



QUANTIFYING RISK, ENABLING OPPORTUNITY

Subject:
Professionalism in Big Data

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Agenda

1) Introduction

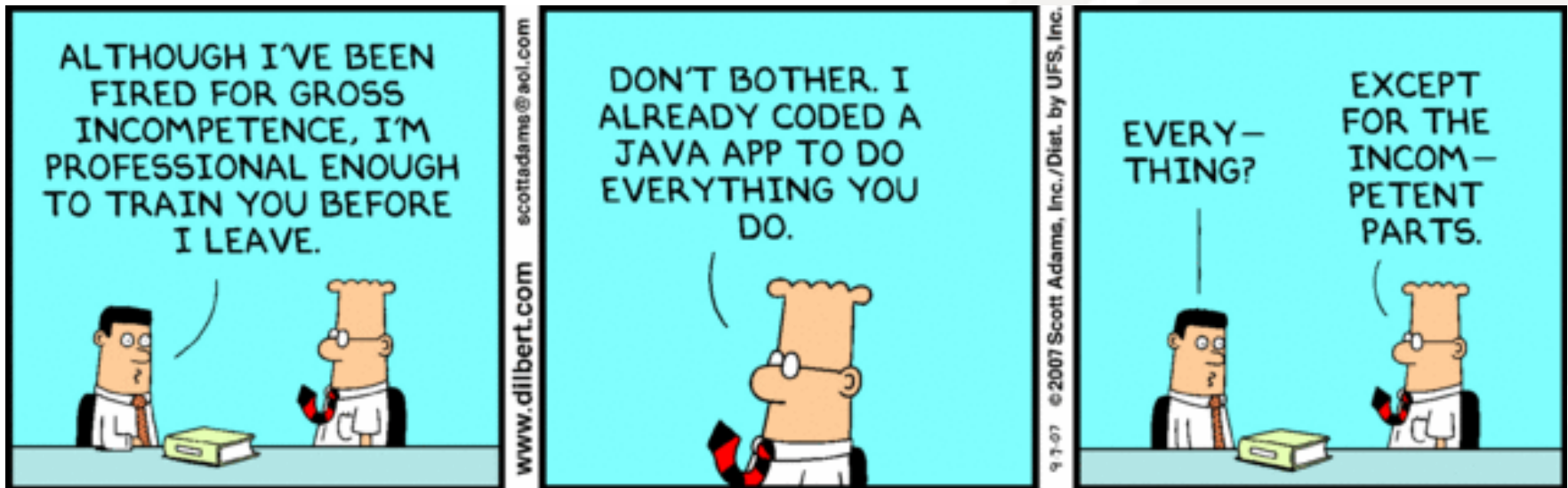
2) Major Professionalism Themes

3) Pitfalls & Shortcomings of Big Data

4) Literature Sources

5) Closing Remarks and Q&A

BLIND CONFIDENCE IN BIG DATA?



Introduction

- Emergence and importance of “Big Data” within Actuarial profession
- Firm grasp of implications and consequences (intentional or unintentional)?
- Specifically, how will “Big Data” impact Professionalism?

