What do we do with data biases?

INTRODUCTION TO DATA ETHICS

Shalini Kurapati, PhD
Co-founder and CEO, Clearbox AI

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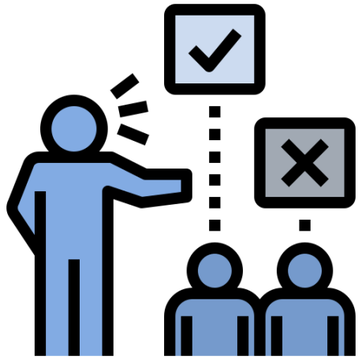
What is bias?

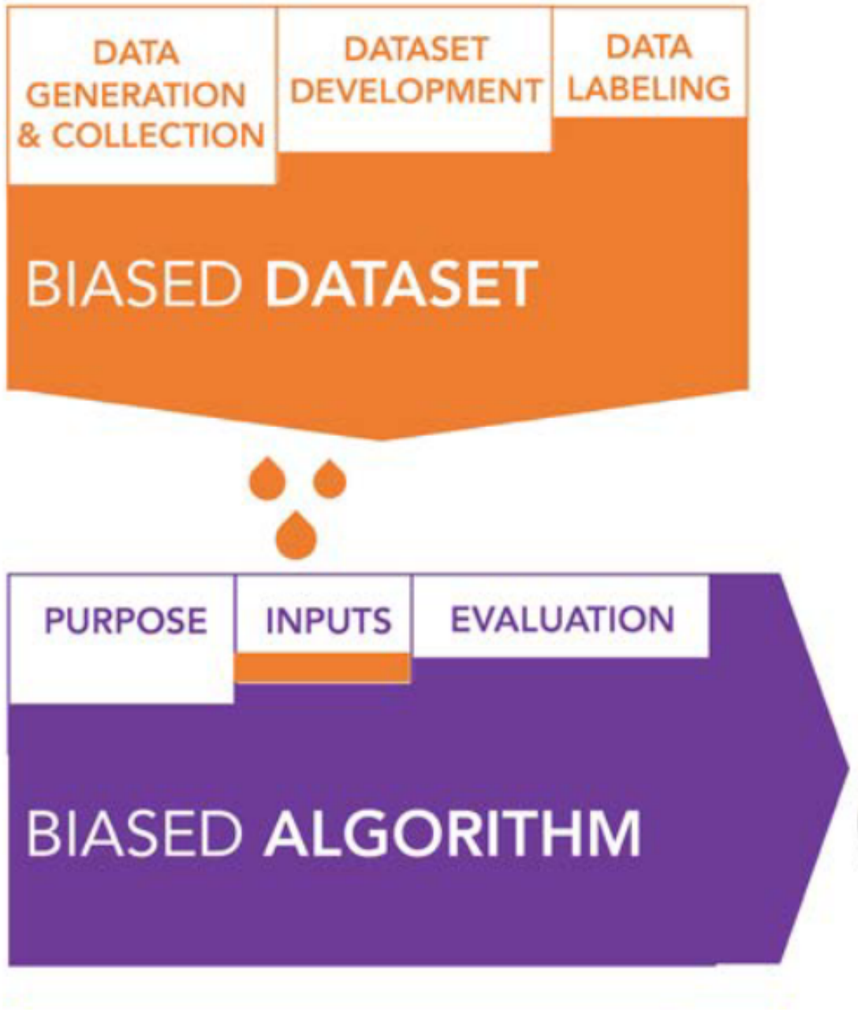


- First thought in data ethics
- Prejudice, for or against a person, group or an idea- unfair
- Data ethics- data bias
- Under, over, or mis-representation
- Harmful effects if biased data is used for decision-making

