# *Digital Futures of Professional Work*

Richard Edwards and Tara Fenwick

**ESRC 'Code Acts in Education' Project**

# Practices and knowledge (and identities) are being transformed

Image: Retrieved from http://madmanbanterings.blogspot.com.au.
madmanbanterings. (2014, July 17). Robotic Surgery: An Ethical Dilemma? [Blog post].

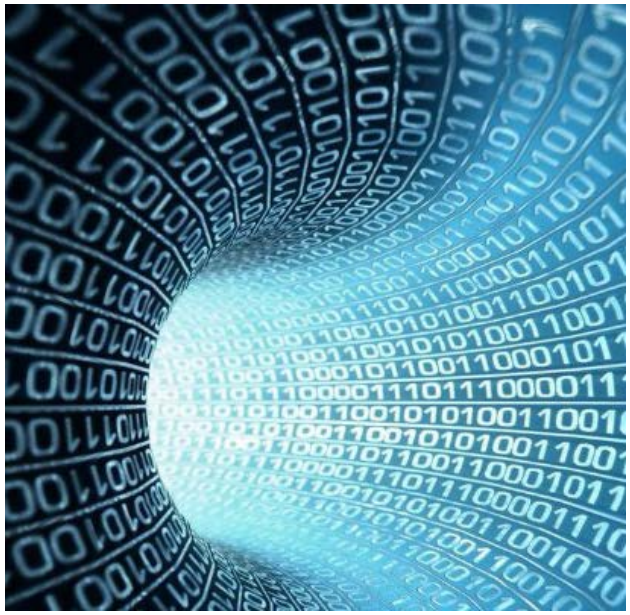
Image: Retrieved from http://www.bbc.com/news.
Triggle, N. (2011, May 6). Call for fewer heart transplant units. *BBC News*.

How are big data, software code & machine learning transforming professional practices?

What are the key issues of these transformations for higher education?

What are implications for professional education?

# What is “big data”?



- huge volume
- high velocity
- diverse variety, exhaustive scope, fine grained
- conjoins different data sets
- integrates different kinds of data

Image: Retrieved from https://www.linkedin.com. Hall, A. (2015, May 8). Computer Science Misconceptions. *LinkedIn.*

Image: Retrieved from http://www.borgenmagazine.com Wang, C. (2016, March 30). Big Data and International Development Policy. *Borgen Magazine.*

# Big data is collected continually through ...

- Directed data
  - Intentionally gathered by human operators
- Automated data
  - embedded sensors in objects, environmental or clickstream measuring
- Volunteered data
  - content posted by users

