 brain scan images, accessed through partnerships with the University of Cambridge and the Donders Institute and Imperial College. The algorithms are then able to recognize very small differences between images, such as abnormal changes in anatomy, helping clinicians potentially diagnose dementia earlier.

The cloud-based platform allows users to upload scans to the company's secure server, and receive an analysis in 30 minutes. It is unclear from the company's website if there is a limit to how many scans can be uploaded at a time.

Avalon AI mission is to accelerate the development of a cure for ageing. Avalon AI use Machine Learning to help neuroradiologists make faster & more accurate diagnoses. The data it gets helps cure Alzheimer's. Avalon AI use Machine learning to automatically derive accurate brain features (e.g. the volume of the hippocampus) from brain scans and compare them to a normative population. It also provides handy 2D and 3D visualisations of brain features.

Avalon AI are building the world's most accurate brain degeneration predictor using brain imaging data. Most brain degeneration predictors use only volumetric measurements to predict whether a brain is degenerating, which limits their accuracies. It uses data not only from structural MRI scans but also from diffusion and functional MRI scans to maximize the sensitivity and specificity of its prediction.

According to the company's website, clinical trials are currently underway in select clinics in India, Pakistan and Ukraine however timelines on when initial findings are expected is not currently specified.



Source: <https://www.techemergence.com/artificial-intelligence-dementia-diagnosis-genetic-analysis-speech-analysis/>
<https://www.aimlmarketplace.com/startup/avalon-ai>

Linguamatics

Founded in 2001, Linguamatics is the world-leader in deploying innovative natural language processing (NLP)-based text mining for high-value knowledge discovery and decision support. It aims to produce software and solutions to help the pharma-biotech and healthcare industries speed up the drug-discovery cycle and improve patient outcomes.

Linguamatics I2E's customers include 18 of the top 20 global pharmaceutical companies; the US Food and Drug Administration (FDA); and leading cancer institutes, hospitals and academic research centres. I2E has been deployed by organizations in pharmaceuticals, biotechnology, healthcare, chemicals and agrochemicals, Government and academia. I2E can be used to mine a wide variety of text resources, such as scientific literature, electronic health records, patents, clinical trials data, news feeds and proprietary content. I2E is available as an in-house enterprise system and a software-as-a-service (SaaS) on the cloud.

Linguamatics text mining platform I2E, is a key tool for pharmaceutical companies to gain actionable insights for key decision-making. Electronic Health Records hold a treasure trove of useful data, but 80% is trapped in unstructured text. I2E unlocks the value in text, by extracting hidden insights and connections, for better healthcare outcomes, improved population health, and reduced costs.

I2E helps identify target genes for diseases and then rank them by factors such as safety and potential for therapeutic benefit. Understanding the drug discovery pipeline helps you maximize profit. I2E can be used to reveal which target areas have already attracted heavy investment and which offer potential for new drug candidates.



Source: <https://www.linguamatics.com/>

Artificial Intelligence in UK Healthcare

The Alan Turing Institute CEO Sir Alan Wilson commented that: "*it is clear that data science and artificial intelligence will revolutionise healthcare.*" He went on to give examples of some of the work currently underway, such as research with the Cystic Fibrosis Trust, which has increased the accuracy of referrals for lung transplants by 35% despite being a recent development.

A new alliance with University College London Hospital (UCLH) is to apply algorithms to such challenges as waiting times in accident and emergency cases. Nearly 24% of patients in the UK waited more than 4 hours for this treatment. This agreement with UCLH is for three years and already spurred a new project to identify patients who are likely to miss scheduled doctor appointments, the next stage in this study will be to trial interventions such as text messages as reminders of, and for the need for such tests as pap smear tests.

More action followed with the British Heart Foundation applying data science to cardiovascular medicine and of course ongoing efforts toward data security.

"The Future is Here" by Deloitte focuses on the Augmented Workforce, using machine learning to support healthcare practitioners in diagnosing, for example. The supply of nurses is unlikely to be adequate, and the same could be said of Doctors, so it seems that AI, AR, or AX, as the industry is now referring to them all, needs to be studied and adopted at speed.

London hospitals to replace doctors and nurses with AI for some tasks

The three-year partnership between University College London Hospitals (UCLH) and the Alan Turing Institute aims to bring the benefits of the machine learning revolution to the NHS on an unprecedented scale.

At the heart of the partnership, in which UCLH is investing a “substantial” but unnamed sum, is the belief that machine learning algorithms can provide new ways of diagnosing disease, identifying people at risk of illness and directing resources. In theory, doctors and nurses could be responsively deployed on wards, like Uber drivers gravitating to locations with the highest demand at certain times of day. But the move will also trigger concerns about privacy, cyber security and the shifting role of health professionals.

The first project will focus on improving the hospital’s accident and emergency department, which like many hospitals is failing to meet government waiting time targets. Using data taken from thousands of presentations, a machine learning algorithm might indicate, for instance, whether a patient with abdomen pain was likely to be suffering from a severe problem, like intestinal perforation or a systemic infection, and fast-track those patients preventing their condition from becoming critical.

Another project, already underway, aims to identify patients who are likely to fail to attend appointments. A consultant neurologist at the hospital, Parashkev Nachev, has used data including factors such as age, address and weather conditions to predict with 85% accuracy whether a patient will turn up for outpatient clinics and MRI scans. In the next phase, the department will trial interventions, such as sending reminder texts and allocating appointments to maximise chances of attendance.

UCLH is aiming to circumvent privacy concerns that have overshadowed previous collaborations, including that of the Royal Free Hospital in London and Google’s DeepMind, in which the hospital inadvertently shared the health records of 1.6 million identifiable patients. Under the new partnership, algorithms will be trained on the hospital’s own servers to avoid any such breaches and private companies will not be involved.

Source: <https://www.theguardian.com/society/2018/may/21/london-hospitals-to-replace-doctors-and-nurses-with-ai-for-some-tasks>

AI in Healthcare Reports

REFORM

Thinking on its own: AI in the NHS

January 2018

This report illustrates the areas where artificial intelligence (AI) could help the NHS become more efficient and deliver better outcomes for patients. It also highlights the main barriers to the implementation of this technology and suggests some potential solutions.

Despite the hype around AI in healthcare, examples of it being implemented and deployed in the NHS are sparse. Broadly speaking, it is incumbent on individual providers to introduce new technologies into the NHS. This has resulted in piecemeal applications and patchy realisation of benefits. With a different approach to technological adoption, however, which would gradually embed AI in service transformation plans, the future could look quite different.

AI could support the delivery of the NHS's Five Year Forward View, which aims to narrow three gaps in health provision. AI could help address the health and wellbeing gap by predicting which individuals or groups of individuals are at risk of illness and allow the NHS to target treatment more effectively towards them. The reduction of the care and quality gap could be supported by AI tools as they can give all health professionals and patients access to cutting edge diagnostics and treatment tailored to individual need. AI could help address the efficiency and funding gap by automating tasks, triaging patients to the most appropriate services and allowing them to self-care.

Source: http://www.reform.uk/wp-content/uploads/2018/01/AI-in-Healthcare-report_.pdf

Thinking on its own: AI in the NHS

Eleonora Harwich
Kate Laycock

January 2018

#reformhealth

BenevolentAI

BenevolentAI uses artificial intelligence to mine and analyse biomedical information, from clinical trials data to academic papers. Following this approach, BenevolentAI can, for instance, identify molecules that have failed in clinical trials and predict how these same compounds can instead be more efficient targeting other diseases.

Benevolent AI can also use the predictive power of its AI algorithm to design new molecules, extracting new hypothesis based on a knowledge graph composed of over a billion relationships between genes, targets, diseases, proteins and drugs.

The company is currently researching new potential therapies for ALS and has one clinical trial planned for next year with a new molecule designed in-house. The system isn't 100% right all the time, so the end result is really a combination of the platform and the insight of the scientists. In the case of ALS, BenevolentAI picked five new compounds and tested on cell cultures with motor neurone disease. One failed the test, three worked as well as current gold standard and one worked exceptionally well. It has an end-to-end organisation capable to doing very basic, exploratory science right the way through clinical trials.

The division of BenevolentAI that is focused on drugs, called Benevolent Bio, currently has two drugs in more advanced stages of development, although neither of those happen to be in the area of cancer. A Parkinson's drug is currently in Phase 2B clinical trials, after years of work.

In 2018 BenevolentAI's first clinical trial will begin in the USA and Europe, targeting excessive daytime sleepiness in Parkinson's disease.

The logo for BenevolentAI features the company name in a lowercase, sans-serif font. The letters are primarily blue, with a thin orange outline. The letter 'A' in 'AI' is slightly taller than the others.

Source: <https://www.wired.co.uk/article/benevolent-ai-london-unicorn-pharma-startup>

BenevolentAI

In April 2018 BenevolentAI announced that they've raised another \$115 million, in a funding round that values the company at about \$2 billion. The London-based firm, which is focused on the pharmaceutical industry, said the latest round of funding will help it scale drug development and its AI platform. The company currently has more than 20 drug programs. It said it will use the raised capital to expand into other areas of the market like advanced materials, agriculture and energy storage.

BenevolentAI's advanced technology is disrupting the pharmaceutical industry by lowering costs, decreasing failure rates and increasing the speed at which medicines are delivered to patients. Its AI technology is used to decipher the molecular process of disease and match drug treatments to the most applicable patients.

BenevolentAI created a bioscience machine "brain" that uses algorithms and data to locate the cause of diseases and generate insights into them that humans otherwise couldn't. Its platform is being used to develop treatments for incurable diseases like motor neurone disease, Parkinson's disease, glioblastoma and sarcopenia. There are 155 people working at the startup in all, with 300 projected by the end of 2018.

In part because of that long cycle, and also because BenevolentAI has spotted an adjacent opportunity, the company has more recently also been extending applications from its "brain" to other adjacent areas that also tap into chemistry and biology, such as material science.

One area of particular interest is to see if Benevolent can create materials that can both withstand extreme heat — to allow engines to work at higher rates without risks — as well as chemicals that could essentially create the next generation of efficient batteries that could provide more power in smaller formats for longer periods.

Other areas where the startup hopes to move into over the coming months and years include agriculture, veterinary science, and other categories that sit alongside those BenevolentAI is already tapping.

Source: <http://blogs.sciencemag.org/pipeline/archives/2018/04/23/benevolentai-worth-two-billion>

<https://www.cnbc.com/2018/04/19/ai-pharma-start-up-benevolentai-worth-2-billion-after-funding-round.html>

<https://techcrunch.com/2018/04/18/benevolentai-which-uses-ai-to-develop-drugs-and-energy-solutions-nabs-115m-at-2b-valuation/>

Janssen: Partnership with BenevolentAI

In November 2016, Janssen announced a partnership with BenevolentAI to utilize BenevolentAI's AI for Drug Discovery technology to identify drug candidates with untapped potential from Janssen's existing portfolio. The partnership allows BenevolentAI to licence the right to develop, manufacture and commercialize clinical stage drug candidates from Janssen's portfolio.

More recently, BenevolentAI launched a phase 2b trial for a drug derived from the partnership to treat sleep-related symptoms in patients with Parkinson's disease, which could be an indication that the partnership is already starting to deliver practical, actionable, clinical-grade results.

In a press release associated with the partnership announcement, Jackie Hunter, Board Director of BenevolentAI and CEO of BenevolentAI Bio, stated:

"We are delighted to have acquired rights to these compounds under a license agreement from Janssen. The agreement adds further depth to our clinical and pre-clinical development pipeline and marks a very exciting time for the role of artificial intelligence to benefit scientific discovery and humanity. The compounds come with a wealth of clinical and biological data that enables BenevolentAI to have further insights into the biology of diseases. Securing these novel clinical drug candidates perfectly aligns with our strategy of developing first-in-class and best-in-class stratified medicines to help patients with high unmet needs."

The logo for BenevolentAI, featuring the company name in a large, blue, sans-serif font.

BenevolentAI

In February 2018 was announced that BenevolentAI, Europe's biggest private artificial intelligence company - and one of the world's top five - has acquired a state-of-the-art drug discovery and development facility on Babraham Research Campus.

BenevolentAI said the move creates an AI-enabled research centre that will dramatically reduce the time it takes for potential new drugs to enter clinical testing and significantly improve the number that are successful in treating or curing disease.

And it will be a global first for an AI company to be able to work end-to-end on the entire drug development process, from discovery to late-stage clinical development.

In acquiring the UK operations and facilities of Proximagen - a successful biotech firm that was founded by Mulvany himself and sold in 2012 to Upsher-Smith Laboratories for \$553million - BenevolentAI adds a large scientific team with deep expertise in assay development and screening, medicinal and synthetic chemistry, drug metabolism and pharmacokinetics, pharmacology and clinical development.

The Cambridge team will be integrated with BenevolentAI's scientists, using AI to cut years off the drug development process.

BenevolentAI

Source:

<http://www.cambridgeindependent.co.uk/business/business-news/benevolentai-one-of-world-s-top-five-ai-companies-acquires-drug-discovery-centre-on-babraham-research-campus-1-5405599>

DeepMind

DeepMind is the world leader in artificial intelligence research and its application for positive impact. DeepMind is on a scientific mission to push the boundaries of AI, developing programs that can learn to solve any complex problem without needing to be taught how.

If it is successful, DeepMind believes this will be one of the most important and widely beneficial scientific advances ever made, increasing the capacity to understand the mysteries of the universe and to tackle some of the most pressing real-world challenges. From climate change to the need for radically improved healthcare, too many problems suffer from painfully slow progress, their complexity overwhelming its ability to find solutions. With AI as a multiplier for human ingenuity, those solutions will come into reach.

As in all long-term research efforts there are many hurdles ahead, but DeepMind's team of renowned scientists and engineers is making exciting progress.

By implementing its research in the field of games, a useful training ground, DeepMind was able to create a single program that taught itself how to play and win at 49 completely different Atari titles, with just raw pixels as input. And in a global first, its AlphaGo program took on the world's best player at Go - one of the most complex and intuitive games ever devised, with more positions than there are atoms in the universe - and won.

At the same time, the DeepMind Applied team is working with experts in different fields to make meaningful real-world breakthroughs. Its systems are having a major environmental impact by learning how to use vastly less energy in Google's data centres, and it is collaborating with clinicians in the UK's National Health Service on delivering better care for conditions that affect millions of people worldwide.



Source: <https://deepmind.com/applied/deepmind-google/>

DeepMind

The progress DeepMind has made is in part down to its approach, which combines the long-term thinking and interdisciplinary collaboration of academia, the energy and focus of a technology start-up, and the social purpose of a team fervent about amazing impact.

DeepMind set its own independent research agenda and roadmap as an autonomous company in the Alphabet group. It is committed to openly publishing its work, with over 200 peer-reviewed papers, including in Nature and Science.

Recognising that there are strong opinions on the safe and ethical use of AI, and that no one team has all the answers, DeepMind is also deeply involved in working through these issues with wider academic and research communities.

Its motivation in all DeepMind does is to maximise the positive and transformative impact of AI. DeepMind believes that AI should ultimately belong to the world, in order to benefit the many and not the few, and it will continue to research, publish and implement its work to that end.

In September 2018 was announced that DeepMind is going big on virtual world AI training through a deal with game-making software provider Unity Technologies (which powers games like Monument Valley and Pokémon Go). DeepMind will run the software at a giant scale to train algorithms in physics-realistic environments—part of a growing trend in AI. Game engines like Unity or Unreal provide customizable settings for advanced AI techniques such as reinforcement learning (a kind of machine learning), in which an algorithm pursues a goal through trial and error until it's been mastered.

Source: <https://deepmind.com/applied/deepmind-google/>
<https://www.fastcompany.com/90240010/deepminds-ai-will-learn-inside-unitys-video-game-worlds>

DeepMind

DeepMind has developed an AI which can successfully detect more than 50 types of eye disease just by looking at 3D retinal scans. Its AI is as accurate as expert clinicians when it comes to detecting diseases, such as diabetic eye disease and macular degeneration. It can also recommend the best course of action for patients and suggest which needed urgent care.

Once DeepMind is in a position to deploy its AI across NHS hospitals in the UK, it will provide the service for free for five years. British eye specialists have been warning for years that patients are at risk of losing their sight because the NHS is overstretched, and because the UK has an ageing population. Part of the reason DeepMind and Moorfields took up the research project was because clinicians are "overwhelmed" by the demand for eye scans.

DeepMind's AI was trained on a database of almost 15,000 eye scans, stripped of any identifying information. DeepMind worked with clinicians to label areas of disease, then ran those labelled images through its system. The two-and-a-half year project required "huge investment" from DeepMind and involved 25 staffers, as well as the researchers from Moorfields.

As well DeepMind's scientists have built an artificial vision system that can take something like a two-dimensional photo and from that construct a 3D model of a scene. DeepMind published details about this new system called the Generative Query Network in the journal "Science". The proposed approach, according to DeepMind, does not require domain-specific engineering or time-consuming labelling of the contents of scenes, allowing the same model to be applied to a range of different environments. It also learns a powerful neural renderer that is capable of producing accurate images of scenes from new viewpoints. It's possible, in the future, that DeepMind's GQN-based AI could generate on-demand 3D scenes that are nearly identical to the real world, using nothing but photographs.

Source: <https://www.businessinsider.com/google-deepmind-ai-detects-eye-disease-2018-8>
<https://bgr.com/2018/06/15/google-deepmind-render-3d-objects-from-2d-images/>

9 AI applications by DeepMind

DeepMind has worked with organisations to implement its technology so far, where some intriguing real-life use cases have already emerged.

1. DeepMind is working with the US Department of Veterans Affairs to predict patient deterioration by analysing patterns from around 700,000 historical medical records.
2. DeepMind is collaborating with Google's AOI health research team and a group of research institutions, led by the Cancer Research UK Centre at Imperial College London to improve the detection of breast cancer.
3. DeepMind for Google has created two new features for Android: Adaptive Battery, which predicts which apps you'll need next and thereby boosts battery performance, and Adaptive Brightness, which learns your brightness preferences in different surroundings to personalise your screen settings.
4. DeepMind has developed a patient safety alert app called Streams that reviews test results for signs of sickness and sends staff instant alerts if an urgent assessment is required. The project is part of DeepMind Health, which launched in February 2017 with the goal of using machine learning systems to improve healthcare treatment and digitise medical processes.
5. Google is in talks with the National Grid to apply its AI frameworks to the UK's energy supply, according to City AM. The potential partnership could be used to apply DeepMind's technology to make the supply of energy across the UK more efficient. And while talks are said to be in the early stages, both firms are exploring how artificial intelligence and 'smart' systems can be deployed.
6. DeepMind partnered with Moorfields Eye Hospital to develop a machine learning-based system that can recognise sight-threatening eye diseases from a digital scan of the eye.
7. DeepMind's has also worked with the NHS aims to improve the treatment of head and neck cancers. The team is analysing anonymised scans from UCLH patients to develop a radiotherapy segmentation algorithm that can automate parts of the process. They hope to eventually apply the algorithm to other parts of the body.
8. DeepMind has developed a text-to-speech system. Known as WaveNet, it uses a neural network to replicate the sound waves produced by human speakers rather than copying the language that they use. The technology is now used to generate the Google Assistant voices for US English and Japanese across all platforms.
9. Google has used DeepMind to cut the electricity bills at its huge data centres. The results were efficiency savings of 40 percent in the cooling systems, and a 15 percent reduction to the overall energy used in the data centres.

DeepMind

A series of controversies over misuse of data have strained confidence, making the public wary at the sight of tech giants moving into healthcare. DeepMind Health, a Google sister company, which has been warned that controversy surrounding its use of patient records could scupper the widespread adoption of artificial intelligence and machine learning.

Nurses at the Royal Free Hospital in London say that Streams, a DeepMind app that pulls together patients' records and test results held in separate systems onto a mobile device, saves them two hours a day. But the Royal Free provided records from around 1.6 million patients as a part of trial to test the acute kidney injury alert system, pitching the hospital and DeepMind Health into controversy.

The UK information commissioner ruled the Royal Free allowed DeepMind access to sensitive patient data without explicit consent. To defuse the controversy, DeepMind Health set up an independent review panel to advise it on future governance.

In its second annual report published in June 2018, the panel highlighted what is at stake if AI companies moving into healthcare do not meet expectations of how they should operate in this field. *"All companies that wish to operate in the area of healthcare data ought to be held to high standards, but the onus is even greater for a company such as DeepMind Health,"* the report says. As it happens, the Streams app does not use artificial intelligence. However, DeepMind is also developing algorithms for analysing retinal scans at Moorfields Eye Hospital in London, applying AI to analyse mammograms, and using machine learning to automate radiotherapy planning for head and neck tumours, each project in collaboration with the National Health Service in England, and relying on patient data. In an era where privacy is centre stage, the success of AI in healthcare hangs on how it handles its vital ingredient: data.



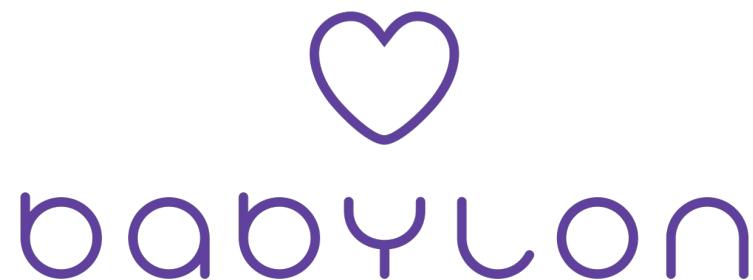
Source: <https://sciencebusiness.net/healthy-measures/news/googles-deepmind-health-told-explain-how-it-will-make-money>

Babylon Health

Babylon's mission is to put an accessible and affordable health service in the hands of every person on earth.

Babylon is a digital health service provider that combines AI technology with the medical expertise of humans. Babylon delivers full access to healthcare, including personalised health assessments, treatment advice and face-to-face appointments with a doctor 24/7.

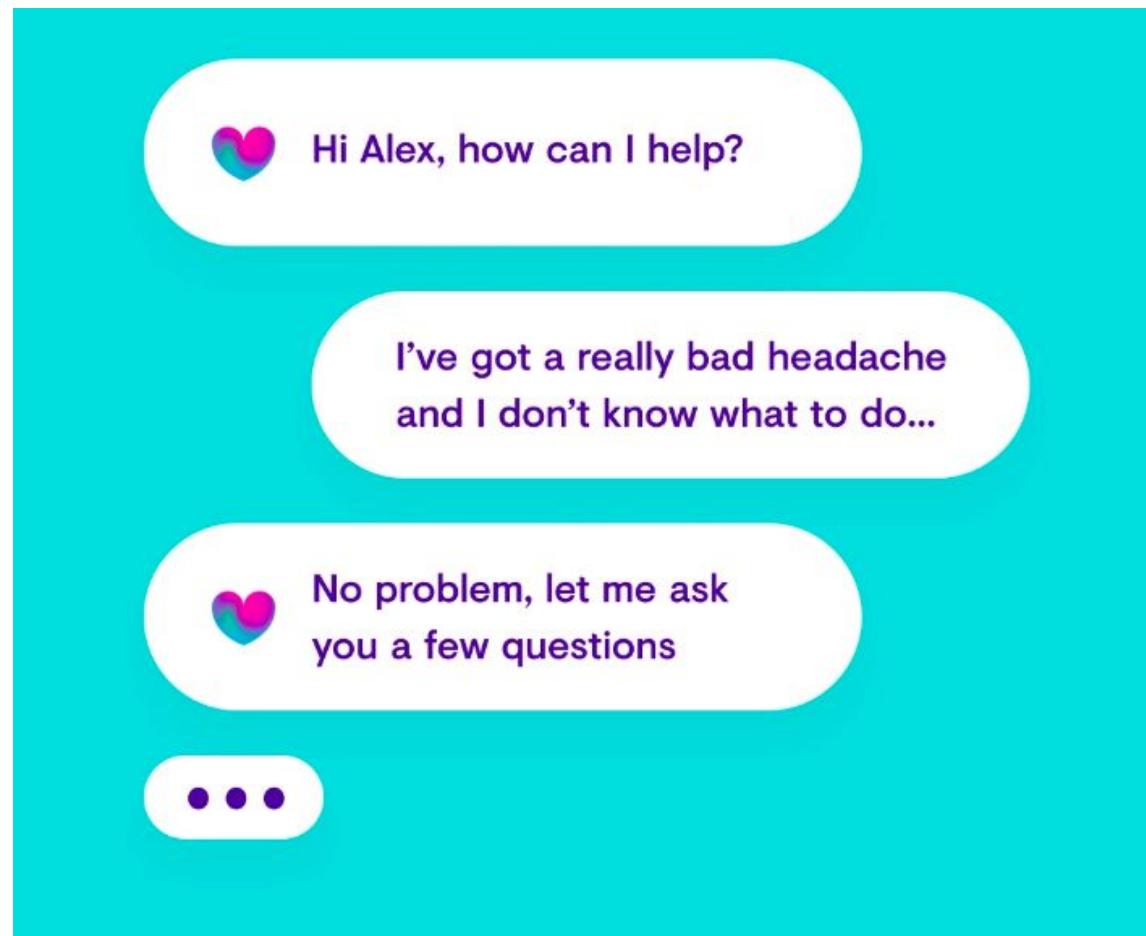
Babylon has partnerships with Tencent, TELUS and Samsung. They have AI licensing deals with Prudential Asia and BUPA. They also offer end-to-end clinical services in the UK, Rwanda and Canada.



