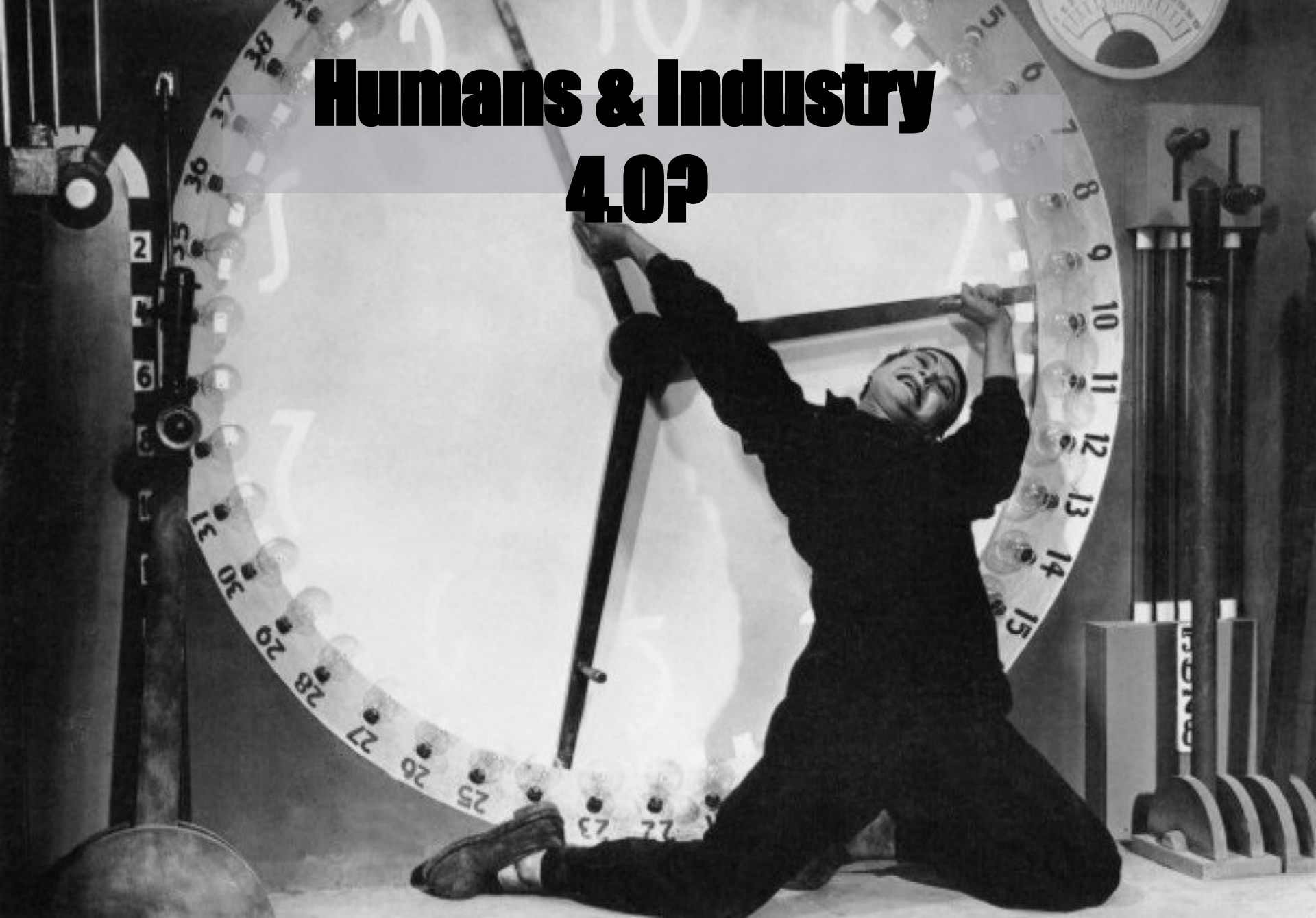


Humans & Industry 4.0?



Or



Humans & Industry 4.0?

THINKE

Or

Humans & Industry 4.0?





The Human Dimension of Industry 4.0

The Human/Machine Blend
and the Role of Simulation

Andy Fawkes FI MechE

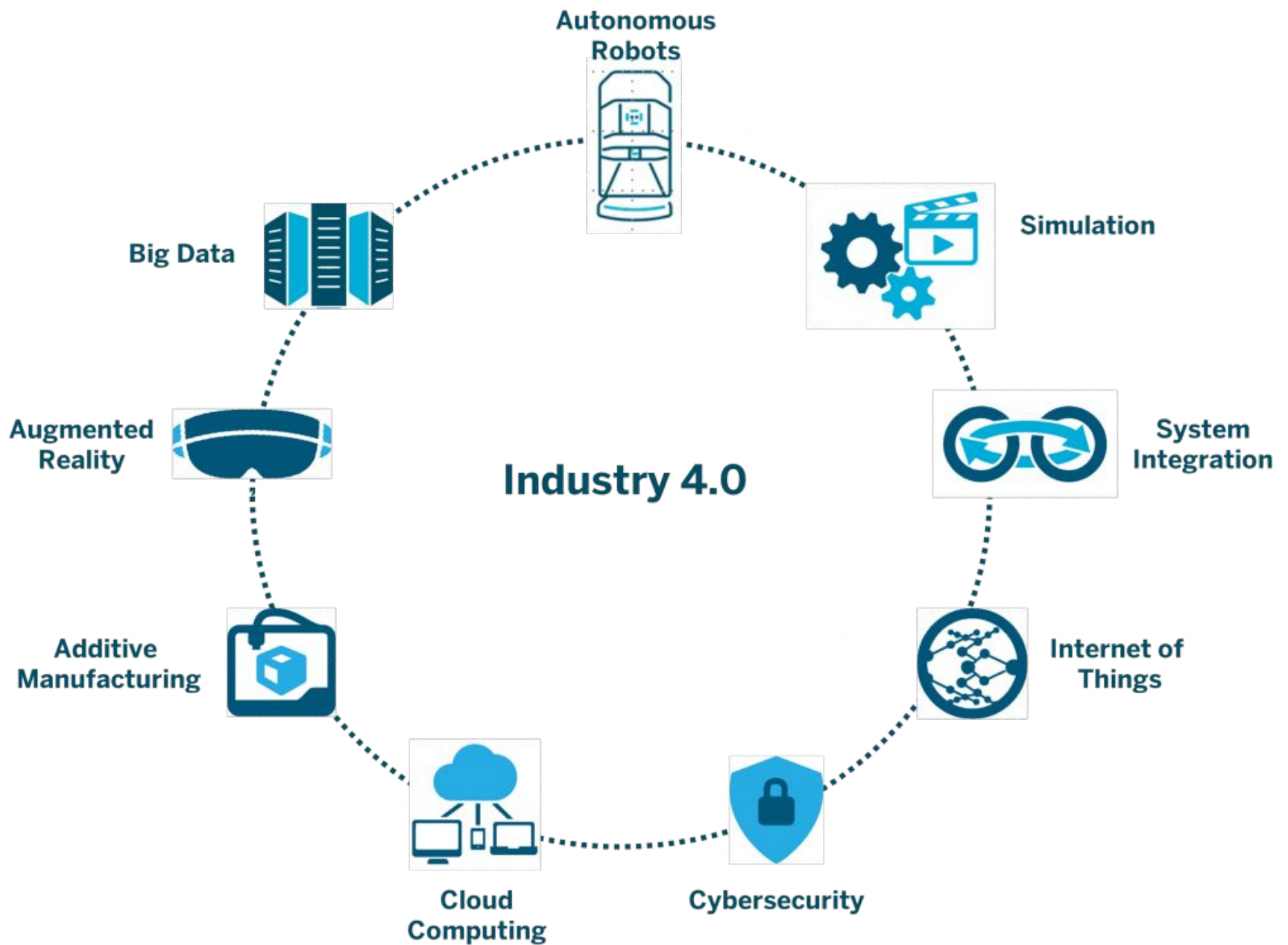
Humans and Industry 4.0

- **Manager View**
- ***Machine View***
- **Employee View**
- **Customer View**
- **Closing Thoughts**

Manager View

What is Industry 4.0?