*(Kitchen, 2014)*

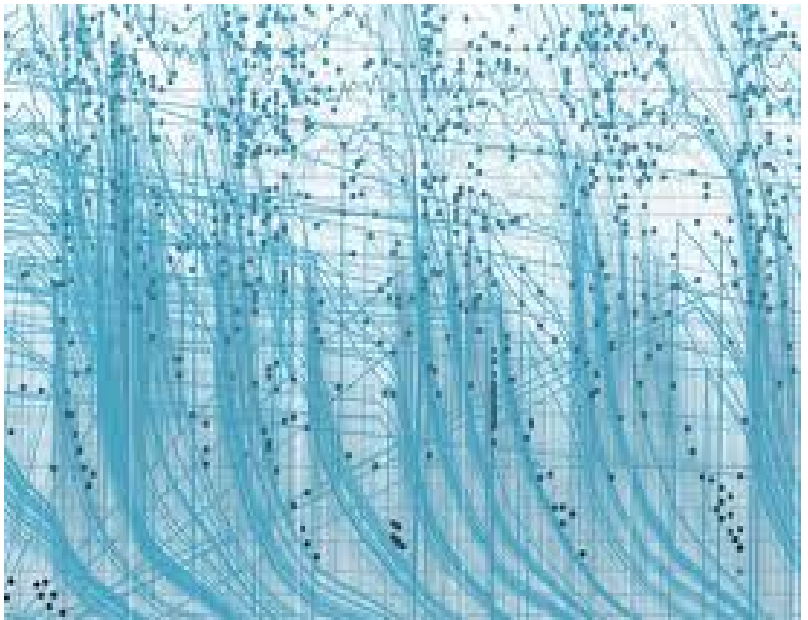
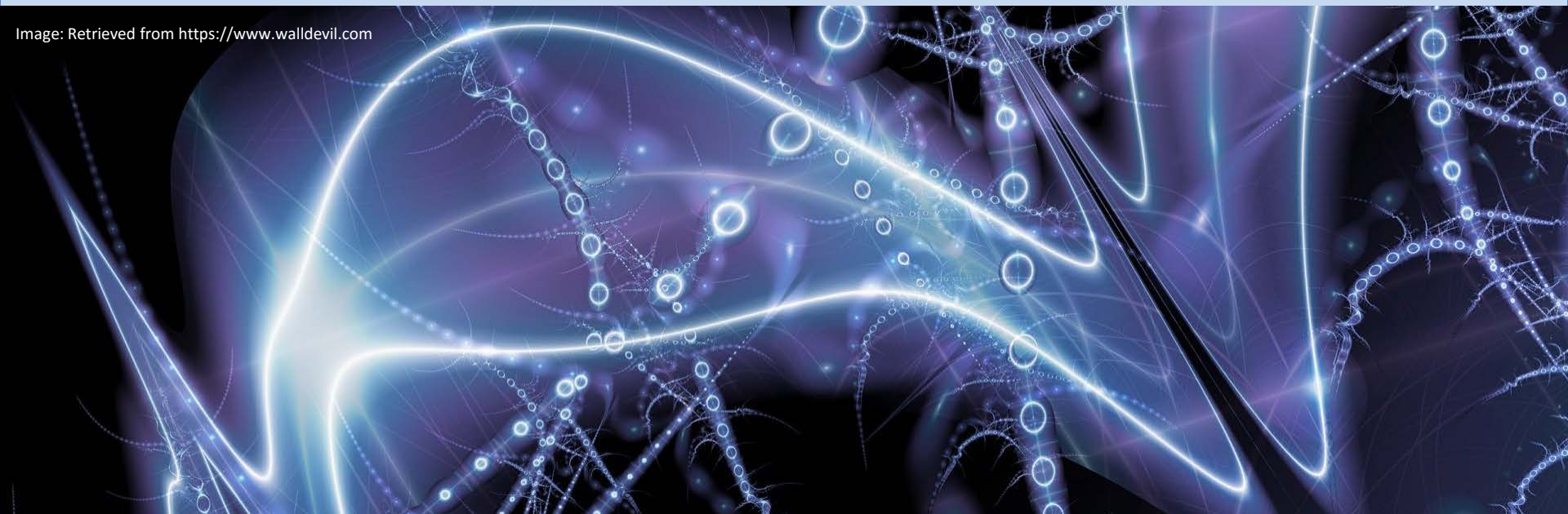


Image: Retrieved from http://news.sys-con.com Newswire, PR. (2017, October 30). Mobile Photo Connect Conference Is Now Visual 1st.

# Code and big data

- coded objects
- coded infrastructures
- coded processes

*(Kitchen and Dodge, 2011)*



# AI and Machine Learning

- the training of algorithms – supervised and unsupervised
- pattern recognitions and predictive analytics

Image: Retrieved from https://wall.alphacoders.com Odobenus. (2015). Robot & Skull [wallpaper]. Wallpaper Abyss.