Source: <https://www.babylonhealth.com/about>

Babylon's interactive symptom checker asks you questions to analyse your condition

Babylon's AI system has been created by experienced doctors and scientists using the latest advances in deep-learning. Much more than a searchable database, it assesses known symptoms and risk factors to provide informed, up-to-date medical information.



Natural Language Processing (NLP)

Our AI can't provide information to patients if it can't understand them, and patients won't use our AI if they can't understand it. To help bridge the gap, we use Natural Language Processing (NLP). NLP helps computers interpret, understand, and then use everyday human language and language patterns. It breaks both speech and text down into shorter components and interprets these more manageable blocks to understand what each individual component means and how it contributes to the overall meaning, linking the occurrence of medical terms to our Knowledge Graph. Through NLP our AI can transcribe consultations, summarise clinical records and chat with users in a more natural, human way.

Machine Learning research at Babylon

Throughout the Babylon platform we use Machine Learning (ML) for a variety of tasks. In the inference engine we combine probabilistic models with deep learning techniques to speed up the inference process. In the Knowledge Graph we predict new relationships between medical concepts based on reading medical literature. In NLP we build language understanding models based on large-scale datasets of interactions with our users and data from the web. We use ML to teach our NLP system new languages.

Babylon would not be feasible without the use of state of the art ML techniques, so we've invested significantly into building a world class research team in this field. Babylon is also keen to contribute back to the AI community through papers, blog posts, and by open sourcing some of our work for the benefit of all.

Source: <https://www.babylonhealth.com/>



Babylon and the NHS

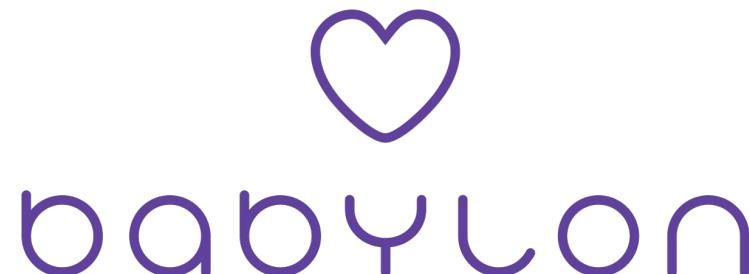
GP at hand aims to put the most accessible, high quality, safe and effective NHS GP service into the hands of every person who chooses to register with it. Users can access that care quickly and conveniently, thanks to the partnership with Babylon. The GP at hand service is offered by an NHS General Practice run by four partners.

Babylon is regulated by the Care Quality Commission in England and was one of the first digital health providers to be inspected. They were found to be delivering safe, effective, caring, responsive and well led services in accordance with all relevant regulation.

Patients can book a video GP appointment from the babylon app at any time of day or night. Consultations are available 24/7 and users can usually be seen within 2 hours. When it's time for the appointment the doctor will call through the app, so there's no waiting around. The doctor will discuss the symptoms and may ask to show them some things on camera, such as a skin rash, or perform simple checks, like feeling the glands on the neck.

Babylon's interactive symptom checker asks users questions to analyse their condition and gives them useful medical information and accurate triage advice on what to do next. This triage service has been developed by a team of dedicated doctors and scientists using the latest technology in artificial intelligence.

The Babylon app lets users keep tabs on their health using a Monitor tool that integrates with over 150 existing health apps and wearables.



Babylon Health

An NHS GP practice that works around you.

The GPs are available 24 hours a day, 365 days a year. Every session is free, no matter how long the appointment lasts. We offer a full NHS GP service including digital appointments, physical appointments at one of our five locations, repeat prescriptions and specialist referrals.



Virtual GP appointment

See a doctor quicker. Video appointments are available 24/7 on mobile or tablet and often within two hours of booking.



Prescriptions sorted

Our NHS GPs prescribe medicines which you can collect from a local pharmacy of your choice, usually within the hour.



Your choice of clinics

If you need to see a doctor in person, we have five clinics in London and you can visit the one most convenient for you.



Digital Healthcheck

Healthcheck is a free information and educational tool to help you understand health risk factors, health profile, and lifestyle changes designed to help achieve a healthy lifestyle.



Instant symptom checker

Check your symptoms and get health information anytime using the symptom checker.



Medical records

Quickly view medical notes and replay a video of your appointment with records securely stored in your app.

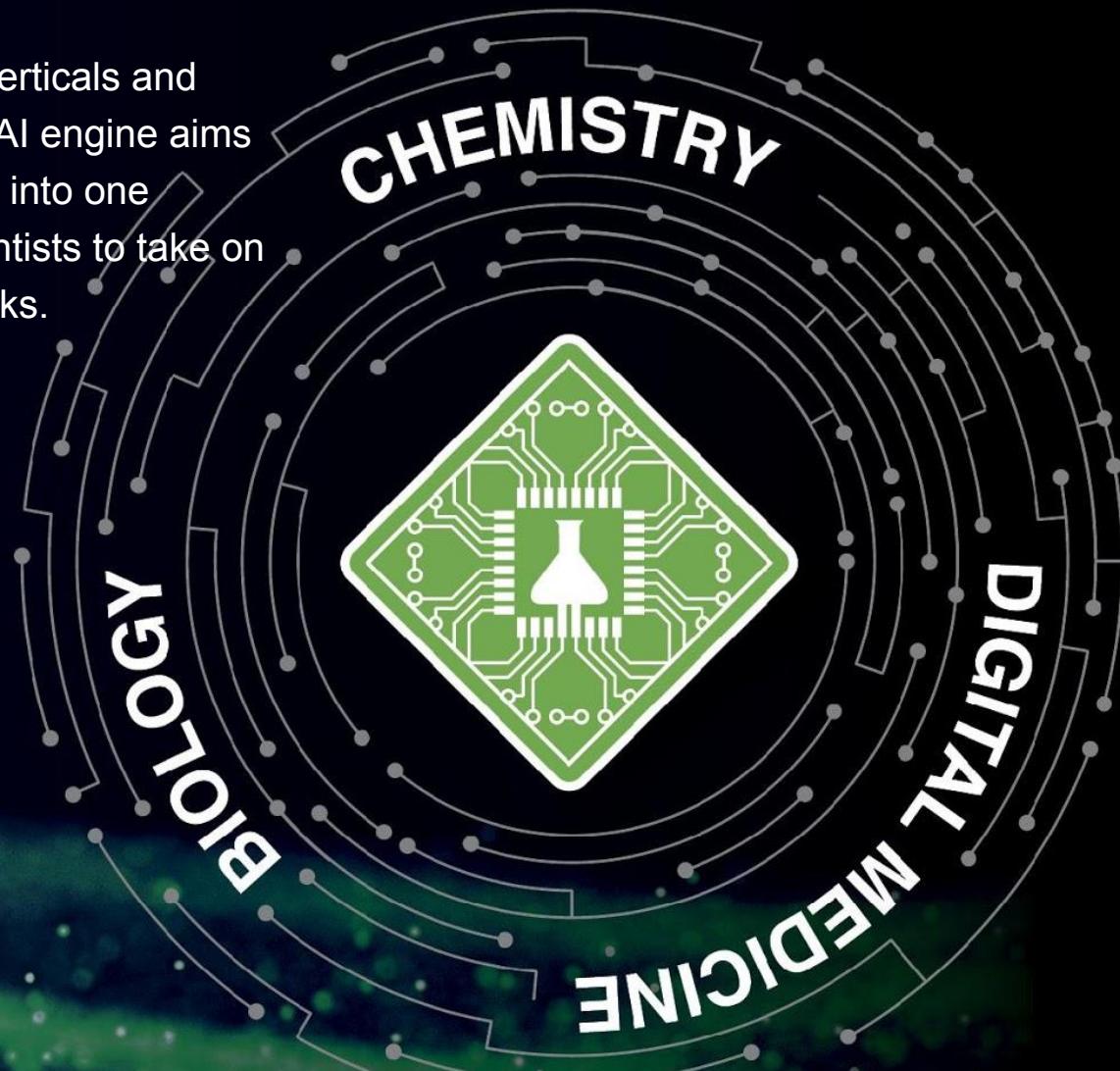
Case Study: Insilico Medicine

- **Insilico Medicine is developing the end-to-end Insilico AI engine covering entire pharma drug discovery process hypothesis generation and target identification to real world evidence collection;**
- We aspire to be a leader in the field of deep learning for drug discovery, personalized healthcare and longevity biotechnology;
- Through our integrated Insilico AI engine, Insilico aims to generate higher-quality drug leads with a higher probability of success than current drug discovery methods and with possibility to discover cures and preventative interventions;
- While some of the pieces of the pipeline enable us to generate revenue and partner on novel molecules, we aspire to build a fully-automated pipeline that will design hypothetical interventions in the matter of days and learn from real world evidence;
- We aim to raise funds in order to complete the development of our AI engine, validate our leads and expand our business into Asia.

Case Study: Insilico Medicine

In the pharmaceutical companies human domain experts in biology, chemistry and digital medicine are disconnected.

While most other AI startups focus on specific verticals and applications in a disconnected manner, Insilico AI engine aims to bridge biology, chemistry and digital modules into one seamless learning pipeline enabling our AI scientists to take on previously impossible chemistry and biology tasks.



Insilico Medicine's mission is to extend healthy longevity through innovative AI solutions for drug discovery and aging research. Insilico Medicine is committed to transforming the pharmaceutical industry with next-generation artificial intelligence. They are developing new tools for drug discovery and repurposing, biomarker development and pursuing novel strategies for rapid validation. Their projects combine advances in genomics, big-data analysis, deep learning and reinforcement learning.

Insilico Medicine and Biotime announced in 2016 the launch of a beta version of Embryonic.AI, an artificially intelligent system for analyzing the embryonic state of human cell samples using gene expression data.

Insilico established in 2017 a collaboration with GSK to discover novel biological targets and molecules. As a first stage of the collaboration, GSK will evaluate Insilico's technology in the identification of novel biological targets and pathways of interest to GSK.

In 2018 a collaboration occurred between Insilico Medicine and Juvenescence AI Limited, which is a drug development and artificial intelligence company focused on ageing and age-related diseases. Juvenescence AI combines advances in artificial intelligence with classical development expertise in order to prioritize and develop compounds from Insilico Medicine, Inc.'s end-to-end automated drug discovery pipeline through to clinical proof of concept.

By using AI and deep learning, the company can analyze how different compounds will affect certain cells, determine what drugs can be used to treat the symptoms, and any possible side effects that may occur.

Even though it's only been around a few years, Insilico has already been named by NVIDIA as one of the 5 top AI companies. With R & D resources spread out across the globe in the UK, Russia, and Belgium and a backing of \$14 million behind it.

Sources: https://www.eurekalert.org/pub_releases/2017-08/imi-iec081417.php

<https://www.businesswire.com/news/home/20180205005024/en/Insilico-Medicine-Juvenescence-Announce-Drug-Candidate-Joint>

Case Study: Insilico Medicine

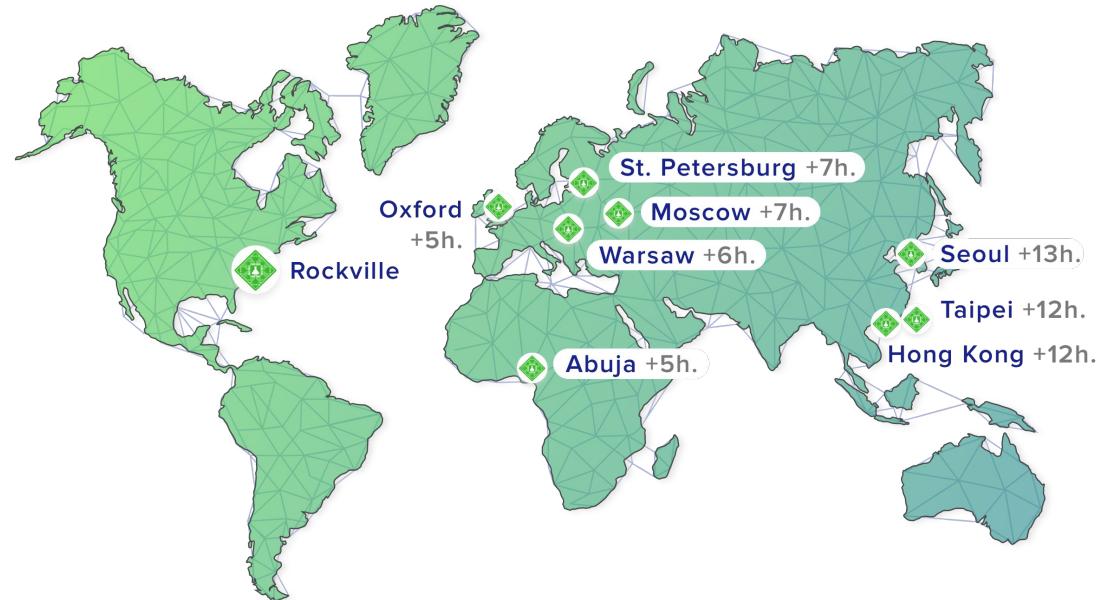
Insilico Medicine has a collaboration with the University of Oxford in cardiotoxicity.

Cardiotoxicity is one of major reasons for drugs to fail in the development or to be withdrawn from the market. Insilico Medicine and Oxford are collaborating on applying machine learning to build predictors of drug-induced cardiac adverse reactions using multiple data types.

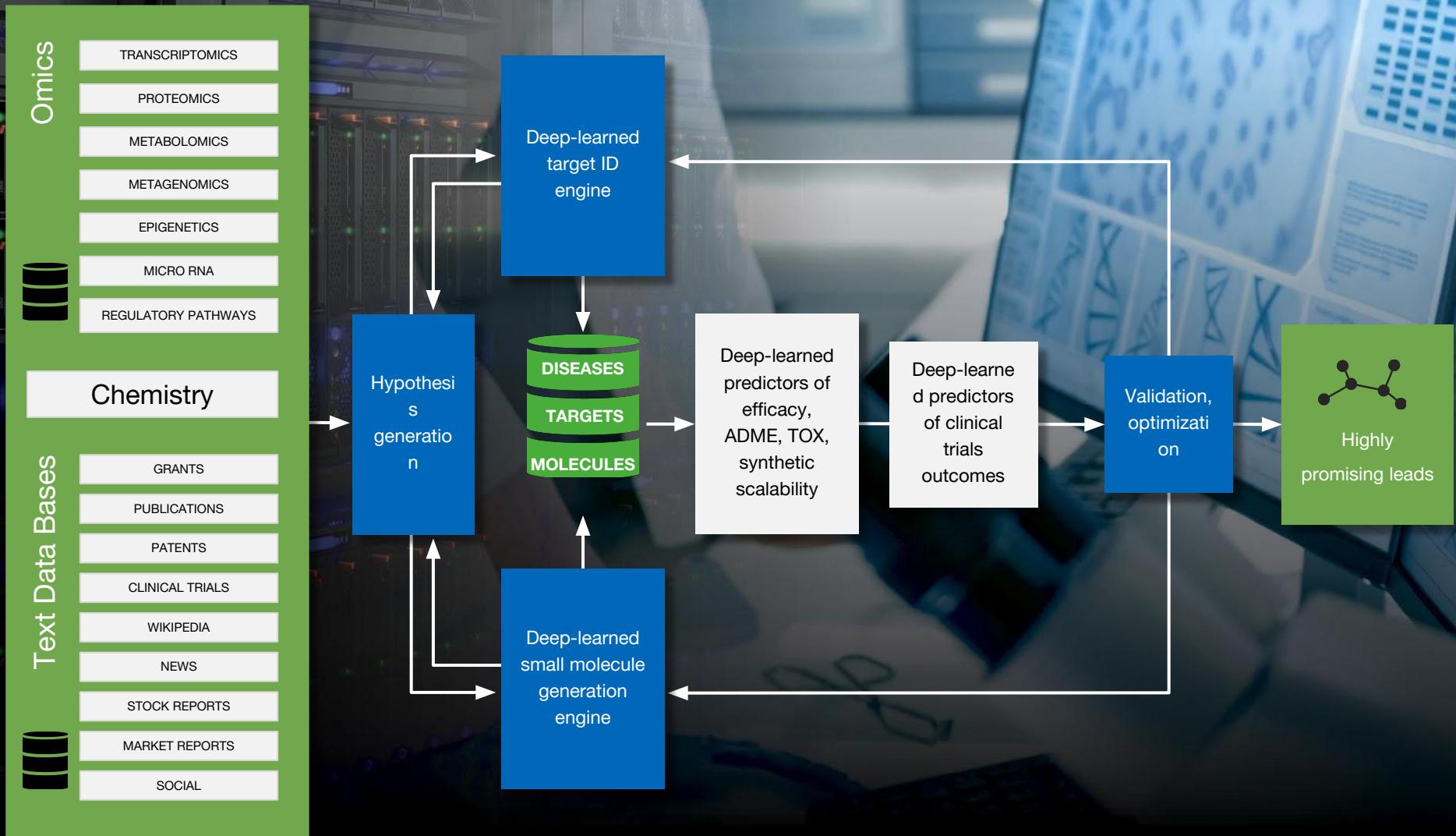
Some of the top Insilico Medicine scientists are based in the UK.

Insilico Medicine collaborates with some of the most prominent UK pharmaceutical companies including GSK.

CEO of Insilico Medicine, Inc, Alex Zhavoronkov, is the co-founder and CSO of the Biogerontology Research Foundation (BGRF). BGRF is a UK non-profit research foundation focused on support of Geroscience.



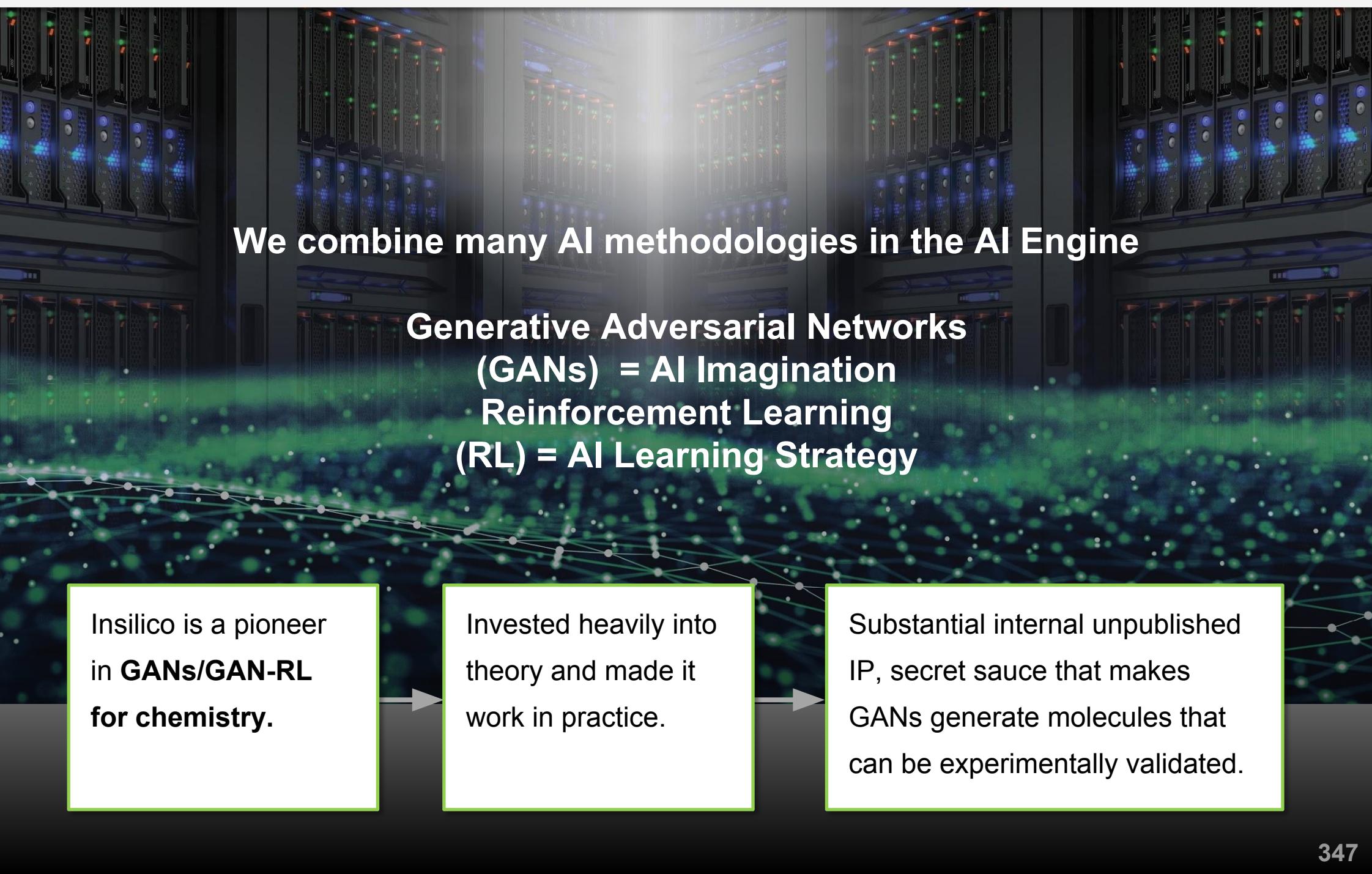
Case Study: Insilico Medicine



Case Study: Insilico Medicine

Type	Title
GAN-RL for Med. Chemistry	Entangled Conditional Adversarial Autoencoder for de Novo Drug Discovery. <i>ACS Mol. Pharm.</i> , 2018
GAN-RL for Med. Chemistry	Reinforced Adversarial Neural Computer for De Novo Molecular Design. <i>ACS Chem. Informatics</i> , 2018
GAN-RL for Med. Chemistry	Adversarial Threshold Neural Computer for Molecular De Novo Design. <i>ACS Mol. Pharm.</i> , 2018
DNNs for Target ID	Machine Learning on Human Muscle Transcriptomic Data for Biomarker Discovery and Tissue-Specific Drug Target Identification, <i>F. Gen.</i> 2018
3D Representation of Molecules	3D Molecular Representations Based on the Wave Transform for Convolutional Neural Networks. <i>ACS Mol. Pharm.</i> , 2018
DNNs for Age Prediction	Population specific biomarkers of human aging: a big data study using South Korean, Canadian and Eastern European patient populations. <i>Journal of Gerontology Section A</i> , 2018
GANs for Med. Chemistry	druGAN: An Advanced Generative Adversarial Autoencoder Model for de Novo Generation of New Molecules with Desired Molecular. <i>Properties In Silico</i> . <i>ACS Mol. Pharm.</i> , 2017
DNNs for Side Effects	Towards natural mimetics of metformin and rapamycin. <i>Aging</i> , 2017
DNNs for Target ID	Use of deep neural network ensembles to identify embryonic-fetal transition markers: repression of COX7A in embryonic and cancer cells. <i>Oncotarget</i> , 2017
GANs for Medicinal Chemistry	The cornucopia of meaningful leads: Applying deep adversarial autoencoders for new molecule development in oncology. <i>Oncotarget</i> , 2016
Dimensionality Reduction Algorithm	In silico Pathway Activation Network Decomposition Analysis (iPANDA) as a method for biomarker development. <i>Nature Communications</i> , 2016
DNNs for Classification of Molecules	Deep Learning Applications for Predicting Pharmacological Properties of Drugs and Drug Repurposing Using Transcriptomic Data. <i>ACS Molecular Pharmaceutics</i> , 2016
DNNs for Age Prediction	Deep biomarkers of human aging: Application of deep neural networks to biomarker development. <i>Aging</i> , 2016
DL Review	Applications of Deep Learning in Biomedicine. <i>ACS Molecular Pharmaceutics</i> , 2016

Case Study: Insilico Medicine



We combine many AI methodologies in the AI Engine

**Generative Adversarial Networks
(GANs) = AI Imagination
Reinforcement Learning
(RL) = AI Learning Strategy**

Insilico is a pioneer
in **GANs/GAN-RL**
for chemistry.