“sounds important, but I am not quite sure what it is”



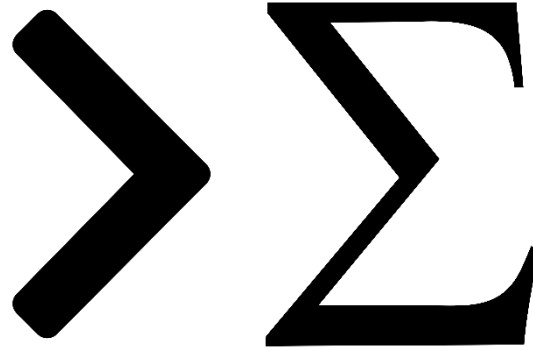
What is Industry 4.0?

We define Industry 4.0 as the next phase in the digitization of the manufacturing sector

McKinsey & Company

Total Greater than the Sum of the Parts(?)

Industry 4.0



- big data
- processing
- connectivity
- analytics
- cyber systems
- AR
- VR
- AI
- robotics
- 3-D printing
- sensors
- IoT
- simulation
- ...

Kevin Kelly (January 2017)

- Intelligence is Multi-Faceted
- Past Industry
 - Artificial Power
- Future Industry
 - Artificial Intelligence
 - Humans teaming with Bots
 - Humans focused on Creativity



Industry 4.0 Requirement

Better



Faster

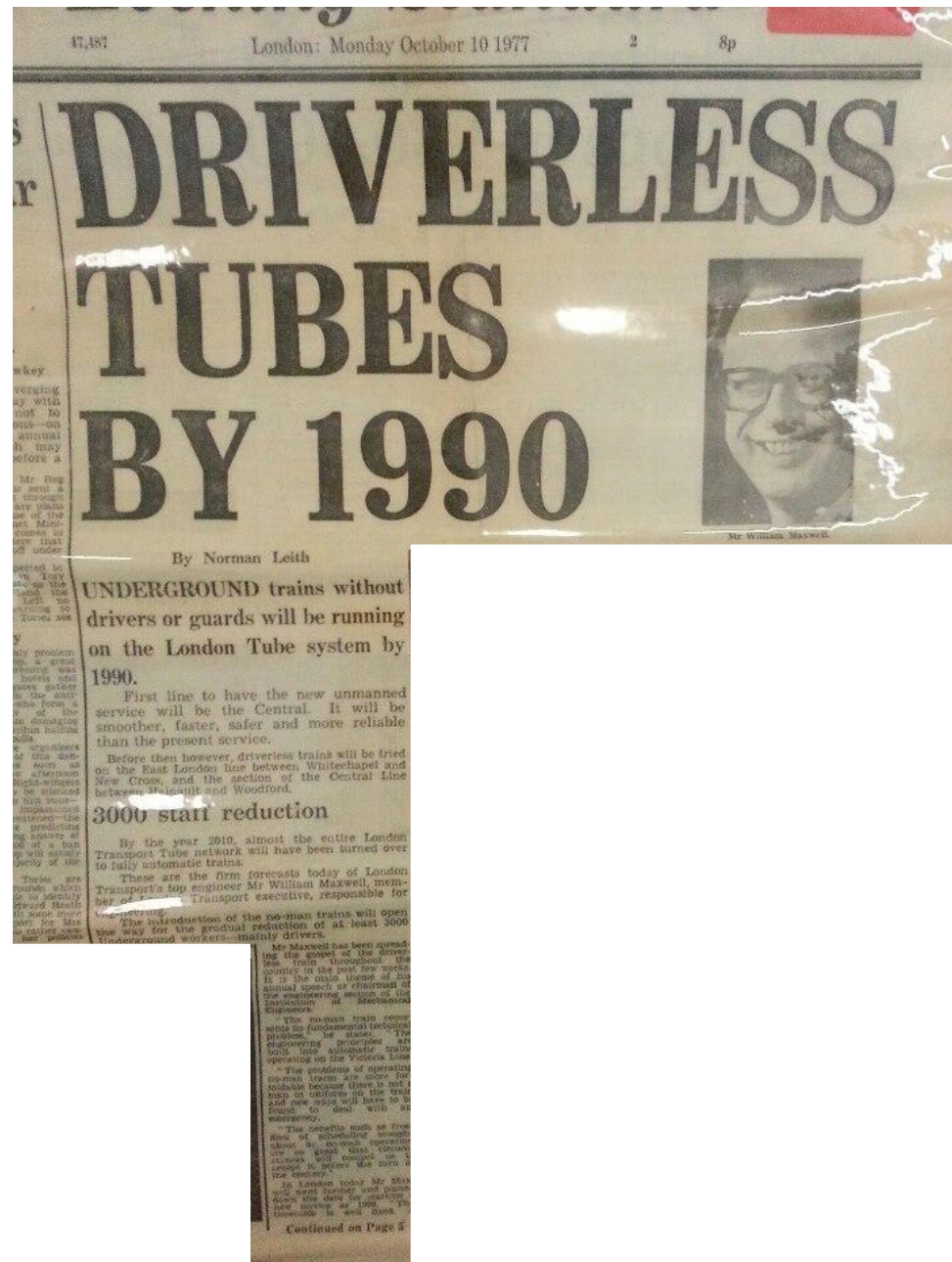


Cheaper



Unrealistic Expectations?

London Evening Standard
10 Oct 1977



50% of Companies see lack of Digital Culture and Training as a top challenge to making operations more digital

Industry 4.0: Building the digital enterprise



2000+
respondents in 26 countries

US\$493 bn
in digital revenue gains p.a.

US\$421 bn
p.a. in cost and efficiency gains

US\$907 bn
in annual digital investments



www.pwc.com/industry40

- “The biggest challenge of industrial leaders isn’t technology - it is the people.
- While digital technologies are rapidly becoming a commodity, success largely depends on an organisation’s Digital IQ.
- With data analytics becoming a core capability for every industrial company, enhancing skills and organisational structures will be critical.”

Machine View

Bohemia Autonomous Systems Research Projects

Dstl Autonomous Systems (AS) Research

- Develop a simulated operational environment that can be used for AS training, mission planning, rehearsal and execution

Assistive Technologies Project

- Using simulation to train automated and robotic systems to support indoor journeys and living for the visually impaired



“Pibot” Robot Pilot (Oct 14)



Google DeepMind (2015)