# Medicine

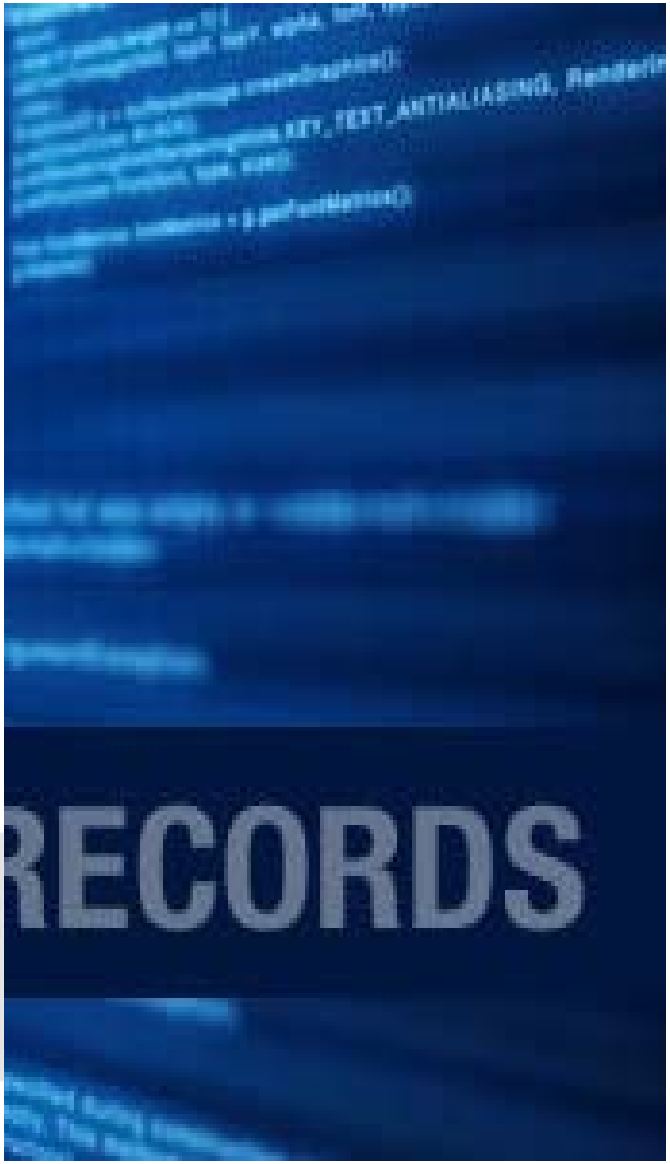
- "up to 80% of diagnosis in future will be conducted through computers" (Vinod Khosia, *Do we need doctors or algorithms*?)
- "self tracking"

*Remotoscope™*

## How big data could be used to predict a patient's future

Datasets will soon be used to foresee and prepare for individual illnesses as well as periods of increased demand on services

Wayne Parslow
Guardian Professional, Friday 17 January 2014 08.30 GMT


According to the hospitals new electronic patients records system he's pregnant.

# Law

- proliferation of service into networks of technology entrepreneurs
- predictive analytics 'changing the responsibility of an attorney'


*Richard Susskind, Tomorrow's Lawyers, 2013*

# Human Resources


Image: Retrieved from https://www.cnbc.com. Umoh, R. (2017, July 28). 3 reasons why millennials want to work for Google and Amazon so badly. *CNBC.*

- retention algorithms
- predictive modeling to identify people problems
- hiring algorithm – predicts which employees will succeed

# Building professionals

- architects
- servicing engineers
- data integration specialists
- document managers
- planners
- ‘professionalised client’
- building contractors