Invested heavily into
theory and made it
work in practice.

Substantial internal unpublished
IP, secret sauce that makes
GANs generate molecules that
can be experimentally validated.

AI in Longevity (Preventive Medicine)

Key Highlights

- It is very notable that, in addition to choosing the AI sector as the top national Grand Challenge, the UK Government also chose the issue of the Aging Population as the second Grand Challenge.
- There is no doubt that AI can bring novel solutions and approaches to bear on the issue of demographic aging, and the prioritization of both ageing and AI is indicative of a progressive government with a proactive commitment to staying on the leading edge of technological change.
- It is, however, our position that the UK Government should be focusing on the intersection of these two challenges to a greater extent than they already are, and that rather than focusing on reactionary, symptomatic medical and socioeconomic solutions, they should be focusing on the accelerated development of preventive medicine, and more specifically to the application of AI to preventive medicine and precision health, and especially to the extension of the healthy and active period of life for people of retirement age.
- By looking at the problem as a solvable biomedical problem that can be neutralized through appropriate investments into preventive medicine, the nation stands not only to gain substantial gains in overall GDP, but to save on the massive healthcare costs associated with demographic aging, while simultaneously minimizing one of their foremost socioeconomic challenges and issues.
- In March 2018 British Business Secretary Greg Clark announced a [£300 million commitment](#) to solutions for demographic aging to bridge the gap between the UK's ageing science sphere with its longevity business and investment landscape.
- [£98 million](#) has been earmarked for a "healthy ageing programme" aiming to develop new products and services to help the elderly live in their homes for longer, combat loneliness and increase overall independence and wellbeing, while [£210 million](#) is being allocated to a "data to early diagnosis and precision medicine program" to improve both diagnosis and treatment of age-related disease.
- By utilizing AI as an accelerative engine for ageing and preventive medicine research and development, the nation can reap much greater economic returns and, most importantly, utilize the UK's achievements in the AI industry to help solve one of the most pressing and prevalent demographic issues the nation will face in the decades to come.

Artificial Intelligence and Ageing Population- - UK National Grand Challenges

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UK as the Possible Leader of International Coalition AI for Healthy Longevity

A good example of this might be the problem of extreme demographic aging in Japan. It is already suffering the significant negative economic effects of the large portion of their population being over the age of 65. If they can leverage the application of AI to preventive medicine and AgeTech, they could potentially save much more than they spend on the accelerated development of these AI-relevant subsectors, which gives them enormous economic incentive to do so.

Similarly, it is possible for Japan to be united among other countries in an international, cross-nation effort led by the UK to apply various countries' specific areas of skill, experience and socioeconomic need in order to apply AI to the advancement of preventive medicine and AgeTech, especially given that among the UK's four grand challenges and industrial strategy priorities, AI was listed as #1, with Aging Population being listed as #2.

These factors make Japan a very natural strategic partner for the UK, which has 20% of their own population aged 65+, for a national development of AI in healthcare program with a focus on preventive medicine and the extension of healthy longevity.

Other potential strategic allies for the UK in this regard include Israel, Singapore and Hong Kong. Israel has a very well developed geroscience (science of aging) landscape and community, as well as growing IT and AI tech hubs. Furthermore, the UK already has a collaborative relationship with Israel in the sphere of advanced biomedicine and preventive medicine such as the £10 million BIRAX (the Britain Israel Research and Academic Exchange Partnership) Regenerative Medicine Initiative established by British Council and British Embassy in Israel in collaboration with the Pears Foundation and the UJIA, which funds advanced regenerative medicine therapies for age-related disease.

Meanwhile, Hong Kong and Singapore make promising allies for the purpose of an integrated AI and preventive medicine development agenda because both regions have some of the highest life expectancies among developed countries (exceeding even Japan in this regard), as well as advanced AI and tech hubs.

If the UK can marshal its resources toward the effective establishment of international alliances with the aim of synergetically developing their AI and preventive medicine industries, they can utilize each nation to the fullest extent of their particular strengths and areas of expertise, and achieve a greater dynamic of progress on this front as a result.

UK as the Possible Leader of International Coalition AI for Healthy Longevity

Deep Knowledge Analytics in collaboration with Aging Analytics Agence and Biogerontology Research Foundation produced analytical report titled **Longevity Industry in the UK Landscape Overview 2018**. 845 pages in length, the report aims to outline the history, present state and future of the Longevity Industry in the United Kingdom, profiling hundreds of companies, investors, and trends, and offering guidance on the most optimal ways in which UK longevity industry stakeholders, as well as government officials, can work to strengthen the industry, and allow it to reach its full potential as a global longevity science and preventive medicine hub. The report uses comprehensive infographics to distill the report's data and conclusions into easily understandable portions, and interested readers can get a quick understanding of the report's main findings and conclusions in its 10-page executive summary.

This special regional case study follows-up on the content and general outline of the Longevity Industry made by our consortium in the previous Longevity Industry Landscape Overviews, including Volume I “The Science of Longevity” (750 pages), and Volume II “The Business of Longevity” (650 pages), published earlier this year.



<https://www.dka.global/longevity-in-uk-2018>

<https://www.dka.global/infographic-summary-longevity>

<https://www.dka.global/longevity-industry-landscape-vol-1>

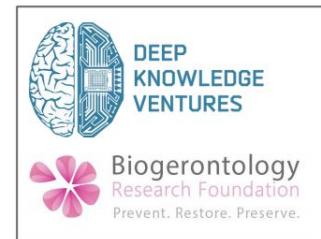
<https://www.dka.global/longevity-industry-landscape-vol-2>

Longevity Industry in UK Landscape 2018

Investors - 200
Companies - 150

Investors
Companies
Non-Profits

Personalized Medicine



You can download high resolution version of this Mindmap via this link: <https://www.dka.global/longevity-in-uk-2018>

170 Companies

Longevity Industry in UK Landscape Overview 2018



You can download high resolution version of this Mindmap via this link: <https://www.dka.global/longevity-in-uk-2018>

UK Longevity Universities & Research Labs



DEEP
KNOWLEDGE
ANALYTICS

LONGEVITY.INTERNATIONAL



BIAS



CISBAN



OIPA



CRA



Aging Research at
King's



C4AR



SID



CIMA



Biogerontology
Research Foundation
Prevent. Restore. Preserve.

BRF



Anglia Ruskin
University

PARI



ARCHA



University
of Glasgow

GARN



CCACE



CARU



NUFFIELD DEPARTMENT OF ORTHOPAEDICS,
RHEUMATOLOGY AND MUSCULOSKELETAL SCIENCES

Medical Sciences Division

NDORMS



FCI



IACDR



The University of Manchester
Manchester Institute of Biotechnology

MICRA



UbbLE



ILC - UK



ATI



CRAG



Ensuring Old Age is Enjoyed and Not Endured

MCHAR



Centre for Social
Gerontology

GEROSCIENCE R&D

Rejuvenation Biotechnology

Gene Therapy

Geroprotectors

Regenerative Medicine

Nutraceuticals

Basic Research on Biology of Aging

P3 MEDICINE

Personalized Diagnostics

Personalized Biomarker Analysis

Personalized Prognostics

Personalized *in vivo* & *in silico* drug testing

Personalized QALY & HALE Estimation

Preventive Therapies

AGETECH

Novel Retirement Plans

Cognitive Enhancement

FinTech for the Elderly

NextGen Mobile Apps for Elderly

Continuing Education

Entertainment for Elderly

NOVEL FINANCIAL SYSTEM

Longevity Index Fund

Longevity Hedge Fund

Longevity Stock Exchange

AgeTech Bank

Longevity Derivatives

Longevity Trust

THE BUSINESS OF PROGRESSIVE MEDICINE PRACTICAL APPLICATIONS

Top 120+ Technologies & Therapeutics TRL 8-9

AgeTech

Microbiome Technology

Blockchain

3D Bioprinting



Gene Therapy



Stem Cell Therapy



Sequencing



Biologics & Small Molecules



Bio-informatics



Technology Readiness Level (TRL)



Commercialized

Pre-Production

Field Test

Prototype

Bench/Lab Testing

Detailed Design

Technology Readiness Levels (TRL) are a common measure of how close a technology is for practical use, used in many engineering disciplines.

By applying it to progressive medicine, we can forecast how long it will take a given therapeutic or technology to witness practical applications in the clinic or home. The darkness of each hexagon represents its TRL, with darker colors indicating a low TRL, and brighter colors indicating a high TRL.

All technologies and therapeutics shown here have a TRL between 8-9.



Biogerontology Research Foundation
Prevent. Restore. Preserve.



Longevity Now Regularly Featured at Leading Healthcare and BioPharma Conferences in the UK

[Biogerontology Research Foundation](#) Trustee Dmitry Kaminskiy and Chief Science Officer Alex Zhavoronkov spoke at the Aging and Longevity Panel at the [Financial Times Global Pharmaceutical and Biotechnology Conference](#) on November 10th, 2017, alongside Aubrey de Grey, Chief Science Officer of SENS Research Foundation, and Joseph Antoun, Chairman of the Global Healthspan Policy Institute. The panel discussion focused on how close geroscience is from bringing practical and actionable results in extending healthy, productive longevity and how far the biopharma industry is from a paradigm shift from treatment to prevention. The fact that this subject is being as part of the agenda at one of the biggest biotech conferences in UK and Europe, featuring the majority of global biopharma companies, is a very strong indicator that geroscience and ageing research is now entering the mainstream consciousness of the public, policy makers and healthcare industry thought-leaders.

The Financial Times' biotech conference follows close on the heels of The Economist's [The Business of Longevity Conference 2017](#) in Hong Kong on October 27th 2017, where Biogerontology Research Foundation Trustee Jim Mellon spoke on the subject of investing in the emerging longevity industry soon after the UK release of his new book [Juvenescence: Investing in the Age of Longevity](#). Furthermore, this is not a chance occurrence but a legitimate trend, given the [World Economic Forum's Prosperity in the Age of Longevity](#) panel discussion in Davos earlier this year, and The Economist's [Ageing Societies 2016](#) in London and [The Business of Longevity 2016](#) conferences in San Francisco.

"The fact that very well-renowned and respected brands such as The Economist and Financial Times are now regularly hosting conferences and panel discussions on the subject of ageing shows the credibility building around the business of longevity. A mere three years ago optimism toward the real emergence of geroscience and longevity was very low, and it was nearly unthinkable that this topic could be included in the agenda of top-tier conferences whatsoever. But the outlook has now changed, and healthspan extension is now a logical topic of discussion for world-leading healthcare thought-leaders. The science of ageing has matured, and we are now witnessing the dawn and rise of the longevity industry" said Dmitry Kaminskiy, Managing Trustee of the Biogerontology Research Foundation.



9-10 November 2017 | The Landmark Hotel London



AI Can Accelerate the Development of Biomarkers of Ageing

While many anti-aging interventions have demonstrated life-extending or other geroprotective effects in model organisms, practical limitations continue to hamper translation to the clinic. One problem is that the evaluation of aging changes and possible anti-aging remedies requires a comprehensive set of robust biomarkers.

Large-scale longitudinal programs like MARK-AGE have been launched to analyze changes in multiple biomarkers during aging and correlation between biological and chronological age. Several “aging clocks” able to predict human chronological age using various biomarkers have already been proposed. Methylation-based markers such as epigenetic aging clocks are currently the most accurate, while transcriptomics and metabolomics have shown to be less so.

Recent studies show that biomarkers of age-related pathologies could be used to evaluate senescence modifications based on the connection between age-related pathologies at the signaling pathway level. However, most of these biomarkers are not representative of the health state of the entire organism or individual systems and are not easily measured or targeted with known interventions.

Machine learning (ML) techniques, such as support vector machines (SVM), are routinely used in biomarker development and rapid increases in labeled data are enabling deep neural networks (DNNs). Methods based on deep architectures have outperformed classical approaches not only in image analysis, but also in solving a wide range of genomics, transcriptomics and proteomics problems.

Personalizing the National Health Service

NHS England recently announced a strategy for driving the delivery of increasingly personalized medicine, defined in the corresponding strategy paper as “a move away from a ‘one size fits all’ approach to the treatment and care of patients with a particular condition, to one which uses emergent approaches in areas such as diagnostic tests, functional genomic technologies, molecular pathway, data analytics and real-time monitoring of conditions to better manage patients’ health and to target therapies to achieve the best outcomes in the management of a patient’s disease or predisposition to disease”.

The detailed strategy has yet to be revealed, but it has been proposed that a new NHS Personalized Medicine service will be built on four principles: better prediction and prevention of disease; more precise diagnosis of disease; more targeted or personalized treatments for disease; and a more participatory role for patients – a positive development in line with political moves towards more patient-centred models of care.

Genomic data typifies big data, being high in both volume and complexity, and requiring innovative computing solutions for storage, processing and analysis. Combining genomic information with other clinical data (from family history and disease symptoms to the results of different predictive or diagnostic tests and medical investigations) yields a veritable treasure trove – for health systems prepared to invest in the infrastructure, expertise and systemic changes needed to put this knowledge to practical use.

For example, better understanding of an individual’s genome could help health professionals to refine their estimates of disease risk, or choices of treatments, to be more accurate and effective. The potential cost savings from avoiding the use of drugs that will be ineffective or cause harmful (adverse) reactions alone could be significant. Personalized medicine has more to offer, however, especially in allowing highly accurate genomic characterization of tumours that lets doctors select treatments that specifically target key weaknesses of cancer cells; this maximizes efficacy and can also reduce unpleasant side effects for patients.

Sources:

Philippa Brice. The UK: your partner for genomics and personalised medicine

<https://www.gov.uk/government/publications/the-uk-your-partner-for-genomics-and-personalised-medicine>

Building on the 100,000 Genomes Project

One crucial element of the new NHS Personalized Medicine strategy is the plan to build upon the groundbreaking 100,000 Genomes Project. This aims not only to sequence 100,000 genomes from NHS patients and their families – this can be necessary for the identification of rare genetic causes of disease – but also to embed genome sequencing services into everyday NHS practice.

The first steps have already been taken in the creation of NHS Genomic Medicine Centres throughout England, and in plans to reconfigure provision of genomics services to a new model that will use the new high-throughput Genomics England Sequencing Centre near Cambridge created for the 100,000 Genomes Project and a network of Genomics Central Laboratory Hubs (centres of expertise in diagnostic molecular, cytogenetic and genomic analysis aligned with Biomedical Research Centres and Academic Health Science Centres) along with smaller Genomics Local Laboratory Hubs to provide common forms of diagnostic testing, as well as interpreting and reporting to doctors the results of more complex testing.

The aim is to create an efficient, integrated and comprehensive service that can combine multiple forms of scientific and clinical data to inform the practice of personalized medicine.

The 100,000 Genomes Project in numbers



100,000 genomes

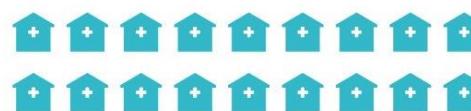


70,000 patients and family members

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21 Petabytes of data.

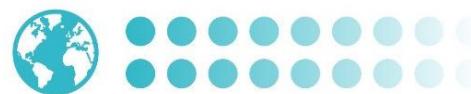
1 Petabyte of music would take 2,000 years to play on an MP3 player.



11 Genomic Medicine Centres, and
74 NHS Trusts within them are involved in recruiting participants



1,500 NHS staff
(doctors, nurses, pathologists, laboratory staff, genetic counsellors)



2,500 researchers and trainees from around the world

Sources: Philippa Brice. The UK: your partner for genomics and personalised medicine

Building on 100,000 Genomes Project

The 100,000 Genomes Project, led by Genomics England, is sequencing the genomes of 100,000 NHS patients and combining this with NHS data. This groundbreaking work highlights the world-leading position the UK holds in genomics. We are already at an advanced stage of a systematic long-term plan for integrating genomic and personalised medicine into the day-to-day delivery of healthcare.

The NHS will be the world's first healthcare system to launch a genomics medicine service.

International interest in UK's approach to genomics and personalised medicine is growing. There is huge potential for this expertise to be shared with governments, healthcare providers and commercial companies.

This prospectus explains what genomics and personalised medicine are, how they can be applied, and why the UK is at the forefront of this field. The UK is investing heavily to set up the necessary infrastructure and levels of service integration to deliver population wide benefits from genomics.

We are in the process of creating an unparalleled end-to-end service, integrating every step of the genomic pathway to maximise patient benefit.

You can draw on this knowledge and experience to invest in the facilities and services needed to optimise these benefits.

Genomics is complex field, but finding suitable commercial partners in UK need not be. The simplest way to access this expertise is through Healthcare UK, UK government's specialists in international healthcare partnership working.

This was published originally by UK Trade and Investment which has since moved to the Department for International Trade (DIT).

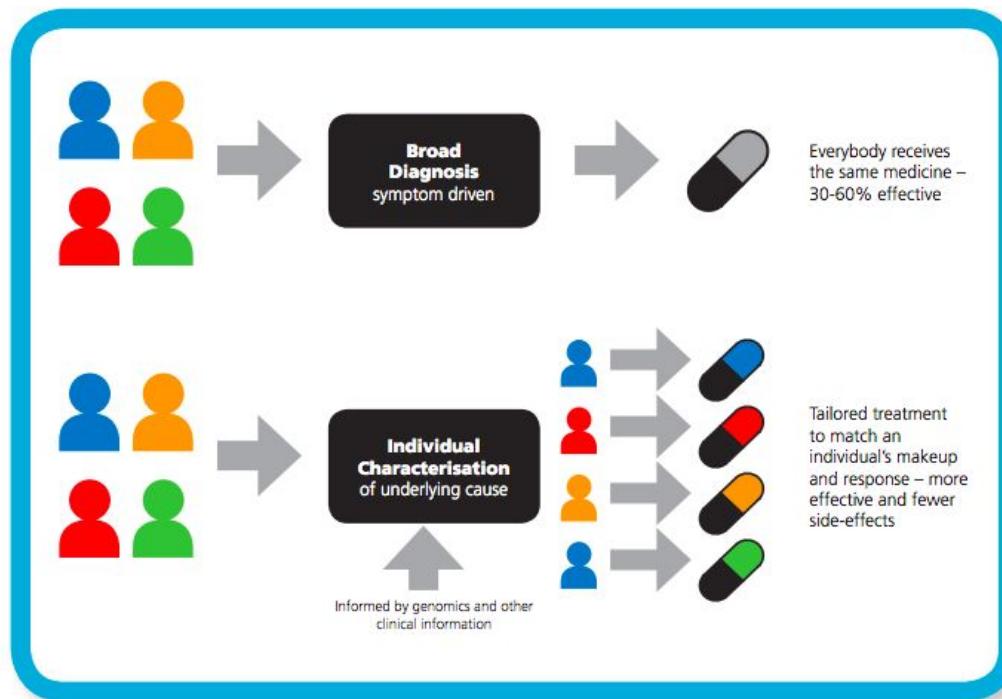
Sources:

The UK: your partner for genomics and personalised medicine

<https://www.gov.uk/government/publications/the-uk-your-partner-for-genomics-and-personalised-medicine>

Future of Personalized Medicine

Traditionally, medicine has been built around clinical teams specialising in a particular organ system working back from a patient's symptoms to arrive at a diagnosis. Personalized medicine recognises that complex diseases should no longer be considered as a single entity. One disease may have many different forms, or 'subtypes', resulting from the complex interaction of our biological make-up and the diverse pathological and physiological processes in our bodies. These will not only vary between patients who have the same disease but also within an individual patient as they get older and their body changes. As we integrate and analyze genomic and other data, we can find common factors and causes of variation, resulting in the discovery of new pathways of disease, changing how diseases are treated. It enables us to recognise that the same underlying change in our DNA or genome can lead to problems in very different parts of the body, which would not have been previously identified with a more traditional care approach.



The current blockbuster approach to drug development assumes that all patients with a particular condition respond similarly to a given drug. All patients with the same condition receive the same first line treatment even though it may be only 30 to 60% effective. Personalized medicine will provide opportunities to improve how we treat disease. Based on comprehensive genomic and diagnostic characterisation, different subtypes of patients with a given condition can be identified, and treatment can be tailored to the underlying cause, as illustrated in the figure.

Sources:

<https://www.england.nhs.uk/wp-content/uploads/2016/09/improving-outcomes-personalised-medicine.pdf>

Future of Personalized Medicine in UK

The UK is by no means alone in its ambitions to reform healthcare to capitalize upon personalized medicine; indeed, it has provoked a proliferation of similar national schemes, notably in the USA where the Precision Medicine Initiative launched last year (and informally dubbed the ‘Million Genomes Project’) aims to recruit a cohort of a million US citizens for research to underpin the delivery of more individualized care.

There are many other efforts to match or exceed the scope of the 100,000 Genomes Project. However, the UK has not only something of a head start, but also a potential advantage in the National Health Service – a gilt edged opportunity to create a seamlessly integrated system and resource for both on-going genomic research and improved clinical care.

So important is the potential of personalized medicine for the UK that a new All-Party Parliamentary Group (APPG) on Personalized Medicine has just formed. Chaired by Jo Churchill, MP, and with a secretariat provided by health policy think-tank the PHG Foundation (formerly Public Health Genetics Unit), the crossbench group of MPs and peers will examine new opportunities offered by genomics, life sciences and digital health technologies for better patient care in the NHS, helping to ensure that the UK makes the most of investment in these areas to maximize the health benefits for the UK population.

Precisely what the personalized medicine of the future will resemble cannot be reliably predicted, but the developments we are already seeing could very well herald the start of truly transformational changes for healthcare.

There are mighty challenges ahead for both science and medicine as they set out to push the boundaries of knowledge, create new solutions to handling big data effectively, and test new paradigms of care, especially in incorporating new areas such as mobile health (mhealth) that could further personalize medical care. No wonder NHS England has referred to the shift towards personalized medicine as “one of the most fundamental changes in NHS history”.