Google DeepMind's Deep Q-learning

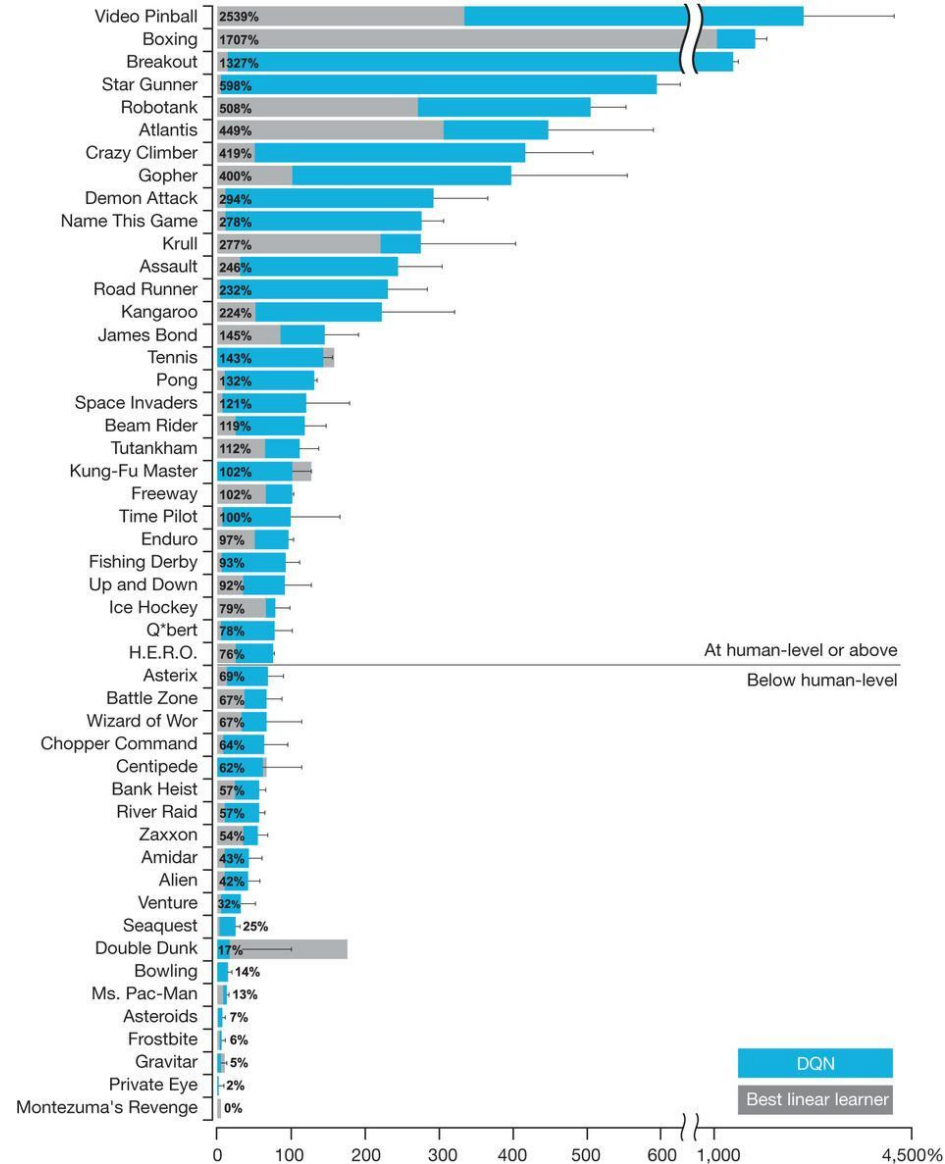
The algorithm will play Atari breakout.

The most important thing to know is that all the agent is given is sensory input (what you see on the screen) and it was ordered to maximize the score on the screen.

No domain knowledge is involved! This means that the algorithm doesn't know the concept of a ball or what the controls exactly do.



Google DeepMind AI (2015)



Google DeepMind AI and “Go” (2016)



So What?

**Computers are being
programmed to learn
how to play games, not
how to play games**

Artificial intelligence
(AI)

StarCraft II: DeepMind unveils latest game its AI plans to conquer

The AI research firm is teaming up with gaming company Blizzard to take on the real-time strategy game

Alex Hern

@alexhern

Friday 4 November 2016 18.45 GMT



Shares

379

Save for later



A screenshot from StarCraft II, one of the most popular eSports in the world. Photograph: AP

After its success at mastering the ancient Asian boardgame of Go, DeepMind is planning to learn its next game - and it's about as different as it can possibly be.

The London-based AI research firm, a subsidiary of [Google](#), is teaming up with Californian gaming company Blizzard to take on the real-time strategy game StarCraft II.

AI v Humans – Strategy Games

Training Autonomous Systems in Simulation

9T05Google

PLUS ANDROID CHROME/OS GOOGLE APPS ANDROID TV YOUTUBE

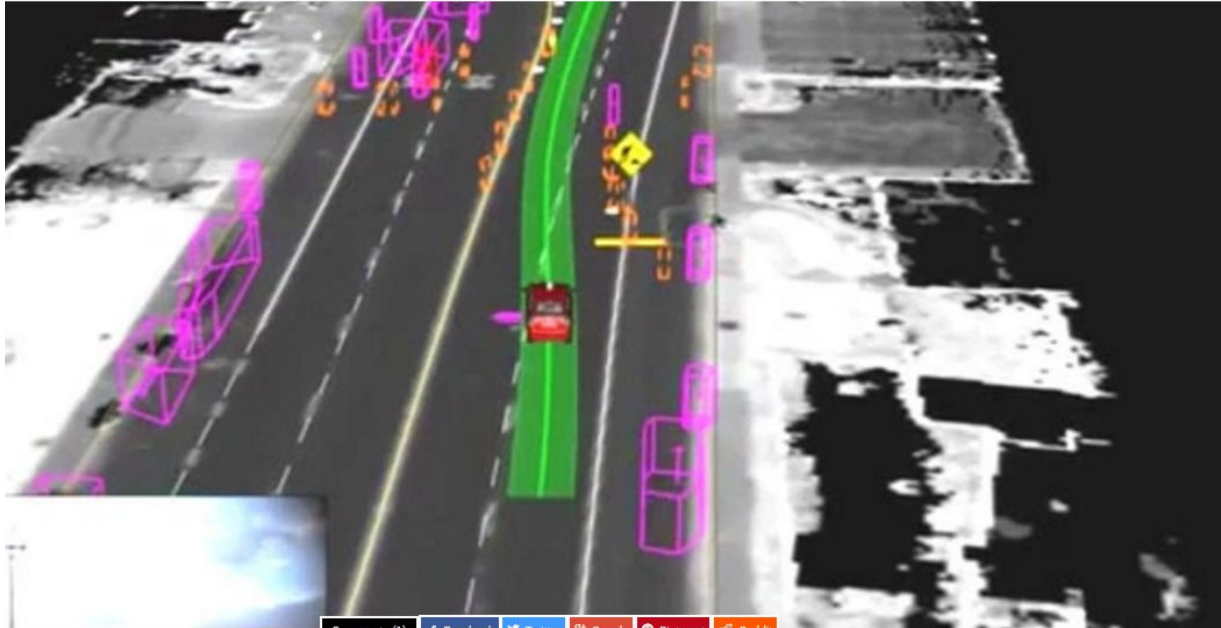
TODAY

GOOG: 764.65 12.65

Google's self-driving cars drive three million miles a day, without leaving the lab

Ben Lovejoy · 11 hours ago [@benlovejoy](#)

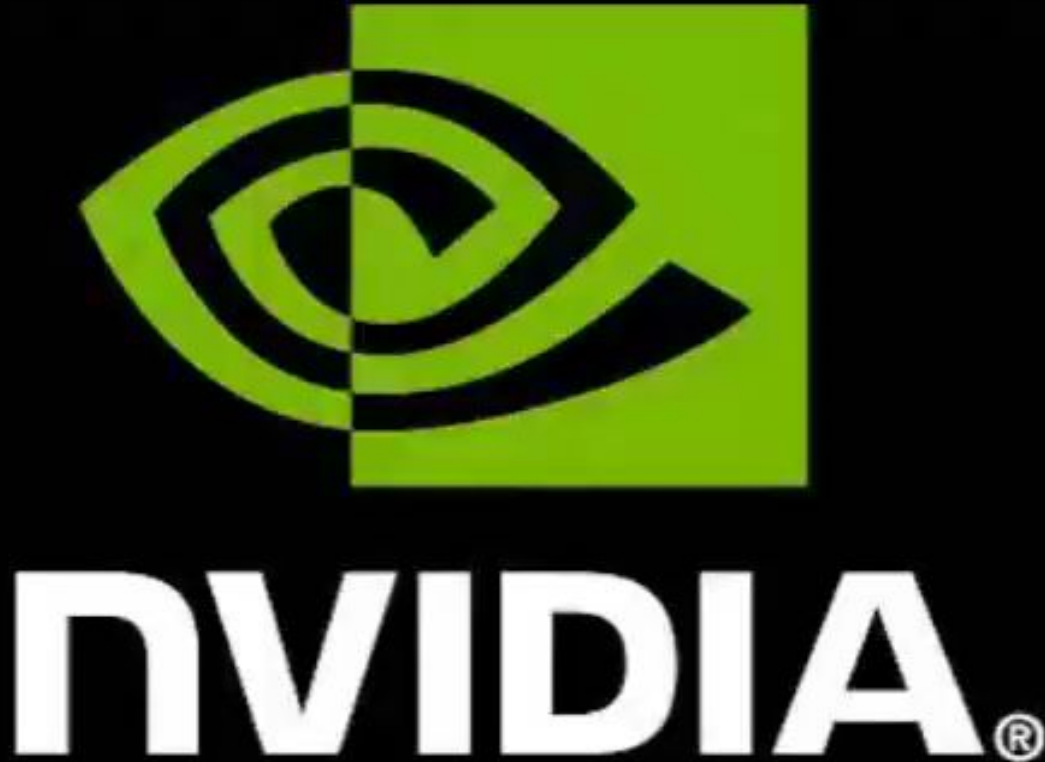
SELF-DRIVING CAR X



Comments (1) [Facebook](#) [Twitter](#) [Google](#) [Pinterest](#) [Reddit](#)

