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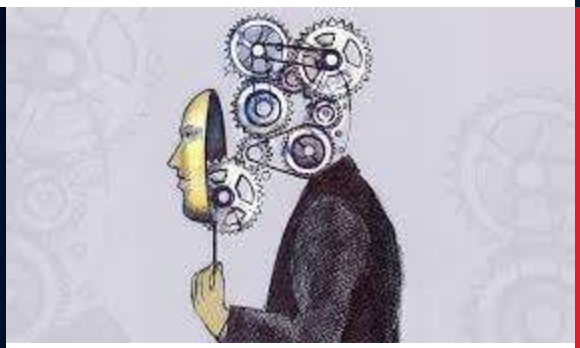
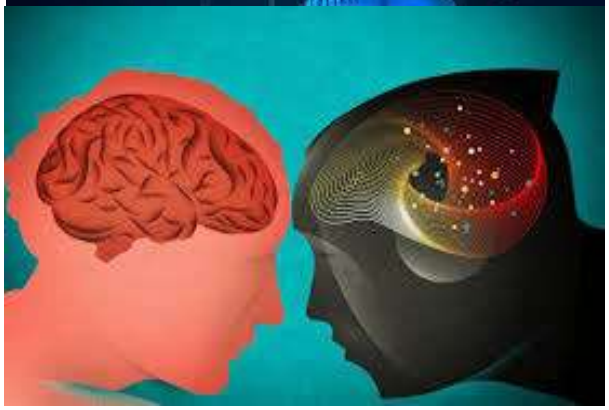
INSME

LOCAL STRENGTH • GLOBAL REACH

International Network for SMEs





INSME Academy

Artificial Intelligence, Robots and SMEs: Possibilities, Problems and Prospects

Date: February, 13, 2019 | From 1 p.m. to 2 p.m. - CET

Jay Mitra, Professor of Business Enterprise and Innovation,
Essex Business School, University of Essex, UK

Image Sources:adweek.com/heiseadvisorygroup.com.strategy-business.com/bigdatamadesimple.com/wsj.com

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AGENDA

- Making Sense of AI
- What's Trending?
- The AI Market
- AI and Business
- AI and SMEs
- What if it doesn't work?
- Jobs and All
- Future Pathways

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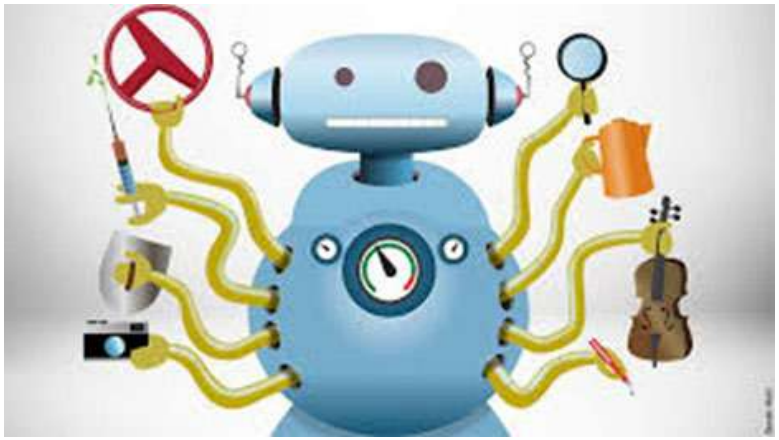

Image source:investors.com

What is AI?

Making Sense of the Artificial in Intelligence?

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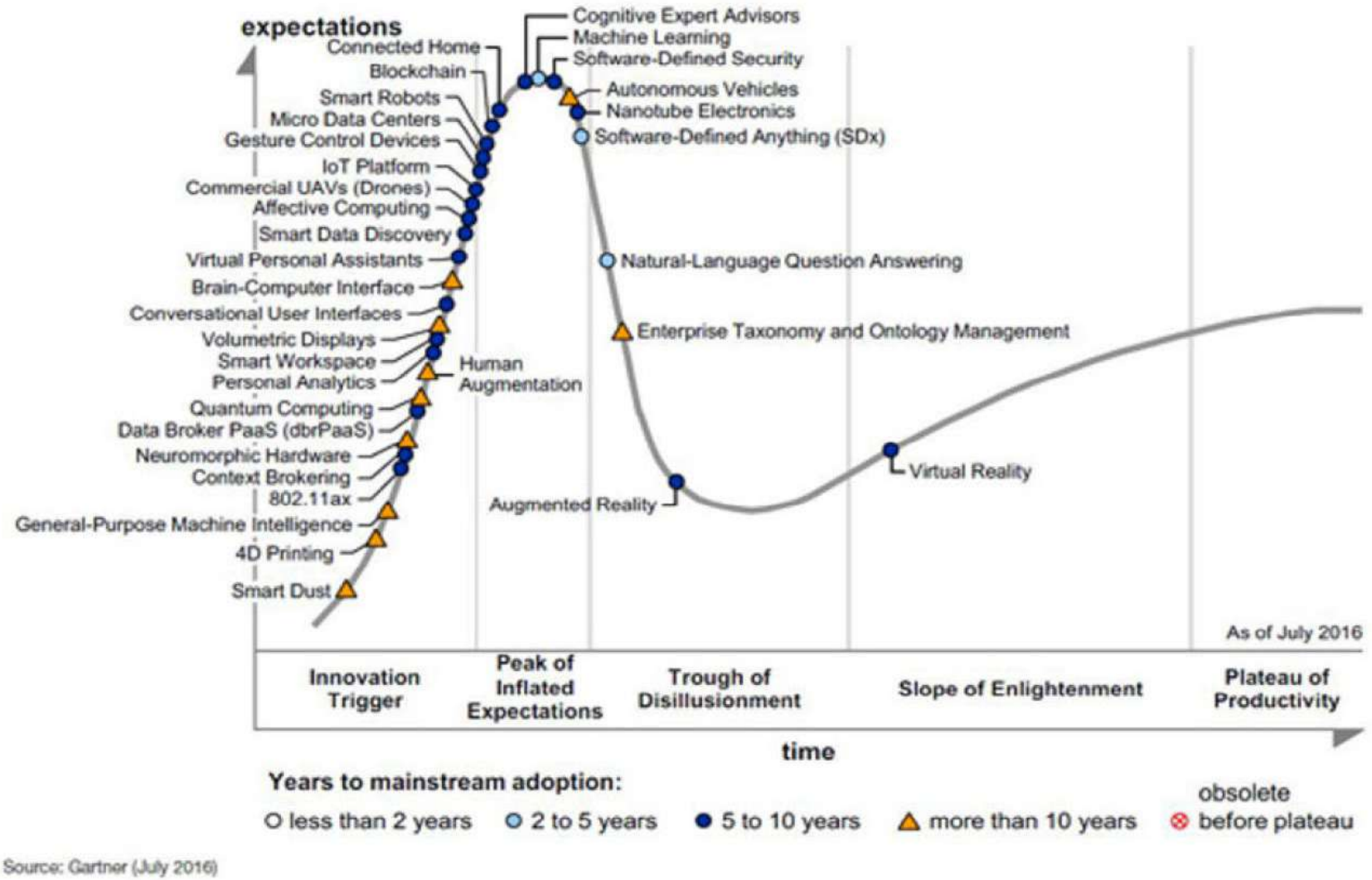
Beauty and the Machine