Sources:

Philippa Brice. The UK: your partner for genomics and personalised medicine

<https://www.gov.uk/government/publications/the-uk-your-partner-for-genomics-and-personalised-medicine>

Future of Personalized Medicine in UK

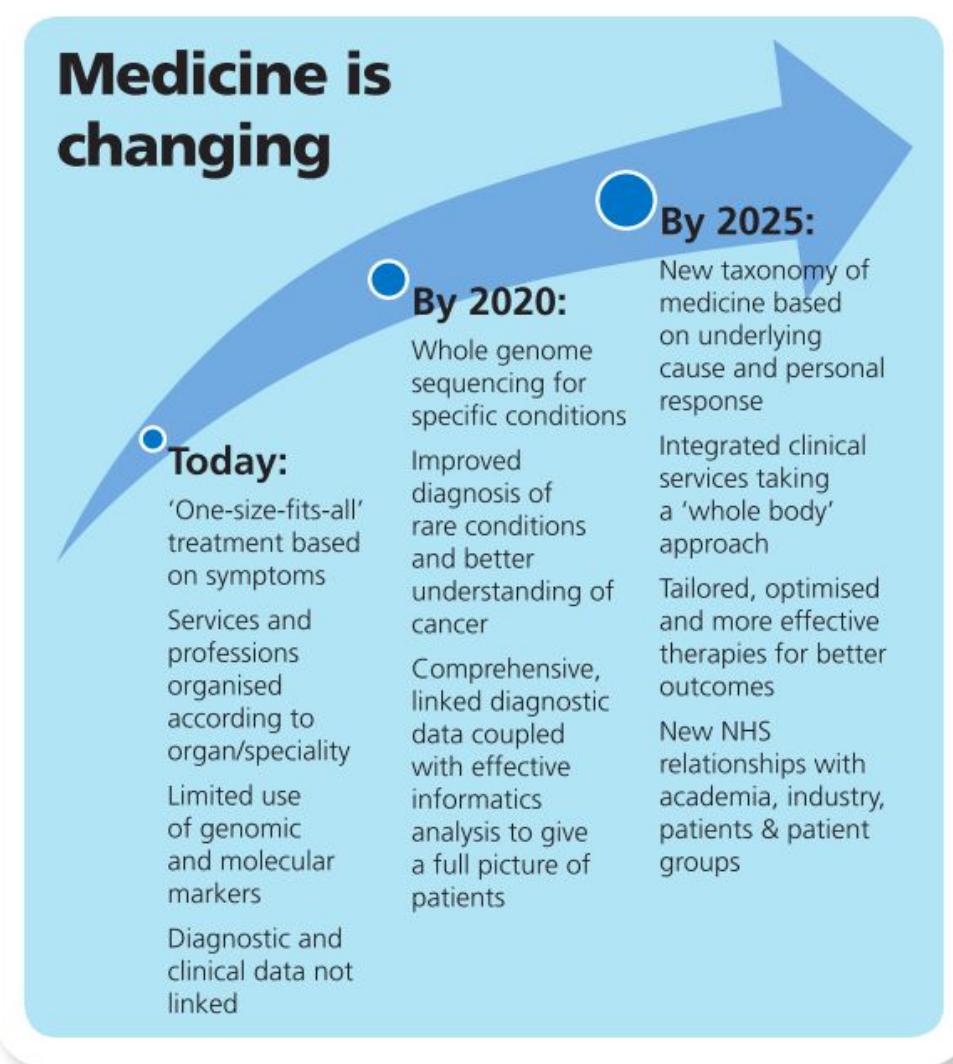
Technological developments across a range of areas are coming together to provide the necessary ingredients to spread a personalised medicine approach across healthcare. Genomic technologies are an increasingly large part of the evolution of modern medicine and our understanding of genomic implications is growing.

The speed and repertoire of diagnostics more generally is increasing. And informatics advances are making discoveries and connections at an enormous pace. This is the dawn of a new era in medicine that will need to move and evolve at the scale and pace of scientific and technological advances if real improvements for patients and the public are going to be made. The figure sets out the changes we might see in the coming decade. Clinical advice and leadership is vital.

We have been working with the Academy of Medical Sciences to develop exemplar clinical pathways in key priority areas, such as diabetes and cardiovascular disease, where there is a real opportunity to improve outcomes for patients and our population. We will continue to work with the Academy as well as with the Academy of Medical Royal Colleges, its constituent colleges and other professional groups, to build the evidence base and clinical understanding.

Sources:

<https://www.england.nhs.uk/wp-content/uploads/2016/09/improving-outcomes-personalised-medicine.pdf>



Future of Personalized Medicine in UK

NHS England has established a national network of 13 Genomic Medicine Centres delivering genomic services across the country. Each of the Genomic Medicine Centres is working in partnership with local providers, across populations of 3 to 5 million, to enable:

- patients and family members, with their informed consent, to participate in the project;
- greater patient and public involvement in the dialogue about genomic medicine;
- clinical and diagnostic data to be captured and collated in new datasets that inform the overall interpretation of the genome sequence and its expression;
- new tracking, collection and handling processes for samples, including the introduction of fresh frozen cancer samples for optimal DNA extraction;
- the creation of genomic medicine multi-disciplinary teams for rare diseases and cancer to help analyse what their genetic information means for that patient; and
- shared risk and decision making through new governance and partnership arrangements across the NHS, with active support from the Academic Health Science Networks.

The Project is coordinated by Genomics England, who have procured whole genome sequencing services and analytical providers. They have created a unique database that enables approved researchers, clinicians, and industry to work on de-identified data to enhance clinical interpretation and answer arising research questions.

Knowledge from the Project will enable clinical teams to better characterise an individual's condition, learn from others with the same disease and connect seemingly different conditions with the same underlying genetic cause. Through the project we are laying the foundations for a personalised medicine approach across the NHS. This is not light years away; it is already changing people's lives.

Sources:

<https://www.england.nhs.uk/wp-content/uploads/2016/09/improving-outcomes-personalised-medicine.pdf>

Future of Personalized Medicine in UK

In a recent report written for the government from the life sciences sector, entitled "Life sciences: industrial strategy", John Bell notes that:

"It is clear that one of the major challenges with healthcare systems over the next twenty years will be to better manage the healthy ageing of a large part of the population. As we move to a setting where almost 30% of the population will be over the age of 65, a wide range of engineering, digital monitoring and technology-based solutions will be required to maintain mobility, allow people to stay at home, and provide much more effective out-of-hospital care. This is the basis for an entirely new industry that could effectively use the NHS and care systems as test beds for products. A more systematic effort to create commercial products could reduce cost and improve outcomes for this population, be it through digital monitoring of disease or mobility, aids for maintaining a safe environment in the home, engineering solutions for mobility, 'smart homes' devices to enhance functionality in the home environment, or aids for people with musculoskeletal disorders. Therefore, there is a significant commercial opportunity; this is primarily an opportunity for digital and engineering medtech companies and could be embedded in the NHS to provide commercial evaluation capabilities. The Life Sciences Strategy recommends the creation of regional Digital Innovation Hubs (expected to roll out early 2018) that support the use of data for research purposes within the legal framework and meet the strict parameters for sharing data and the security standards set out by the National Data Guardian. These Hubs will create controlled environments for real-world clinical studies, the application of novel clinical trial methodology, and the comprehensive evaluation of new innovations so that patients can benefit from scientific breakthroughs much faster."

Sources:

<https://www.gov.uk/government/publications/life-sciences-industrial-strategy>

The Four 'P's of Personalized Medicine

1. **Prediction** and **prevention** of disease: Using genomic technologies and other diagnostics we will be able to identify people most at risk of disease even before the onset of their symptoms. Earlier detection will open up the prospect of new treatment options and support people to make informed lifestyle choices. This will create the potential to reduce the growing burden of disease, particularly for long term conditions such as cardiovascular diseases, cancer, chronic respiratory diseases and diabetes.
2. More **precise** diagnoses: Currently a diagnosis is made based on tests and investigations of a patient's symptoms. But whilst two patients might share the same symptoms, the cause of them could be different. Knowledge of each individual's complex molecular and cellular processes, informed by other clinical and diagnostic information, will enable us to fully understand the abnormal function and determine the true cause of the symptoms. This ability to diagnose more precisely can be optimised when coupled with new and improved technologies such as those that provide rapid and real time results and those that can be used at the point of care. Patients and health professionals can make shared decisions about medicines and adjust dosing in real time.
3. Targeted and **personalised** interventions: Personalised medicine offers the opportunity to move away from 'trial-and-error' prescribing to optimal therapy first time round. Currently key pharmaceutical interventions are effective in only 30-60% of patients due to differences in the way an individual responds to and metabolises medicines. Knowledge of the genetic variants responsible for individual drug response can be used to create an individual's 'pharmacogenomic' profile, identifying optimal treatment. We are already beginning to see the development of simple point of care tests, based on genomic knowledge, which enable clinicians in a wide variety of settings to identify the best therapy. This marks the beginning of an end to the frustrating and costly practice of 'trial-and-error' prescribing. The development and regulatory approval of so called companion diagnostics - a diagnostic test, device or imaging tool used as a companion to a therapeutic drug - is already making this a reality.
4. A more **participatory** role for patients: The ability for a clinician to discuss with their patients information about individual genomic characteristics, lifestyle and environmental factors, and interpret personal data from wearable technology will drive a new type of conversation. They can consider lifestyle changes, and when treatments might not be necessary. It might also lead patients to consider preventative measures when there is high likelihood of a disease developing. This is a new era of medicine and it requires new knowledge amongst professionals, patients and the public to have confidence in using the information available to them.

Sources:

<https://www.england.nhs.uk/wp-content/uploads/2016/09/improving-outcomes-personalised-medicine.pdf>

Preventive Medicine in UK

Preventive medicine in UK falls under the remit of the Department of Health, which has a number of umbrella institutions fulfilling this mandate. Its primary responsibilities include ‘health protection’, ‘health improvement,’ and ‘health inequality’ issues. These domains of preventive medicine broadly fall under the remit of Public Health, and indeed, Acheson described Public Health as, “the science and art of promoting health, preventing disease, and prolonging life through the organized efforts of society”. Preventive public health medicine seeks to set out implementation programs to reduce the burden of disease. It relies on a finite resource of public funding and justifies its expenses through a process of health impact assessment.

It is acknowledged that the Government cannot provide for every possible health intervention and the basis of its monetary allocation is on a utilitarian distributive principle of, ‘*maximum good for maximum people*’. Indeed, the *Policy Appraisal and Health 1995, Saving Lives 1999, and Choosing Health 2004* document elaborate the mandate of Health Impact Assessment as a viable and justified appraisal tool influencing health and more specifically preventative medicine expenditure. This health impact assessment policy has wide ranging effects on all resource aspects of our healthcare and although there is controversy surrounding the implications of these economic appraisal tools, measuring the impact of preventive medicine in the older person is germane for future policy development and allocation of resources.

Sources:

Puneet Kakar. Preventive Medicine in the Older Patient: A United Kingdom Perspective. *Int J Prev Med.* 2012 Jun; 3(6): 379–385.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3389434/>

Industrial Strategy: The Grand Challenges

The Industrial Strategy sets out Grand Challenges to put the UK at the forefront of the industries of the future, ensuring that the UK takes advantage of major global changes, improving people's lives and the country's productivity. The first 4 Grand Challenges are focused on the global trends which will transform our future:

- growing the Artificial Intelligence and data driven economy
- clean growth
- future of mobility
- **ageing society**



Ageing society: The UK population is ageing, as it is across the industrialised world. The prospect of longer lives will require people to plan their careers and retirement differently. Ageing populations will create new demands for technologies, products and services, including new care technologies, new housing models and innovative savings products for retirement. The state has an obligation to help older citizens lead independent, fulfilled lives, continuing to contribute to society, must be created an economy which works for everyone, regardless of age.

In support of the Grand Challenge on data and artificial intelligence (AI), a new Centre for Data Ethics and Innovation is being established to enable and ensure safe, ethical and ground-breaking innovation in AI and data-driven technologies. The centre will work with government, regulators and industry, as well as across sectors and applications, to ensure that the UK's regulatory regime fully supports – and removes barriers to – the ethical and innovative use of data and AI. This will lay the foundations for AI adoption which could benefit households across the UK by up to £2,300 per year by 2030, and ensure that the positive impact of these technologies on the UK economy and society can be maximised.

Source: <https://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges>;
<https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future>

Ministers Announce £300 Million Research Fund To Help Brits Reach 100

Ministers will inject more than £300 million into researching old age in order to support the ageing population. They say “*we need to ‘revolutionise’ the way people get older – ensuring they remain healthy and independent for longer.*”

The funding will support a research hub looking at dementia as well as a major project looking at the prevention and treatment of disease, involving more than 500,000 patients. Under the plans set out by Mr Greg Clark, a £210 million competitive fund will be established to invest in the development of innovative diagnostic tools, medical products and treatments.

It will include the creation of a series of regional centres across the UK to improve the diagnosis of patients using technologies such as artificial intelligence. A further £98 million will be invested in a healthy ageing programme to develop products and services to help people to live in their homes for longer. In addition, £40 million will go to the UK Dementia Research Institute, in partnership with University College London, to create a hub in which 350 leading scientists will research treatments for the condition.

An estimated 850,000 people in UK are living with the disease.

Care minister Caroline Dinenage added: “*As a society we are living longer – a child born today can expect to live to 100 years – but now we must seize the opportunity to improve the quality of lives lived longer.*”

The state pension age for men and women will rise to 66 by 2020, and Government actuaries believe it will reach 70 in the 2050s and 71 in the 2060s.



Health and Treatment Optimisation

The CHHP Health optimisation programmes joins the best in medicine and applied physiology to achieve better health and treatment outcomes and sustain the highest possible quality of life.

The team of specialists work intensively, yet flexibly with the patient to rapidly and measurably reach the goals: improving health outcomes, minimising disease risks and ageing processes, optimising physical or cognitive capabilities, or maximising 'effective longevity'.

At CHHP the team delivers 'multidisciplinary care' to ensure the very best opinions and access to the most advanced treatment under one roof.

The internationally recognised team of specialists come from across the medical specialties including: cardiology; respiratory; weight management and metabolism (including diabetes); oncology; orthopaedics; and clinical and performance nutrition.

The CHHP Executive package is supported by Specialist Physiotherapists, Physiologists, Sports Scientists, Nutritionists and Cardiologists, who will help to identify how executives can improve their overall levels of health and fitness and translate this into their busy lives.

The CHHP Executive package analyses sleep quality, heart health, how the body copes with pressure and travel, along with body composition, to enable corporate executives to understand their health numbers and how to enhance their personal performance and productivity.



Convergence of UK Silver Tsunami and Longevity Science

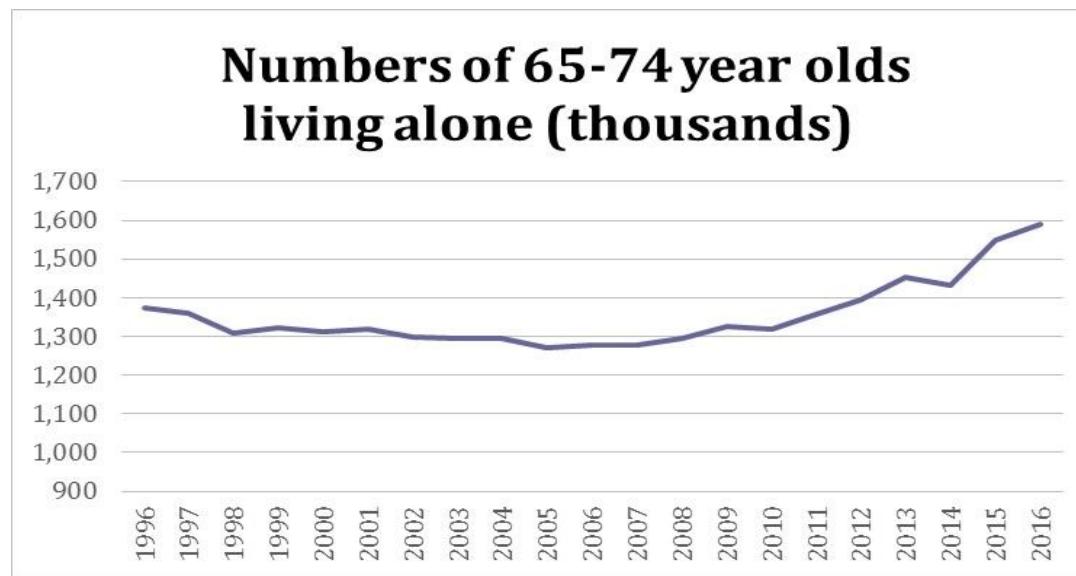
"There is about £2.2bn spent on pathology services in the NHS. You may be able to reduce that by 50%. AI may be the thing that saves the NHS," he said.

The system will save billions of pounds by enabling the diseases to be picked up much earlier.

Taking this example and applying it more generally to a wider array of diseases, the NHS could create significant cost savings by better diagnosing and treating patients with the assistance of machine vision of X-rays, MRIs, cell culture results, epidemiological data crunching, and so forth.

A lot of work is currently done by expensive, error-prone humans that need not be.

Nick Ackland (UK) lost his forearm in an accident and has been testing an advanced bionic arm and hand that is so precise he can use a keyboard



Source: <http://blog.ilcuk.org.uk/2017/08/02/social-crises-housing-isolation-and-an-ageing-population/>



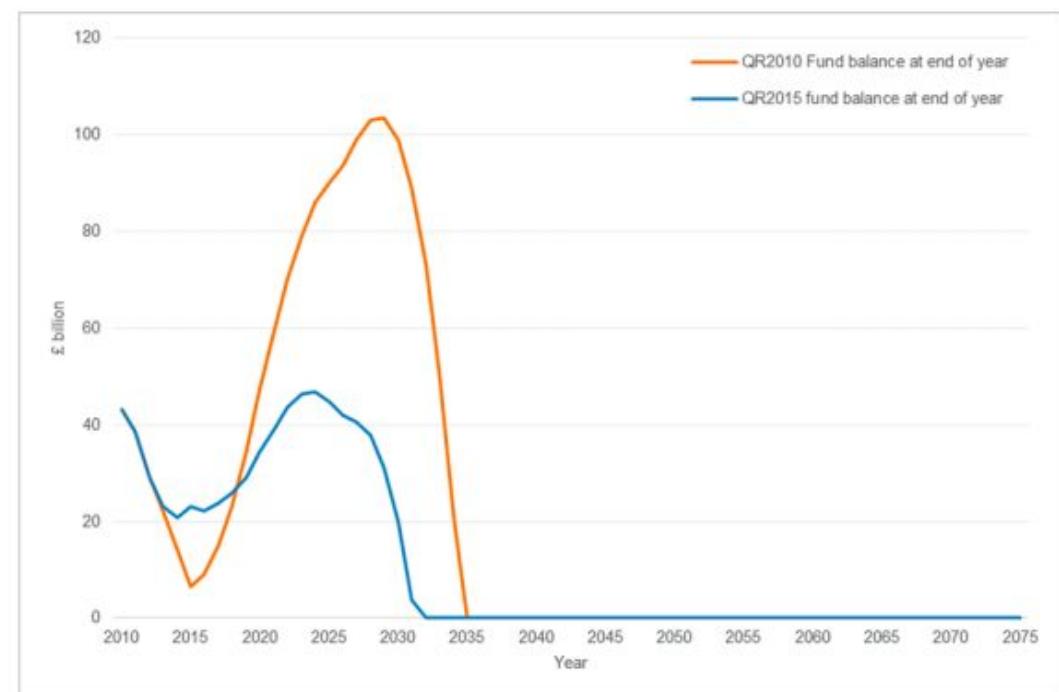
National Insurance Fund

"National insurance contributions made by employers and workers will need to rise by billions of pounds to sustain the state pension, under projections from the government actuary." states Josephine Cumbo, Pensions Correspondent.

Two reports on NIF published in 2010 and 2015 gave a very unoptimistic predictions about the future if the Fund. As can be seen on the picture, it is predicted that Fund will be a bankrupt by 2035.

The slower projected increase in the Fund largely reflects changes in assumptions relating to earnings growth. Specifically:

- This review assumes lower earnings increases (of around 1% pa) for the three years 2016-17 to 2018-19;
- The period of lower short-term earnings growth is assumed to continue for an additional three years, to 2021-22, for this review;
- This review assumes lower long-term earnings growth (down from 4.45% pa to 4.30% pa).



Source: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/653374/QR_2017_report_Oct_2017.pdf
<https://www.ft.com/content/dc16d7b4-f51f-11e7-88f7-5465a6ce1a00>

Biomarkers of Ageing

Vadim Gladyshev, Professor of Medicine at Brigham and Women's Hospital, Harvard Medical School:

"The use of the new tool to track human biological age may enable discovery of drugs and other interventions that target the fundamental process of aging, thereby delaying the onset of all chronic diseases at once, instead of targeting one disease at a time. The project has parallels with MouseAge, a tool for assessing biological age in mice, which we develop jointly with In Silico Medicine."

Insilico Medicine, Inc., a Baltimore-based company specializing in the application of artificial intelligence for drug discovery, biomarker development and aging research, announced in 2018 a publication of a research paper titled "Population-specific biomarkers of human aging: a big data study using South Korean, Canadian and Eastern-European patient populations" in The Journal of Gerontology. Insilico believe AI will transform biomarker development and drug discovery much sooner than most pharmaceutical companies and regulators expect. In the paper, the authors present a novel deep-learning based hematological human aging clock, a biomarker that predicts the biological age of individual patients.

In 2017 the company announced the launch of the Beta 1.0 version of YOUNG.AI. The first version was publicly unveiled on September 12th, 2017 at the 4th Aging Research for Drug Discovery Forum and the Artificial Intelligence and Blockchain for Healthcare Forum in Basel, Switzerland, 11-13 of September. The beta 1.0 version features deep learned photographic and basic blood biochemistry-based predictors of age as well as the ability to track drug and supplement intake.

Sources:

https://www.eurekalert.org/pub_releases/2017-09/imiant091117.php

https://www.eurekalert.org/pub_releases/2018-01/imi-apd011118.php

Biomarkers of Ageing

While many anti-aging interventions have demonstrated life-extending or other geroprotective effects in model organisms, practical limitations continue to hamper translation to the clinic. One problem is that the evaluation of aging changes and possible anti-aging remedies requires a comprehensive set of robust biomarkers.

Large-scale longitudinal programs like MARK-AGE have been launched to analyze changes in multiple biomarkers during aging and correlation between biological and chronological age. Several “aging clocks” able to predict human chronological age using various biomarkers have already been proposed. Methylation-based markers such as epigenetic aging clocks are currently the most accurate, while transcriptomics and metabolomics have shown to be less so.

Recent studies show that biomarkers of age-related pathologies could be used to evaluate senescence modifications based on the connection between age-related pathologies at the signaling pathway level. However, most of these biomarkers are not representative of the health state of the entire organism or individual systems and are not easily measured or targeted with known interventions.

Machine learning (ML) techniques, such as support vector machines (SVM), are routinely used in biomarker development and rapid increases in labeled data are enabling deep neural networks (DNNs). Methods based on deep architectures have outperformed classical approaches not only in image analysis, but also in solving a wide range of genomics, transcriptomics and proteomics problems.

Using Artificial Intelligence (AI), **Insilico Medicine** has developed a system that measures the biological age using readings found in a common blood test. Insilico Medicine calls it the Aging Clock, and it is based on biomarkers of aging found in our blood chemistry. Insilico Medicine says its number-crunching has yielded the most precise measure of a person’s biological age. To develop their algorithm, the company used AI techniques to analyze the blood tests of an international group of 130,000 people.