Google's self-driving cars have notched up almost 1.5 million miles in autonomous mode since the project began in 2009 – but they drive twice as many miles every single day in the lab. Google's latest monthly report reveals that every software change is tested by using it to simulate driving the entire driving history of the fleet, autonomous and manual.

Nvidia Isaac Robot Training (May 2017)





“it can only be attributable to human error”

Computers still aren't that clever



AI in Games/Simulation can be Bad!

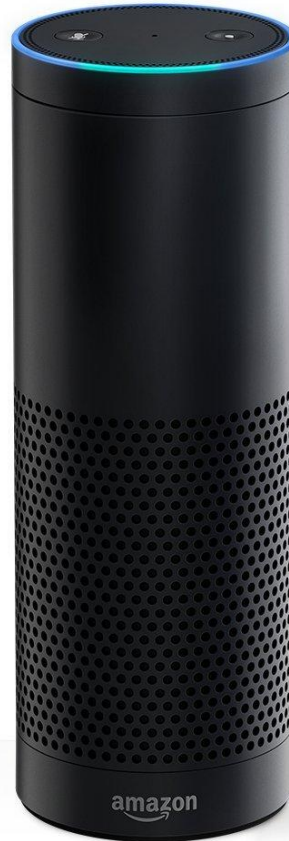


Good Communicators?

Google Home



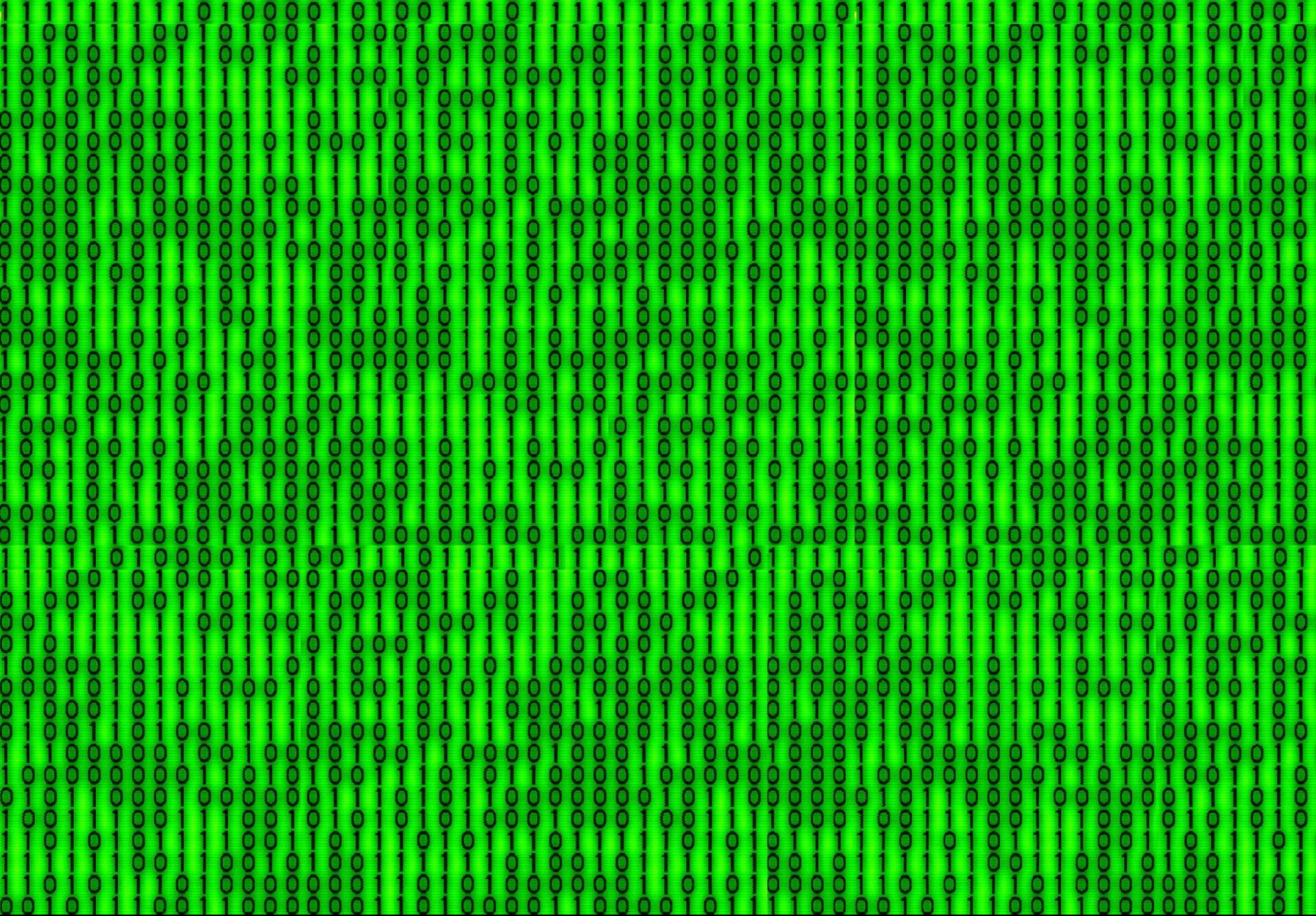
amazon echo





Islands of Data

THINKE



Enterprise AI

Home > Features > Applications Features

AI in the enterprise - how the big enterprise software vendors are striving to make systems smarter, from IBM to SAP

Are artificial intelligence (AI) and predictive analytics just the latest trendy buzzwords, or is the technology about to transform the enterprise? We spoke to IBM, Microsoft, Insidesales.com, Salesforce.com, Google and SAP to find out.



Scott Carey
June 21, 2016

The world's biggest tech companies are investing heavily in artificial intelligence (AI): software that can learn to think and solve problems in a human-like way.

According to Deloitte: "By end-2016 more than 80 of the world's 100 largest enterprise software companies by revenues will have integrated cognitive technologies into their products."

Each company takes a slightly different approach to making business processes smarter through the development and deployment of machine learning, or cognitive computing. Here we have rounded up some of the biggest names in the industry and what their approaches are to AI.

