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Lessons from data science in Healthcare & their potential applications for insurers

Rebecca Pope and Ian Carey
@kpmguk

05 November 2018



When will AI replace actuaries?

Robots will take most jobs, predicts Bill Gates



Microsoft founder Bill Gates has warned of the potential dangers of AI
RICHARD POHLE

- *Bill Gates has warned it is inevitable that smart machines, powered by artificial intelligence, will replace most human work.*
- *The Microsoft founder said it was only a matter of time before robots replaced humans in a substantial number of jobs.*
- ***“Work won’t be the central, almost religious activity it is today. That’s an inevitability. Then you’ll have all sorts of philosophical questions about purpose.”***

- *Source: The Sunday Times, April 15 2018*



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Lessons from data science in Healthcare

Rebecca Pope

5 November 2018

Expertise
Sponsorship
Thought leadership
Progress
Community
Professional Meetings
Education
Working parties
Volunteering
Research
Shaping the future
Networking
Professional support
Enterprise and risk
Learned society
Opportunity
International profile
Journals
Support



“ **What does the NHS & actuarial science have in common?
Data, data, data”**



Artificial Intelligence in the NHS



Reduce costs



Reduce inefficiencies



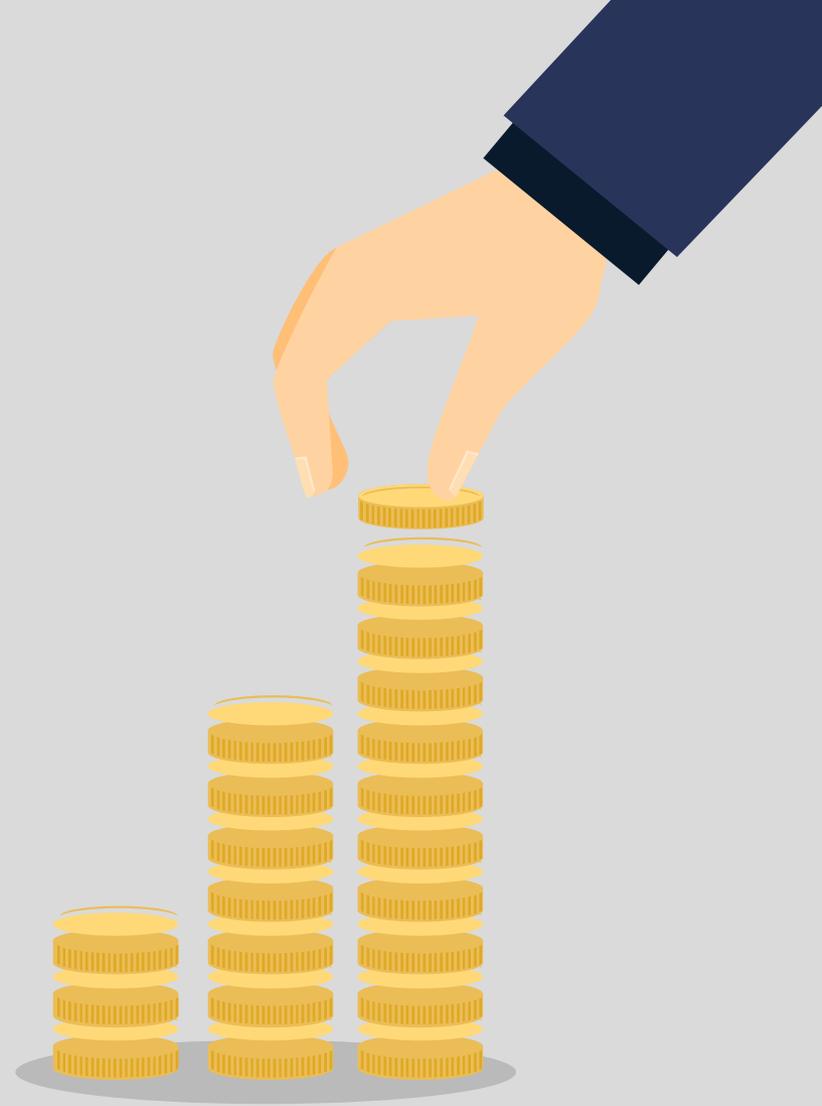
Improve patient care & quality



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£billions

Machine learning
has been recognized
to offer transformative
value within the
health service