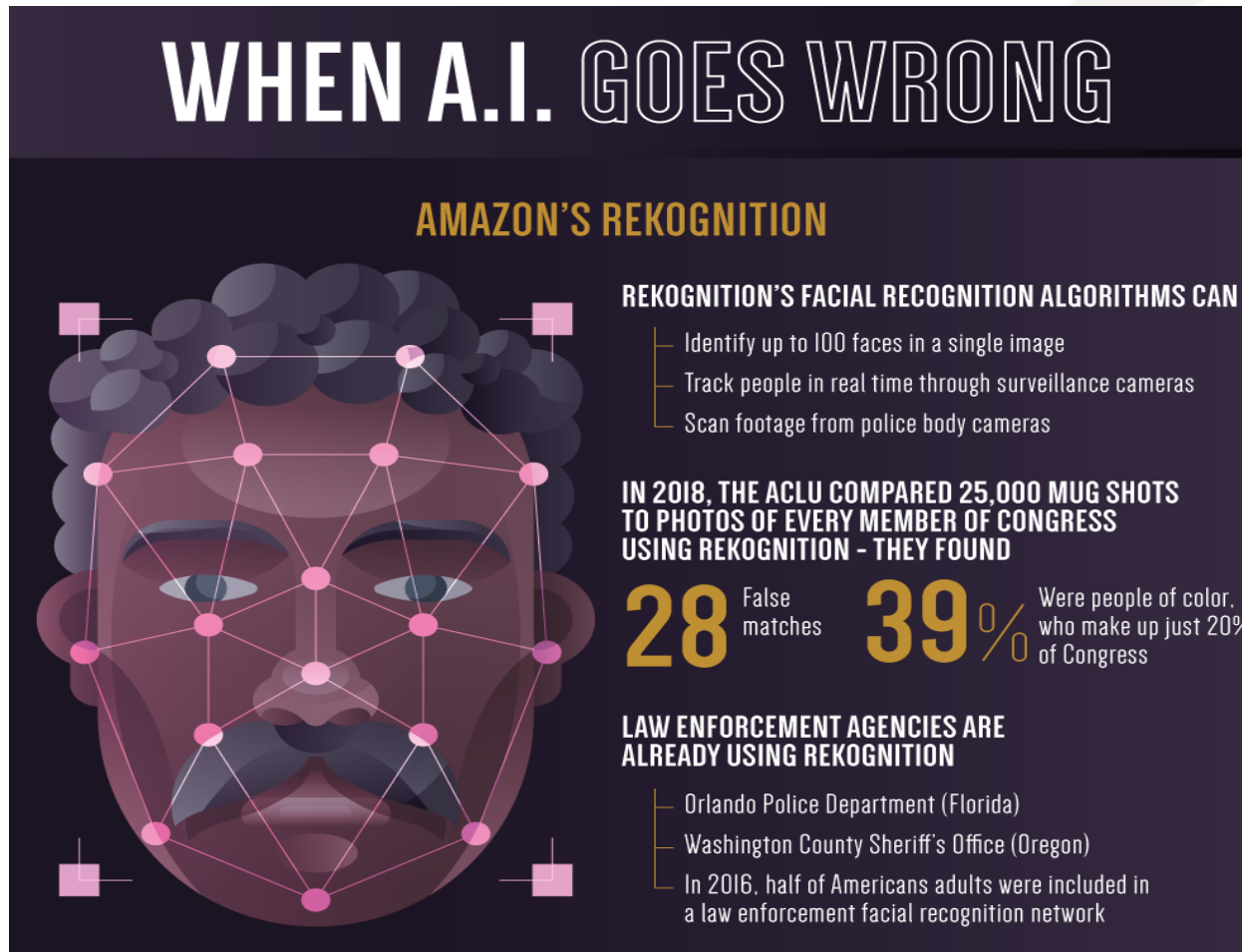
Major Themes Identified

- Transparency
- Fairness/Discrimination
- Governance
- Education
- Accountability
- Privacy

Transparency

- Algorithmic systems using big data are increasingly used as part of decision-making processes in the public and private sectors, with potentially significant consequences for individuals, organisations and societies.
- However, the very properties of scale, capability to handle complex datasets, and autonomous learning that make these systems useful also make it difficult to provide clear explanations for the decisions they make.
- This lack of transparency risks undermining meaningful scrutiny and accountability, which is a significant concern when relating to decision-making processes that can have a considerable impact on fundamental human rights.
- Transparency critically contributes to ensure fairness
- Recent trend of Big Data: little emphasis placed on explaining the “why”