Most Popular in Applications



Best browsers for privacy 2017

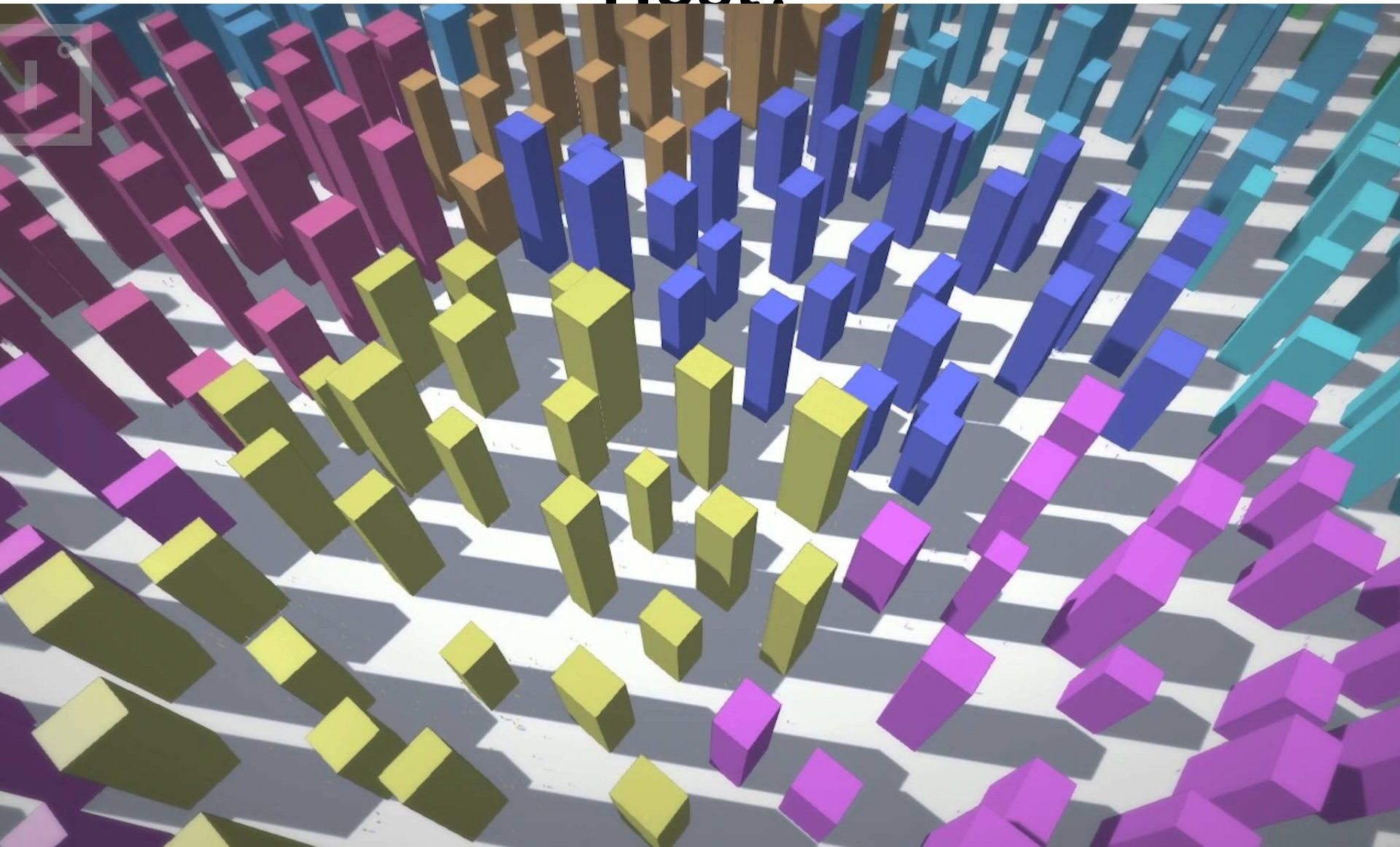


Application incidents down 30 percent at Barclays...

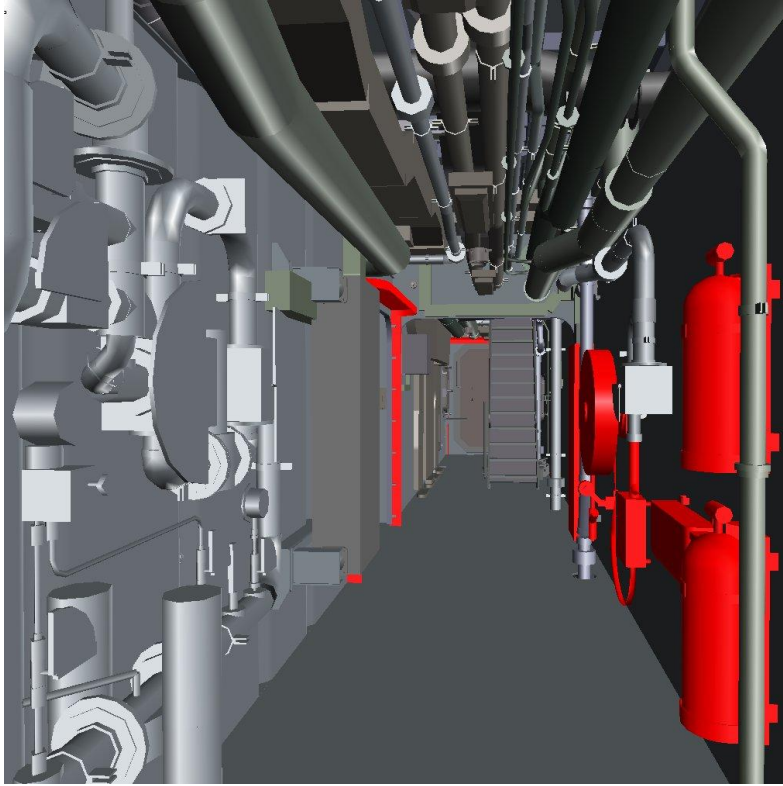


Best Windows 10 apps for business users

Improbable SpatialOS as Industry 4.0 Host?



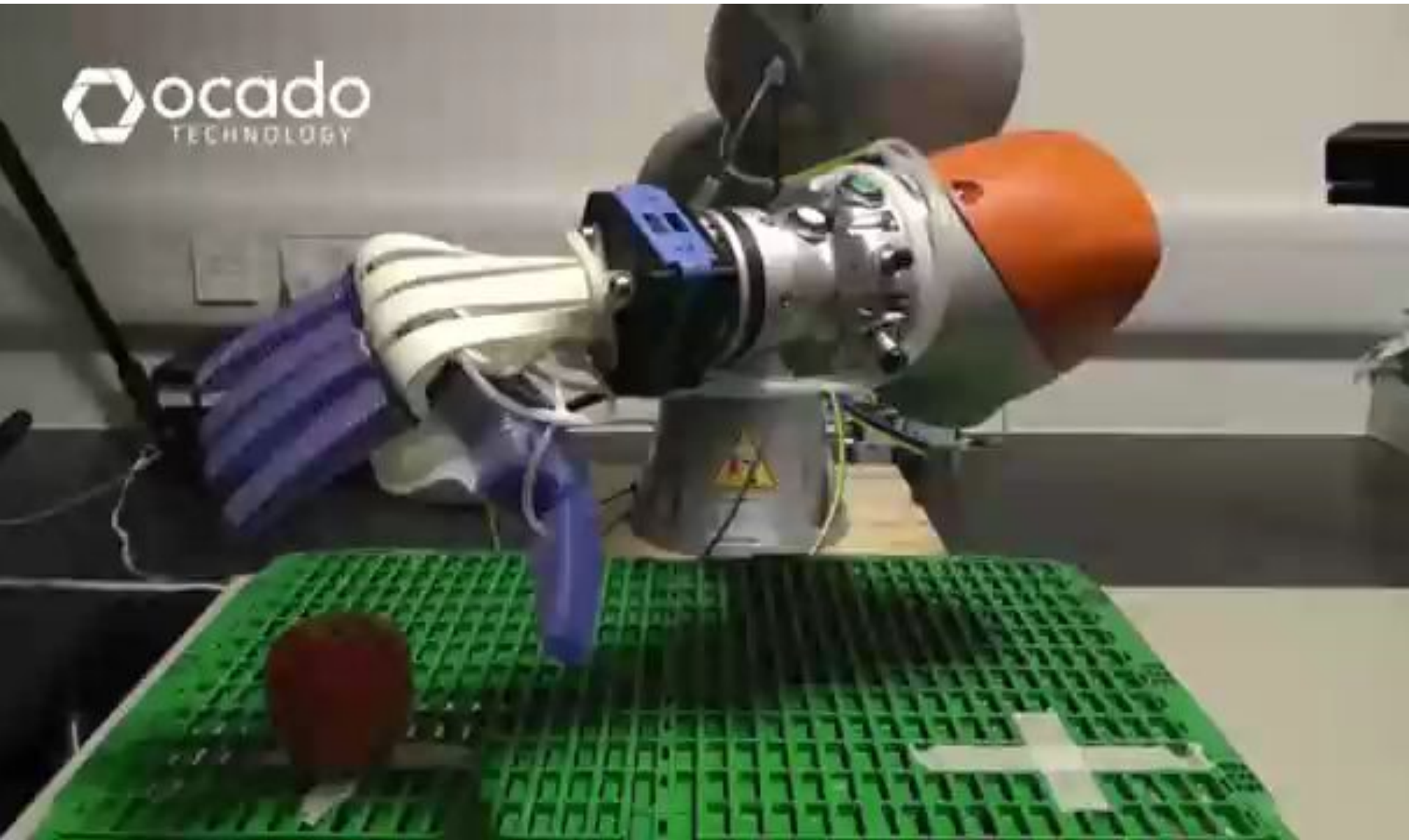
UK T45 Destroyer - CAD to Interactive Simulation