Image sources: morgan-motor.co.uk/youtube.com/nytimes/alphr.com

Emerging Technologies and the Innovation Hype Cycle



Source: Gartner (July 2016)

Granular picture reveals peaks of development and how best to identify opportunities

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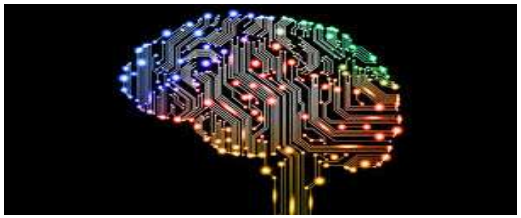
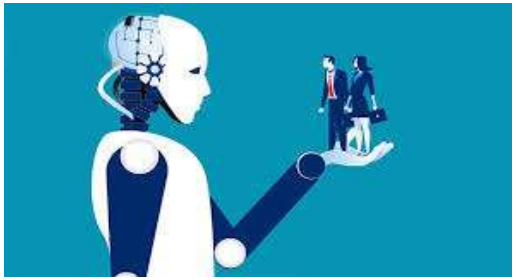
Artificial Intelligence

Coined in 1956 in Dartmouth, USA

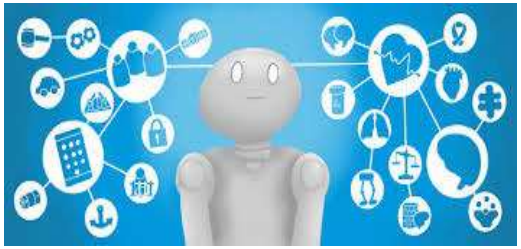


Real growth in last 10 years because of "deep learning" architectures inspired by human brains (neurons and connections)

AI/Machine learning: Involves computers crunching large quantities of data to find patterns and make predictions without being explicitly programmed to do so. Trained on large amounts of labeled data



Enabling computers to not only read text and numbers but to see, hear, and speak



AI = omnibus term for a "salad bowl" of different segments and disciplines (Fei-Fei-Li, Stanford's AI lab) includes, inter-alia:

Image source: geneticliteracyproject.com/sloanreview.mit.edu/news.stanford.edu/sciencenews.org/AvataIntelligence/Hacker Noon

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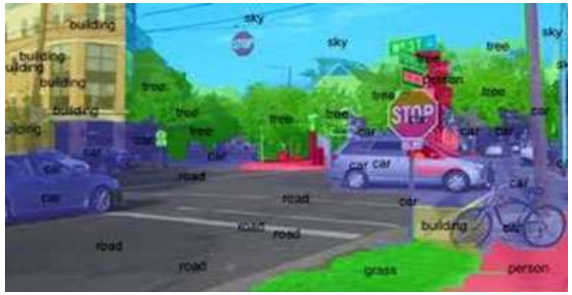
Includes, inter-alia….

Robotics:changing factories and assembly lines



Computer Vision: used in applications from identifying something or someone in photo to self-driving car technology

Human brain focuses on obvious correlations between input data and outcomes

Speech recognition: underlies voice assistants on phones and home speakers

Deep learning algorithms uses vast seas of information and discovers connections between obscure features of data too subtle or complex for human brain

Functions in defined single domains. Not capable of general intelligence

Alpha Go does not play chess; loan underwriting algorithms do not do asset allocation

Image sources: blogagorithmia.com/bhuvaneshwarank.github.io/Business News Daily

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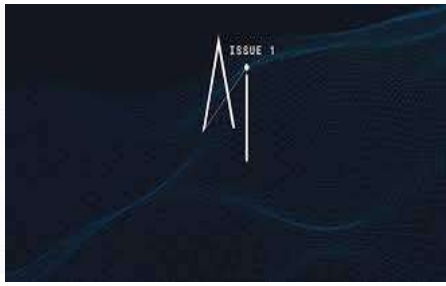

Image sources: sdtimes.com/Vetting Evolution/polymexgroup.com/forbes.com

Preparation of large amounts of data, thousands of layers deep with billions of parameters, intensive monitoring of sophisticated algorithms, lots of customisation, and massive computing power drive AI capability.