[1] Icon made by noomtah from www.flaticon.com

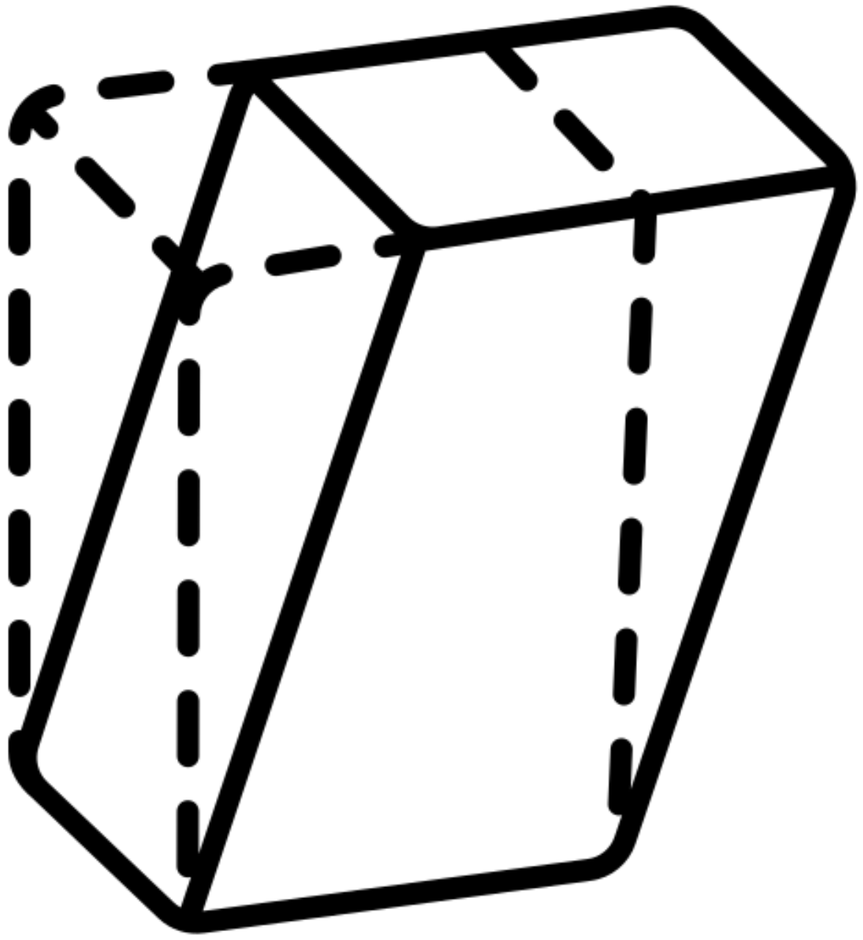
Anytime, anywhere

- At all stages of data and life cycles
- Data collection
- Data cleaning, preparation, development
- Data labeling



Data specific biases

- Technical or statistical process bias
  - Sampling bias- representation
  - Measurement bias
  - Self-reporting bias
  - Labeling bias
- Human and Systematic bias
  - Gender
  - Ethnicity/minorities
  - Culture



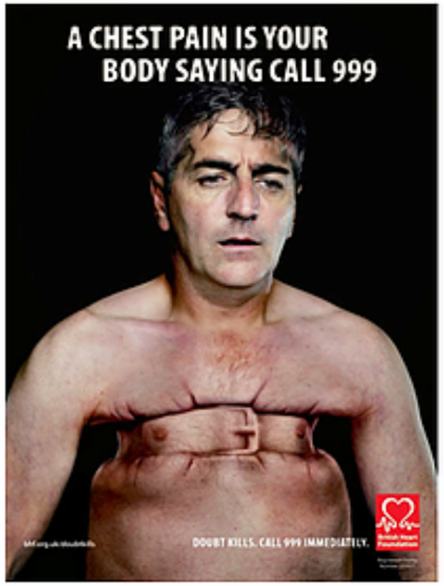
[1] Icon made by Flowicon from www.flaticon.com

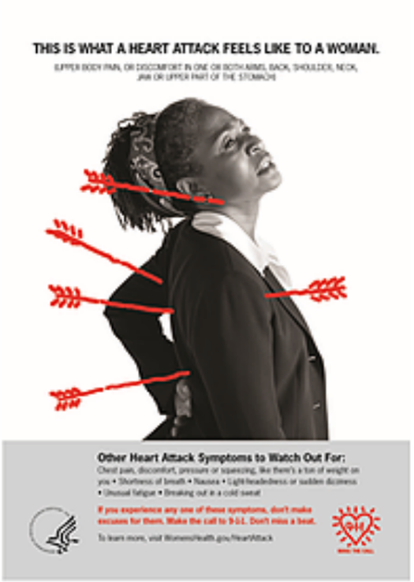
Representation is crucial

- Lack of representative data
- Facial recognition- better outcomes with a white mask
- Hand soap dispensers to healthcare outcomes
- Recommended: Coded bias