Amazon Kiva Robots (+ a Human)



Ocado Technology - RBO Hand 2



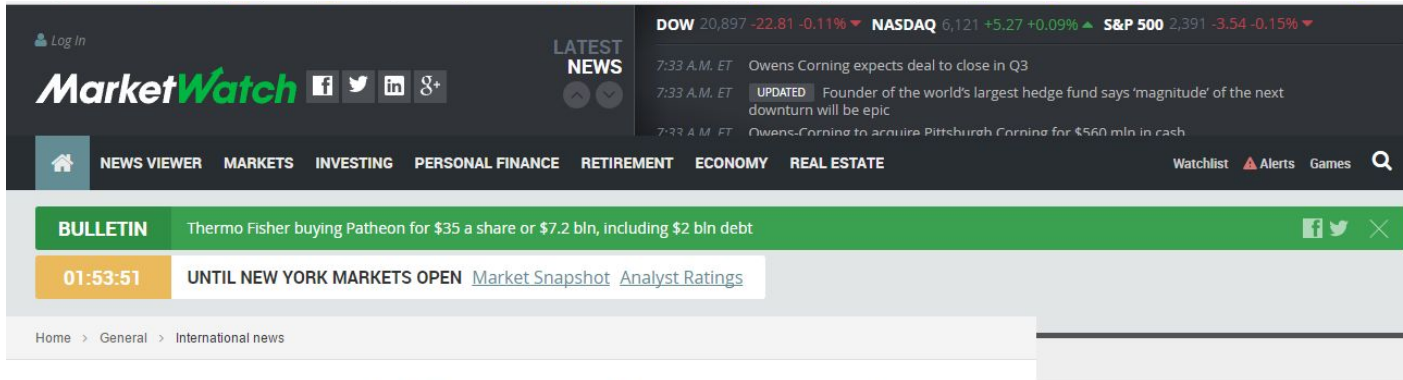
Boston Dynamics Robot “Handle” - Feb 17



Are we there yet?



Threats?



WannaCry attack hits Renault, 200,000-plus victims

Published: May 15, 2017 2:15 a.m. ET



By
**NICK
KOSTOV**

The cyberattack that spread around the globe over the weekend, hitting businesses, hospitals and government agencies in at least 150 countries, is likely to keep growing as people around the world return to work, law-enforcement authorities warned.

Investigators launched a far-reaching hunt for the perpetrator, as institutions around the world worked to mitigate damage from the highest-profile computer-worm outbreak in nearly a decade. Europe's police-coordination agency estimated at least 200,000 individual terminals had fallen victim to the attack, while Chinese authorities put the number as high as 1 million world-wide.

"This is something we haven't seen before," Europol director Rob Wainwright told U.K. television channel ITV. "The global reach is unprecedented."

Among the highest-profile corporate victims was French auto maker Renault SA, which was forced to shut down factories across Europe.

When workers arrived at a Renault plant in Sandouville, in northern France, on



THINKE

travel

[Destinations](#) [Themes](#) [News](#) [Travel Troubles](#) [Cruising](#) [Snow](#) [Kiwi Traveller](#)

The terrifying untold story of QF72: What happens when 'psycho' automation leaves pilots powerless?

MATT O'SULLIVAN

Last updated 08:43, May 14 2017



For the first time, the captain of the imperilled Qantas Flight 72 reveals his horrific experience of automation's dark side.

Trust the Machine?

Employee View

Baron Charles Dupin (1826)

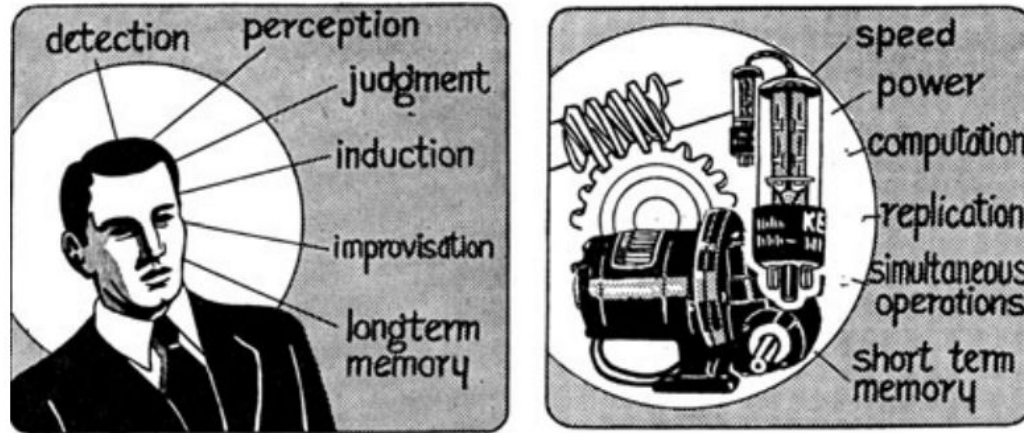
(Géométrie et Mécanique des Arts et Métiers)



- “We have been very much occupied in perfecting the machines and the tools which the worker uses...
- However, if he were only considered as an instrument, a tool, a motor, he would necessarily be placed in the first rank of all instruments
- since he has the immeasurable advantage of being an instrument who observes and corrects himself, a self-stopping motor which functions with the motivation of its own intelligence and which perfects itself..."

Paul M Fitts (ed) (1951)

Human Engineering for an Effective Air Navigation and Traffic Control System



- We suggest that great caution be exercised in assuming that men can successfully monitor complex automatic machines and take over if the machines break down.
- Engineers should seriously consider systems in which machines would monitor men and prevent them from making dangerous mistakes.

Human Boredom

Does cockpit automation foster boredom?

Sometimes we're extremely busy, sometimes it's quiet. Duties ebb and flow. We deal with it

PATRICK SMITH

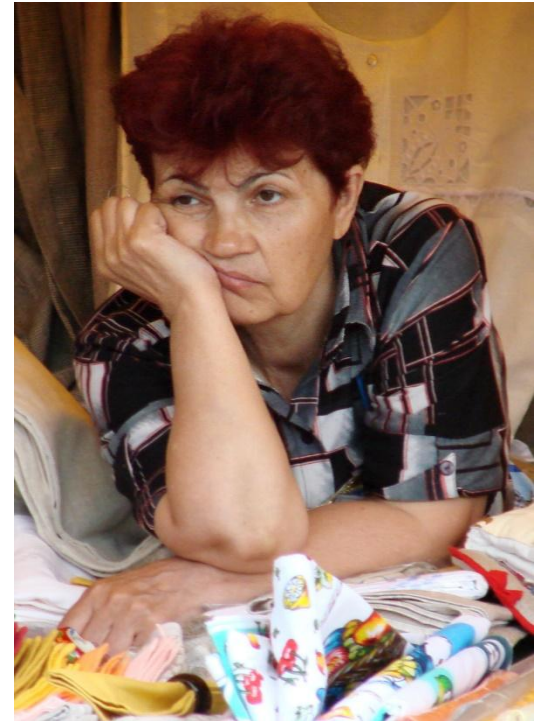
f Share 0

Twitter 0

g+1 0



TOPICS: AIR TRAVEL, ASK THE PILOT, BUSINESS, LIFE NEWS



How Does a UAS Pilot Feel at the End of the Day?