Sources: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4931851/>
<http://longevityfacts.com/ai-based-app-measures-bodys-aging-clock/>

AI Can Accelerate the Development of Biomarkers of Aging

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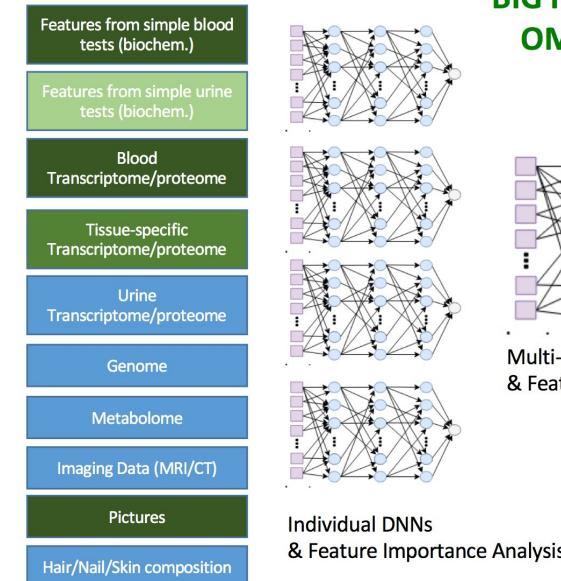
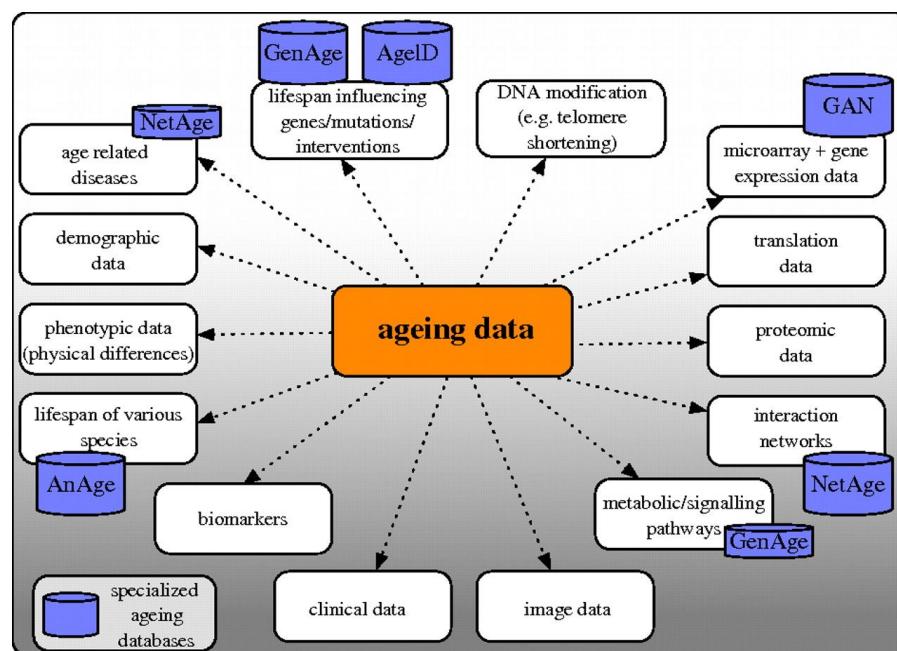
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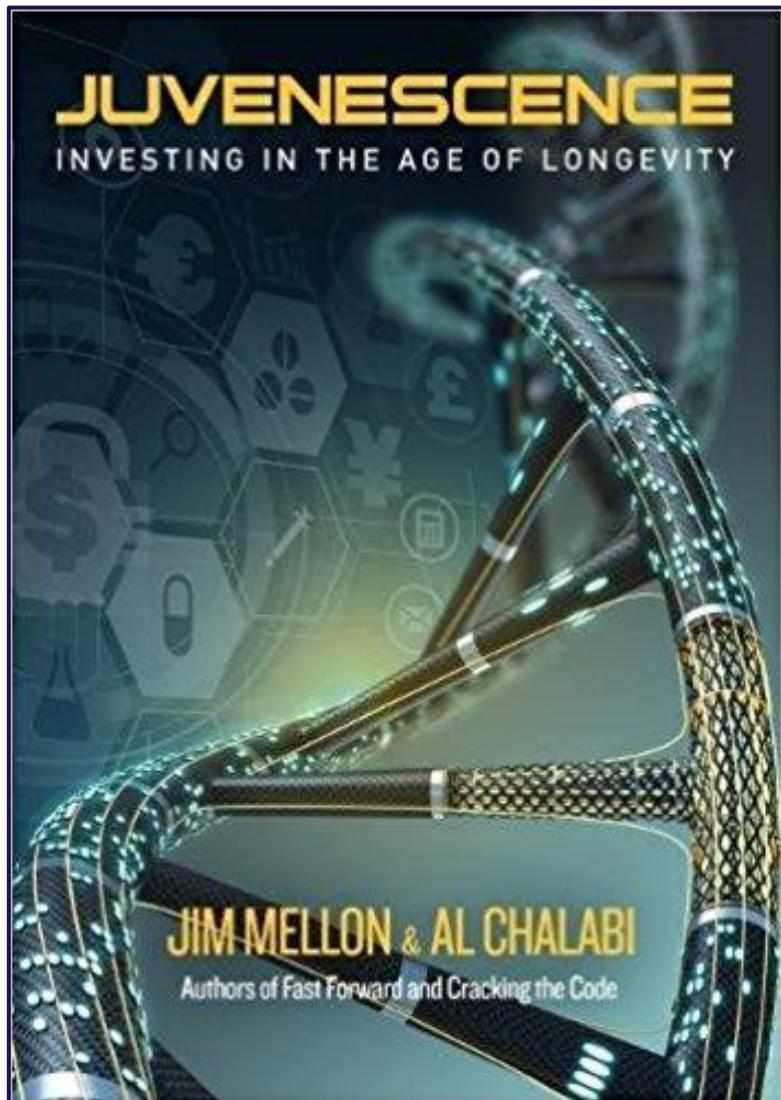
One core problem posed by biomarkers of ageing is the sheer amount of data involved. This is the precise area where AI excels - i.e., analyzing, processing and deriving insights from mountains of data too large for humans to handle. It is for this reason that AI stands as the most promising tool to accelerate the development of effective biomarkers of aging.

AI Can Accelerate the Development of Biomarkers of Aging

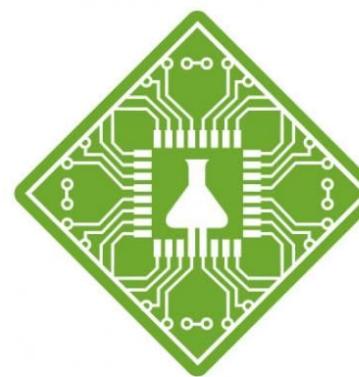


BIG IDEA: USE AGE FOR MULTI-OMICS DATA INTEGRATION

UK Longevity Investment Landscape is Booming



Today the UK is home to several leading longevity industry investors. British billionaire businessman, author of 'Juvenescence: Investing in the Age of Longevity', and founder of the biotech VC fund Juvenescence Limited, Jim Mellon, has already poured funds into Insilico Medicine, Inc. an artificial intelligence company on the forefront of applying AI for Longevity that utilises advances in genomics, big data analysis, and deep learning for in silico drug discovery and drug repurposing for ageing and age-related diseases.



JUVENESCENCE.AI

The first investor in Insilico Medicine was Deep Knowledge Ventures, led by well-known Longevity investor Dmitry Kaminskiy, editor of 1400-page *Longevity Industry Landscape Overview*.

Collider Health - Tina Woods

Tina Woods is CEO and Founder of Collider Health, a health innovation engine that works with corporates, government, start-ups, third sector and investors to accelerate innovation and transform health with sustainable impact at scale. Tina is an ecosystem architect and builds collaborative networks and strategic partnerships to facilitate smart investment. She supports startups and works with corporations to help them partner with and invest in startup businesses, and to develop new products and services through collaborating with leading edge players, for example in blockchain technology and artificial intelligence. Woods has many years of experience working with pharma and medical devices and more recently has started to work increasingly with clients in insurance, pensions and banking in new areas and ventures, particularly in private health and innovative businesses in the ageing space. She is currently helping the NHS build their Artificial Intelligence ecosystem as an advisor to the national AHSN AI Initiative, supporting Innovate UK with consortia development for the UK Healthy Ageing Grand Challenge, designing the Innovation and Excellence Categories for the 2019 AXA Health Tech & You programme, and a number of other projects.

She has extensive connections and networks with the innovation community: Woods is a strategic partner with D/SRUPTION and writes regularly for them. She also has a particular interest in innovation in the ageing space, and works regularly with a number of innovation networks. She is chair of Future Health Collective, a multi-disciplinary, cross-sector group geared to foster collaboration and radical innovation in areas of unmet need in health and social care.



Tina Woods

Founder & CEO, Collider
Health Chair, Future Health
Collective

Innovation Warehouse / AgeTech and Longevity Hub

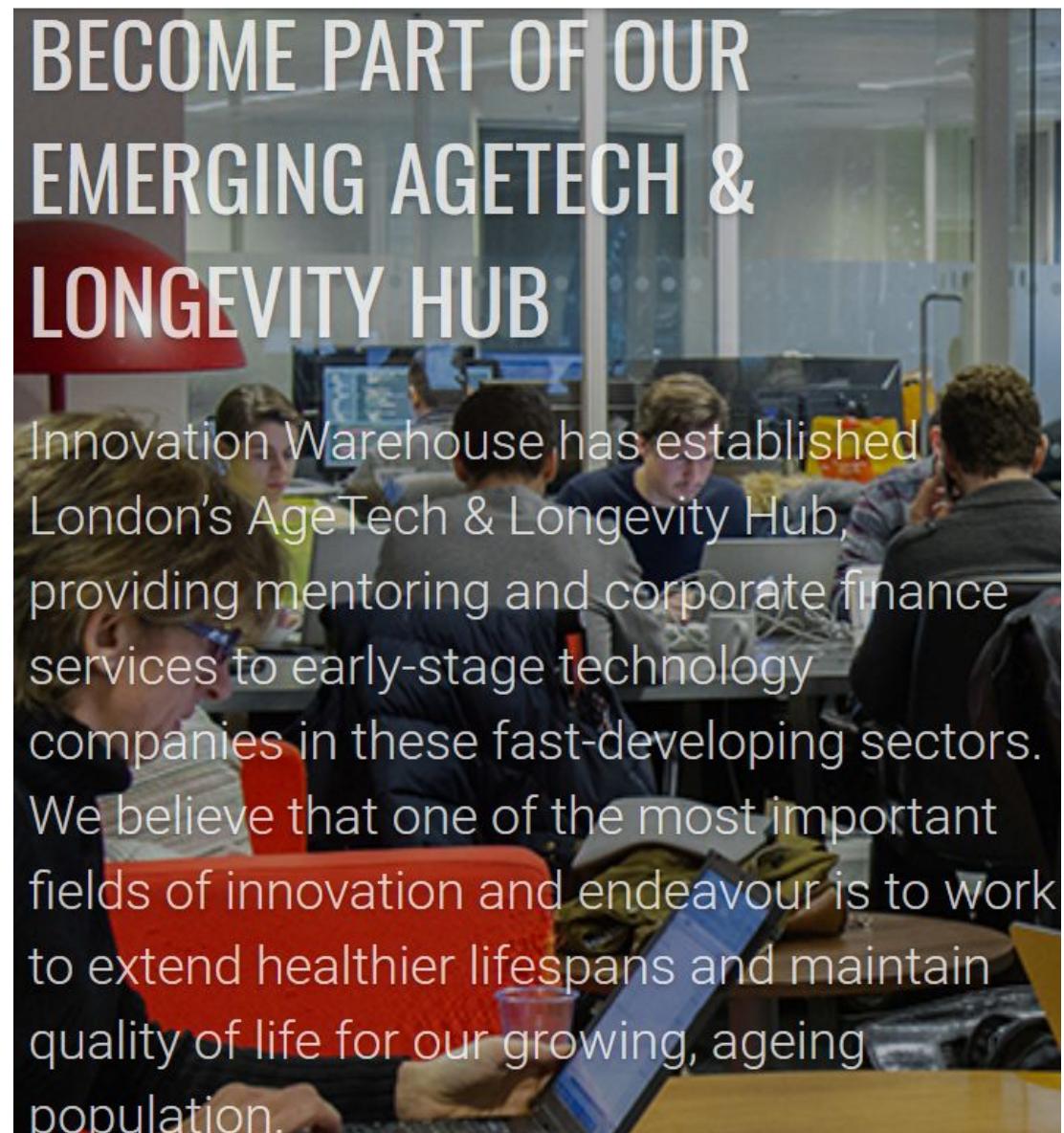
Innovation Warehouse was founded in 2010 as a community for digital high-growth start-ups in London.

The idea was brought to life by a group of entrepreneurs and angel investors with significant experience and a proven track record of working with start-ups.

Every day, over 200 entrepreneurs, angels and mentors work together from their Smithfield coworking location.

In 2018, Innovation Warehouse established London's AgeTech & Longevity Hub, providing mentoring and corporate finance services to early-stage technology companies in these fast-developing sectors.

They believe that one of the most important fields of innovation and endeavour is to work to extend healthier lifespans and maintain quality of life for our growing, ageing population. They seek a present where people age better and live longer independently.



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Insilico Medicine Aging.ai 2.0



One of the most promising projects developed by Insilico Medicine is called Aging.AI 2.0, which is an AI-empowered platform integrating multiple predictors of clients age and used to track changes of health over time and optimize clients lifestyle.

<http://young.ai/>



Track your age
at every level!



See what makes you
younger or older!



Stay young!



Insilico Medicine's mission is to extend healthy longevity through innovative AI solutions for drug discovery and aging research. Insilico Medicine is committed to transforming the pharmaceutical industry with next-generation artificial intelligence. They are developing new tools for drug discovery and repurposing, biomarker development and pursuing novel strategies for rapid validation. Their projects combine advances in genomics, big-data analysis, deep learning and reinforcement learning.

Insilico Medicine and Biotime announced in 2016 the launch of a beta version of Embryonic.AI, an artificially intelligent system for analyzing the embryonic state of human cell samples using gene expression data. Insilico established in 2017 a collaboration with GSK to discover novel biological targets and molecules. As a first stage of the collaboration, GSK will evaluate Insilico's technology in the identification of novel biological targets and pathways of interest to GSK.

In 2018 a collaboration occurred between Insilico Medicine and Juvenescence AI Limited, which is a drug development and **artificial intelligence company focused on ageing and age-related diseases**. Juvenescence AI combines advances in artificial intelligence with classical development expertise in order to prioritize and develop compounds from Insilico Medicine's end-to-end automated drug discovery pipeline through to clinical proof of concept.

By using AI and deep learning, the company can analyze how different compounds will affect certain cells, determine what drugs can be used to treat the symptoms, and any possible side effects that may occur.

Even though it's only been around a few years, Insilico has already been named by NVIDIA as one of the 5 top AI companies. With R & D resources spread out across the globe in the UK, Russia, and Belgium and a backing of \$14 million behind it.

Sources: https://www.eurekalert.org/pub_releases/2017-08/imi-iec081417.php

<https://www.businesswire.com/news/home/20180205005024/en/Insilico-Medicine-Juvenescence-Announce-Drug-Candidate-Joint>

AI for Drug Discovery in Longevity Research Reaches a New Degree of Credibility Through Frost & Sullivan's Best Practices Award

Meanwhile, in 2018, AI for Drug Discovery as a legitimate and official subsector within the broader longevity research landscape, and longevity research as a legitimate niche within the broader drug discovery landscape, attained a new degree of recognition.

This occurred when leading business consulting firm Frost & Sullivan awarded Insilico Medicine the [North American Artificial Intelligence for Aging Research & Drug Development Technology Innovation Award](#), as part of their 2018 Best Practices Awards.

More than this, the fact that a highly respected business consulting firm like Frost & Sullivan created a specific category of award for this specific area of research and development is highly indicative of the increasing level of repute that AI in Drug Discovery for aging research is garnering from both the broader geroscience community as well as the wider drug development communities.

This new development may also serve to highlight the high degree of synergy that is possible through the convergent integration of two cutting-edge and highly innovative classes of R&D.



AI for Drug Discovery in Longevity Research Reaches a New Degree of Credibility Through Frost & Sullivan's Best Practices Award

F R O S T & S U L L I V A N



INSILICO MEDICINE

2018 North American Artificial Intelligence for Aging Research
and Drug Development Technology Innovation Award

Insilico Medicine

Insilico Medicine is committed to transforming the pharmaceutical industry with next-generation artificial intelligence. Insilico Medicine is developing new tools for drug discovery and repurposing, biomarker development and pursuing novel strategies for rapid validation.

The company utilizes advances in genomics, big data analysis, and deep learning for in silico drug discovery and drug repurposing for aging and age-related diseases. In addition to working collaborations with the large pharmaceutical companies, the company is pursuing internal drug discovery programs in cancer, dermatological diseases, fibrosis, Parkinson's Disease, Alzheimer's Disease, ALS, diabetes, sarcopenia, and aging.

Through a partnership with **LifeExtension.com** the company launched a range of nutraceutical products compounded using the advanced bioinformatics techniques and deep learning approaches. It also provides a range of consumer-facing applications including **Young.AI** and **Aging.AI** and operates Chemistry.AI intended to capture the tacit knowledge of medicinal chemists.

Through a partnership with the BitFury Group, the company is working on a range of AI solutions for blockchain to help return the power over life data back to the individual. The company raised venture capital and partnered with Juvenescence Limited, a holding company focused on longevity biotechnology. The company aspires to become the **"Bell Labs" for artificial intelligence and associated technologies for healthcare and longevity biotechnology** and commercialize its research by forming subsidiaries around the specific technologies and licensing the intellectual property, molecules and data to the biotechnology and pharmaceutical companies.



Source: https://www.eurekalert.org/pub_releases/2018-04/imi-itp042718.php

AI and Security

Key Highlights

- While the ongoing digitization of value chains is increasing efficiency and productivity, cybercriminals are exploiting the ongoing trend of digitization in order to target digital ecosystems like IoT devices, Software as a service (SAAS) and cloud infrastructures.
- UK businesses need to proactively build their cybersecurity infrastructures to ensure that their increasing digitization does not leave them vulnerable to new forms of cybercrime.
- As the amount of data generated and handled by companies increase, the capacity for human employees to analyze such data in attempts to pinpoint security threats is being rapidly overwhelmed.
- AI can offer new and more scalable security solutions. Unsupervised learning algorithms can learn for themselves and improve over time. Because AI is adept at identifying statistical anomalies, they can learn to identify non-obvious security threats that would otherwise remain hidden to human eyes under mountains of data.
- By automating security monitoring, the scalability of security systems is no longer bounded by the number of employees on a given company's security team. This turns security scalability into a technological problem.

Security companies indicated in the report

1. AimBrain	14. Elliptic	27. Salviol Global Analytics
2. Arachnys	15. Encode	28. Sauron Security
3. barac	16. EyesClear	29. Senseon
4. Biolink Tech	17. Fraud / Fraugster	30. Spherical Defence
5. Callsign	18. Intelliagg	31. Sum&Substance
6. criticalcyber.systems	19. iProov	32. Tessian
7. CrowdVision	20. Moonshot CVE	33. Toneboard
8. CYBERLYTIC	21. ONFIDO	34. Trudera
9. CyberSparta	22. OnFrame	35. Verisart
10. Cybertonica	23. Panaseer	36. Visio Ingenii
11. CyNation	24. Perpetual Encryption	37. Vivacity Labs
12. DARKTRACE	25. quantexa	38. WeSee
13. Diffblue	26. RIPJAR	

AI companies in the Security Industry

Company Name	Website	Description	Number of Employees	Technology
DARKTRACE	darktrace.com	Darktrace is the world's leading AI company for cyber defense and leader in Enterprise Immune System technology. Darktrace is headquartered in San Francisco and Cambridge, UK, and has 650+ employees in over 30 offices worldwide.	501-1,000	Recommendation Systems
Onfido	onfido.com	Onfido uses machine learning to help over 1,500 companies verify the identity of their users online. As a team of 180 with offices in 5 countries, It works with global customers including BBVA, Square and LendingKart.	101-250	Computer Vision
Diffblue	diffblue.com/	Diffblue is a University of Oxford spin-out that is applying artificial intelligence to software development. It's the result of a decade's worth of research, and able to create an exact mathematical model for any code base, after receiving just a few examples to work from.	51-200	Chatbot & AI Assistants
iProov	iproov.com	iProov is a fast-growing UK cyber-security business based in London, providing strong biometric identity authentication of online users. The business has won many innovation grants from InnovateUK, the UK Government's innovation agency, and has raised substantial Series A finance.	11-50	Computer Vision
Callsign	callsign.com	Callsign was founded in 2012 with the mission to provide the most secure and seamless authentication experience for enterprises and users. Today Callsign is deployed to hundreds of thousands of users globally. Its clients are enterprises, financial institutions and consumer-facing digital services and include some of the world's largest banks, such as Lloyds Bank and Deutsche Bank.	51-200	Intelligent data analysis

Darktrace

Darktrace's Enterprise Immune System uses machine learning and AI algorithms to detect and respond to cyber-threats across diverse digital environments, including cloud and virtualized networks, IoT and industrial control systems. The technology is self-learning and requires no set-up, identifying threats in real time, including zero-days, insiders and stealthy, silent attackers.

Darktrace is now one of the few cybersecurity startups that analysts say can validly claim to be using AI and machine learning to successfully identify hackers, as it attempts to spearhead an industry shift away from clunky anti-virus and firewalls towards intelligent code that can make decisions on how best to secure corporate and government networks.

To hone its algorithms in its incipience, Darktrace favored ex-intelligence staff, not just from the U.K. but hackers formerly of the NSA's offensive cyber division, Tailored Access Operations, which infamously saw its innards exposed by the Edward Snowden leaks.

For its next trick, Darktrace is getting customers to place almost faith in its AI with the Antigena product. Launched in April 2017, it goes the next step, removing the human from the equation and eradicating what the immune system has detected all on its own.



Source: <https://www.forbes.com/sites/thomasbrewster/2018/05/15/darktrace-unicorn-one-billion-valuation/#5a4a56a720b7>

Onfido uses machine learning to help over 1,500 companies verify the identity of their users online. Its technology verifies the authenticity of a user's identity document and compares it with their facial biometrics. As a global innovator in the Computer Vision space, its AI learns to identify fraud as it evolves over time, enabling its clients to rapidly onboard more users while protecting themselves against fraudulent activity.

Onfido currently has a strong team of AI engineers on staff, specialists in machine learning and computer vision, who are regularly tinkering with the company's algorithms to make them more sophisticated and of course to become smarter by way of all the images the platform is processing.

In the past year or so, Onfido has been gradually shifting its focus more to financial services and e-commerce, and specifically identity checks for businesses in these verticals. The challenge for banks, payment platforms and others is that they have a strong requirement to verify the identities of people with whom they do business. Onfido does this with an interesting solution that is based on standard identity documents — it recognises some 600 formats, from drivers' licenses from dozens of countries, to passports, to identity cards and so on — and a "selfie" on your phone. This isn't a photo as such, but in fact a live picture. The client then responds to instructions for two or three different actions, such as a blink, a smile, saying a sequence of numbers or looking over their shoulder. Onfido takes the responses to these commands to check that the person is not using a static photo, and to compare the face in the selfie to the picture on the ID card, while also running the ID card check at the same time. Its algorithms then provide a risk report for you, noting if you come up as completely compatible, mostly so, or to flag when it appears that you are not who the document says you are. All the data is then passed on to the company requesting the checks, both "compatible" checks and those that are flagged for further checks.



Source: <https://techcrunch.com/2017/09/27/onfido-raises-30m-more-for-its-ai-based-identity-verification-technology/>

Diffblue

Diffblue's goal is to automate all traditional coding tasks: bug fixing, test writing, finding and fixing exploits, refactoring code, translating from one language to another, and creating original code to fit specifications. Diffblue is creating a world where a computer understands its own programming, and is able to adjust and upgrade its code, far beyond common tools that just find bugs. Diffblue's current AI engines are able to build a mathematical model of code, and generate unit tests automatically. Further products include finding security vulnerabilities in code, and automatic code maintenance and modernising. Diffblue's ultimate goal is self-writing code.

Born out of ten years of research, Diffblue describes its core AI as being able to build an exact mathematical model of any code base, with just a few examples provided. The resulting model then allows a deep semantic understanding of what a computer program is trying to do, from which a number of aspects of software development can be automated. Initially, Diffblue are working on three products built on the core AI engine.