[1] https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms

A mirror to our stereotypes



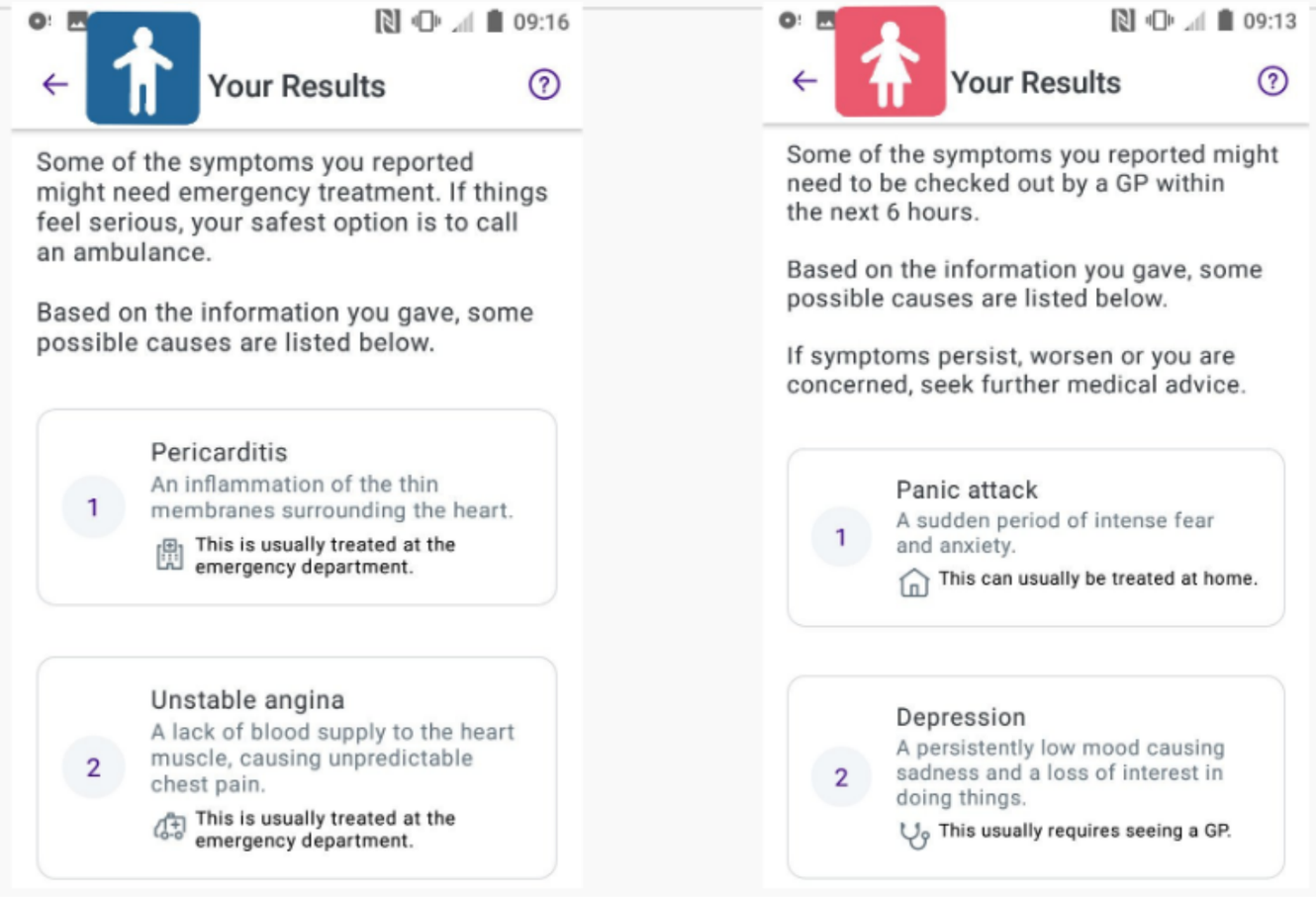


W G H

- Medical studies and data, historically done on white males
- E.g. Heart attack symptoms are different for men and women
- What happens if we use a diagnostic app using this data?