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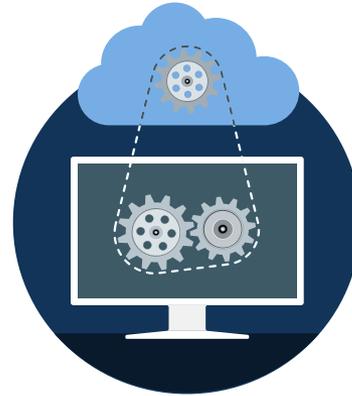
Critical hurdles to overcome for the benefits of AI to be realized



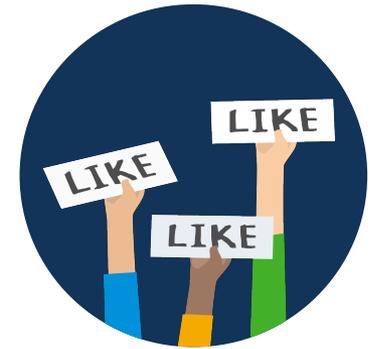
Trust of the public, clinicians and policy makers



'Silos' of data



Infrastructure for collecting data

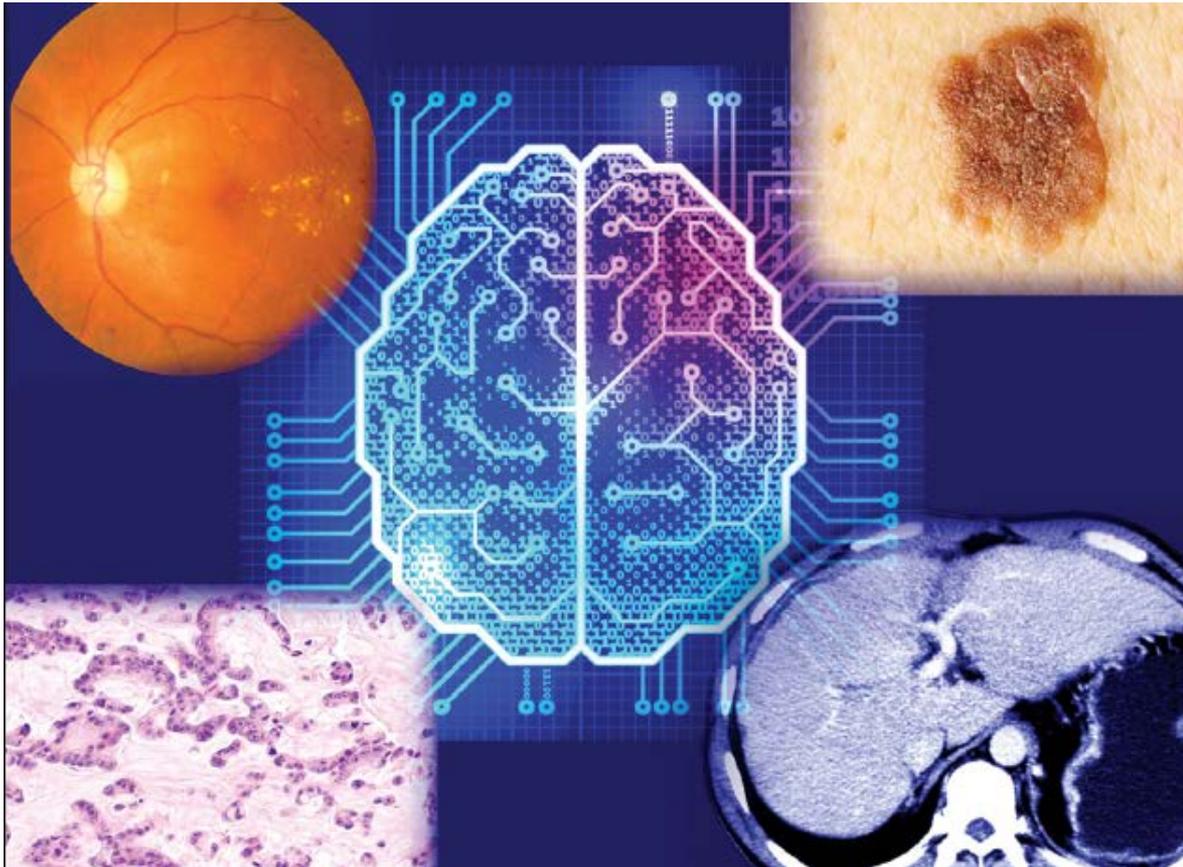


Issues around consent



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Augmenting diagnostic 'vision' with AI