The first is a testing product that automatically spots bugs and writes tests, which is one of the lower-hanging and most laborious parts of quality software development. It's also a crucial one, especially for mission-critical applications where a software failure can cost lives or huge amounts of money.

The second Diffblue product in the works is a security product that automatically flags up exploitable bugs and generates tests for those bugs.

The third product is a refactoring product that automatically rewrites badly expressed or out of date code.



Source: <https://www.ai-expo.net/global/partners/diffblue/>
<https://techcrunch.com/2017/06/27/diffblue/>

iProov

iProov is a London-based firm with facial biometric technology that has been patented both in the UK and US. iProov prides itself on becoming the first ever British and foreign firm to receive a contract from the US Department of Homeland Security Science and Technology Directorate's Silicon Valley Innovative Program(SVIP).

The iProov technology also helps in making sure that both returning and new users are genuine and protects against fraudulent attempts to use stolen identity or access personal data. iProov's technology is expected to work with the already implemented CBP systems, particularly on which travelers' information is pre-registered.

Presentation attack detection (PAD) and face matching are the two outstanding capabilities of iProov's core one-time biometric technology. Face matching is the core of its authentication. iProov developed its DELFINA face matcher, which uses the latest advances in deep neural networks, to deliver world-leading matching performance. It is optimised for 'selfies' taken on smartphones and PCs in a huge variety of lighting conditions, poses and facial features.

Unlike most other face biometrics, iProov's Presentation attack detection (PAD) operates on passive challenge/response protocols. This means that in order to authenticate, users are not required to move their head from side-to-side, blink, or read out numbers; iProov's Flashmark technology determines liveness without the need for movement or speech.



Source: <https://algorithmlab.com/blog/2018/08/30/iproov-uk-based-facial-biometric-company-to-secure-us-border/>
<https://www.iproov.com/technology>

Callsign

Callsign was founded in 2012 with the mission to provide the most secure and seamless authentication experience for enterprises and users. Callsign's Intelligence Driven Authentication Solution enables more informed and truly adaptive access control decisions, putting enterprises and their users back in control.

Callsign's Intelligence Driven Authentication™ (IDA) proactively defends against data breaches and cybercrime. Callsign applies artificial intelligence to understand user patterns and intelligently adjust authentication journeys in real-time. IDA applies deep learning to device, location and behavior analytics to paint the complete threat picture of every access attempt. With Callsign's technology, enterprises define adaptive authentication journeys that react to real-time threats and accurately orchestrate user authentication actions for secure and seamless access.

The Policy Engine enforces the IDA journeys based on what is being performed, who is performing it and contextual intelligence. The Authentication Engine is the hub for authentication actions and assertions. It requests the required authentication action from the user to mitigate the identified risk. The Analytics Engine applies deep-learning algorithms to understand user authentication patterns. It fuses together more than 300 data elements from device sensors to pinpoint suspicious activity in real-time.

Callsign offers everything from SaaS multi-tenant and single-tenant databases to on-premise deployments. In all cases, the service uses a noSQL database backend, Spring integration combined with Apache Kafka for data streaming, scikit-learn for machine learning and TensorFlow for AI.



Source: <https://www.callsign.com/technology/>

Robotics in UK

Key Highlights

- A new report by the International Federation of Robotics finds that the automation of production processes is accelerating, with 74 robots for every 10000 employees as the new global average.
- Nonetheless, the UK currently ranks 22nd in terms of robot density, and remains the only G7 country whose robot density is below the world average.
- A 2017 report by the Royal Society for the encouragement of Arts, Manufactures and Commerce (RSA) titled The Age of Automation has called on business leaders to accelerate their adoption of robotics in order to catch up with the rest of the developed world.
- Furthermore, this situation may be further exacerbated by the UK's coming break from the EU, given that 80% of funding for UK robotics research comes from the EU according to the House of Commons Science Committee.
- The UK Government committed an additional £17.3m worth of funding for university research into AI and robotics. Nonetheless, analysts warn that the UK should strive to take additional proactive steps to growing its robotics industry in tandem with its AI industry.

Robotics companies indicated in the report

1. Adama Robotics	11. Consequential Robotics	21. Mov.AI
2. Aerial Power	12. Drone Space AI	22. Oxbotica Ltd
3. AI Build	13. EMOTECH LTD	23. q-bot
4. Airrow ltd	14. evolve dynamics	24. RoboSavvy
5. Albora Technologies	15. FlockCover	25. Rovco
6. Automata	16. H Robotics	26. Shadow Robot
7. Baro Vehicles	17. Intelligent Robots	27. Sky-Futures
8. BeTomorrow	18. MIO TECHNOLOGIES LTD.	28. SLAMcore
9. BotsandUs	19. Mogees	29. Unmanned Life
10. Cambrian Intelligence	20. Moley Robotics	30. ZOA Robotics

AI companies in Robotics

Company Name	Website	Description	Number of Employees	Industries
FlockCover	flockcover.com	Flock is a London-based, VC- and Government-backed insurtech startup, pioneering the use of Big Data to intelligently price insurance. Flock has been awarded grants from Innovate UK, the Ordnance Survey, Slaughter and May and Norton Rose Fulbright.	11 – 50	InsurTech
Oxbotica Ltd	oxbotica.ai	Oxbotica is developing the next generation of autonomous vehicles, creating the software that makes them go.	11 – 50	Transport & Infrastructure
Rovco	rovco.com	Rovco was founded to lead the way in bringing AUV and ROV 3D computer vision and artificial intelligence technologies subsea. Rovco is majority owned by the existing management team, and grant funded by InnovateUK, the UK's innovation agency.	11-50	Transport & Infrastructure
Moley Robotics	moley.com	Moley Robotics has created the world's first fully-automated and intelligent cooking robot. It learns recipes, cooks them and clears up after itself. The system comprises a full suite of appliances, cabinetry, safety features, computing and robotics.	11-50	Others
Q-bot	q-bot.co	Q-Bot develops intelligent tools using robotics and AI that can inspect, monitor and maintain the health of our buildings and infrastructure. Q-Bot's mission is to transform the built environment with robotics and AI to become a global leader in construction innovation.	11-50	Transport & Infrastructure

Flock

In March 2018 Flock has launched Europe's first "pay-as-you-fly" drone insurance solution. The "Flock Cover" smartphone app provides on-demand insurance for commercial drone pilots in the UK, with policies starting from just £5 for up to eight hours of liability and hull cover.

Flock also offers a predictive risk analytics engine, which means that pilots can see their risks (and book insurance) for any flight up to 10 days in advance. To accommodate the rapidly growing number of commercial drone pilots in the UK, Flock expanded its offering by providing pay-as-you-fly insurance policies for "commercial operators in training". Flock is working closely with its partners, including Allianz, as well as drone manufacturers, software companies and training schools, to roll out smarter insurance policies for drone pilots throughout Europe.

The company says that 1,000 commercial drone pilots now use Flock Cover representing a departure from flat-rate annual premiums in favour of Flock's on-demand model.

The Flock Cover app aggregates real-time data, including hyperlocal weather conditions, population density, proximity to high-risk areas (such as airports), and more. Flock's proprietary algorithms then analyse this data to quantify the risk of any given drone flight in a matter of milliseconds. This quantified risk metric is then converted into an intelligently and fairly priced insurance premium, allowing drone pilots to purchase hourly insurance policies for their flights at the touch of a button.



Source: <https://www.insurancejournal.com/news/international/2018/03/13/483092.htm>
<https://techcrunch.com/2018/05/29/flock-raises-2-25m-for-its-on-demand-drone-insurance/>

Oxbotica

Gatwick Airport will use self-driving cars that use Oxbotica's LiDAR-based Selenium system, but only "airside". The vehicles will move staff around the airport, but at this stage, they will not be used by airline passengers.

Oxbotica's Selenium autonomous driving system can be fitted to any type of vehicle. It does not require GPS satellite location, but uses LiDAR or "light detection and ranging". Unlike radar and sonar, LiDAR uses extremely rapid pulses of laser light, which makes it very accurate.

Oxbotica is already running a number of projects with self-driving vehicles. Selenium was used for the Transport Systems Catapult (TSC) in Milton Keynes, which was the first successful test in public of self-driving vehicles in the UK. It was also used in the GATEway Project (Greenwich Automated Transport Environment) in Greenwich, with CargoPod vehicles making deliveries for Ocado, the world's largest online-only supermarket. Another project, with the Driven consortium, will involve a fleet of self-driving cars travelling from Oxford to London.

Caesium is Oxbotica's fleet management system, a cloud-based service that schedules and co-ordinates fleets of autonomous vehicles. It enables route optimisation and data exchange between the vehicles without human intervention.

Selenium uses the knowledge of where it is in the world, together with local information about the environment around the vehicle, to determine a safe path and velocity to move the vehicle towards its goal.



Source: <https://www.zdnet.com/article/gatwick-airport-to-trial-british-self-driving-car-system-from-oxbotica/>
<https://www.oxbotica.ai/>

Rovco

According to subsea technology firm Rovco, subsea inspection and decommissioning costs could be slashed by 80% with the help of artificial intelligence. The company has secured Innovate UK funding to develop a 3D visualization system as part of a two-stage AI demonstrator project.

Phase one will see Rovco working in partnership with the Offshore Renewable Energy (ORE) Catapult to develop the software and equipment needed to gather live 3D data from extreme subsea environments. The technology will be trialled at ORE Catapult's marine energy test facility in Northumberland. 3D survey methods deliver more precise measurements and reliable metrics for asset condition monitoring when compared to traditional visual survey techniques.

The second phase of the project will include the development of a complete 3D vision-based survey solution using AI. The technology will feature cutting-edge camera and embedded graphic processing equipment installed on small remotely operated underwater vehicles (ROVs).

The project's first phase will be 70% supported by Innovate UK, with the remaining 30% funded by Rovco. Phase two is expected to be further backed by Innovate UK when technical feasibility is proven. This latest venture follows Rovco's previous Innovate UK funded study, which successfully demonstrated the market need and overall feasibility for 3D models of subsea assets.



Source: <https://www.imarest.org/themarineprofessional/item/3951-rovco-to-develop-ai-subsea-inspection-robots>

Moley Robotics

Moley Robotics has created the world's first fully-automated and intelligent cooking robot. The system comprises a full suite of appliances, cabinetry, safety features, computing and robotics. Over the past two years Moley has been focused on technology development, harnessing and coordinating the global resources.

The machine consists of two remarkably dexterous robotic arms installed atop a cooking area, complete with hobs, a sink and an oven. The robot's sophisticated and fully articulated hands were created by Shadow Robot Company, another London-based firm, whose products are used all over the world, including by NASA.

Rather than cooking like a machine, the system works by first recording human actions in 3D and then converting these into highly precise movements. Moley hopes to produce a version complete with cameras so that users can teach it to create their own dishes, which can then be uploaded to a digital recipe library and shared with other people. They also want later models to be capable of dealing with tricky things like stopping mixing at the appropriate time to prevent splitting or over-beating.

Moley is capturing the imagination of many industries and sectors, and has been approached by major players in the restaurant industry, airlines, kitchen developers and even chef training schools.



Source: <http://www.moley.com/>

<https://www.iflscience.com/technology/robot-chef-home-could-arrive-2017/>

Q-bot

Q-Bot has developed the first affordable and scalable solution, using a unique robotic device called SprayBot to apply insulation in situ. Q-Bot's mission is to transform the built environment with robotics and AI to become a global leader in construction innovation. Q-Bot has developed a number of exciting robotic and AI technologies which can be deployed across a range of applications. They include robotic vehicles, advanced manufacturing and 3D printing techniques, control routines for autonomous localisation and navigation, 3D mapping of environments with automatic categorisation of features, as well as tools to manage the installation process and data collected.

Q-Bot has developed a highly innovative, robotic device that can deploy through a small opening, survey and map the space, apply insulation in situ and then validate the job done. This unique approach transforms inefficient, cold and draughty properties into warm and cosy homes at a fraction of the cost and time of traditional methods. It also minimises disruption for the occupants and can reduce energy bills by as much as 1/4, saving hundreds of pounds. This has resulted in Q-Bot acquiring significant clients in the social housing sector, including Camden Council, Cardiff City Council, CityWest Homes, Islington Council and Peabody.

Q-Bot has already created dozens of jobs and insulated hundreds of homes, but our goal is to have an impact on a global scale, by transforming the construction industry with smarter solutions.



Source: <https://www.clearlyso.com/q-bot-secures-1-5m-of-investment-to-accelerate-growth-and-support-the-rollout-of-robotic-insulation-service/>

Computer Vision in UK

Key Highlights

- Computer vision encompasses the use of AI to process and analyze visual data, and to derive high-level understanding from digital images and videos.
- In practice, much of the power behind computer vision's increasingly low error rates is due to its use of unsupervised learning models like machine learning and deep learning, which are capable of learning from data in such a way as to continually improve their success rate. The semi-recent advent of Generative Adversarial Networks (GANs) has accelerated the growing success rate of unsupervised learning algorithms even more by creating a system whereby deep learning models try and invalidate their own findings to facilitate a constant retooling and honing process that gradually optimizes the success rate of the main algorithmic classifier or predictor.
- Computer vision will also come to play an increasingly prominent role in military applications of AI. Computer vision can be used to help process the vast swathes of data generated by surveillance systems, and will come to play an increasingly prominent role in the coordination of autonomous vehicle and drone activity.
- One of the largest near-term applications of computer vision is its use in healthcare. In recent years computer vision systems have been used to automate the analysis of medical imagery, reaching surprising levels of accuracy. in 2016 a machine-learning based computer vision system made headlines by successfully diagnosing lung cancer on medical images with a lower error rate than human doctors.
- While one might think that practical, everyday applications of computer vision are far off, and more focused on niche use-cases, the fact is that the field is coming to become involved in our everyday lives to an increasing extent. In October 2018 it was announced that UK convenience stores will be trialling the use of computer vision and self checkout kiosks as a form of age verification. This trend is set to continue as well, with computer vision being at the heart of driverless cars, and with the UK Government recently stating that they want the nation to be at the forefront of this industry, which they estimate to be worth £28 billion in the next 17 years.

Computer Vision companies indicated in the report

1. 11derma	25. iProov	49. Selerio
2. Alchera Technologies	26. Irisium	50. SenSat
3. Blippar	27. IXICO	51. Skin Analytics
4. Blue Vision Labs	28. KludeOn	52. Skyscape
5. boomApp	29. Kudan	53. Smartify
6. CloudFactory	30. Lifecake	54. Snaptivity
7. Cocoon	31. Machine Medicine	55. SpaceVee
8. Cortexica	32. Machines With Vision	56. Spectral Edge
9. Creavision Technologies	33. Manchester Imaging	57. Surreal Vision
10. CrowdEmotion	34. Matrix Mill	58. ThinkSono
11. CrowdVision	35. MedimSight	59. Third Space Auto
12. Cyanapse	36. MindVisionLabs	60. ThirdEye
13. DeepAR	37. Mindx	61. Titan Reality
14. DigitalBridge	38. Neurence	62. TouchByte
15. Disperse.io	39. ODIGA	63. Trarvel Ltd.
16. Emteq.net	40. ONFIDO	64. Trint
17. Explore UG	41. OnFrame	65. Urban Hawk
18. FaceSoft	42. Photolemur	66. Valkyrie Industries
19. FiveAI	43. Pixoneye	67. Visio Ingenii
20. Focal Point VR	44. Pupil	68. Vivacity Labs
21. Gamar	45. Roborace	69. WeSee
22. Humanising Autonomy	46. Scalpel	70. WIREWAX
23. Hummingbird Technologies	47. Scape	71. Zanran
24. InnersightLabs	48. SeeQuestor	

AI companies in Computer Vision

Company Name	Website	Description	Number of Employees	Industries
Blippar	blippar.com	Blippar is a leading technology company specializing in augmented reality, artificial intelligence and computer vision. Blippar has created a range of products that can be harnessed across a wide range of sectors from an AR SDK to web-based AR which requires no app.	201-500	Entertainment
Cortexica	cortexica.com	Cortexica works with the world's leading brands providing Computer Vision, Machine Learning and Video Analytics Software Systems, supported by industry specific professional services. Cortexica is working with businesses across a range of verticals including retail, manufacturing, automotive and media.	51-200	HR
Neurence	neurence.com	Neurence provides Intelligent cloud-based recognition engine allowing computers to understand unstructured human environments.	11-50	Marketing & Advertising
Pixoneye	pixoneye.com	Through AI & cutting-edge computer vision technology, Pixoneye allows brands to harness a revolutionary new source of mobile customer data, providing them with a unique understanding of their users and the tools to enable unprecedented personalisation.	11-50	Marketing & Advertising
Spectral Edge	spectraledge.co.uk	Based in Cambridge, UK, with strong academic roots, Spectral Edge is a fast growing deep tech company that combines cutting-edge image processing with machine learning to improve pictures and videos on mass market devices.	11-50	Research

Blippar

Blippar is a London based, software development firm that provides augmented reality and image recognition technologies. Blippar's Computer Vision APIs can recognize millions of objects across 16 verticals including cars, faces, logos, flowers, landmarks, artwork, animals, currencies and more. Businesses can integrate The APIs into their apps, website or products to enable visual search, automatic image processing and tagging. Blippar uses artificial intelligence and deep learning algorithms to help companies make their worlds more powerful and efficient.

The Department of Engineering at the University of Cambridge has done an independent evaluation of the accuracy of Blippar's computer vision capabilities in areas of Car Recognition, Face Recognition and Face Verification. The first section of the report evaluated Blippar's car recognition technology, assessing its ability to distinguish between different makes and models of cars.

The second section of the report analysed Blippar's facial recognition and verification technologies. For this section, the researchers created a quantitative and qualitative analysis of Blippar's computer vision software. The team of researchers assessed Blippar's face verification technology, using the external LFW dataset, which includes 13,233 images of celebrities taken from Yahoo News. Blippar's technology matched faces on this database with an accuracy of 99.67%.

The researchers compared Blippar's recognition to those of several other major players for example they have compared Blippar's face recognition to Amazon and Microsoft's APIs. They also mentioned that Blippar's face recognition had a high accuracy performance under varying head pose/rotation, scale and illumination.



Source:

<https://www.blippar.com/blog/2018/02/23/blippars-computer-vision-artificial-intelligence-accuracies-have-been-independently-verified-publicly-available-data-sets>

Cortexica

Cortexica began by using just computer vision, eventually combining it with artificial intelligence and machine learning. Cortexica was the first company to use GPUs in conjunction with the cloud for commercial visual search.

This pioneering combination went through several applications: first was an app to identify wines, followed by the identification of logos on live television, a way to recognise cars without registration information, and eventually fashion. The company's technology has been adopted by several large retailers in the field, including US chain Macy's, online retailer Zalando, and high street staple John Lewis.

Cortexica's patented technology replicates the human ability to find visually exact and similar matches to an image from a dataset of other images. This requires no training and can be applied to images of any content. Cortexica customises its suite of algorithms for each use case, replicating the most natural way of providing perfect search results.

Its technologies can automatically detect and segment the image, automatically apply the right configurations and process a response in under a second. Depending on requirements Cortexica utilises different models (RNN & CNN) to learn, detect and categorise.

Cortexica's visual search systems could be widely applied to solve visual matching or search problems. In the future, it could help make workplaces safer by recognising if workers are wearing the necessary safety gear, or by detecting flaws in manufacturing facilities.



VISUALLY EMPOWERING BUSINESS

Source: <https://www.cortexica.com/leading-vision-ai/>

<https://www.imperialinnovations.co.uk/impact/case-studies/cortexica-revolutionising-visual-search/>

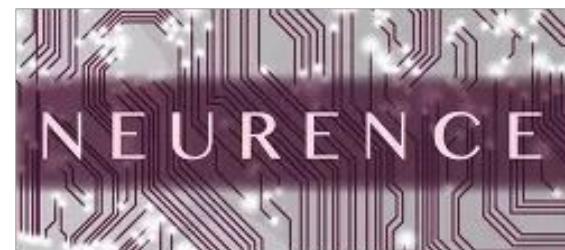
Neurence

Neurence was founded by a group of world-class mathematicians and software engineers in Cambridge, England. Representing one of Europe's premier technical groups, the team at Neurence has built a highly intelligent, cloud-based central repository of information, Sense.

Sense acts like a "brain", with an ability to actually see, hear and understand the world around it. Neurence's technology self-learns, therefore the more devices that are connected to the cloud, the more intelligent the Sense cloud becomes. The Sense platform can be used to power any number of devices, such as phones, smart glasses and home appliances. Connected devices will instantly be able to access an almost infinite library of information, stored in the cloud.

Taggar is an example of an application that is made possible when plugging devices into Sense's cloud. By connecting smartphones into Sense, they are able to take advantage of Neurence's highly advanced pattern-matching algorithms, powering the most advanced image recognition technology to date on phones.

By constantly communicating the camera and audio feed to Neurence's cloud-based brain, devices accessing the Sense cloud software can actually understand what they are looking at and the sounds they are hearing. With devices accessing Sense's cloud technology, Neurence allows: Instantaneous recognition of images and sound; Scalable recognition of millions of objects; Immediate user-generated content



Source: <http://neurence.com/>

Pixoneye

Pixoneye is a data analytics startup based in Tel Aviv and London that uses on-device software to analyze a user's smartphone pictures to predict his or her interests, in order to allow retailers to send tailored advertisements, rewards programs, and special offers.

In June 2018 Pixoneye raised £6M investment to improve privacy, data ownership and value for consumers through artificial intelligence that stays on-device

Pixoneye's software can be implemented into any app via an SDK (software developer kit) and analyses a wide range of consumer data types (photos, location and activities) using deep learning (a method of AI) on-device. None of the data is seen, removed or stored — instead only the probability of an individual's characteristics are taken (such as gender, holiday destination preferences, or fashion style). Pixoneye started building photo analysis in 2015 due to the richness of data photos can provide about a consumer and their needs, and because treating this data securely is the hardest of technological challenges—if photos can be used securely for on-device insights, all other forms of data can be managed securely.

Pixoneye work with a range of industries such as retail, insurance, and travel to enable brands to personalise their services. Brands can deliver increased customer lifetime value, and consumers win by being targeted with products and services that actually fit their needs and their stage in life.



Source: <https://www.pixoneye.com/>

<https://medium.com/@danit.edelsburg/pixoneye-raises-6m-investment-to-improve-privacy-data-ownership-and-value-for-consumers-through-e6f1f823fe1>

Spectral Edge

Spectral Edge is a fast growing deep tech company that combines cutting-edge image processing with machine learning to improve pictures and videos on mass market devices. Its patented IP is embeddable and can be implemented purely in software or silicon, without needing any apps or filters. This is done in real time on a pixel-level. Mooted use cases include for enhancing low light smartphone images, improving security camera footage or even for drone cameras.

In April 2018 Spectral Edge announced its first customer, IT services provider NTT data, which said it would be incorporating the technology into its broadcast infrastructure offering — to offer its customers an “HDR-like experience”, via improved image quality, without the need for them to upgrade their hardware. On the smartphone front, the company is waiting for consumer hardware to catch up — noting that RGB-IR sensors “haven’t yet begun to deploy on smartphones on a great scale”.

HDR is a natural application of its image fusion capabilities because its software can automatically work out which elements are needed to produce the perfect picture that resembles what we would see naturally without introducing artifacts. By creating a thumbnail version of any captured image and adjusting its visual elements to satisfy different output requirements, such as low light improvements, over exposure or colour correction, its innovative technology “steals the feel” of that thumbnail to produce a final, natural looking, artifact-free image with less noise and greater contrast. Spectral Edge has already developed a suite of exciting technologies for smartphones and on demand broadcast. The same technology, however can be incorporated into any application with sophisticated imaging requirements, from security and surveillance systems to webcams, driverless cars and drones.