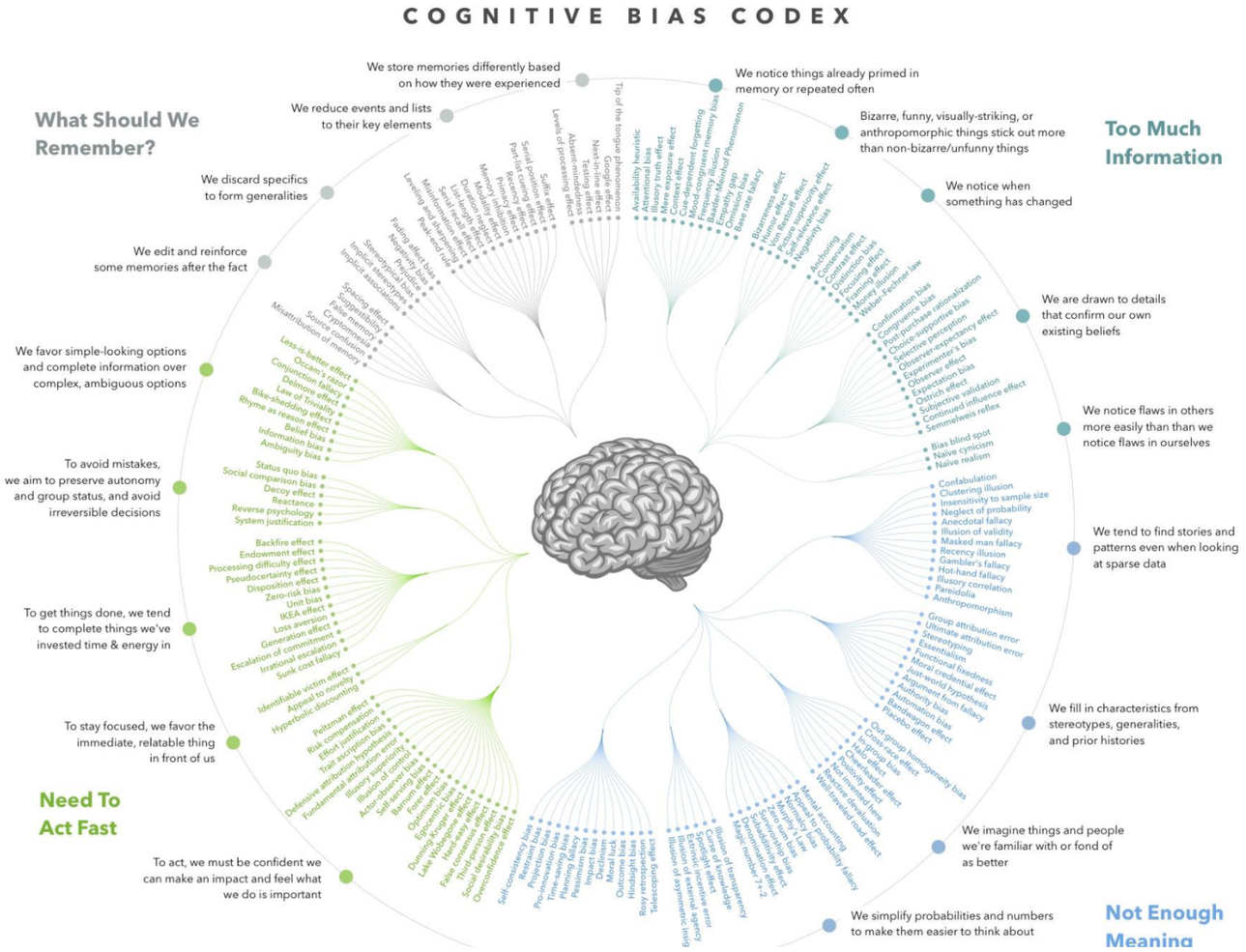
[1] https://womeningh.org/

Serious impact



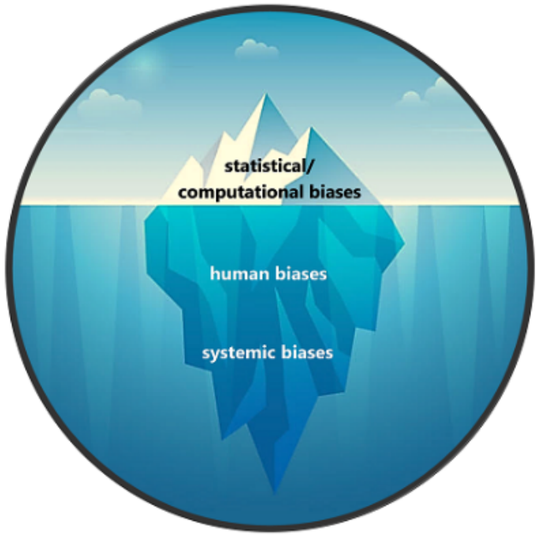
- Heart attack symptoms- emergency for a man, panic attack for a woman

Way too many and counting!



[1] CC BY, John Manoogian III (JM3)

Tip of the ice berg



- Statistical biases tip of ice-berg
- Human and systematic bias- attitude and societal changes
- Test for bias, prevention and mitigation, open to feedback

[1] Schwartz, R. , Vassilev, A. , Greene, K. , Perine, L. , Burt, A. and Hall, P. (2022), Towards a Standard for Identifying and Managing Bias in Artificial Intelligence, National Institute of Standards and Technology

Let's practice!

INTRODUCTION TO DATA ETHICS

Fair data or FAIR data?

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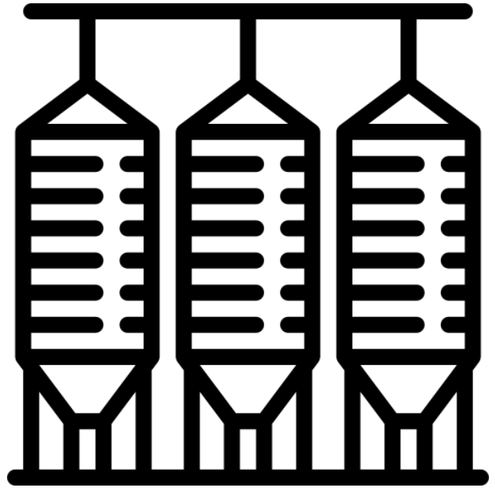
A new FAIR data you say?

- FAIR: **F**indable, **A**ccessible, **I**nteroperable, **R**eusable
- Fairness or unbiased data
- But what are FAIR data principles
- Valorize data through efficient data management systems
- Reuse of data, better awareness, retrieval
- Making data ready for collaboration and sharing
- Scientific research, more data intensive industries

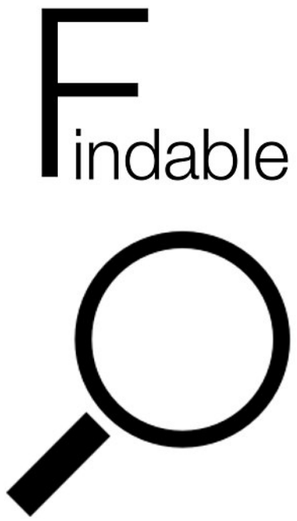
Why FAIR?



- Organizational silos, forgotten data
- Transparency, innovation and collaboration
- Digital and computing technologies/AI
- Data management for reuse by humans and machines

[1] Icon made by Smashicons from www.flaticon.com

Findable



- Data description, rich meta data
- Persistent link, like a *doi*, no broken links
- Human and machine friendly

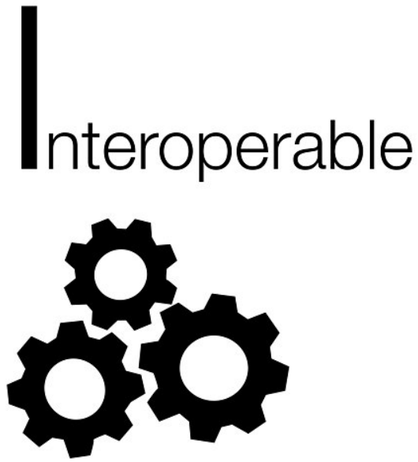
[1] CC BY-SA 4.0, Sangya Pundir

Accessible

- Physical or digital infrastructure
- Accessible through login or openly

[1] CC BY-SA 4.0, Sangya Pundir

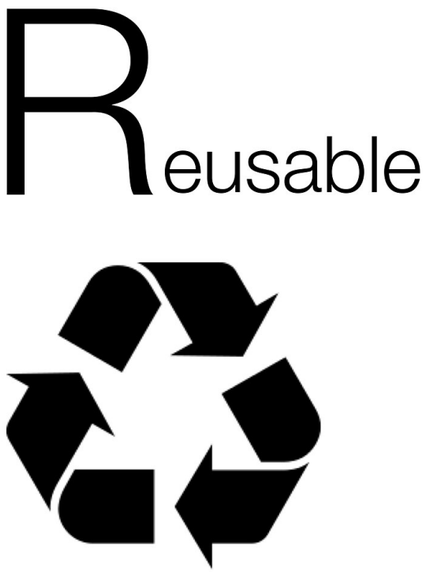
Interoperable



- Data works across different OS, file formats, devices
  - Windows/PC, Mac, Linux
  - e.g. spreadsheets .csv instead of Ms Excel
  - standards for interoperability