10 million
images

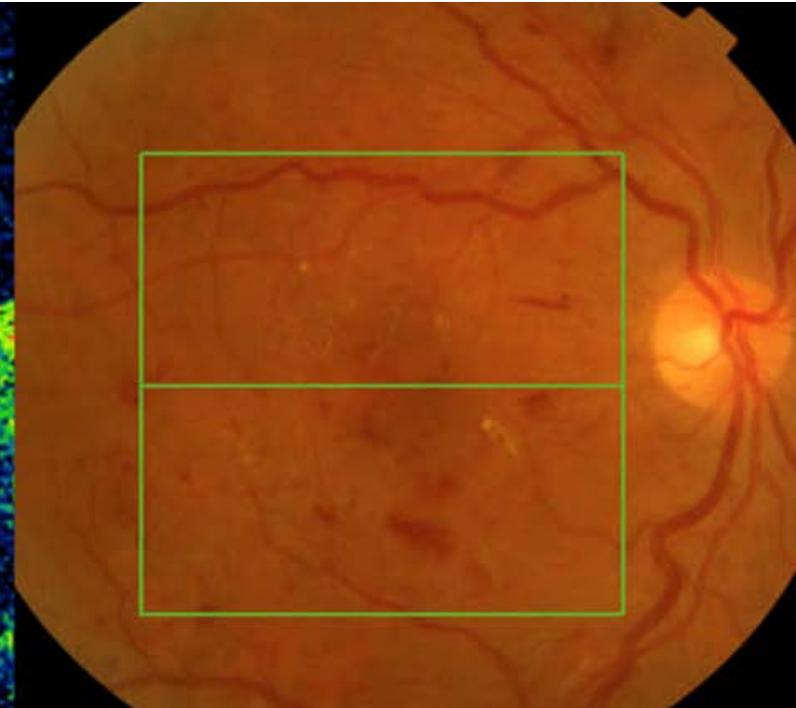
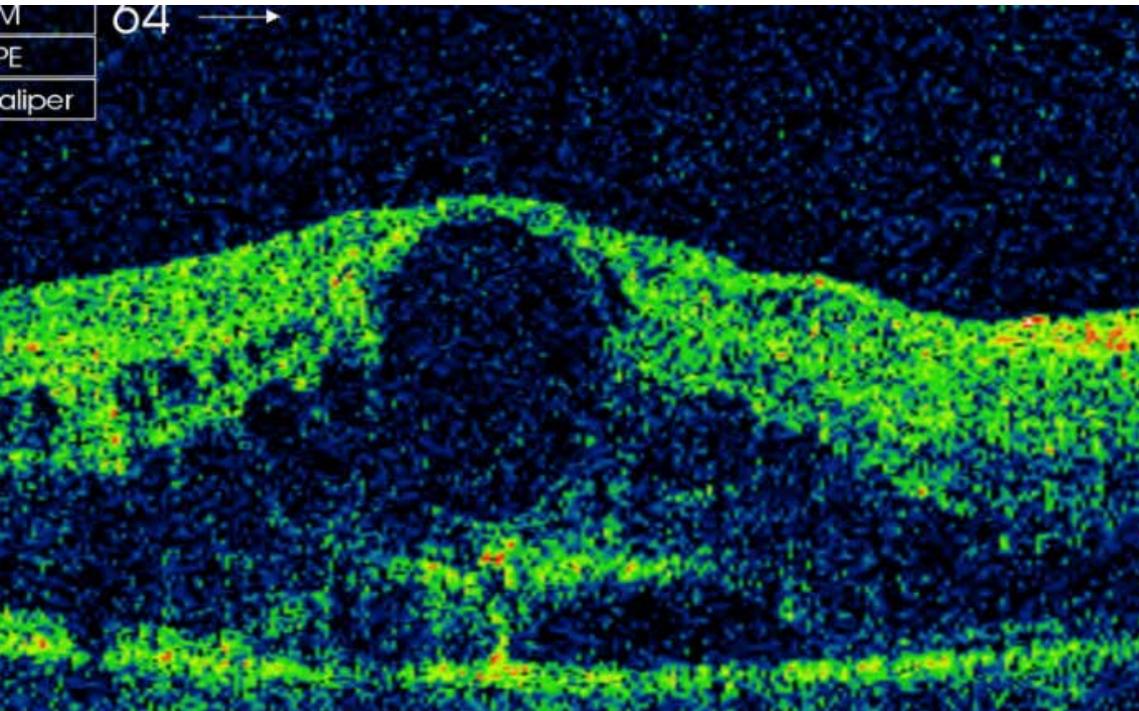
200,000
skin lesions