Outcomes similar to large battalion of statisticians with unlimited time and resources, but more cheaply and efficiently . Likely to lead to dramatic drop in cost of making predictions.

Electricity made lighting more affordable. Given level of lighting now costs 400 times less than in 1800

Indirect social ubiquity impact: Already a part of everyday experience. Movie recommendations, driving directions, social media feeds, and the voice on your phone are all examples of how AI already plays a role in your daily life, and that of your customers

Key objective: efficient, effective, cost-beneficial and user-friendly application

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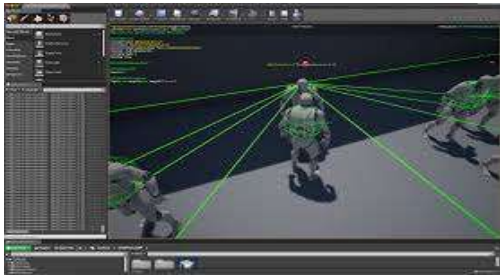
Possible Four Waves

Internet AI: Large volumes of data from internet use. Bases on idea of users labeling data. Creates detailed profile of personalities, habits, demands and desires. Ideal for tailored content for a given platform

Business AI: Algorithms trained on proprietary data (e.g. customer purchases/machine maintenance records) for improved decision making

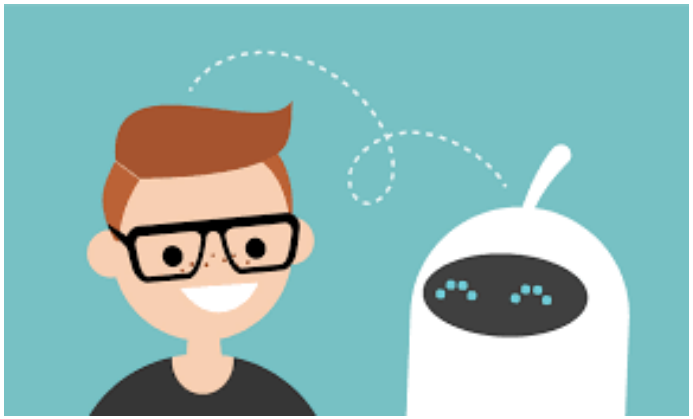


Perception AI: Upgraded version with eyes, ears and various senses allowing new data capture enabling new applications. Through use of sensors and smart devices (speech interfaces + computer vision applications))

Autonomous AI : Integrating 3 previous waves. Machines can sense and respond to world around them, move intuitively and manipulate objects

Source: adapted from Lee, Kai-Fu L – AI Superpowers: China, Silcon Valley and the New World Order (Houghton Miffin Harcourt

Image sources: IndianExpress.com/roosboard.com/answers.unrealengine.com/shutterstock.com



What's Trending?

Image Sources:path59.com/analyticsvidhya.com

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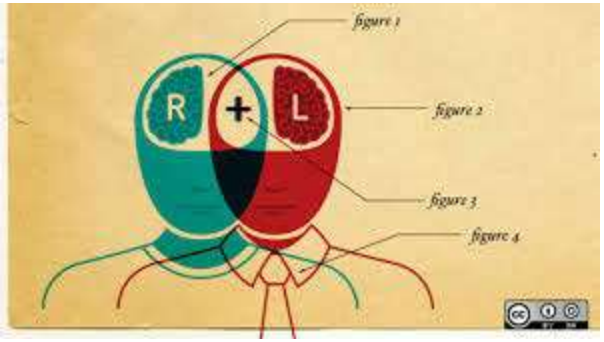
Artificial Intelligence Trends, 2019

Source: CB Insights, 2019



Open Source Frameworks making access to and use of AI easier

Google's TensorFlow MachineLearning Library (from 2015). Hundreds of users contribute on GitHub, a collaborative software developing platform

Facebook's Caffe2 released in 2017 : a lightweight, modular deep learning framework for both cloud and mobile applications. Combined with PyTorch, an open source machine learning platform for Python, in May 2018 to move from prototyping to execution

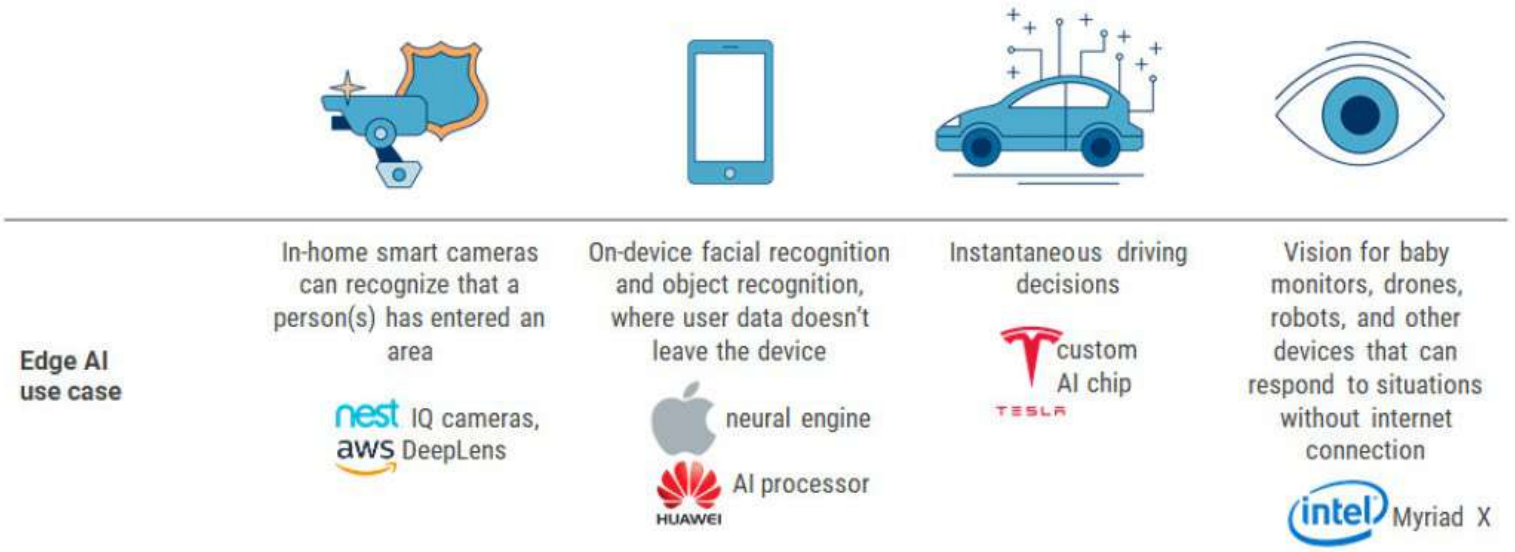
Montreal Institute for Learning Algorithms and its Theano open source library