THINKE

[Wansteady](#)[subscribe](#)[search](#)[jobs](#) [dating](#) [more](#) [UK edition](#)

theguardian

website of the year

[home](#) [UK](#) [world](#) [politics](#) [sport](#) [football](#) [opinion](#) [culture](#) [business](#) [lifestyle](#) [fashion](#) [environment](#) [tech](#) [travel](#)[browse all sections](#)[home](#) > [tech](#)**Tesla**

Tesla driver killed while using autopilot was watching Harry Potter, witness says

Driver in first known fatal self-driving car crash was also driving so fast that 'he went so fast through my trailer I didn't see him', the truck driver involved said

Sam Levin and Nicky Woolf
in San Francisco

Friday 1 July 2016 18.43 BST



Shares

1,733



Save for later



📷 Screenshot from a YouTube video by Joshua Brown of a trip from Boston to Orlando using Tesla's autopilot.
Photograph: Youtube

The Tesla driver killed in the first known fatal crash involving a self-driving car may have been watching a Harry Potter movie at the time of the collision in [Florida](#), according to a truck driver involved in the crash.

THINKE

Do We Need Humans to Build Trust with Machines (Just Like with Other Humans)?



Human/Machine Interfaces



Virtual Reality





Daqri Helmet

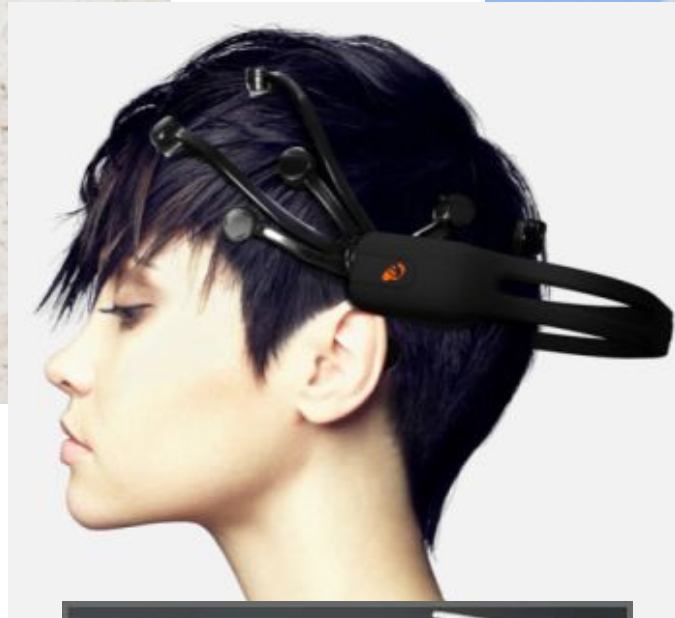


Augmented Reality in the Workplace



THINKE

Quantified Human



THINKE

Personal Responsibility to Train?

HRreview

HR ▾

DIVERSITY ▾

EMPLOYMENT LAW ▾

LEARNING ▾

RECRUITMENT ▾

REWARD ▾

WELLBEING ▾

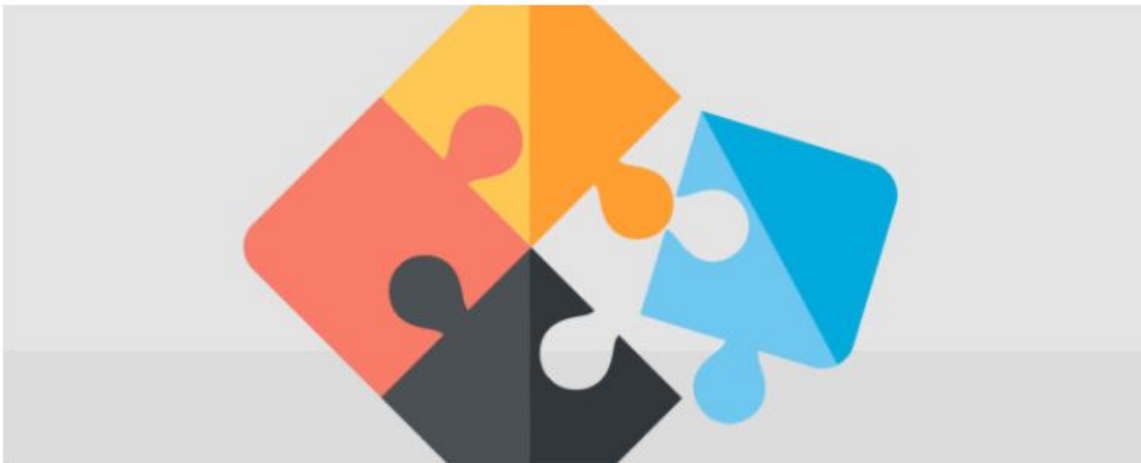


YOU ARE HERE: [Home](#) → [News](#) → Britain forced to 'up-skill' to keep pace with digitalisation



Britain forced to 'up-skill' to keep pace with digitalisation

Rebecca Clarke Tuesday, June 21, 2016 0 Comment Digitalisation



Hitwise, a division of Connexity, reveals Brits are turning to the internet to expand their skill set to keep pace with the increasing demand on today's connected workforce. Over 4.1 million Brits have searched for instant-skills and 'how to' queries in the first quarter of 2016.