100,000
specimens



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Diabetic-related eye disease



Clinical decision making: Sepsis

nature
medicine

Article | Published: 22 October 2018

The Artificial Intelligence Clinician learns optimal treatment strategies for sepsis in intensive care

Matthieu Komorowski, Leo A. Celi, Omar Badawi, Anthony C. Gordon & A. Aldo Faisal



- ✓ 3rd cause of death world wide
- ✓ Main cause of mortality in hospitals
- ✓ How to **optimally** treat patients?
- ✓ Sequential decision-making problem



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I48.0
Atrial
fibrillation

I50.2
Congestive
heart failure

R53.1
Weakness

John Doe

78 years old

148.0 150.2

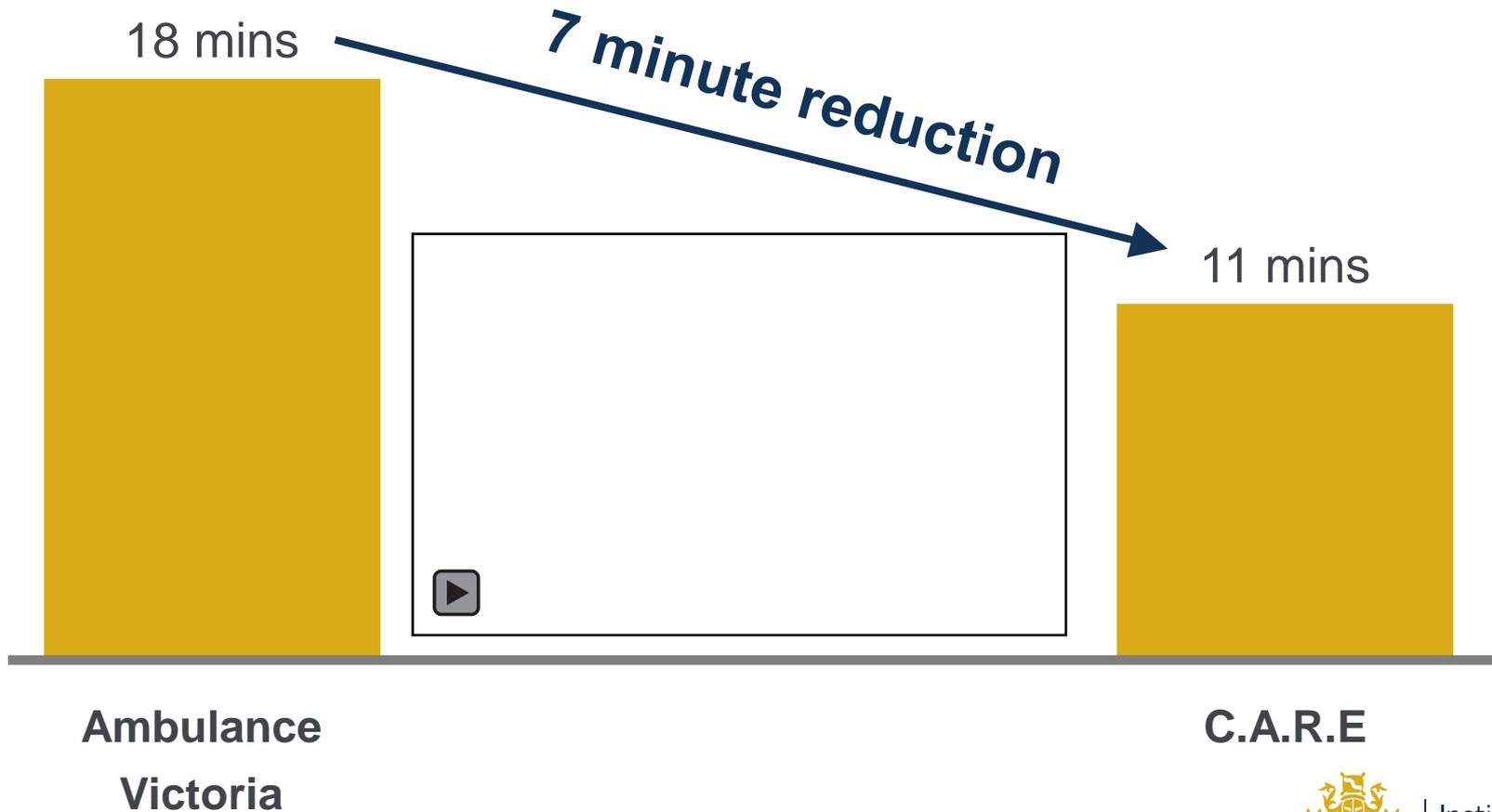
R53.1 150.1

150.1
Left
ventricular
systolic
dysfunction



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Impact on stroke care?



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Welcome to the 4th industrial revolution