*(Jaradat et al 2013)*

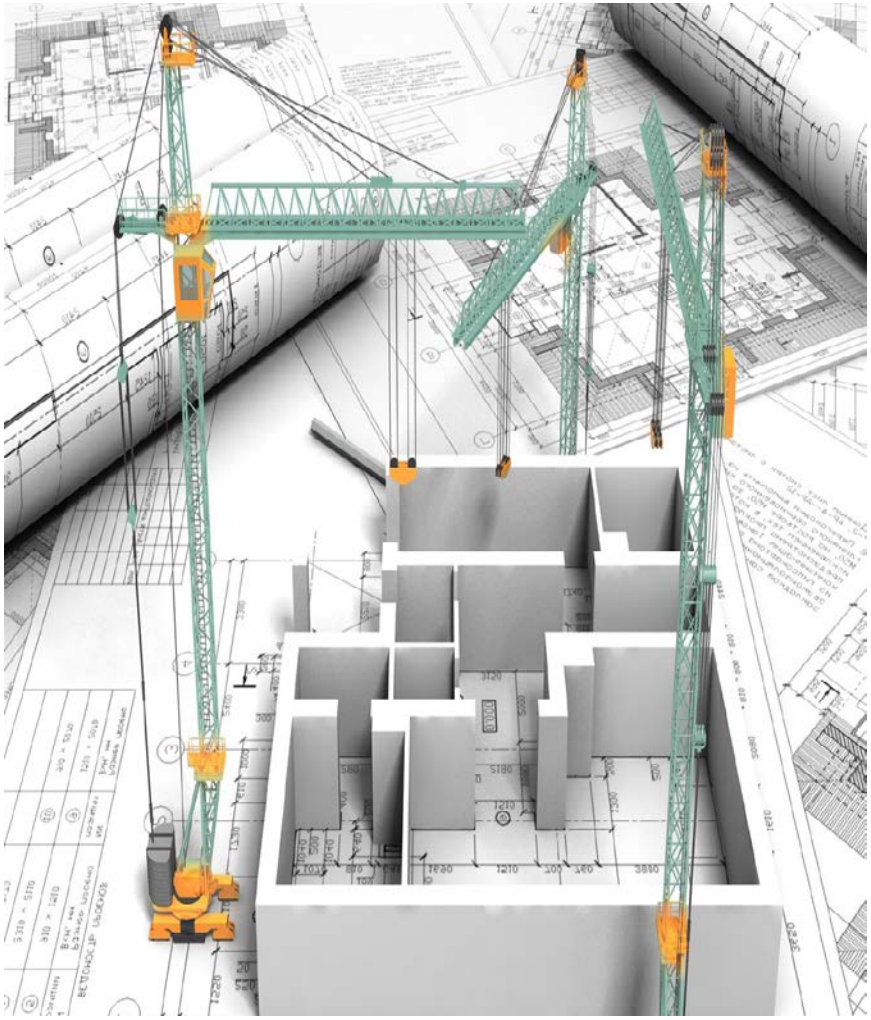
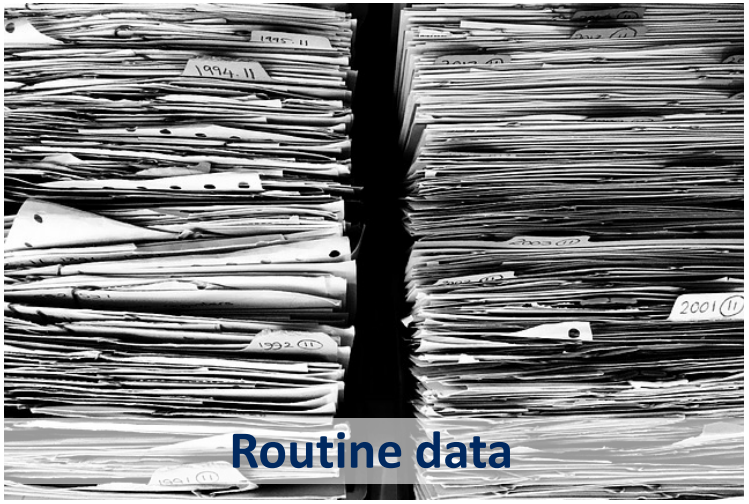


Image: Maiers, T. (2016, July 16). The Phases of Architecture - Phase One - Pre-Design. *LinkedIn.* https://www.linkedin.com