[1] CC BY-SA 4.0, Sangya Pundir

Reusable



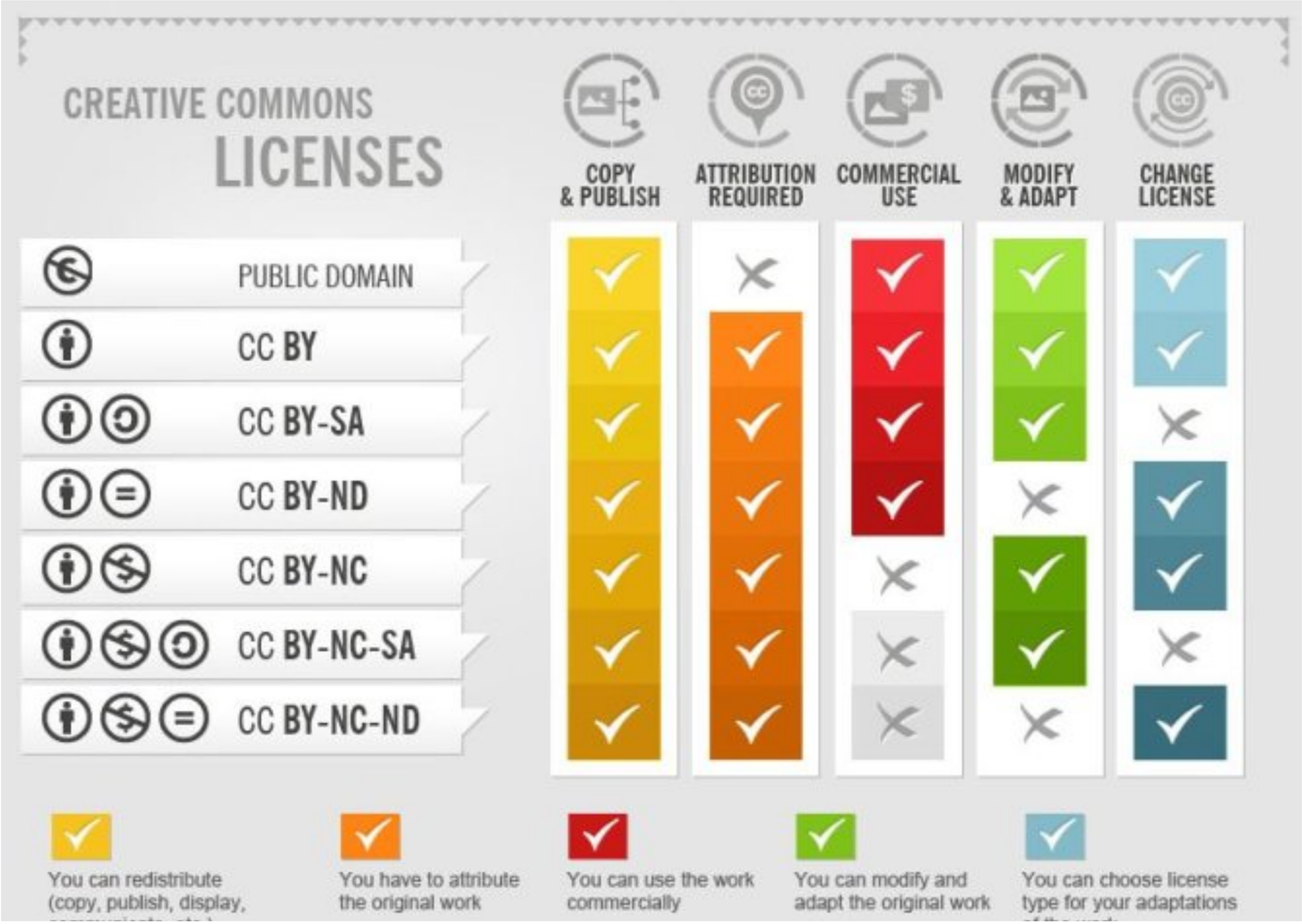
- Reuse data with clear rules
- Human and machines

[1] CC BY-SA 4.0, Sangya Pundir

Terms of reuse

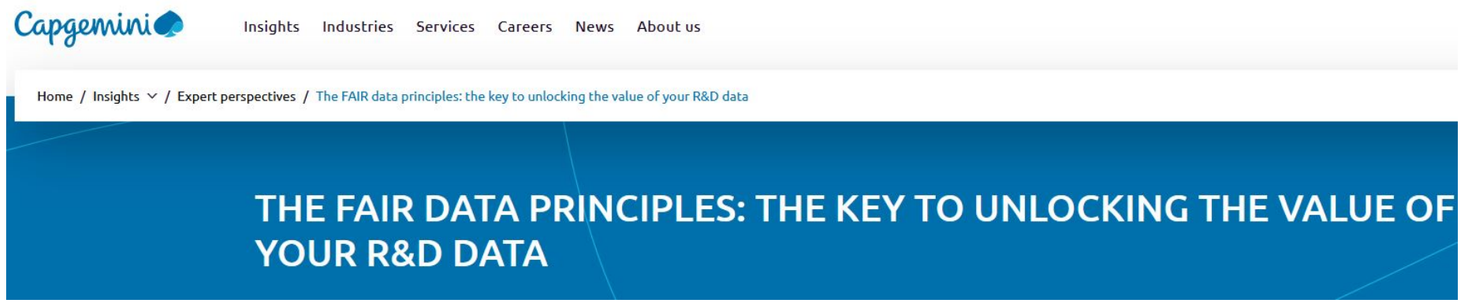
- Clear expectations
- Documentation for use, adaption
- Credit, where credit is due
- Many ways- copyright, licenses