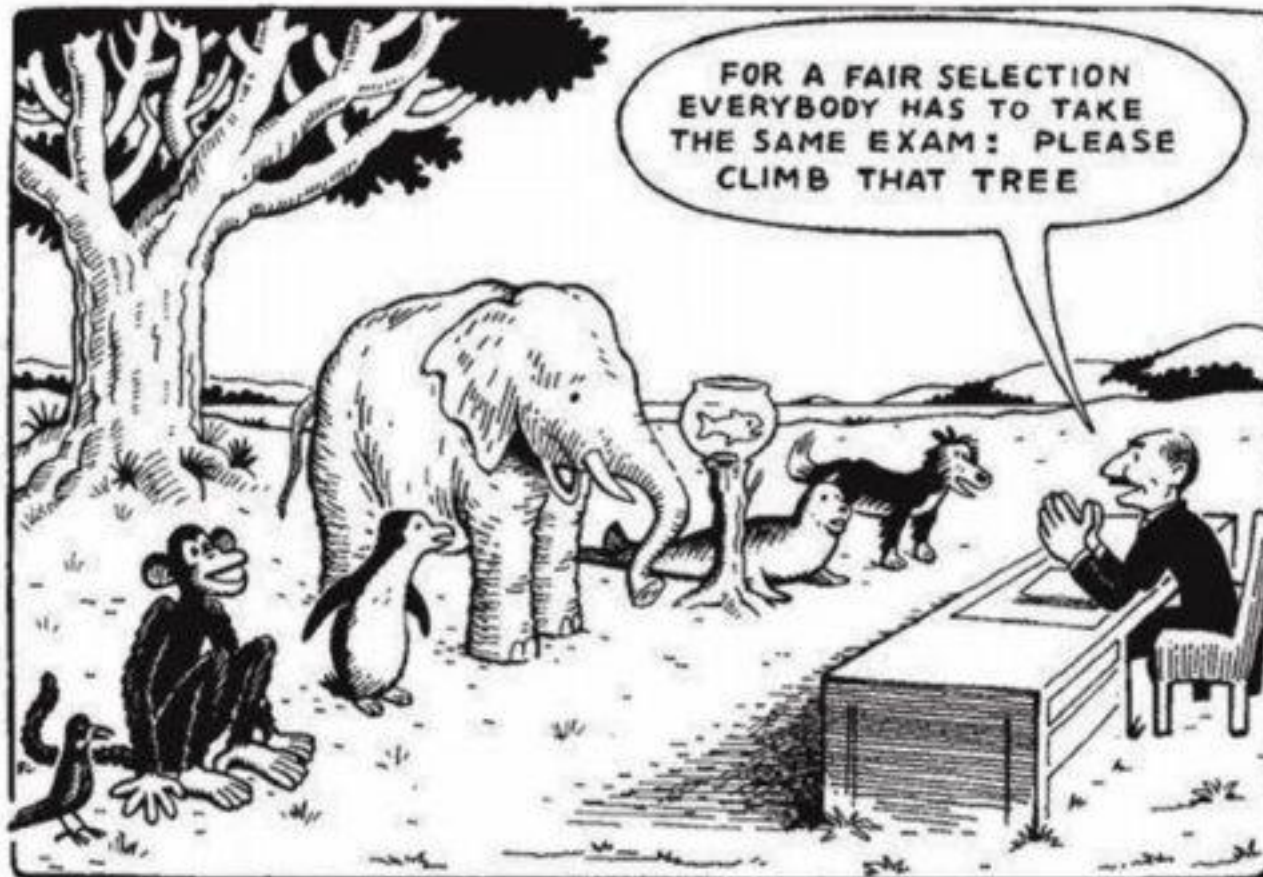
Case Study: Banning of AI Facial Recognition



Case Study: Banning of AI Facial Recognition

- San Francisco has become the first US city to ban the use of facial recognition technology by the police and local government agencies in May 2019
- Tech successfully identifies white male faces as these were used for training. Often misidentifies people of colour and women
- Bias could lead to them being disproportionately held for questioning when law enforcement agencies put the tech to use or wrongfully arrested
- Government ordered for further testing of tech prior to voting on reintroduction thereof in the future
- Assured public that it would be given notice prior to reintroduction

Fairness/Discrimination



Fairness/Discrimination

- Fairness is an immensely complex concept with different, sometimes competing, definitions.
- Fundamental component underpinning responsible systems, algorithmic processes should seek to minimise their potential to be unfair and maximise their potential to be fair.
- Social justice lens: potential for algorithmic systems to systematically disadvantage, or even discriminate against, different social groups and demographics is highlighted.