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Diffusion





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Legal & regulatory issues



Public polling

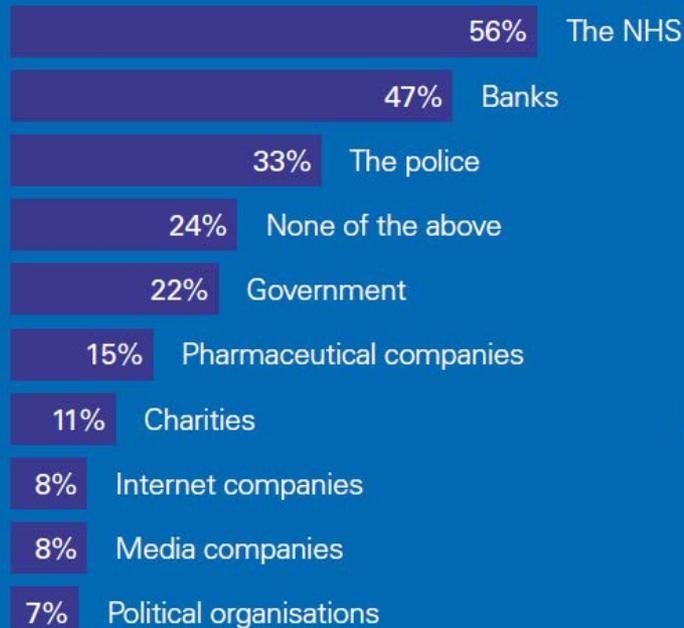


How the UK can win the AI race

What we know, what the public think and where we go from here

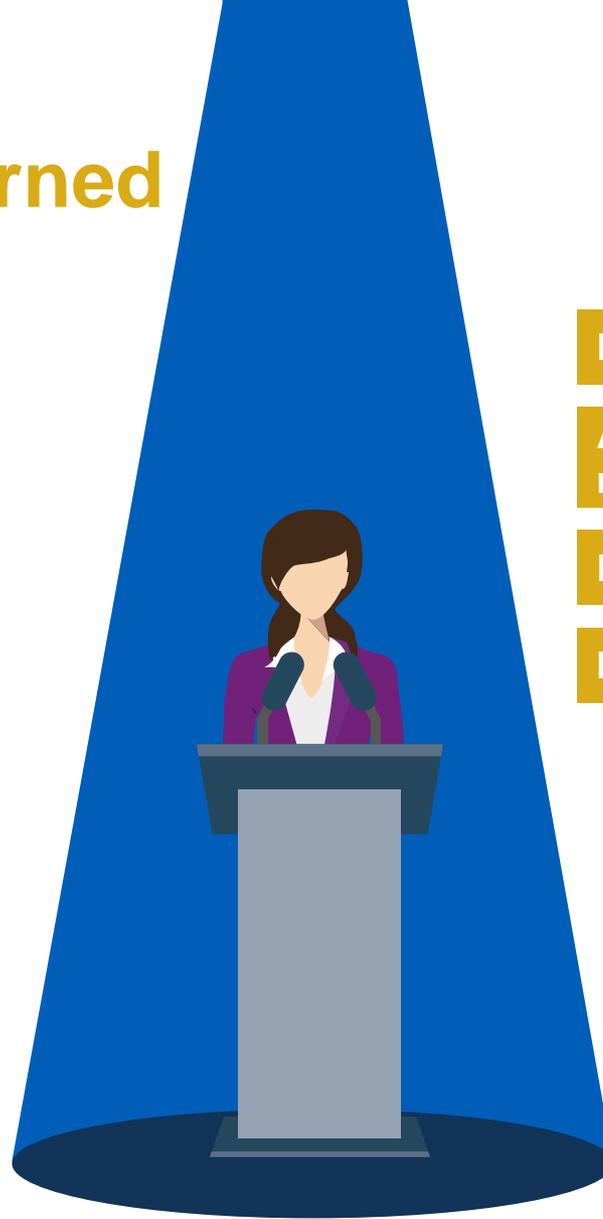
Respondents are more likely to share their personal data with the NHS than any other organisation, followed by banks and the police

Which, if any, of these organisations would you be willing to share your personal data with if it meant an improved service or capabilities?



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Lessons learned



Data is never 'ready' for AI

Augmented intelligence (not replacement!)

Bias in the machine...

Invest & upskill your workforce



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Lessons for actuaries

Ian Carey

Expertise
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Networking
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Enterprise and risk
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Opportunity
International profile
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Support

When will AI replace actuaries?

- *4 Waves of AI (term coined in 1956)*
 - *Internet AI (think tailored ads based on what you do online)*
 - *Business AI (e.g. what Rebecca was talking about)*
 - *Perception AI (upgraded for eyes, ears and a myriad of other senses)*
 - *Autonomous AI – (ability to sense and react to the world around them and to make decisions independently)*

<https://www.youtube.com/watch?v=JVHbetNYyhc>

- *Nobody knows!*
- *Data scientists will be automated first as regulatory requirements for actuaries to sign things off preserve us!*



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When will AI replace actuaries?

- **With enough data, Google thinks it can predict when a patient will die with up to 95 per cent accuracy.**
- In May, Google scientists published the account of a woman who came to hospital with late stage breast cancer and fluid building in her lungs.
- Hospital predicted 9.3% chance of dying during stay based on their records and vital sign testing etc.
- Google's neural network, was fed **175,639 data points** on the woman including past health records and her current vital signs. It delivered a decidedly more grim prediction, calculating the woman had a 19.9% chance of dying during her stay. She unfortunately died within a week.
- Where the system was able to add value was its ability to incorporate data not easily analysed by traditional systems such as clinical notes buried in PDFs or scribbled on old charts, while disregarding redundant data.
- Google analysed more than **46 billion data points** for this tool.

Source: www.news.com.au, June 20 2018 (also Bloomberg and Nature)