Image Sources: hackernoon.com/hpcwire.com/lexum.com

Developing AI at the Edge: i.e. direct ability to process information by smartphones Wearable devices, cars instead of communicating with a central cloud or server

Large firms such as Qualcomm, Apple and Nvidia working with start-ups to build chips for 'edge' services

Apple released A11 Chip for iPhones: machine learning tasks at up to 600 billion operations per second Qualcomm's $100m AI fund for on device AI/Intel's Myriad X and NCS2 (Neural Compute Stick)/Nvidia's Jetson AGX Xavier



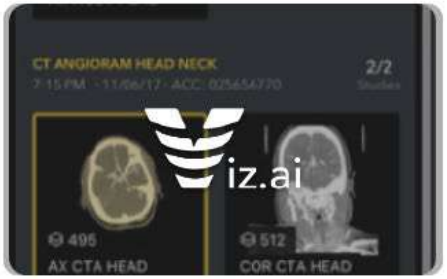
Idx-DR software identified patients with more than mild diabetic retinoipathy 87.4% of the Time (89.5% for those who did not have it.

Viz LVO for analysis and notification of CT scans by VizAI (Series A VC funding provided by Google Ventures & Kleiner Perkins, Caufield and Byers ($21m)

Artervs for spotting lung and liver leisons funded by GE ventures

Diabetic retinopathy

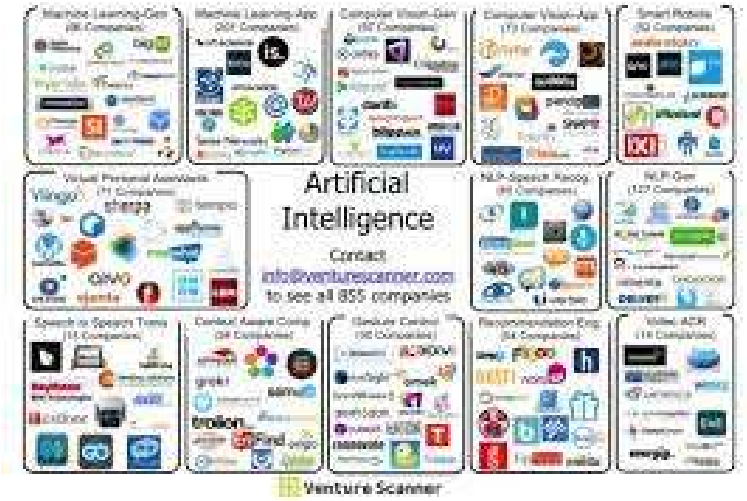
Liver and lung AI lesion



CT-scan analysis for strokes

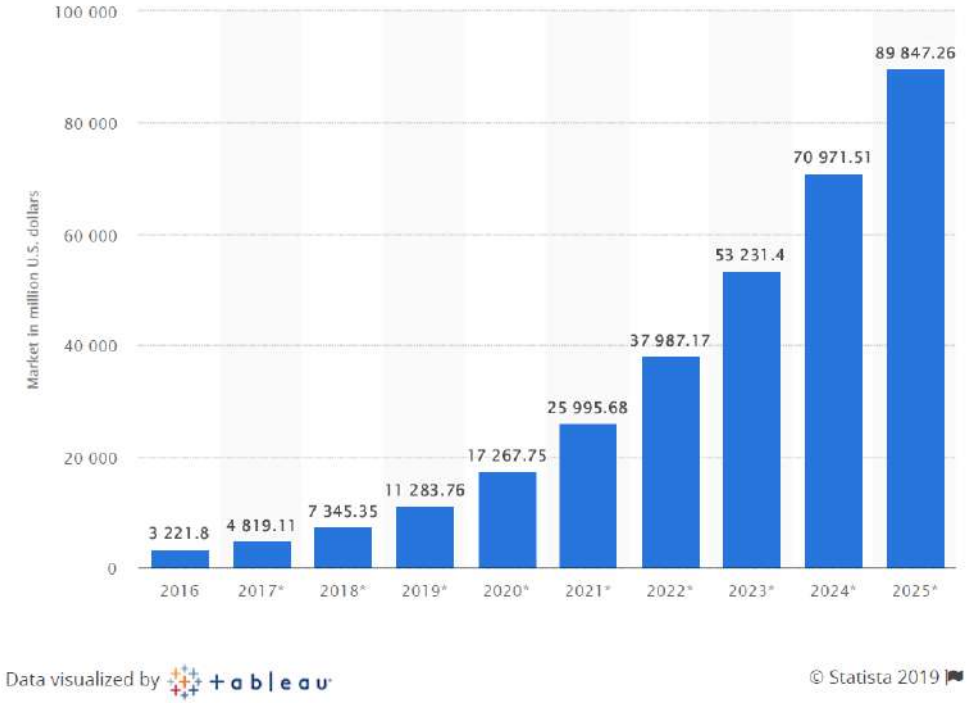
Smartphones as at-home diagnostic tools
Dip.io using traditional urine analysis dipstick to monitor urinary infections and pregnancy-related problems. Picture of dipstick using smartphone and computer vision algorithms accounting for lighting conditions and camera quality.