Data licensing- Creative Commons



[1] Foter, CC-BY-SA

Industry needs to go FAIR



- FAIR data common in scientific research data management
- Pharma companies (Janssen, Novartis), technology firms (Deloitte, Accenture)
- Resource intensive at first, attitude change
- Data ethics
- Innovation and collaboration leading to societal benefits, like alternative energy disease treatment

[1] https://direct.mit.edu/dint/article/2/1-2/276/10011/The-Need-of-Industry-to-Go-FAIR [2] https://www.capgemini.com/insights/expert-perspectives/the-fair-data-principles-the-key-to-unlocking-the-

Let's practice!

INTRODUCTION TO DATA ETHICS

Open data for science and society

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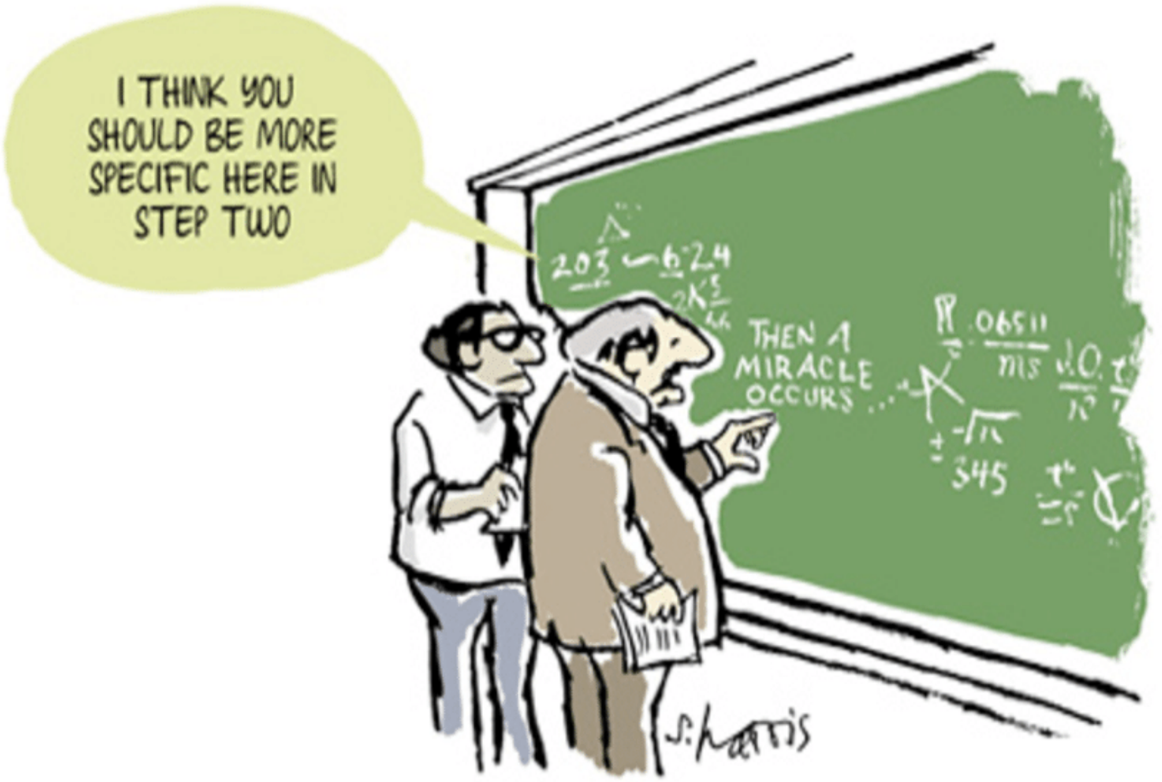
Why open up data?

- Data ethics discussion are around privacy
- Collaborative nature of innovation
- Benefits to science, innovation, economy and society
- Opportunities and challenges