Source: <https://techcrunch.com/2018/04/10/spectral-edges-image-enhancing-tech-pulls-in-5-3m/>
<https://www.spectraledge.co.uk/>

AI in LegalTech

Key Highlights

- LegalTech consists of technology, software and IT solutions used to provide legal services and analysis.
- Specific subsectors of LegalTech include Practice management, document storage, billing, accounting, electronic discovery, legal research and document automation and assembly.
- Specific use-cases for AI in LegalTech include:
 - Software-based analysis of contracts and other legal and non-legal documents using natural language processing software in order to help partially automate due diligence
 - Automation of contract drafting and other forms of legal writing
 - Analytic platforms that allow both individual and corporate consumers to conduct legal matters themselves in lieu of hiring legal counsel
- Recently [LawGeek](#) had 20 experienced attorneys compete against an AI LegalTech algorithm trained to evaluate contracts. Participants were given four hours to find 30 legal issues in five NDAs, with the AI achieving a 94% accuracy rating compared to the human lawyer's average of 85%. Moreover, whereas the AI engine finished in 26 seconds, the human lawyers averaged between 51 minutes to 25 hours to complete the task.
- It is rapidly becoming apparent that AI is poised to disrupt the legal industry in uncountable ways, and not just as aides for lawyers, but as supplements for many of their core functions. AI is capable of not only doing certain kinds of legal work faster, but doing it with a higher degree of accuracy as well.
- Given the UK's existing strong reputation for fair, ethical and internationally reputable governance and law, the nation stands to become an international leader in the application of AI to LegalTech.

LegalTech companies indicated in the report

- | | | |
|-----------------------|--------------|-------------------|
| 1. Cognitiv+ | 6. Juro | 11. Seal Software |
| 2. ContractPodAi | 7. LawPanel | 12. ThoughtRiver |
| 3. Cursor Insight | 8. Luminance | 13. Waymark Tech |
| 4. Eigen Technologies | 9. Resolver | |
| 5. Ginie AI | 10. Rossum | |

AI companies in LegalTech

Company Name	Website	Description	Number of Employees
Cognitiv+	www.cognitivplus.com	Cognitiv+ provides legal and regulatory analytics to corporates, consultancies and legal firms enabling them to understand and act upon their compliance obligations using artificial intelligence.	11-50
Luminance	www.luminance.com	Luminance uses artificial intelligence to read and understand complex detailed documents, enabling users to carry out necessary due diligence more efficiently. Luminance has been trained to think like a lawyer.	11-50
Eigen Technologies	www.eigentech.com/	Eigen is a research-led artificial intelligence company based in London and New York. Its mission is to help individuals and organizations make the right decisions, and it does this by unlocking the value of their qualitative data.	51-200
Resolver	www.resolver.co.uk/	Resolver Group is the market leader in consumer complaint resolution. Its extensive insight into consumer complaint data and innovative services are helping to champion better outcomes for everyone. Resolver offers consumers a unique, independent online resolution service free of charge.	51-200
Waymark Tech	waymark.tech/	Waymark Tech provides an AI, specifically NLP that sits within your existing systems and parses the millions of pages of regulation to provide clients with the answer to their questions when they need the information the most.	1-10

Cognitiv+

Cognitiv+ is applying artificial intelligence to automate contract analysis and management, offering businesses a way to automate staying on top of legal risks, obligations and changing regulatory landscapes.

Cognitiv+'s data-parsing tool is not being designed to interpret legislation but rather to "monitor it in a structured fashion", combining that tracking with analysis of a company's own contracts with a view to flagging compliance risks and requirements.

Cognitiv+ is using what he describes as "a number of AI technologies" to perform the contract analysis at near real-time speeds, leaning on open source algorithms for the core tech. But he describes the IP as "the process and all the stages we take for analyzing a contract, the training" — so, in other words, the legal expertise needed to get a proper handle on compliance.

Presumably the tech might also be able to flag up a badly drafted contract. Contracts are uploaded to the system for analysis and tracking, with examples of the sorts of critical information Cognitiv+ can extract including the parties of the contract; the limit of liability; renewal and termination information; and jurisdiction.

Users are delivered intel on an ongoing basis via reports, dashboards and notifications. The tool is generally being designed for use by in-house lawyers, commercial staff, procurement, financial and compliance departments.



Source: <https://techcrunch.com/2017/03/08/cognitiv-is-using-ai-for-contract-analysis-and-tracking/>

Luminance

Luminance is the world's most advanced artificial intelligence platform for the legal profession. Luminance's ground-breaking AI technology reads, understands and learns from the interaction between lawyers and documents, offering a faster and more comprehensive platform for review. Sophisticated machine learning algorithms provide a unique, immediate and global overview of any body of legal documents, empowering lawyers with an instant understanding of the scope of a project before document review even begins.

As the only artificial intelligence platform that ensures the lawyer remains at the heart of the process, Luminance means substantial time-savings from day one, whilst ensuring legal teams have more control and confidence than ever before. Machine learning algorithms give computers the ability to learn and teach themselves from the data they are given, without being explicitly programmed. Luminance's unique combination of supervised and unsupervised learning allows the system to constantly improve and adjust its algorithms based on every data room it encounters.

The revolutionary technology behind Luminance ensures the platform works in any language and jurisdiction of law. Rather than having to be manually trained to adapt to new challenges that arise, Luminance has been designed primarily to fit into the existing workflows of any law firm and legal team. The power of machine learning means Luminance offers the only truly language-agnostic technology on the market, and the majority of its clients use the platform to review multilingual projects. Because it detects patterns in the language of any data set, Luminance does not need to be 'fluent' in a language in order to be useful. The more concepts the team identifies to Luminance in non-English languages, the more sophisticated its understanding becomes.



Luminance

Source: <https://www.luminance.com/>

Eigen Technologies

Eigen is a research-led artificial intelligence company based in London and New York. Its mission is to help individuals and organizations make the right decisions, and it does this by unlocking the value of their qualitative data.

Eigen automates the extraction and classification of information from documents. Its simple, flexible Natural Language Processing (NLP) technology accurately extracts information from diverse types of documents at scale and can be integrated into its clients' workflows. Eigen uses state-of-the-art machine learning algorithms to recognize patterns in text and give accurate answers to unique questions. This enables its clients to use data in new ways to make the right business decisions: driving down costs, finding opportunities, calculating risks, and meeting regulatory requirements.

Eigen's clients include some of the most respected names in finance, law, and professional services. As a research-led company, we translate the latest methodologies from applied physics, mathematics and machine learning into the technology that underpins our product.

Its core algorithms aren't pre-trained to any specific language, and this means that it can find patterns in the documents no matter which language they're written in. Eigen's clients currently use its platform to analyze documents in multiple European and Asian languages. The clients have used Eigen to help them with everything from meeting regulatory requirements to calculating their risk-weighted assets and making quick decisions about whether to bid on asset portfolios.



Source: <http://www.eigentech.com/#demo-cta>

Resolver

Resolver offers consumers a unique, independent online resolution service free of charge. It offers one place and one process to connect consumers directly to the people who can resolve their customer service issues. Resolver's system is focused on communication and fair, efficient resolution. It helps consumers get their voices heard effectively, so businesses get their issues resolved more efficiently. This way, the consumer is happy with the outcome and the business retains the customer.

For businesses, Resolver offers value-added services, providing an enhanced issue-resolution process and real-time consumer insight at every touchpoint by using advanced AI programming systems.

Resolver's Decider platform offers fully online, end-to-end arbitration and dispute resolution. It provides a fast and cost-efficient way to resolve disputes between two third parties. Decider allows for mediators, facilitators or adjudicators to act independently to resolve disputes. It reduces the complexity, lowers the cost and increases the convenience of dispute resolution for all parties.

Resolver is working with MoneySavingExpert.com, the UK's biggest consumer advice website, bringing together their awesome campaigning power with Resolver's focus on helping consumers raise and resolve issues.

Resolver regularly consults with regulators, ombudsmen, government departments, and consumer rights organisations to improve its process.



Source: <https://www.resolver.co.uk/about>

Waymark Tech

Waymark Tech develops software for companies in highly regulated industries and Professional Services firms with clients facing increasingly complex regulatory demands. Waymark's Wayfinder is an AI that continually monitors and analyses regulatory changes, and makes recommendations to ensure compliance. Instead of overloading compliance officers, Waymark frees your people to focus on higher-order problem solving, and avoid paperwork burnout.

Waymark Tech provides an AI, specifically NLP that sits within your existing systems and parses the millions of pages of regulation to provide clients with the answer to their questions when they need the information the most.

In 2017 Waymark Tech announced the launch of a new AI-powered tool that automatically identifies regulatory crossovers and conflicts between incoming regulations, such as MiFID II, GDPR, and PRIIPS. The tool can also identify areas of potential conflict between incoming legislation packages, acting as an early warning system to flag implementation challenges. MiFID II, for example, requires financial services firms to provide regulators with easy and immediate access to their client database while GDPR incentivises companies to encrypt this data. The new tool currently covers 43 EU regulations, including MiFID II, PRIIPS, UCITS V, BASEL III, EMIR, GDPR, AIFMD, and SFTR.

Powered by artificial intelligence developed by Waymark, the Wayfinder platform provides financial services and law firms with a list of specific articles from the incoming regulations that are directly relevant to them, depending on their activity, geography, and size. The software also provides companies with practical step-by-step guidelines to ensure compliance with these regulations.



Source: <https://www.finextra.com/pressarticle/69827/waymark-tech-introduces-ai-tool-to-identify-crossover-between-financial-regulations>

AI in FinTech

Key Highlights

- FinTech encompasses the use of IT technology to provide financial products and services. In practice, much of the FinTech industry today focuses on the use of smartphones to provide mobile banking and investment services.
- FinTech is one of the quickest adopters of AI technologies, both in the UK and abroad, stemming in part from the fact that the finance industry and banking sector has long been a sector used to embracing advances in IT and computer science. AI is coming to play an increasingly predominant role in the FinTech industry. London-based financial sector research firm Autonomous predict that the UK finance sector can leverage AI to cut 22% of operating costs.
- Some of the most predominant use cases for AI in the FinTech sector include:
 - Using chatbots to automate customer service, monitor personal finances and to offer financial and investment guidance,
 - Machine-learning algorithms for faster and less biased credit scores,
 - Machine-learning algorithms to detect fraud,
 - Machine learning and Natural Language Processing algorithms for financial analytics,
 - Natural Language Processing algorithms to scan legal and regulatory text for compliance issues, and
 - AI-driven data aggregation (e.g. sentiment and market data).
- Due to the UK's very well-established finance industry and banking sector, in addition to its robust and thriving FinTech industry, the nation is already ahead of the curve in terms of FinTech innovation, and has strong potentials to become the world leader in the specific application of AI to FinTech.

FinTech companies indicated in the report

- | | | |
|-------------------------------------|---------------------------------|--------------------------|
| 1. ABAKA | 31. causaLens | 61. Fortuitapps |
| 2. Acorn Machine | 32. Cause Analytics | 62. Fractal Labs |
| 3. Acuity Trading | 33. Chip | 63. FriendlyScore |
| 4. Aesthetic Integration // Imandra | 34. CityFALCON | 64. Glass |
| 5. Agrimetrics | 35. Cognitive Finance Group | 65. Globacap |
| 6. aire | 36. Coinfirm | 66. Gospel Technology |
| 7. AITrading | 37. Connected Space | 67. Grapedata |
| 8. Akoni Hub | 38. CoVi Analytics | 68. Habito |
| 9. AlgoDynamix | 39. CUBE | 69. Hadean |
| 10. Aligned Cells | 40. Data Quarks | 70. HeapX |
| 11. AlliedCrowds | 41. DataMine Lab | 71. Heckyl |
| 12. Apomatix | 42. Datapo.com | 72. Herrmann Global |
| 13. Aria Networks | 43. DealX | 73. Hertzian |
| 14. Arkera | 44. DF2020 Limited | 74. HighCastle |
| 15. ArrayStream Technologies | 45. Digital Contact | 75. Hivemind |
| 16. ARRIA NLG | 46. Duco | 76. Humaniq |
| 17. Audit XPRT | 47. Duuzra | 77. Ignitho Technologies |
| 18. AuditWare Systems Limited | 48. Dynistics | 78. Invacio |
| 19. Autto Limited | 49. EasyAsk | 79. Ixty |
| 20. Beauhurst | 50. Eligible | 80. Kensai |
| 21. Big Data Scoring | 51. Enforcd | 81. KITE EDGE LTD |
| 22. BigData4Analytics | 52. Envision World | 82. Knowsis |
| 23. Bigstep | 53. Equant Analytics | 83. Knox EA |
| 24. Bird.i | 54. Euklid | 84. krzana |
| 25. Bled Tech | 55. everycs | 85. Launchcloud |
| 26. Blue Lion Research | 56. Fetch.AI | 86. LiveMetrics |
| 27. BMLL Technologies | 57. Financial Network Analytics | 87. Loqate GBG |
| 28. Brolly | 58. Fluidly | 88. machineOS |
| 29. Cambridge Intelligence | 59. Flumes | 89. MarketsFlow |
| 30. Cambridge Quantum Computing | 60. ForecastThis | 90. Massive Analytic |

FinTech companies indicated in the report

91. Matchdeck Ltd	121. Projected AI	151. Tallysticks
92. MCO Europe	122. Proportunity	152. TatvaSoft UK
93. MDOTM	123. Qlearsite - Organisational Science	153. Teebly
94. Memgraph	124. Quorso	154. Telex AI Company Ltd
95. Mentat Innovations	125. QwertyBit	155. ThoughtMachine
96. Metafused	126. RAMM Science	156. Timetric
97. MicroBlink	127. Ravelin	157. TradeRiser
98. Microgen Plc	128. RCloud	158. Tradeteq
99. Migacore Technologies	129. REalyse	159. Traydstream Limited
100. Mind Foundry	130. ReGal 38I83	160. Urban Hawk
101. Moneyfarm	131. RemitRadar	161. Valsys
102. Multiply	132. Riskopy	162. Vortexa
103. Netz	133. Ropnoy	163. We Predict
104. Nexus Frontier Tech	134. RotaGeek	164. WealRo
105. Nobly POS - Point of Sale	135. Runagood	165. Web7 Direct UK
106. Octeract	136. Signol	166. WebzSuite
107. Old St Labs	137. Simply POS	167. WilmotML
108. Olvin	138. Singular Intelligence	168. Yedup Ltd
109. OTAS Technologies	139. Sns Analytics	169. Zenith One
110. Oval Money	140. Spin Analytics Limited	170. Util
111. Pace	141. Spotlight Data	171. Venturespring
112. Pearlai	142. Startable	172. Xenesis
113. Pi Ltd (predictx)	143. Startup Network	
114. Plandek	144. SteelEye	
115. Plum	145. Stockflare	
116. Plural AI	146. Stratagem	
117. Policy Radar	147. Symilarity	
118. Precise Prediction	148. Synthesized	
119. Privitar	149. TAB	
120. Procensus	150. TAINA Technology	

AI companies in FinTech

Company Name	Website	Description	Number of Employees
ABAKA	www.abaka.me	ABAKA is a financial wellbeing platform for employees, powered by Artificial Intelligence. It enables employers and pension providers to directly engage, educate and empower their members.	11-50
Habito	www.habito.com	Habito is using technology to bring the mortgage-application process into the 21st century. Using Habito, home buyers can for the first time be sure they're getting the best deal for them.	101-250
Heckyl	www.heckyl.com	Heckyl connects decision makers in business, finance and government to a broad and dynamic network of information, news, people and ideas enabling faster, more effective decisions.	51-200
Ignitho Technologies	www.ignitho.com	Ignitho is a Digital Technology Solutions company set up with a mission to transform enterprises, igniting thought through new models that disrupt the existing order with efficient value propositions.	51-200
Stratagem	www.stratagem.co	Stratagem is revolutionising sports trading by fusing expert insight with smart technology to better predict the outcomes of sporting events around the globe.	11-50
ARRIA NLG	www.arria.com	Arria NLG is the leader in real-time data storytelling using Natural Language Generation (NLG) technologies.	51-200
Privitar	www.privitar.com	Privitar is a privacy engineering company that enables organisations to safely use, share, and derive insights from data.	11-50
Oval Money	www.ovalmoney.com	Oval is a platform designed to tackle the global issue of financial literacy by empowering people to be wiser about their money.	1-10
Humaniq	humaniq.com	Humaniq is a simple and secure financial services provider on a mission to help eradicate poverty using pre-eminent technologies including blockchain and biometrics.	51-200
Moneyfarm	www.moneyfarm.com/uk	Moneyfarm is a digital wealth manager offering advice and investments in both the UK and Italy.	51-200

ABAKA

ABAKA has created an AI-powered SaaS (Software as a Service) platform that enables financial institutions to offer digital financial advice to their customers. In October 2018 Abaka was crowned winner in Wayra UK's AI & Blockchain Accelerator Program which selects the best European start-ups in their respective fields to scale globally.

Offering intuitive, mobile-first way to manage pensions, save money and improve financial wellbeing at work to individual employees, the ABAKA app features a chatbot called Ava - a personal adviser powered by machine-learning, which works alongside existing human resources and pension platforms.

ABAKA directly helps employees engage with their savings and pensions by providing them with financial education and advice delivered through Ava, a unique intelligent agent.

Ava is a truly intuitive and innovative way to communicate with employees, helping them to make intelligent and educated decisions with their savings and encouraging financial wellbeing at work.



Source: <https://www.finextra.com/pressarticle/75674/abaka-wins-at-wayra-uk-ai-and-blockchain-accelerator/ai>
<https://www.covermagazine.co.uk/cover/news/3031179/artificial-intelligence-first-ever-self-service-platform-for-sme-employees>

Habito

Habito gets the best mortgage possible. Fast, transparent and impartial - it takes care of it. Using a unique combination of cutting edge technology and industry-leading mortgage experts, homebuyers can, for the first time, be sure they are getting the best deal for them.

Unlike a traditional broker, Habito's technology analyses every mortgage on the market from over 90 lenders to find the best one for you in seconds. Once Habito finds the right mortgage, it will be with you every step of the way. Clients will have a dedicated mortgage expert who will keep them updated with the progress of their application from start to finish, and will always be on the end of the phone or livechat to answer their questions.

Since its launch in April 2016, Habito has helped more than 20,000 people better understand their mortgage and has completed € 58 million in mortgage applications. In addition, using artificial intelligence Habito has developed chatbot – Digital Mortgage Adviser – which has halved the average amount of time spent on each case. Coupled with this, the team are always on hand to answer questions – with access to over 10,000 mortgage products across a wide-range of lenders, they can find the best possible deal for the customer.

Over the next 12 months, Habito plans to further develop its machine learning capabilities by creating a fully automated end-to-end platform which will enable it to offer new services, such as real-time mortgage approvals and automatic alerts when a better mortgage deal becomes available to registered customers.



Source: <https://www.habito.com/>

<http://www.eu-startups.com/2017/01/uks-digital-mortgage-broker-habito-raises-e-6-4-million-to-offer-a-fully-automated-end-to-end-platform/>

Heckyl

Heckyl connects decision makers in business, finance and government to a broad and dynamic network of information news, people and ideas enabling faster, more effective decisions.

In essence, Heckyl helps the clients explore new ideas and keep pulse on the current business events/issues. Whether they are a short term trader, investor, or Fund Manager, and whether they prefer equities, forex, or commodities, they will find a wealth of information that matters to them streaming at their fingertips.

Heckyl uses state-of-the-art systems to simultaneously gather data from hundreds of thousands of sources from all over the world and present ready-to-use, actionable intelligence to the user, in real time. Its systems are engineered for performance, reliability and accuracy.

Heckyl groups related news articles together, using advanced entity recognition techniques and mathematical algorithms. Its highly optimized, low-latency, in-memory Market Feed Handler is designed to receive tick-by-tick live Stock Exchange data and perform millions of calculations in real time, to bring you never-seen-before market movement analysis. Heckyl's revolutionary NLP (Natural Language Processing) based sentiment analysis engine is carefully hand-crafted, to accurately and efficiently gauge the impact of news on the stock market, in real time.

The Heckyl platform can be integrated easily with any existing trading application, so you can continue to use your own systems, and yet offer its revolutionary features to your end users.



Source: <http://www.heckyl.com/>

Ignitho Technologies

Ignitho is a Digital Technology Solutions company, recognised as a preferred partner for Digital Applications & Innovation for enterprises using Frugal Innovation methodology – “the ability to do more with less” – developed in collaboration with a world-renowned thought leader from the University of Cambridge. Ignitho specialises in Innovation Services - Rapid Application Development & Deployment and Innovation Ventures.

Ignitho Innovation Labs is Ignitho's platform to frugally innovate with enterprises on co-ideating and co-creating experimental prototypes and POC's (Proof Of Concept) on limited budgets, using new technologies. With an initial focus on Artificial Intelligence, Machine Learning and Augmented Reality / Virtual Reality, Ignitho already has a track record of successfully delivering solutions in these technologies for western enterprise customers.

Its Scalable Cloud Implementation services will help you to deliver applications and services at high speed; scaling and improving products at a faster pace than organisations using traditional infrastructure. Ignitho's Microservices and API gives enterprises the ability to move away single codebase, and shift to agile, independent teams delivering on their own cadences. With Ignitho's combined prowess of Distributed Agile and Frugal DevOps practices, its Microservices and API enables enterprises to develop and deploy applications across a range of intuitive platforms, spanning the web, mobile and wearables.

Ignitho

Source: <https://www.ignitho.com/platforms/ignitho-labs>
<https://www.ignitho.com/services/microservices-api>

Stratagem

Stratagem, a UK betting company, is hoping to take some of the guesswork out of predicting the outcomes of football matches. Their current business model includes a group of 65 analysts stationed around the globe that are concentrating on collecting and analyzing data to produce predictions on future outcomes.

The future model, however, is focusing on using AI and computer vision to do the same work without human error. In order to achieve this goal, they've been programming neural networks to observe football matches and analyze circumstances that generally result in goals. Technologically, the company is employing some cutting edge AI tech, using computer vision to watch the football matches and analyze the potential scoring opportunities.

Stratagem is using deep neural networks to achieve this task — the same technology that's enchanted Silicon Valley's biggest firms. It's a good fit, since this is a tool that's well-suited for analyzing vast pots of data. The company's software is currently absorbing thousands of hours of sporting fixtures to teach it patterns of failure and success, and the end goal is to create an AI that can watch a range of a half-dozen different sporting events simultaneously on live TV, extracting insights as it does. At the moment Stratagem is focusing on just a few sports (soccer, basketball, and tennis) and a few metrics (like goal chances in soccer). Stratagem's AI makes its calculations watching a standard, broadcast feed of the match. Right now, the computer gets it correct about 50 percent of the time. Despite this, the company say its current betting models are right more than enough times for it to make a steady return, though they won't share precise figures.



Source: <https://www.theverge.com/2017/7/6/15923784/ai-predict-sport-betting-gambling-stratagem>

ARRIA NLG

Arria NLG, the leading provider of Artificial Intelligence-based Natural Language Generation ("NLG") solutions, announced in October 2018 the successful launch of EY's Natural Language Generation portal.

NLG specialises in extracting insights from complex data sources and communicating information in natural language (i.e. as if written or spoken by a human).

Arria's technology is adding value wherever on-demand narratives or reports are required, be it financial analysis and reporting, business intelligence dashboards, or alongside other cognitive technologies such as conversation agents and virtual assistants. Arria's game-changing product is NLG Studio.

NLG Studio brings the best of the company's advanced technology into a self-service tool available in the cloud or on-premise. With NLG Studio's ease of use, business users and developers alike can build and deploy their own NLG systems, accessing the proven rules-based linguistic capabilities and software architecture that Arria uses to build advanced NLG solutions for its global clients. While the company offers professional services directly, it also nurtures a comprehensive partner program trained in delivering NLG solutions using Arria's technology. Arria's mission is to make NLG accessible to everyone to support its NLG Everywhere vision.

Arria has global offices in EMEA, USA, Canada, and Asia-Pacific.