Fast track regulatory approval opens up possibility for new commercial pathways. 80 AI Imaging and diagnostics firms raising equity financing



The AI Market Place

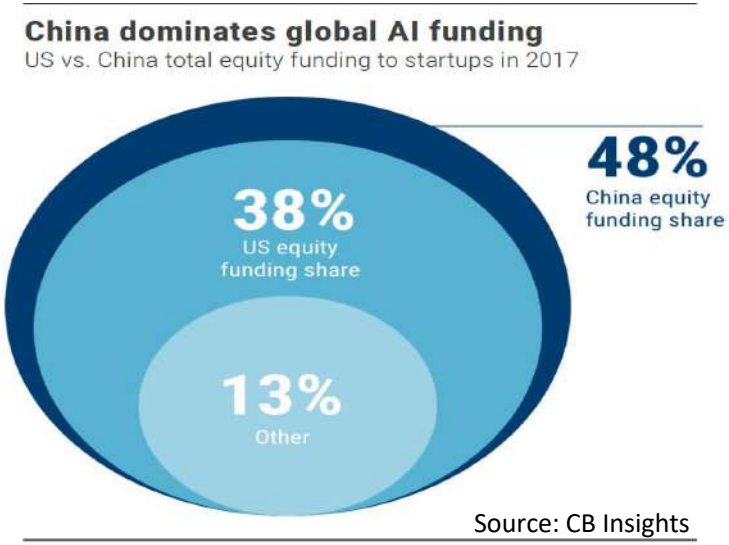
Image Sources: what'sthe bigdata.com/ reuters.com

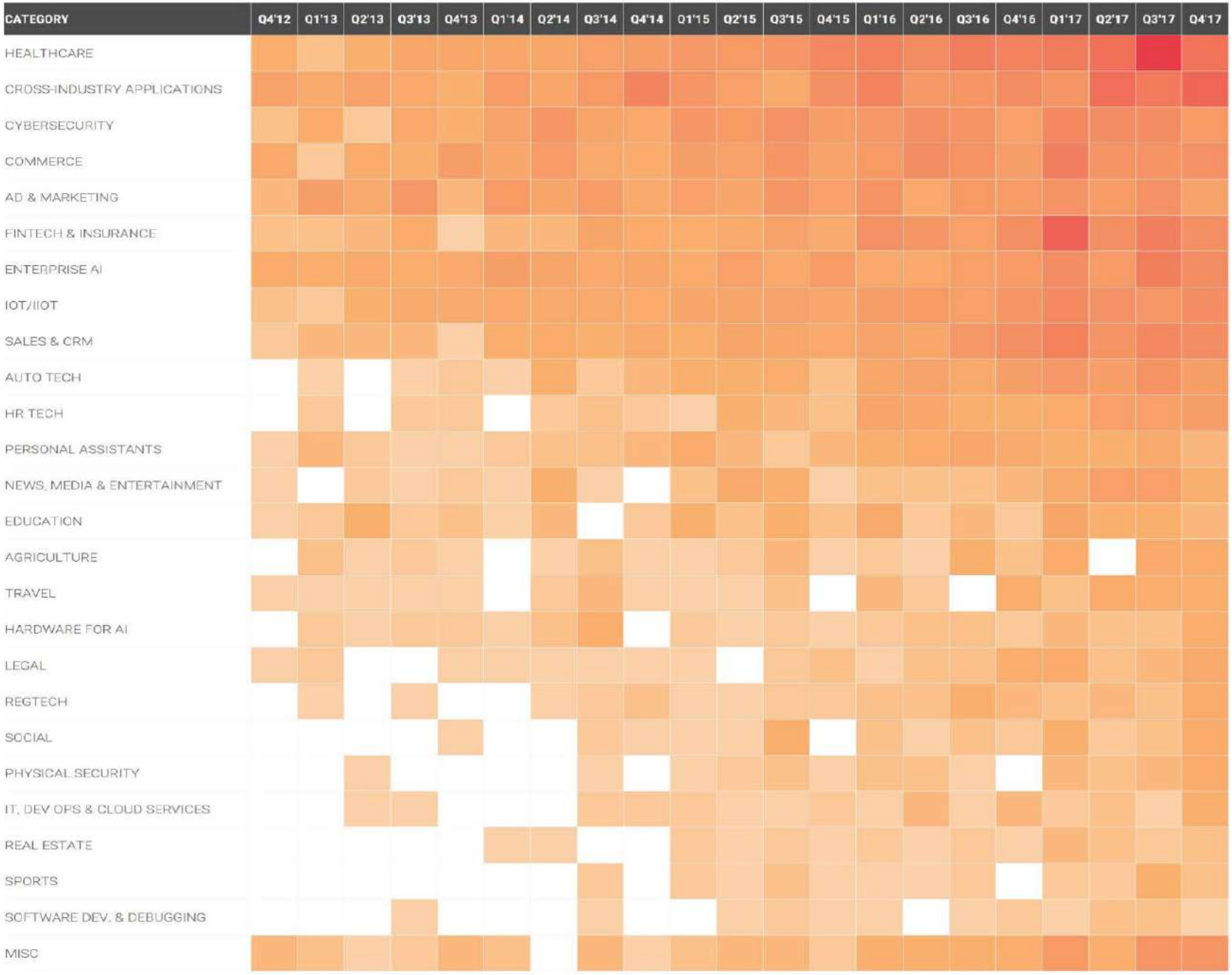


Market in US $m

In 2018, the global AI market is expected to be worth approximately 7,35 billion U.S. dollars.