Fairness/Discrimination

- Social effects of algorithmic systems using big data for decision-making are seemingly endless.
- Demonstrate the need for clear mechanisms of accountability due to their potential to bring about consequences that are detrimental on various levels:
 - Detrimental to the individual: individual citizens might become the recipients of inaccurate decisions (e.g., facial recognition software) or be treated more harshly in comparison to others.
 - Detrimental to groups: where algorithmic processes appear to produce different results for different (demographic) groups, this often places some of those groups at a disadvantage.
 - Detrimental to society: entire societies are disadvantaged if the outcomes of algorithmic processes cannot be relied on to be accurate and/or neutral.

Case Study: Amazon Sexist Recruitment Bot

“Amazon's Secret AI Hiring Tool Reportedly 'Penalised' Resumes With The Word 'Women's'” (in Gizmodo)

“Amazon used AI to promote diversity. Too bad it's plagued with gender bias” (Mashable)

“Amazon scraps secret AI recruiting tool that showed bias against women” (Reuters)

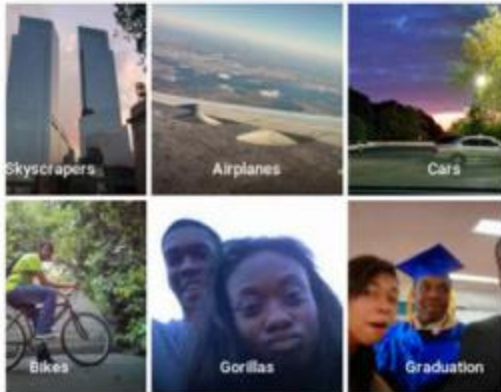
“Amazon scrapped 'sexist AI' tool” (BBC)

Case Study: Amazon Sexist Recruitment Bot

- Intended to review job applications and give candidates a score ranging from one to five stars
- AI system was trained on data submitted by applicants over a 10-year period, much of which came from men starting from development in 2014
- System effectively taught itself that male candidates were preferable
- Clear that the system was not rating candidates in a gender-neutral way because it was built on data accumulated from CVs submitted to the firm mostly from males
- The system started to penalise CVs which included the word "women". The program was edited to make it neutral to the term but it became clear that the system could not be relied upon
- The project was eventually abandoned

Case Study: Google Photo Tagging Blunder

 **STOP FORCED ABORTION LAWS IN A...**
@jackyalcine
Google Photos, y'all fu [REDACTED] up. My friend's not a gorilla.



6:22 pm · 28 Jun 2015

3,254 Retweets · 2,385 Likes



Follow

“Google engineer apologizes after Photos app tags two black people as gorillas” (Verge)

“Google apologises for Photos app's racist blunder” (BBC)

“Google says sorry for racist auto-tag in photo app” (Guardian)

Case Study: Google Photo Tagging Blunder

- As part of the new Photos app, users' photos were tagged and arranged automatically based on objects in the photos
- Example: pictures of cars are all arranged in an album appropriately labelled "cars." The tag feature learnt as it receives more data, refining its method for recognizing and categorizing objects
- Google's Photos application was found in June 2015 to categorize photos computer programmer Jacky Alcíné and his girlfriend (both black individuals) as "gorillas"
- Issue was due to consumer cameras poor facial recognition as a result of inadequate analysis of skin tones and lighting
- Google attempted to fix the algorithm, but ultimately removed various "tags" whilst promising to work on longer-term fixes that revolve around which labels could be problematic and better recognition of dark-skinned faces