In scientific research

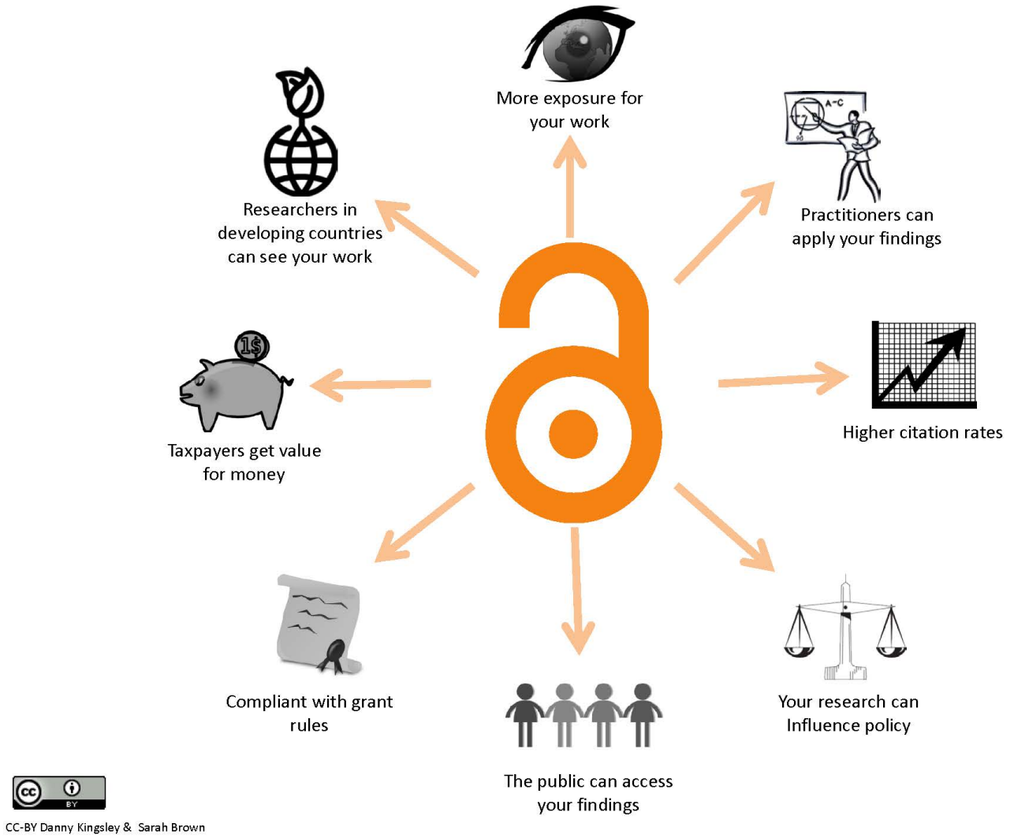
- Scientific articles often don't provide data
- Verification of results
- Reproducible research and generalization
- Advancement of the scientific endeavor
- Push for open data
- Data for others to reuse, public funding



[1] Cartoon source: Sidney Harris in American Scientist, Nov-Dec 1977

Inclusive and equitable science

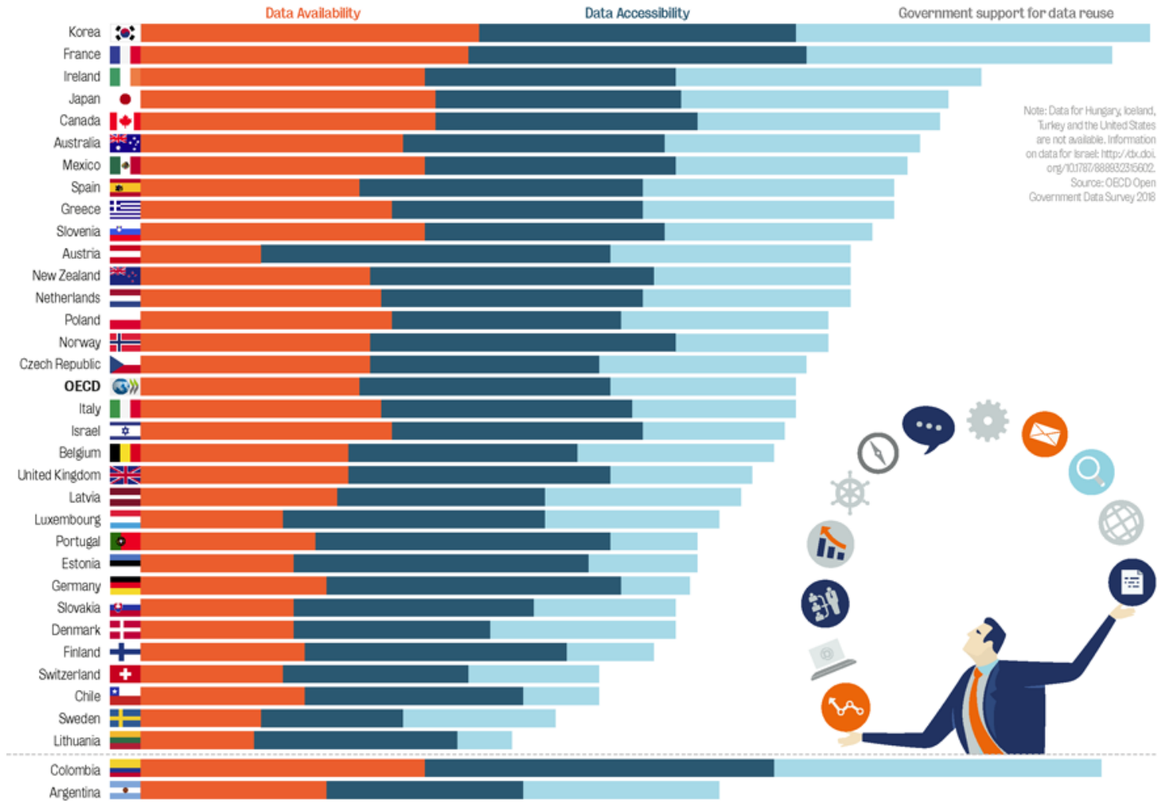
- More exposure and impact of scientific outputs
- Practitioners and policy makers can adopt findings
- Value for money for taxpayer, research funding
- Public engagement, citizen science
- Researchers in developing countries can benefit



[1] Image source: Danny Kingsley and Sarah Brown under a CC BY license

Open government data

- Transparency, value creation- data as a common good
- Large volumes of data
- Reuse of data to enhance business creation, innovation
- Citizen engagement and citizen-centric services



[1] https://www.oecd.org/gov/digital-government/policy-paper-ourdata-index-2019.htm

Success stories

Business based on open data

- ApplyBoard, Canadian company
- Online platform for international student recruitment
- Open data on student visa processing times

Global Open Data for Agriculture and Nutrition

- Agricultural and nutritional data to be available, accessible, usable and unrestricted
  - Land-use and productivity data
  - Hydrological, soil data
  - Pest and disease management
- Eradicate hunger, food security, sustainable agriculture

[1] https://www.godan.info/agriculture [2] https://open.canada.ca/en/story/applyboard

Work in progress

- FAIR- Findable, Accessible, Interoperable, Reusable, resource intensive
- Data quality, bias
- Data privacy, data ownership
- Attitude and cultural shift

Let's practice!