The largest proportion of revenues come from the AI for enterprise applications market.

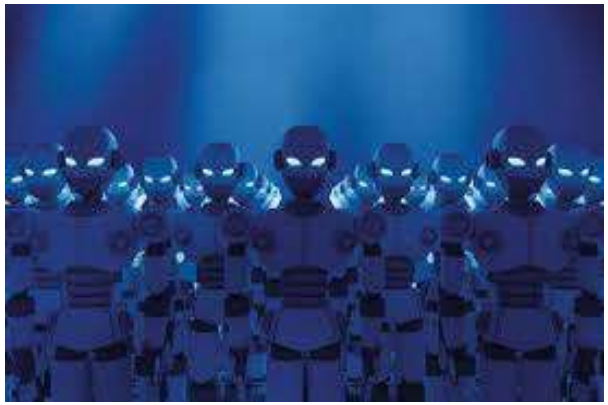


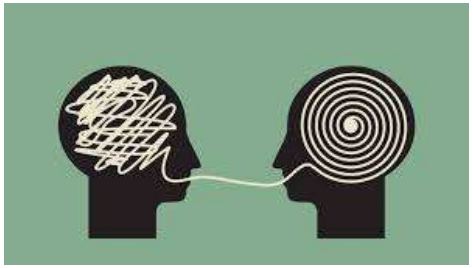


Source: CB Insights, 2019

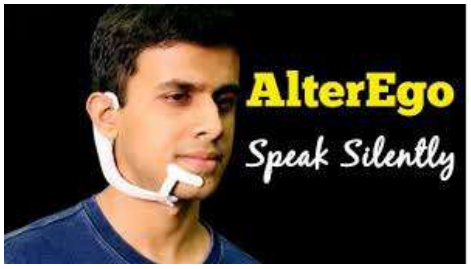
Image Source:unreservedmedia.com/fortune.com

How Does AI Affect Day to Day Business?

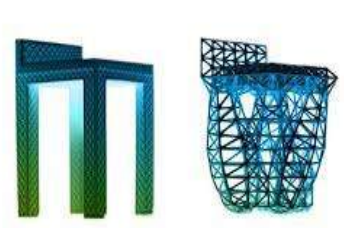




On the fly translation technology: Enabling us to speak the same language. AI based devices that translate on the fly (**Pixel Buds)**



Mind Readers. Noninvasive wearable device (MIT). Answers many queries within seconds, send private messages, and internally record streams of information to access later, without observable external actions. Interprets electric impulses in the jaw that are triggered when words or phrases are internally vocalised. Useful for high noise environments (**AlterEgo**)

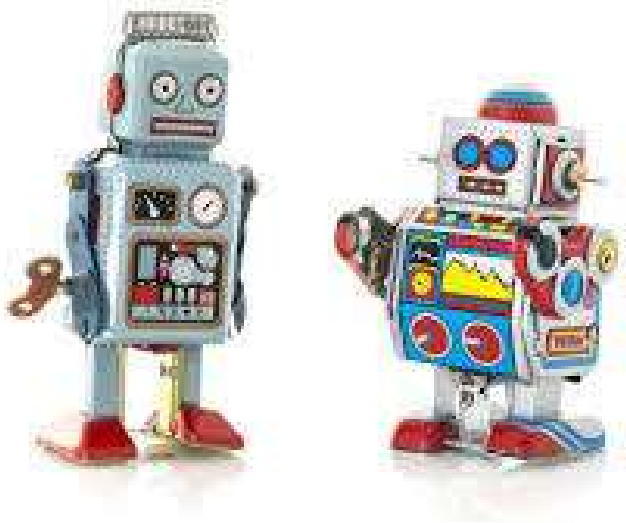


Generative design: Software that produces hundreds of options based on designer inputting requirements, limitations, other qualities including cost of materials. As choices are narrowed down software figures out preferences to find better options (**Dreamcatcher by Autodesk).**

Retail therapy! Using data from millions of transactions to figure out extra needs; Home depot's AI use . kitchen renovation; selectig right make up shade (Modiface); what promotions work better (Celect); Robots scanning shelves for out of stock items

Image Sources: singularityhub.com/youtube.com/newequipment.com/insideretail.asia

AI and SMEs



"Small business owners are more concerned with keeping the lights on and the doors open than navigating what is seemingly a complex web of new technology".

Image Source: smallbusiness .co.uk

Qualtrics survey: 96 percent of them expect AI to handle repetitive research tasks such as data cleaning within 5 years. Meanwhile, 63 percent think AI will take over statistical analysis within the next decade

From sentiment analysis to machine learning algorithms that track customer preferences and habits (companies like Facebook allow companies of all sizes to use chatbots, which rely on machine learning), powerful data gathering mechanisms are now available to businesses large and small..

In Euston Road, London: Unpicking biology and advancing human health

Scientists and coders all in large open plan room Powerful computer in private, temperature-controlled office. – runs AI system

Founded in 2013 by biotech entrepreneur Ken Mulvany, currently employs 90 people in the UK and US and has raised £109.5m.

Machine learning can draw inferences about what it has learned. Can process natural language and formulate new ideas from what it reads.

Sifts through vast chemical libraries, medical databases and onventional scientific papers, looking for potential drug molecules to predict how these same compounds can instead be more efficient targeting other diseases.

Conventional approach: screen large nos. of molecules for signs of pertinent biological effect/Winnow away the dross in series of expensive tests and trials. - declining in productivity and rising in cost

Why? Most of the obvious molecules have been found. Obscure ones need long development periods to find them with high failure rates.