Source:

<https://www.prnewswire.com/news-releases/arrias-nlg-artificial-intelligence-engine-now-powers-ernst--youngs-natural-language-generation-global-portal-300727205.html>

Privitar

Privitar is an enterprise software company headquartered in London, with a global client-base across North America, Europe and Asia. Privitar is leading the development and adoption of privacy engineering technology enabling its customers to innovate and leverage data with an uncompromising approach to data privacy.

Privitar delivers data privacy and anonymization software to a global client-base in the financial services, retail, telecom and pharmaceutical sectors. About 70% of Privitar's clients are in the financial services sector. Privitar's Publisher tool creates an anonymous copy of the data while ensuring that the data is still fit for purpose and optimized for a specific use case. Another Privitar tool — called Lens — aggregates data while preventing the isolation of material about a specific user.

The company's product development is based on the relatively new discipline of privacy engineering, which includes technology, architecture and controls, and has been focused on big data, although data of any volume can benefit from Privitar solutions. In terms of big data, Privitar Publisher, by way of example, can be deployed alongside Hadoop, Amazon Cloudera or Microsoft Azure and a privacy policy can be created that is coherent with risk requirements, either internal or external.

To date, Privitar's data privacy solutions are only available as enterprise software and are targeted at Tier 1 banks, but it is not ruled out the possibility of providing a software-as-a-service solution for Tier 2 and smaller organisations.



Source: <https://datamanagementreview.com/regulation-and-compliance/blog-entry/privitar-provides-products-meet-data-privacy-design>
<https://innovator.news/startup-of-the-week-privitar-47c76f258d33>

Oval Money

Oval brings trust back into personal finance and opens it to everyone. The team is committed to driving education, fairness, and financial inclusion in the industry. Oval will combine expense tracking, saving, and investing into one app, while also adding a social element by enabling its community of users to share tips and suggestions to one another.

Oval aims to help users grow their savings in less time by teaching them to monitor spending habits and make saving virtually automatic. Oval users achieve savings using commands that tell Oval to make a deposit into the app's secure digital savings account each time there is new income or spending in a linked account. Oval says the system is based on the latest research from financial experts and behavioural economists.

Users are to make financial decisions through a combination of technological solutions and the suggestions and advice of other users.

There are three types of programs: round-ups that save the spare change from transactions, percentage saving that puts aside an amount equal to a fixed percentage of a transaction or income, and fixed amount saving which saves an amount chosen by the user each time a transaction is made at a specific merchant or on a specific category or user tag.

During its closed beta trial, the average amount saved by users over the past 3 months is just over £400, or about £135 pounds per month. And Oval users seem to be improving their ability to save as they get used to the platform.



Source: <https://techcrunch.com/2017/04/05/oval-combines-tracking-saving-and-investing-into-one-app-driven-by-ai-and-you/>

Humaniq

Humaniq, a next generation bio-identification mobile app built on a Hybrid Blockchain is one of the most promising FinTech projects that serves as a gateway for socio-economic growth in the developing world. Humaniq is a simple and secure mobile app, delivering financial inclusion solutions to the 2.5 billion unbanked / 1 billion underbanked globally.

Humaniq is designed for those who don't possess identification, with the mobile app utilizing a new reputation concept based on facial recognition for identity management. The fourth-generation mobile bank is based on the Ethereum blockchain and is attempting to tackle the global problem of financial exclusion for those who don't have bank accounts. It is set to launch the first version of its mobile app on iOS and Android. Users need to complete the bio-identification process, which takes around 20 seconds and doesn't require a passport or email. With the use of a smartphone, they take a photo of themselves, record a video of them smiling and grinning, and pronounce the randomly selected text shown on the screen to record their voices. Using modern face-recognition algorithms for neural networks, Humaniq states that it can identify a user with incredible accuracy.

Humaniq is also offering users an initial deposit of Humaniq tokens (HMQ) once they pass the bio-identification process. It will also support bitcoin and ether. The HMQ tokens will be used as a medium of exchange for users on the platform, where they can get paid for tasks by third party services that plug into Humaniq such as insurance, data security, small business loans and pensions.

Humaniq will start their Initial Coin Offering (ICO) on April 6, when they will be sponsoring a startup competition at BlockShow Europe 2017 in Munich. They have already raised over \$110,000 in bitcoin and ether during their pre-ICO crowdfunding in a December campaign, beating their target of \$68,000, which went toward the development process of the app and website development and participation in conferences.



Source: <https://www.nasdaq.com/article/humaniq-aims-to-tackle-barriers-to-economic-inclusion-with-blockchain-app-cm764760>

Moneyfarm

Moneyfarm is a digital wealth manager that helps people protect and increase their wealth through time. Robo-adviser Moneyfarm has bought the technology behind a chatbot to launch what it calls its own artificial intelligence personal banker. The personal finance chatbot, Ernest, uses Facebook Messenger to connect to an individual's bank account. After connecting to your bank accounts, the chatbot used natural language processing to answer questions about your financial well-being and transactions, but also to give you proactive notifications to help you manage your money better.

Moneyfarm says it will combine the technology behind Ernest with its existing services. Firstly, an AI-powered chatbot can be used to on-board or acquire customers in a more scalable way than is currently in operation. Namely, Moneyfarm uses humans via chat or phone for this purpose.

Secondly — and quite interestingly — when EU legislation in the form of PSD2 forces banks to open up their data, Moneyfarm plans to use the Ernest technology to make sense of a customer's transactional data to offer them more informed advice to help them financially plan for the future.

It uses a combination of natural language processing technology and machine learning to interact with users. Moneyfarm says the Ernest technology taps into customers' daily transactional behaviour, which will help it give more personalised financial advice that considers broader spending habits.

UK robo-adviser Moneyfarm has more than 150,000 active users and had raised \$30m (£22.9m) in capital from backers.



Source: <https://www.ftadviser.com/investments/2017/10/06/moneyfarm-to-launch-artificial-intelligence-personal-banker/>
<https://techcrunch.com/2017/10/06/digital-wealth-manager-moneyfarm-acquires-tech-behind-fintech-chatbot-ernest/>

AI in InsurTech

Key Highlights

- Some of the most prominent use-cases for AI in InsurTech include:
 - The use of chatbots and AI assistants to streamline agent queries and customer service communications
 - The use of machine learning algorithms to develop optimized products for insurance clients from client data
 - The use of machine learning algorithms for insurance market analytics to help identify trends and opportunities
 - The use of automated online interfaces to pay and settle claims
- Some of the most important near-future trends and developments to keep an eye on with regards to AI in the InsurTech sector include:
 - **IoT:** Embedded sensors can collect data (e.g. on driving or health behaviours) in order to provide more personalized insurance pricing
 - **AI Interfaces:** Automated identify verification (e.g. photo and voice identification) can enable faster authentication. Machine learning algorithms can use personalised user data to personalize client communications as well as sales processes. Unsupervised learning algorithms can use client data in order to customize specific insurance products according to client behaviour and need. All of these factors will lead to enhanced customer onboarding.
 - **Automated Claims Settlement:** Unsupervised learning algorithms as well as automated online platforms can increase the speed of settling claims while simultaneously decreasing the probability of fraud.

InsurTech companies indicated in the report

- | | | |
|------------------------|-----------------------|-----------------------|
| 1. Celaton | 8. Cytora | 15. Quantemplate |
| 2. AltViz | 9. Digital Clipboard | 16. Skyline Partners |
| 3. Anorak Technologies | 10. Digital Fineprint | 17. Torafugu Tech |
| 4. Applied AI | 11. FlockCover | 18. Tractable |
| 5. Artificial | 12. iCede | 19. Trak Global Group |
| 6. Blue Technologies | 13. Logical Glue | 20. Zoral |
| 7. Corax | 14. Oseven Telematics | |

AI companies in InsurTech

Company Name	Website	Description	Number of Employees
ContractPodAi	contractpod.com	ContractPodAi is an easy to use, intuitive and affordable single touch point document and contract assembly and lifecycle management solution driven by artificial intelligence which allows you to assemble, automate, sign and manage all your contracts and documents.	51-200
Cursor Insight	cursorinsight.com	Cursor Insight is an online marketing solution that comes with user analysis, based on mouse cursor motions. It offers its users with insights in online marketing, electronic signatures and user identification, and machine learning technology services.	11-50
Cytoria	www.cytoria.com	Cytoria is an artificial intelligence company powering a new way for commercial insurers to target, select and price risk. With the Cytoria Risk Engine, insurers can measurably grow premium and reduce loss ratios, while delivering more accurate prices to customers.	11-50
Digital Fineprint	digitalfineprint.com	Digital Fineprint is an insurtech startup that builds AI and big data tech solutions to help insurers and brokers protect businesses.	11-50
Rossum	rossum.ai	Rossum's artificial intelligence understands complex structured documents, enabling companies to capture data from financial documents efficiently and with human-level accuracy. Unlike existing text mining solutions, Rossum's unique deep neural networks reflect the way humans read documents.	11-50

ContractPodAi

ContractPodAi is one of the world's fastest growing AI based contract management solution providers, empowering global corporations across the world.

ContractPodAi now comes fully embedded with E:V® - the world's first end to end artificially intelligent contract analyst.

With an intuitive and easy to use interface, E:V® is able to fulfill the overall contract analyst function. E:V® can read, interpret, analyse and report on key contract information, manage full contract workflow and approvals and automatically set alerts and reminders for important dates.

Using the most powerful and market leading cognitive technology, machine learning and natural language processing – and trained by senior commercial lawyers – ContractPodAi® comes loaded “out of the box” with fully comprehensive features including:

- AI powered Contract Discovery function
- Contract Automation and Self Servicing Contract Desk
- Legal Front Door
- Full Contract Lifecycle Management
- BI Analytics and Reporting
- Workflows and Approval Automation
- Contract Collaboration



Source: <http://www.contractpod.com/>

Cursor Insight

Cursor Insight is a technology company providing a new insight in digital marketing. Its algorithm identifies unique cursor patterns. It decodes personality types and emotional states by analysing cursor movements made by users while browsing. Cursor Insight creates value from the non-verbal communication of online audiences by classifying users based on psychological factors.

Its machine learning technology recognises in real time if an unauthorised individual is impersonating an authentic user. With the addition of Cursor Insight's solution to your existing sign-in process, you can dramatically reduce the risks arising from shared accounts, users forgetting to log out, stolen passwords and identity theft. Its secure Biometric Two-Factor User Authentication works invisibly in the background, from before login until logout, securely across any website, application or enterprise system.

Protect your business critical contracting processes with Cursor Insight's audited, eIDAS compliant Advanced Electronic Signature solution. Digitise all your paperwork for all your client segments.

Its Advanced Electronic Signature solution provides the level of legal compliance of traditional, ink-signed financial services contracts. Within its carefully designed and patented IT process Cursor Insight uses military grade encryption, timestamps and organisational certificates. Implementing its solution makes it impossible for anyone to legally dispute a signature or the content of an electronically signed document.



Source: <https://cursorinsight.com/>

Cytoria

Cytoria is an AI company powering a new way for commercial insurers to target, select, and price risk. Its award-winning technology transforms the speed and accuracy of commercial underwriting, making insurance more accessible and affordable for businesses all over the world.

Cytoria is a trusted partner to global insurers, backed by leading venture capital, and supported by builders of some of the world's most successful technology companies. With a world-class team of experts in machine learning, risk modelling, insurance, and strategy, Cytoria is powering the future of commercial insurance. The Cytoria Risk Engine integrates with existing underwriting applications, e-trade platforms, and direct-to-consumer websites.

Cytoria Terminal puts the power of the Risk Engine at your fingertips. Using its intuitive web application, underwriting teams can discover the risk score and price for every insurable business and property, and focus on the most attractive appetite relevant risks. The Risk Engine API connects directly to e-trade platforms and core underwriting systems to automate the underwriting process. Once integration is complete, Cytoria risk scores are displayed in your underwriting interface. The Underwrite Direct SDK can be embedded into any website or app using a few lines of Javascript code, enabling you to return quotes to customers in seconds without asking questions.

The Cytoria Risk Engine computes an accurate score and price for every business and commercial property, enabling insurers to improve risk selection and underwrite without asking questions. Its customers typically achieve loss ratio improvement of up to 5% and reduce expenses by 10%.

Cytoria

Source: <https://cursorinsight.com/>
<https://cytora.com/ai-underwriting/>

Digital Fineprint

Digital Fineprint is an insurtech startup that builds AI and big data tech solutions to help insurers and brokers protect businesses. Its tech helps to educate SME customers on their digital and non-digital risks, supporting insurers to preserve the livelihoods of millions of people across the UK.

Its product – DFP Risk Atlas – provides insurance intelligence that clearly shows the SME business owner where their risks lie, and shows the insurance community which products and solutions to build to protect from those risks. DFP Risk Atlas is a SaaS platform insurance intelligence solution using data analytics and AI to deliver actionable insights for the insurance community.

Digital Fineprint developed a ground-breaking technology into the insurance industry helping insurers to gain new customers and new data points. This is a genuine application of artificial intelligence to distill insights from open data and improve insurance distribution and sales. Digital Fineprint doesn't just aggregate data but builds predictive models that generate product recommendations tailored to the SME needs in GDPR compliant way.

DFP's technology has received industry awards, patent pending status, strong traction and significant investment. It has been awarded "Best General Startup", "Best InsurTech" at TDI, "Best FinTech" at Invest UK, "Best Investment in FinTech", featured in the "TIE 50 top startups" in the world, and was listed in the Top 100 insurtech firms 2018.



Digital Fineprint

Source: <http://www.digitalinsuranceagenda.com/221/digital-fineprint-turning-open-data-into-insurance-data/>
<https://digitalfineprint.com/>

Rossum

Rossum's mission is to teach computers to support human creativity, and unshackle the human mind from rows and spreadsheets. Rossum's artificial intelligence understands complex structured documents, enabling companies to capture data from financial documents efficiently and with human-level accuracy.

Rossum's secret sauce is its in-house computer vision engine, inspired and going beyond state-of-the-art research. This core technology is complemented by its dataset – unlike any published before, comprised of tens of thousands of semi-structured documents, continuously grown and carefully annotated in detail by its data team.

Rossum does not just repackage past advances in text mining and natural language processing. Rossum's architecture uses a unique approach to spatially represent textual documents and a new custom OCR engine. Both innovations are based on its own proprietary deep learning research and implemented on top of the popular machine learning frameworks TensorFlow and Keras.

Rossum's technology now allows a single large-scale neural network to process each document page, throughout from a pixel image to the text string output. This proves that the neural network has gained a degree of understanding of the document's content. Rossum uses this knowledge to examine other aspects of the document using the network – from page rotation, to language, to document or page type.



Source: <https://rosum.ai/>

AI Diversity of Practical Applications

Key Highlights

- AI Technology has matured at an incredibly swift pace over the past several years, with many new AI techniques and technologies created in R&D labs a mere few years ago now bringing forth a large diversity of real-world practical applications.
- In this report's current classification framework, we have attempted to be as inclusive and diverse as possible in categorizing the various companies comprising the UK's AI industry landscape according to the various market subsectors and technology domains under which they fall.
- However, it is obvious that the diversity of practical applications of AI is growing, coming to penetrate an increasing number of market and industry subsectors.
- A recent report by PricewaterhouseCoopers, for instance, has argued that AI will automate 20% of existing jobs over the next 20 years, and that no sector would be unaffected, or, in other words, that AI will come to penetrate literally every sector, much in the same way that other horizontal technologies like IT, computers and the internet have come to penetrate nearly every imaginable industry sector.
- Our intention was to create not a static classification framework, but one that will evolve over time to encompass an increasing number of industry subsectors and a growing number of technological domains.
- In subsequent editions of this report, we intend to add more subsectors to our classification framework. For instance, the various companies classified in the present report under the "Other" category will in subsequent editions be assigned more specific subsector.
- The aim of this chapter is to give a very brief view of the wide diversity of practical applications of AI today, and to drive the point home that the number of applications is growing day by day.

HT2 Labs

HT2 Labs is the R&D company for Learning and Performance Technology. Through its software, HT2 Labs enable organisations to create exceptional learning experiences for their users. HT2 Labs research some of biggest problems in education and workplace learning; developing technologies that can help, even if that's only in a small way. Right now its research interests revolve around semantic meaning, competency development and machine learning.

Curatr is HT2 Labs' Social Learning platform offering a new approach to online learning that really gets people talking as a key part of their learning experiences. Curatr uses the best of the content users already own to help trigger conversations, encouraging learners to add back their own content using live video capture and rich text chat as part of the learning process. Clients who use Curatr report stunning results, high engagement and huge cost savings.

Learning Locker is the Learning Record Store (LRS) which allows organisations to take control of their learning data and store, search and share a lifetime of experience and achievement; available as Open Source or Enterprise SaaS. Learning Locker comes ready to accept data in the xAPI format. With users' data flowing, Learning Locker allows them to create customisable dashboards using a WYSIWYG interface.

Red Panda is a personal learning hub that helps connect learners' unique learning experiences and preferences in a simple, user-friendly interface. Using intelligent search, Red Panda allows organisations to deliver continuous learning experiences – blending formal with informal learning experiences, and allowing learners to add activities that support their own personal development objectives. Red Panda's range of powerful features provide the building blocks of a rich learning experience for the user, and simple tracking and reporting tools for the organisation – including the ability to exploit xAPI to provide rich analysis of the learning of their users.



Source: <https://www.ht2labs.com/solutions/>

Mendeley

Mendeley is a free reference manager and academic social network that can help users organize their research, collaborate with others online, and discover the latest research. Trusted by over 6 million researchers in every field from institutions worldwide, Mendeley has a truly global network. Mendeley facilitates collaboration across the globe and in every field of research.

Mendeley Data is a secure cloud-based repository where clients can store their data, ensuring it is easy to share, access and cite, wherever they are. With the Mendeley Reference Manager, users can easily organize and search their personal library, annotate documents and cite as they write. Unique DOIs and easy-to-use citation tools make it easy to refer to users' research data, also the data is archived for as long as the user needs it by Data Archiving & Networked Services. Mendeley Datasets supports versioning, making longitudinal studies easier.

With the Mendeley Careers tool, part of the unified Mendeley ecosystem, users have a free assistant to help them build their career in science, technology, engineering or medicine and perhaps a better balanced lifestyle. Unlike other STEM job search engines and job boards that match candidates based solely on their search alerts, Mendeley Careers goes further. It uses human curation and sophisticated algorithms to match the most relevant opportunities with candidates, developed from a detailed understanding of their interests and expertise.

Mendeley collects funding opportunities from over 2,000 organisations across the globe including US government agencies, the European Union, and UK Research councils.



Source: <https://www.mendeley.com/homepage5/?switchedFrom=>

Oxademy Technologies

Oxademy is an award-winning EdTech and consultancy with an international presence. Oxademy Technologies and its subsidiary Oxademy Business School announced a partnership with VFS Edu Support Services Pvt. Ltd., the education services arm of VFS Global to form the new global digital learning platform ‘VFS-Oxademy’.

VFS-Oxademy will offer a first-of-its-kind knowledge-driven artificial intelligence (AI) cloud infrastructure called OX360 which identifies each learner's strengths and weaknesses and generates learning paths based on individual learner's behaviour, personalising the learning to each individual student.

OX360 technology is content-agnostic and supports a wide range of learning content from professional to academic learning. The platform also provides a dynamic content generation technology. The innovative technology understands every learner preference, style, and concentrates on their learning path across the context, delivering a unique one-on-one experience on “inform, perform procedure and perform task” principles of human cognitive learning methods.

Oxademy's cloud infrastructure partners are cloud compliant and provide governance-focused and audit-friendly service features with applicable security compliance regulations or audit standards. Partners can host data within 4.4 Local Data Connectivity their own data centers. Oxademy does not ask for or store any private information on its servers and all business sensitive data and communications between its servers and client browser are encrypted.



Source: <https://edtechnology.co.uk/Article/ai-based-online-learning-programme-launched-by-vfs-oxademy>
<http://159.203.137.105/oxademynew/>

Improbable

Improbable is dedicated to building powerful technology designed to help solve previously impossible problems and enable the creation of new realities. In gaming and entertainment, Improbable unlocks truly next-generation gameplay through virtual worlds of unprecedented scale, persistence and richness. In other industries, Improbable hopes to help answer critical questions through simulations that could lead to a better functioning world. Improbable boasts extraordinary games industry talent from top studios like Blizzard, Bioware, Ubisoft and Rare.

Improbable's platform, SpatialOS, lets developers transcend the limits of regular computation, allowing swarms of servers running in the cloud to cooperate in order to simulate worlds far larger and more complex than any single server could.

SpatialOS introduces an additional computational abstraction, called "Workers". Simplified, rather than chopping up the simulation by physical space, Workers distribute the simulation by the type of task happening. Crucially, if the computation is too much for one Worker to handle, or a server crashes unexpectedly, SpatialOS will dynamically bring up additional servers and distribute the load across them in real time.

SpatialOS gives studios the power to build, run and manage games without limits. Developers using the platform are making diverse and exciting games. From flying ships and floating islands to action-packed, AI-driven and massively multiplayer shooters, its featured studios are using SpatialOS to make previously impossible games.



Source: <https://www.wired.co.uk/article/improbable-quest-to-build-the-matrix>
<https://improbable.io/>

Beamery

Beamery is a London-based startup that offers self-styled “talent CRM” – aka ‘candidate relationship management’ and recruitment marketing software targeted at fast-growing companies. Beamery combines elements of customer relationship management (CRM), marketing, and artificial intelligence (AI) to “treat candidates like customers”.

Beamery uses machine learning to enable proactive recruitment, “build talent pools, power collaboration and drive better decisions with predictive analytics.”

The start-up works with Facebook, among others, and analyses interactions between candidates and employers to identify candidates clients should target and helps recruiters to build relationships with them.

Its pitch centers on the notion of helping businesses win a ‘talent war’ by taking a more strategic and proactive approach to future hires vs just maintaining a spreadsheet of potential candidates.

Its platform aims to help the target enterprises build and manage a talent pool of people they might want to hire in future to get out ahead of the competition in HR terms, including providing tools for customized marketing aimed at nurture relations with possible future hires.

By combining Talent CRM and Marketing software, Beamery helps companies attract and engage passive talent. Instead of relying on organic applications and job ads, companies can approach recruiting proactively and build pipelines of talent for both open and future roles.



Source: <https://recruitingblogs.com/profiles/blogs/artificial-intelligence-meets-recruiting-beamery-new-features>
<https://techcrunch.com/2018/06/20/beamery-closes-28m-series-b-to-stoke-support-for-its-talent-crm/>

Peakon

Peakon provides hundreds of enterprise clients from BMW to Betfair to Capgemini with its solution, making the SaaS company one of Europe's fastest-growing at the moment.

Peakon uses AI and smart surveys to boost the 'employee experience'. Peakon collects feedback through smartphone surveys, that are more "varied, engaging and continuous than the usual annual survey". It then uses machine learning to understand what motivates employees, what problems they have, and how those problems can be fixed.

Peakon's topic analysis feature analyses the employees comments and identifies the important themes and issues that people care about – and what the sentiment around each topic is. Peakon's proprietary machine learning algorithm analyses employee comments to discover common themes discussed within them. Each topic also displays a score. This is the average score of all the comments that are associated with the topic. This enables managers and leaders to quickly judge the sentiment around each topic, and prioritise accordingly.

Other benefits of using Peakon is how it creates stronger teams with employees who feel they're being heard. Data also sheds light on some of the most critical areas for a company's long-term performance - like employee satisfaction and retention.

Peakon is now shooting for global leadership in employee engagement and analytics market, which Deloitte has estimated at \$1 billion.



Source:

[https://nordic.businessinsider.com/a-copenhagen-based-startup-turns-employee-feedback-into-a-science--and-it-just-scored-\\$22-million-to-take-on-the-us--/](https://nordic.businessinsider.com/a-copenhagen-based-startup-turns-employee-feedback-into-a-science--and-it-just-scored-$22-million-to-take-on-the-us--/)

<https://peakon.com/products/engage/topic-and-text-analysis/>