INTRODUCTION TO DATA ETHICS

Evolving accountability and impact

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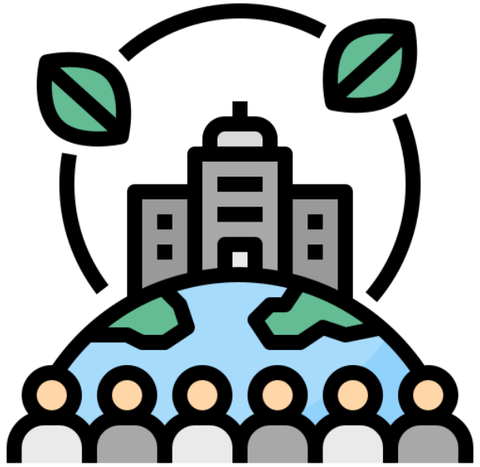
Accountability is not the same as compliance

- Focus on data privacy and protection
- Compliance
  - GDPR- General Data Protection Regulation of the EU
  - Controllers & Processors
- Evolving
  - Regulations
  - Rights and attitudes
  - Environment and society
  - Progress

[1] Icon made by Vectors Tank from www.flaticon.com

Impact and risk assessments



- Data protection impact assessment
- Residual risks - risks of re-identification
- Fairness and discrimination
- More to accountability

[1] Icon made by noomtah from www.flaticon.com

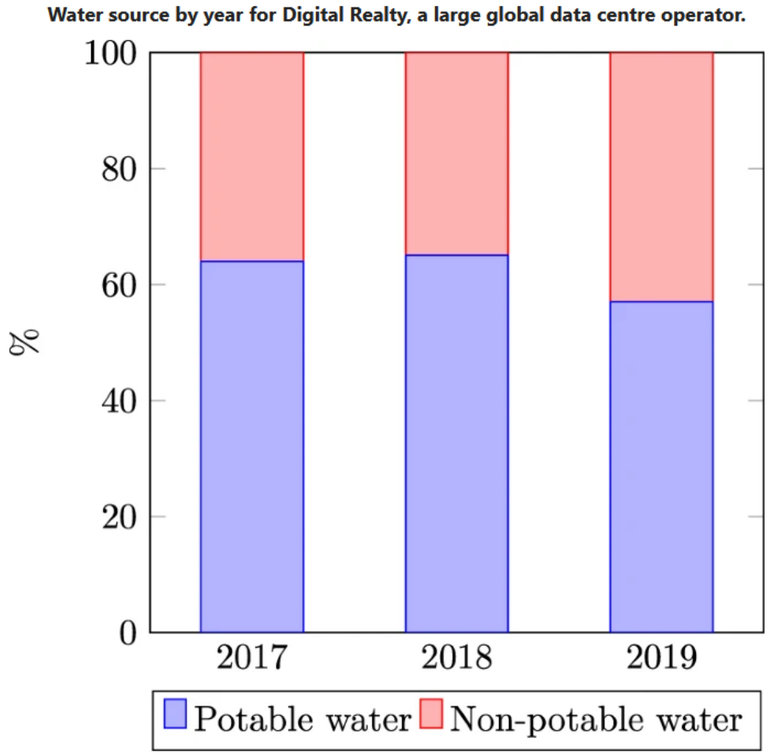
Not your obvious data ethics topic

CARE Principles for Indigenous Data Governance

- Good data management and protection not sufficient
- Sensitive to power dynamics and historical injustices
- Data ethics for reconciliation, CARE for indigenous data governance
- Data generated by, from indigenous people
- Collective Benefit, Authority to control, Responsibility, Ethics

[1] https://www.gida-global.org/care

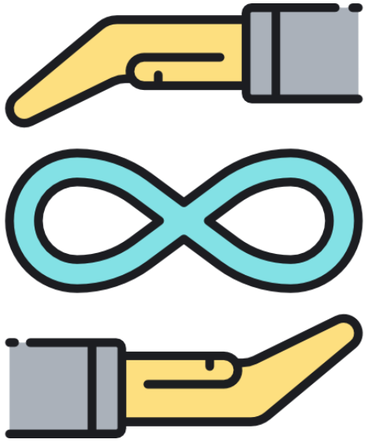
Data and drinking water



- Data centers use potable water for cooling, how to reduce?

[1] https://www.nature.com/articles/s41545-021-00101-w

Accountability is continuous



- Regulations, codes of conduct
- Analytics, AI impact assessment
- Monitoring and oversight data activities
- Stakeholder analysis
- Competitive advantage, future-proof

[1] Icon made by Flat-icons-com from www.flaticon.com

Let's practice!

INTRODUCTION TO DATA ETHICS

Congratulations!

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Understanding Data Ethics

- Ethics vs. Data ethics
- Beyond do no harm
- Data ethics and AI ethics

Data ethics: Now and forever

- Ethics across the data life cycle
- Data protection and security
- Trust and transparency
- Informed consent and data ownership

Data for good

- Data-specific biases
- fair data or FAIR data?
- Open data for science and society
- Evolving accountability and impact

All the best!

INTRODUCTION TO DATA ETHICS