Doubling of scientific output every 9 years./ Data slam sliced for publication to lengthen researchers' personal CVs. Therefore, hard to synthesise data.

First clinical trial will begin this year in the USA and Europe, targeting excessive daytime sleepiness in Parkinson's disease

Image Source: twitter.com/Wired UK (and data; March, 2019)/The Register.co.uk/ Source: adapted from 'The conomist, 7 Jan, 2017; The shoulders of gAInts in Science and Technology; Pgs 60-61

Ping An – Chinese insurance co.
Lie detection through monitoring of video interviews of income and plans, of 50 tiny facial expressions.

Leroy Merlin, French home-improvement retailer, used to order new stocks on Fridays, defaulting to same items as the week before. Now uses algorithms provided by AI start-up Vekia, to read past sales data + other information affecting sales, including weather forecasts, to stick shelves more effectively

Image Sources: desertempireins.com/en.wikipedia.org/Sun Plaza/

AI and Supply Chains

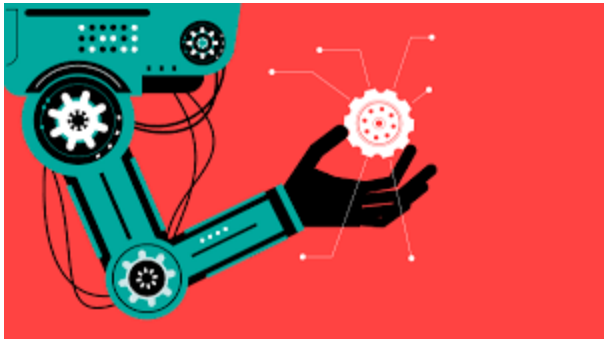


Image Sources: supplychaindigital.com/hbr.org

Consider delivery by trucks: 25 packages to be delivered. No. of possible routes adds to around 15 septillion (trillion trillion)!

Firms likely to derive between $1.3 trn and $2trn in economic value from using AI in supply Chains & manufacturing

Managing finances and paying suppliers: scanning invoices and predicting payments (e.g. Workday's financial planning tool to pick out late payers)

Improving manufacturing through computer vision systems (CVS): inspection of products on assembly lines and spotting flaws (e.g. Landing AI – start-up working with Foxconn); Nvidia uses CVS to check proper assembly of its chips

Predicting equipment failure: useful for firms with large asset holdings to help avoid big costs of unexpected breakdowns . Combining data on past performances with those generated by smart sensors on machinery (IoT) – e.g. start-up C3IOT working with American air force and defence dept. to scan maintenance logs and past technical problems for wear and tear of aircrafts

Image Sources: hackernoon.com/eyefortransport/supplychains insights/MIT SloanManagement Review

Building "**Digital Twins**" – virtual representations of assets to run simulations of how weather, etc.affect machinery and asset utilisation.

Refrigeration: Lineage Logistics (keeps food cold for grocers and restaurants): uses AI to forecast in what order items will arrive at and leave a warehouse to organise pallets in the right position (boosted efficiency by 20%)

Improvements in **inventory management and demand forecasting,** freeing up storage space and cash. Cost to firms of overstocking was c. $470 bn; of understocking $630bn (ref: IHL Group). Amazon's algorithms predict demand for millions of products as much as 18 months ahead. Main problem item is clothing – linking stick of different sizes and colours to warehouses depending on nearby buyers' shapes and tastes

Tracking movement of goods: Efficient routing of systems and predicting arrival. Putting sensors on ships or designing whole systems to use data like GPS signals (for arrival forecasts). Efficient routing of packages. (UPS saves $50m a year for every mile that drivers in America are able to reduce daily route)

Image Sources: networkworld.com/Food Logistics/handshake.com/getapp.com

AI and Customer Service

Image Sources:indigoextra.com/chatbotsmagazine

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Making humans more efficient . Share of customer service interactions worldwide handled by AI rose fivefold, to 15%, and is expected to rise to 40% by 2019 (Source, Gartner)

Rise of virtual agents: c 30% of firms now offer stand alone bots to answer questions and solve problems, but with narrower range than humans. AI trained on logs and transcripts of past customer interactions. The more the data the better. Solving problems, dealing with many more enquiries without hiring extra people. Handling 1.5.m to 2m queries a day is a workload equivalent of 7,000 people .

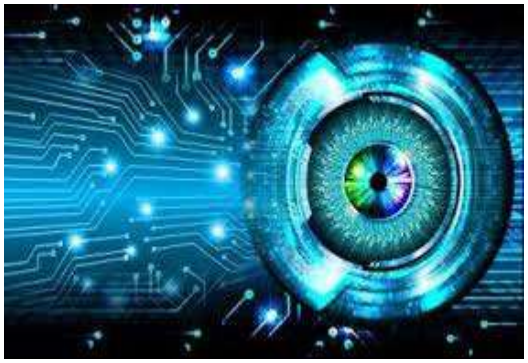
Enhances customer-service agents' knowledge, performance and speed (voice printing service recognises clients' voices and alerts impersonation problems - particular value to financial services. Responses to customer queries which a human agent can approve or adapt before sending ; Recognising "compassion fatigue" (start-up firm Cogito for Humana and Metlife)

Freeing customer-service agents from routine tasks for new tasks and new revenue. Better selling through AI enhanced recommendation tools (used by Amazon and Netflix). Work out customers' potential daily spending, choose clients who will receive personal phone calls and in what order

Image Sources:pwsc.com/virtualagentchat.com/webio.com

Likely decline in phone-based customer services by 10% by 2019 (Gartner)
But important that customer services are not diluted.