HR COMMUNITIES

You can join our social communities here



Customer View

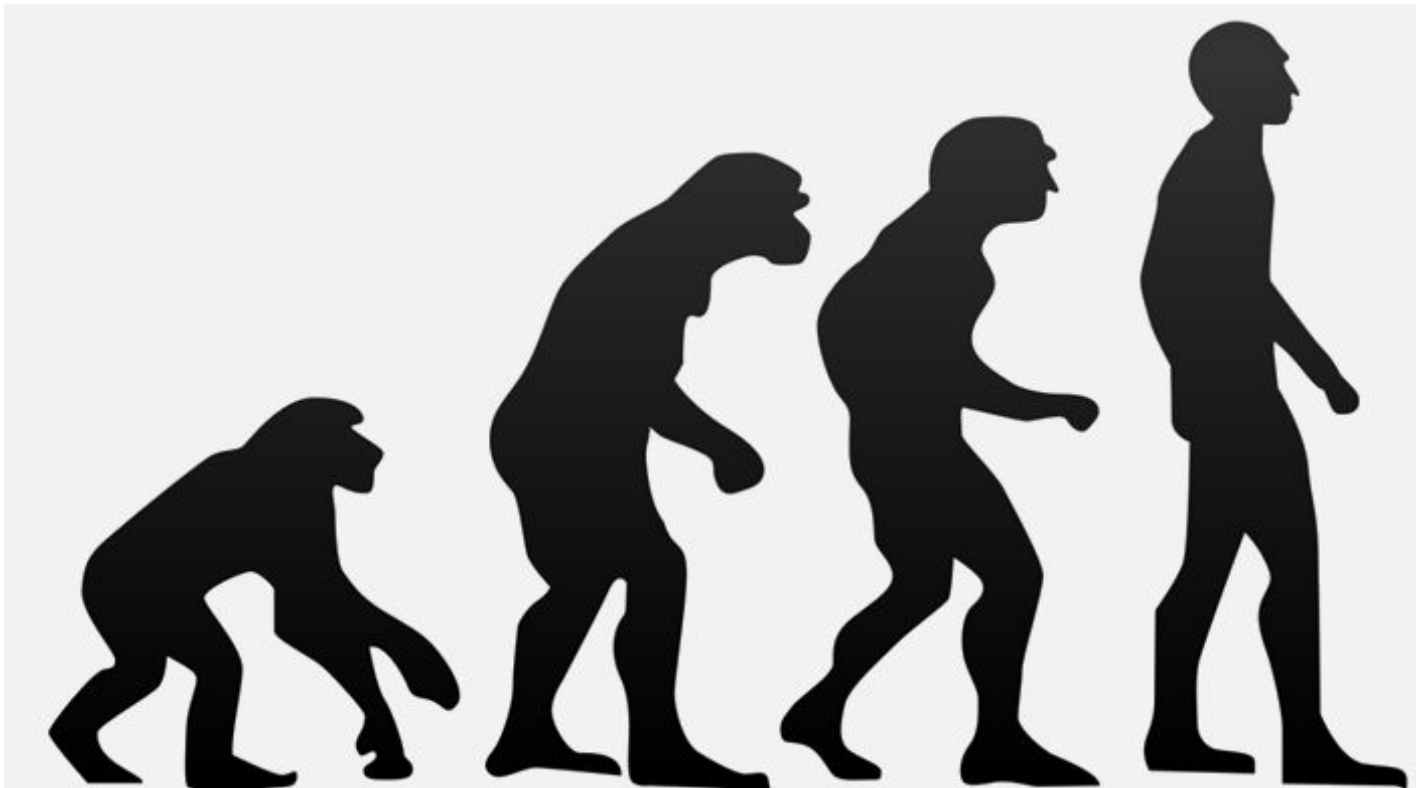
Individual/Enterprise Customers

- More education in design required?
- With more product diversity how do governments regulate the market?

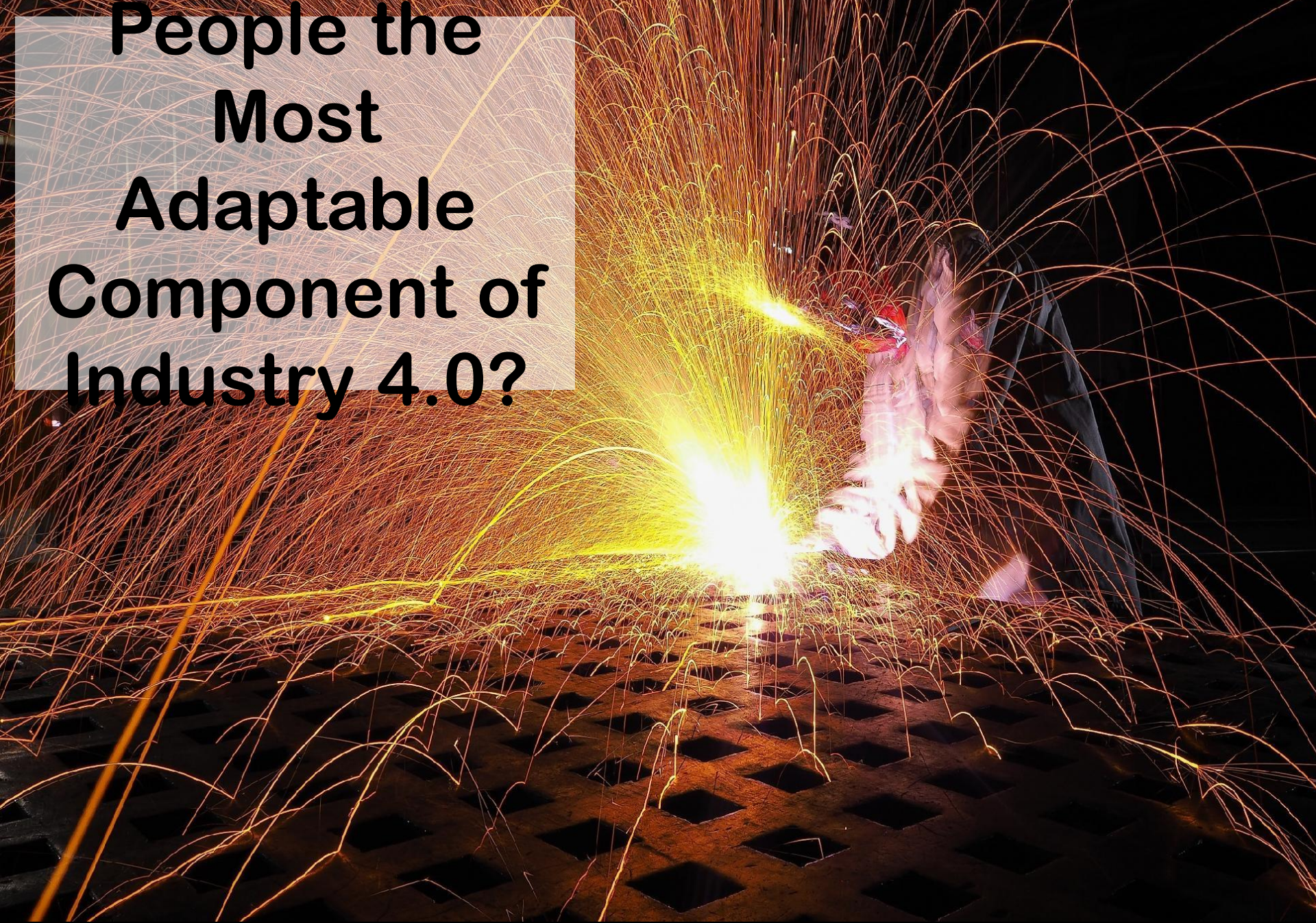
Closing Thoughts

Humans are Special

- **Millions of Years of Evolution**
 - **Highly Developed Body, Senses & Mind**

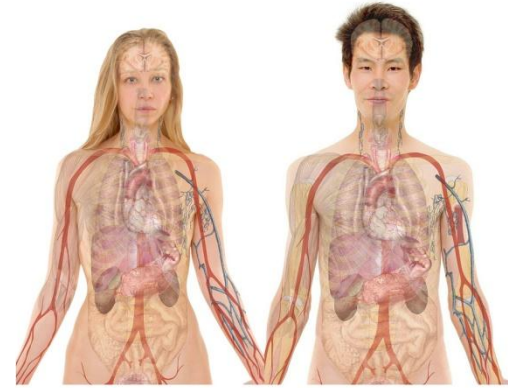


People the Most Adaptable Component of Industry 4.0?



Autonomous Systems - More than Engineering

- **Psychology**
 - study of mind and behaviour
- **Physiological**
 - study of normal function in living systems
- **Psychiatry**
 - study, diagnosis, treatment, & prevention of mental disorders
- **Philosophy**
 - study of reality, existence, knowledge, values, reason, mind, and language
- **Political**
 - practice and theory of influencing other people



http://commons.wikimedia.org/wiki/File:Female_with_organs.png
http://commons.wikimedia.org/wiki/File:Male_with_organs.png

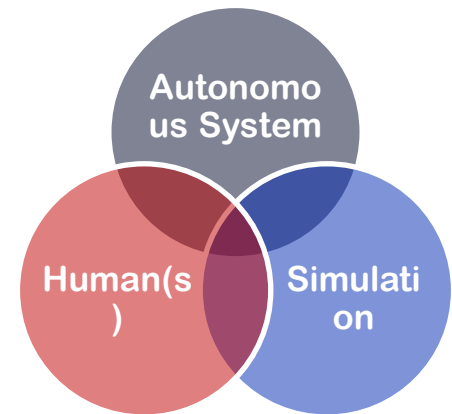
The Optimum Human/Machine Blend

Humans & Machines working in Harmony
Maximising the Strengths of Both



Final Thoughts

- Human factors become more important as automation increases
- Simulation can play a key role in testing and training humans and autonomous systems both separately and together
- Should there be more Focus on Human Factors in Engineering Education?



Questions?



Chief Automation Officer Required?