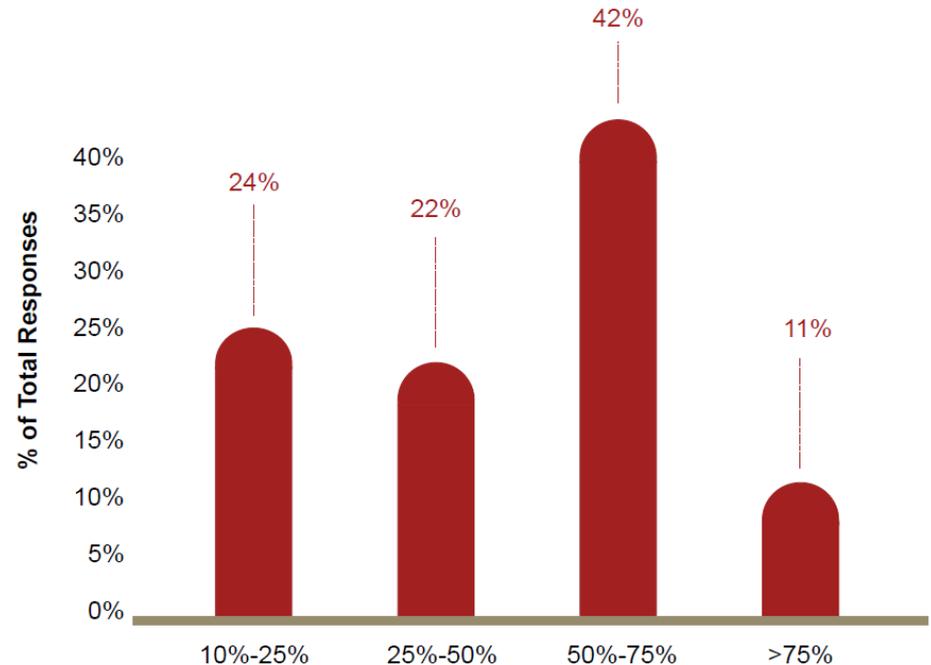


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Data, data, data!

- According to a 2018 US survey, actuaries spend significant time on data manipulation...
 - more than 50% spend at least half of their time
 - more than 75% spend at least 25% of their time
- Is this a good use of the actuarial skillset?

Proportion of time actuaries spend on data manipulation



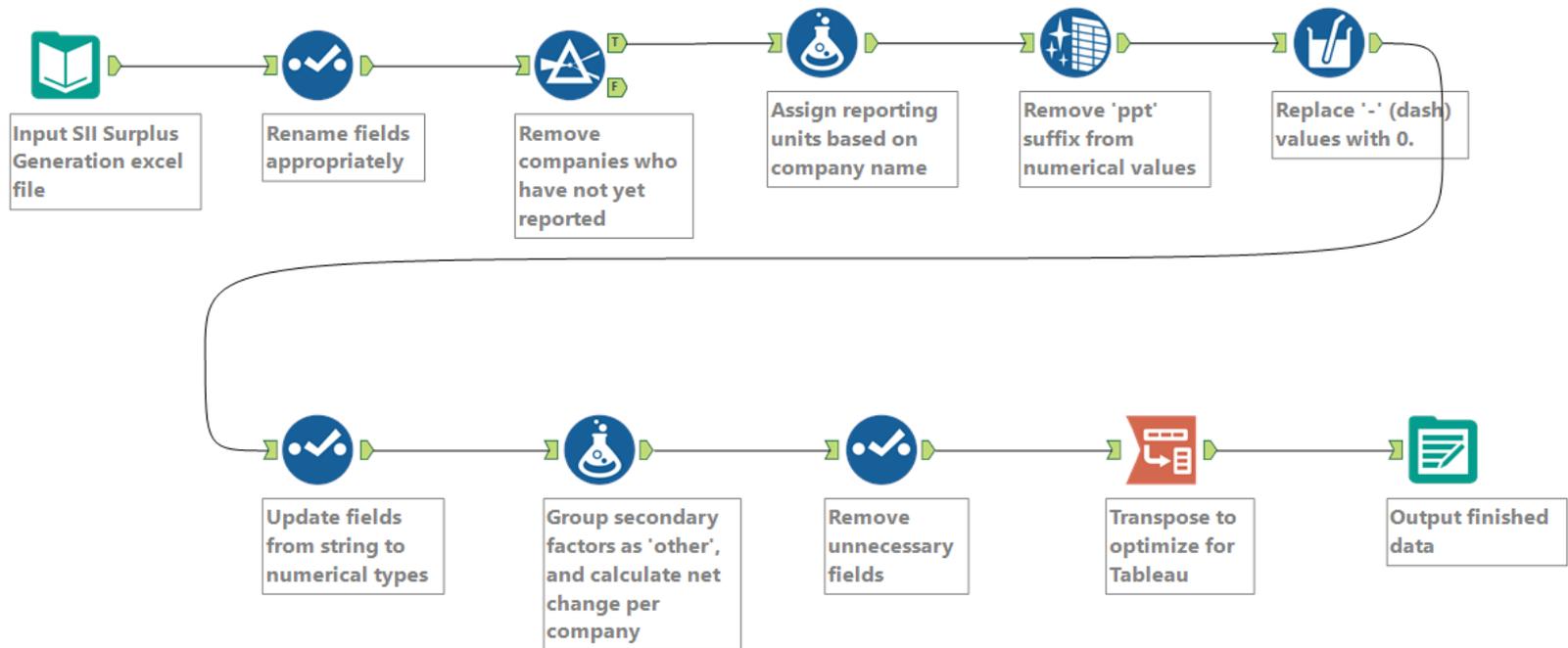
Source: PWC actuarial modernisation survey, q2 2018