Computer vision at unmanned vision-enhanced checkouts: Items in a basket are recorded by cameras and shopper is charged accordingly, Can handle 50 customers per hour, double that of manned checkout (Metro Group in Germany)



Instead of multiple forms for insurance claims customers take photos of damage (car) and submit them via an app for a quick quote for repairs (Ping An, Chinese insurance co.) Services making customers' lives easier generates more custom who will provide more training data to make the AI system smarter. PingAn handles 30% of 15m claims per year using AI on its app. Reduced cost better customer service

Image Sources:NVIDIAblog/slideshare.net/genpact.com/venturebeat.com

Market Players and SMEs

The Question of SMEs

SMEs in low-tech industries have been successful in applying and integrating knowledge from external partners (??!!)

SMEs appear to engage in open innovation rather as a consequence of their search of changing their existing business model and to adapt to new market realities.

Limited technological capabilities and resource constraints and a lack of financial and human resources force SMEs to look outside for innovation partners

Equally same set of constraints impede participation as knowledge partners

Key players likely to start-ups and established niche SMEs

Key mode as part of community of Innovation

Shapeways

3D printing marketplaces and services

oDesk

Digital collaboration platform teams

oDesk
Changing How the World Works.

Cassantec

Predictive maintenance solutions

CASSANTEC
THE PROGNOSTICS COMPANY

Blue Yonder

Comprehensive predictive analytics methods enabled automated decision making

blue yonder

Image source:shapeways.com/change.org/supplychainit.com/slideshare

What if it doesn't work? Problems with AI

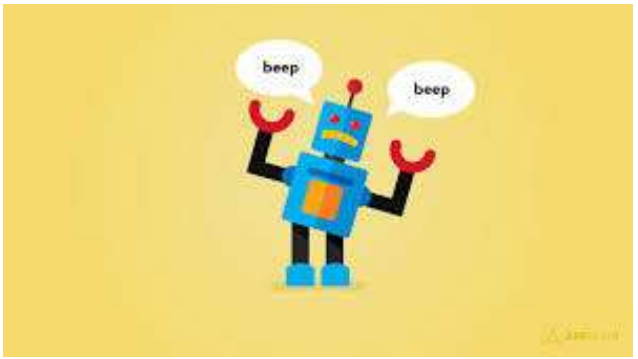


Image Sources: kaspersky.com/blogapplovin.com

Cost cutting affecting payroll and staff count

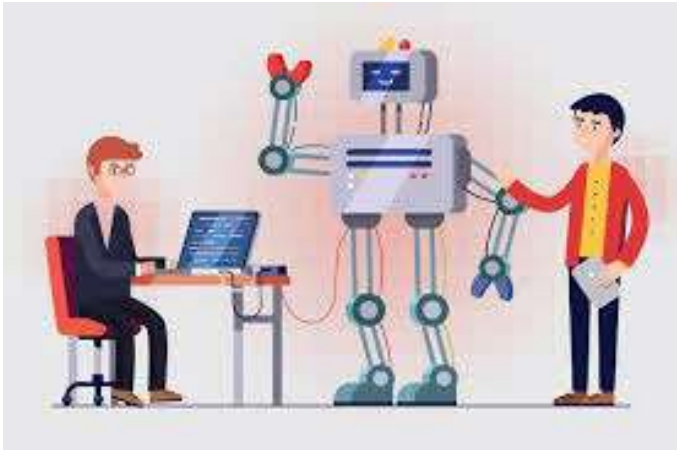
By 2030 up to 375m people or 14% of global workforce could have jobs automated away
*There is not one more important (topic) for all of us" than technology creating inequality and concentrating huge wealth in just a few pe*ople (Gini Rometty, IBM CEO, 2017; Principles for the Cognitive Era

Digital refugees created by AI – Marc Beinoff, Salesforce,

Protecting privacy as AI spreads.
AI offering better tools than Internet to monitor.
E.g. advanced forms of facial recognition can detect person's sexual orientation.
Can militate against fair treatment
Snooping on private citizens

Possible problems with competition caused by one major player making a breakthrough in developing technology.

Rise of monopolies in industries outside the tech sector stifling innovation



Jobs and All

Image Sources: cio.com/informatio-age.com

Forecast Impact on Employment by Sector

Job Creation Opportunities

Source: CB Insights, 2019

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Future Pathways

The Direction of Travel

- From Complicated business situations: relative ease of predicting outcome by understanding how the system works despite many inputs and outputs (e.g. Global air travel system

- To Complex business situation: different parts interact independently making prediction of and controlling outcome almost impossible (e.g. interconnected global financial system and the 2008 crisis). But benefits from one system can create losses for others

- Moving transactions executed within an organisation into open markets (e.g. from containers in shipping (320% rise in bilateral trade in 5 years and 790% in 20 yrs) to web services, SaaS, blockchain) – all distributing tasks in multisided markets

- Networks become primary vehicle with porous organisations offering complete experiences instead of product and service features

- Requiring entrepreneurial management capabilities with discovery-driven and options-oriented tools

Digital or Cognitive Futures?

- Cognitive technologies: AI, natural language processing, human-computer interaction, deep learning, neural nets – all with exponential advances
- Unstructured data : video, audio, sensor outputs, tweets, anything encoded – all require cognitive technologies.
- But computers or even AI do not understand what data means or reasons for algorithmic choices. Need for learning systems
- Made possible by application program interfaces (APIs) encoded into digital services enables a form of thinking into every digital application
- Cognitive oncology – enabling oncologists to identify personalised evidence-based treatment options based on massive volumes of data (Bumrungrad International Hospital, Thailand, Manipal Hospitals, India; + 20 hospitals in China)
- Cognitive assistants for intimate, personalised customer relationhips (Banco Bradeso, Brazil, North Face, Meditronic plc (cognitive ap for predicting hypoglycemic event hours in advance)
- New job disciplines – data curation, system training, etc.
- Future may be Intelligence Augmentation rather than AI
-

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