Governance

- Big data is growing at an exponential rate, whilst legislation regarding the uses and application thereof seems to be lagging behind.
- The development and application of algorithmic systems incorporating big data is undergoing rapid growth with uncertain implications for citizens and society.
- Industry standards for best practice are all but non-existent.
- The interpretation of existing laws is sometimes uncertain when applied to algorithmic outcomes, and judicial experience is in short supply. While much of this is the result of rapid dynamic growth, it must not limit the rights and legal protection of citizens.
- Government will need to consider the adequacy of currency privacy rules and rules for access, ownership and use of personal data.

Governance

- Governance requires global dialogue and collaboration across borders.
- Without multilateral negotiation regulatory intervention for transparency and accountability risks being interpreted as protectionism or as an attempt to gain access to foreign trade secrets.
- Suggested policy options:
 - Establish a permanent global algorithm governance forum (AGF) for multi-stakeholder dialogue and policy expertise related to algorithmic systems and associated technologies, to provide a forum for coordination and the exchange of governance best practices
 - In international (trade) negotiations, protect ability to investigate algorithmic systems and hold parties accountable for violations of European laws and human rights

Education

- Need to ensure that new and current actuaries have the right skills in data science techniques through adjusting exam system, CPD and life-long learning
- Adjusting current actuarial curriculums to incorporate bigger focus on “Big Data” and its applications. Stellenbosch University has recently created its first Data Engineering qualification in 2019
- Actuaries are increasingly expected to have the necessary skillsets to prove their algorithms are not discriminatory to regulators, and making data more actionable and insightful to consumers.

Education

- Focus on educating non-technical professions on reasoning behind actuarial decision making
- Decision notifications should be standardised and short, akin to nutrition labels, while information should be limited to that which can impact a user's decisions, or wider public understanding.
- Investigative journalism and whistle-blowers play an important role in uncovering questionable uses and outcomes of algorithmic decision-making (e.g. Cambridge Analytica election manipulation)

Accountability

- Professionals bound by code of conduct, adhere to standards of practice and qualification, subject to counselling and discipline if they fail to do so
- Actuaries have professional obligations to uphold the reputation of the actuarial profession and fulfil the profession's responsibility to the public in the emerging area of Big Data
- In many situations, actuaries also have unique insights into the results and implications of the use of Big Data and must be willing and capable to explain such insights, where appropriate, to the key stakeholders of the work, such as regulators, consumers, company management, auditors, etc.
- Key attribute of the applicable standards: requirement for actuaries to provide explanations/rationales for their conclusions. Professional judgment from actuaries is critical in the utilization of Big Data in actuaries' work

Accountability

- Actuaries provide added value to Big Data work in their ability to “connect the dots” through a deep understanding of the subject matter.
- In exercising professional judgment, it is important for actuaries to be cognizant of the fact that without performing proper analyses or validation, the results of Big Data can be misleading.
- A combination of a good understanding of the context in which the data was obtained and avoidance of unthoughtful adherence to the results of a model can aid in better Big Data outcomes.
- The availability of new data and its use will test society’s willingness to accept the efficiency benefits compared to privacy considerations

Accountability

- With the proper background, an actuary can understand and direct the work of the Big Data multidisciplinary team based on their professionalism requirements and subject matter expertise.
- Actuaries are increasingly expected to have the necessary skillsets to prove their algorithms are not discriminatory to regulators, and making data more actionable and insightful to consumers.
- Companies also have a responsibility as part of their business-as-usual to protect any consumer information they collect, hold or use, but are also exposed to increasingly sophisticated and persistent cyber breaches.