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Example (very simple) Alteryx workflow

- You can see that annotations have been added to each stage of the workflow, so that the data preparation process is well-documented.
- When source data changes, you only need to hit 'play' to run the Alteryx workflow, and the output will be updated to include those changes.



Actuaries need data science skills and tools

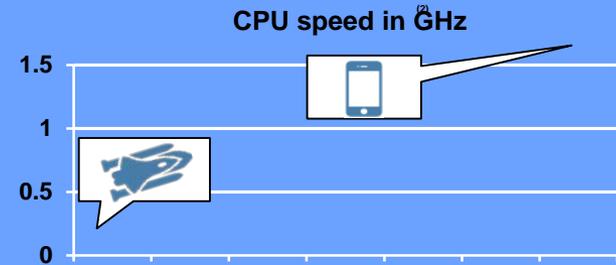
Below are some examples only – not an exhaustive list!

Data preparation	alteryx		
Robotic process automation	blueprism®		
Visualization		Qlik Q®	
Coding / machine learning			

Computing power has increased significantly over time

We have seen a **1 trillion-fold increase** in computer processing capabilities over the past **60 years**⁽¹⁾

Today's smartphone has more computing power than the Apollo 11 Guidance Computer



Source: ⁽¹⁾Experts Exchange, "Processing Power Compared"
Source: ⁽²⁾Frost & Sullivan, "Addressing Mobile Cybersecurity"



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Upskilling is fun!...

- **Datacamp** leaderboard for e-learning coding training (R and Python)
- **Alteryx** workflows look so much nicer than Excel and are auditable, applicable to large data sets, reusable and reproducible
- **Hackathons** for Coding and Data Visualisation tools
- **Drag and drop functionality** in tools makes building dashboards easy for non-coders
- **Interactivity** of dashboards (e.g. drill-down) means being able to answer questions from the Board on the spot vs at the next Board meeting in 1-2 months time!
- If we don't upskill we will struggle to attract new talent and risk becoming stuck as “champions of regulatory requirements”



...and allows actuaries to focus on providing insights to add value



Actuarial as an Insight Organization

Embracing data science, there will be more time to **focus on insight generation to drive value** creation, positioning the function in the center of the business and enabling actuaries to shift towards being more commercially valuable.

Six defining characteristics of high performing actuaries



The Strategist

Drives the actuarial function to optimize global business strategy



The Predictive Analyst

Turns the regulatory environment into a competitive advantage



The Operationalist

Stays ahead of technology and masters the complexities of data analytics

Has a deep knowledge of the business and its customers



The Talent Champion

Finds the right model for the actuarial function

Invests in and motivates talent, promotes key skills and collaborates



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Data Science helps actuarial teams become high performing

Actuaries - doing data science since the 1600's

- *“An important advance came in 1662 from a London draper named John Graunt, who showed that there were predictable patterns of longevity and death in a group, or cohort, of people of the same age, despite the uncertainty of the date of death of any one individual. This study became the basis for the original life table.*
- *The first person to demonstrate publicly how this could be done was Edmond Halley (of Halley’s comet fame). Halley constructed his own life table, and showed how it could be used to calculate the premium amount someone of a given age should pay to purchase a life annuity (Halley 1693).”*
- https://en.wikipedia.org/wiki/Actuarial_science



Actuaries today?

“Data science tools!”



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Questions

Comments

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