Privacy

- Consumer rights vs consumer wants/needs
- What information are consumers willing to give or sign away in order to gain access to certain “free” services or prices (social media platforms, competitions, applications, etc.)?
- Some companies hoard data, unsure of its value or unclear if or when it will be useful to them but, all the while, reticent to delete or not capture it for fear of missing out on potential future value
- Increase in the volume of data held on people and the way it is used (or perceived to be used) may lead to an increase in privacy and discrimination concerns
- With the increase in information or data collection, little to no discourse regarding data deletion.

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- Merely compiling large amounts of personal data is a violation of privacy, even if the information is never used or never used in ways the individuals might object to
- With the increase in information or data collection, little to no discourse regarding data deletion.

Case Study: My Health Record

“As a doctor, here’s why My Health Record worries me” (Kerryn Phelps, various news outlets)

“My Health Record privacy framework 'identical' to failed UK scheme, expert says” (Guardian)

“Police can access My Health Record without court order, parliamentary library warns” (Guardian)

“Why I'm opting out of the government's digital health record and you should too”

Case Study: My Health Record

- My Health Record (in Australia) is a digital medical record that stores medical data and shares it between medical providers
- Australia's impending (July 2018) "My Health Record" system has a privacy framework that is identical to a failed system in England that was cancelled after it was found to be selling patient data to drug and insurance companies
- Privacy advocates have raised concerns about the security of information, particularly for those with conditions that might result in discrimination, such as mental health problems or HIV
- Questions raised over potential for unrelated secondary uses
- Process of registration, opt-out instead of opt-in, widely criticized
- Users not able to delete any history records

Pitfalls/Shortcomings of Big Data

- Overconfidence in the accuracy of both original and purchased data can lead to a false sense of security that can compromise these efforts to such an extent that it undermines the overall strategy
- Surveys conducted have shown:
 - Most collected data is inaccurate
 - Data collected not an accurate reflection of population
 - Inaccuracies in collected/observed data
- Impacts of inaccurate or incomplete data include:
 - Underestimating customer worth and not capitalizing on the power of habit
 - Decreased customer loyalty and revenue
 - Moving the customer relationship along too fast
 - Delivering the wrong or inappropriate micro-targeted message
 - Assessing risk inaccurately
 - Predicting inaccurate outcomes

Pitfalls/Shortcomings of Big Data

- Cause of bad data
 - Outdated or incomplete information may persist due to the cost and/or effort of obtaining up-to-date information
 - Multiple data sources may incorrectly interweave data sets and/or be unaware of causal relationships between data points and lack proper data governance mechanisms to identify these inconsistencies
 - Using biased sample populations
 - Relying on self-reported data versus observed (actual) behaviours
 - Incorrect models
 - Malicious parties may corrupt data

Pitfalls/Shortcomings of Big Data

- Important considerations
 - Know the data sources
 - Explore the data yourself
 - Keep expectations for big data in check
 - Use and draw conclusions from big data judiciously
 - Complement big data with other decision-making tools
 - Be nimble and responsive
 - Reward customers for correcting their data

Literature Sources

1) **“Predictability Inaccurate – Prevalence and Perils of Bad Big Data”**

- Deloitte Review, Issue 21, July 2017. Lucker, J., Hogan, S.K., Bischoff, T.

2) **“What Data Science means for the future of the Actuarial Profession”**

- Institute and Faculty of Actuaries, Sessional Research Event, London, 3 April 2017

3) **“A Governance Framework for Algorithmic Accountability & Transparency”**

- European Parliamentary Research Service, Study: Panel for the Future of Science and Technology. April 2019. Various

4) **“Big Data and the Future Actuary”**

- Society of Actuaries: Innovation and Technology, April 2019. Schwartz, S., Douglas, M.

5) **“Big Data and the Role of the Actuary”**

- American Academy of Actuaries: Big Data Task Force, June 2018. Various

6) **“Understanding Algorithmic Decision Making: Opportunities & Challenges”**

- European Parliamentary Research Service, Study: Panel for the Future of Science and Technology. March 2019. Various

Thank you



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