# **Data sharing for dementia care** (Eric Meyer, OII, University of Oxford

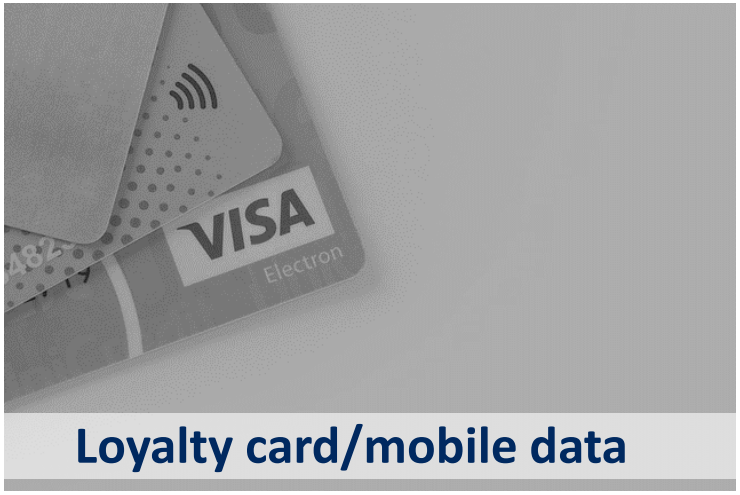
**Medical data**

**Purposively collected data**

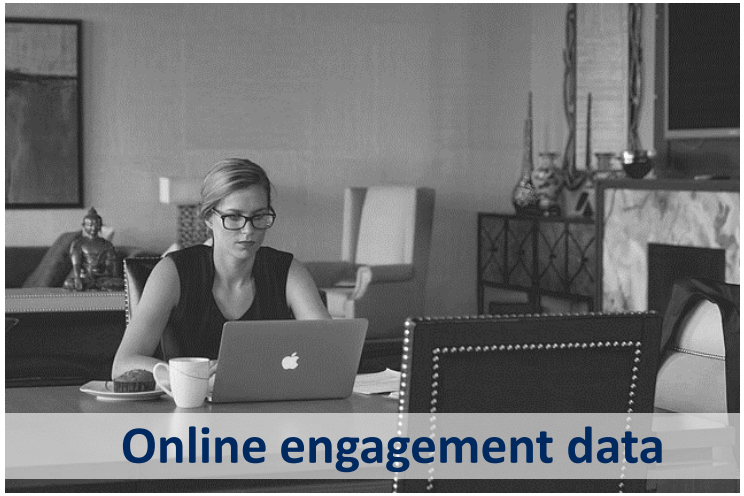


**Routine data**

**Non-medical data**




**Loyalty card/mobile data**



**Online engagement data**

# Policing

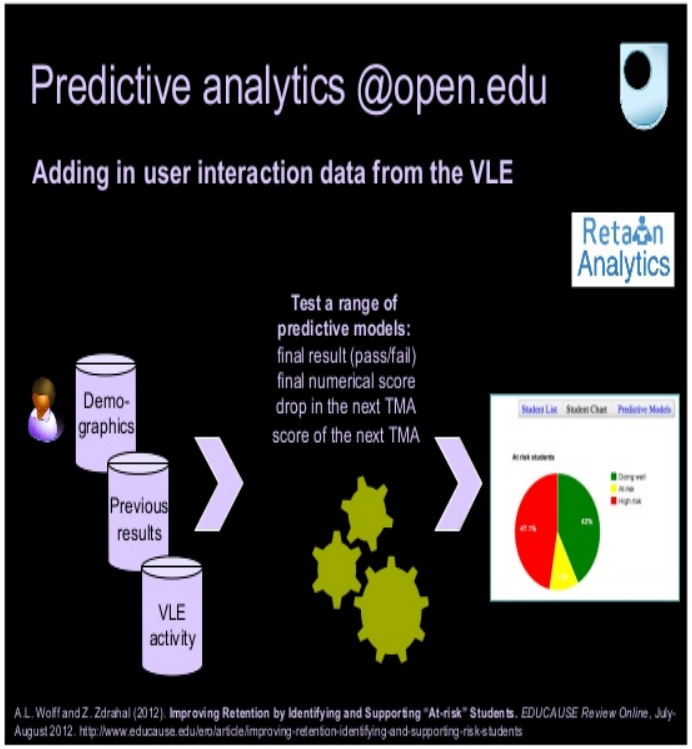
- AI identification of crime hot spots

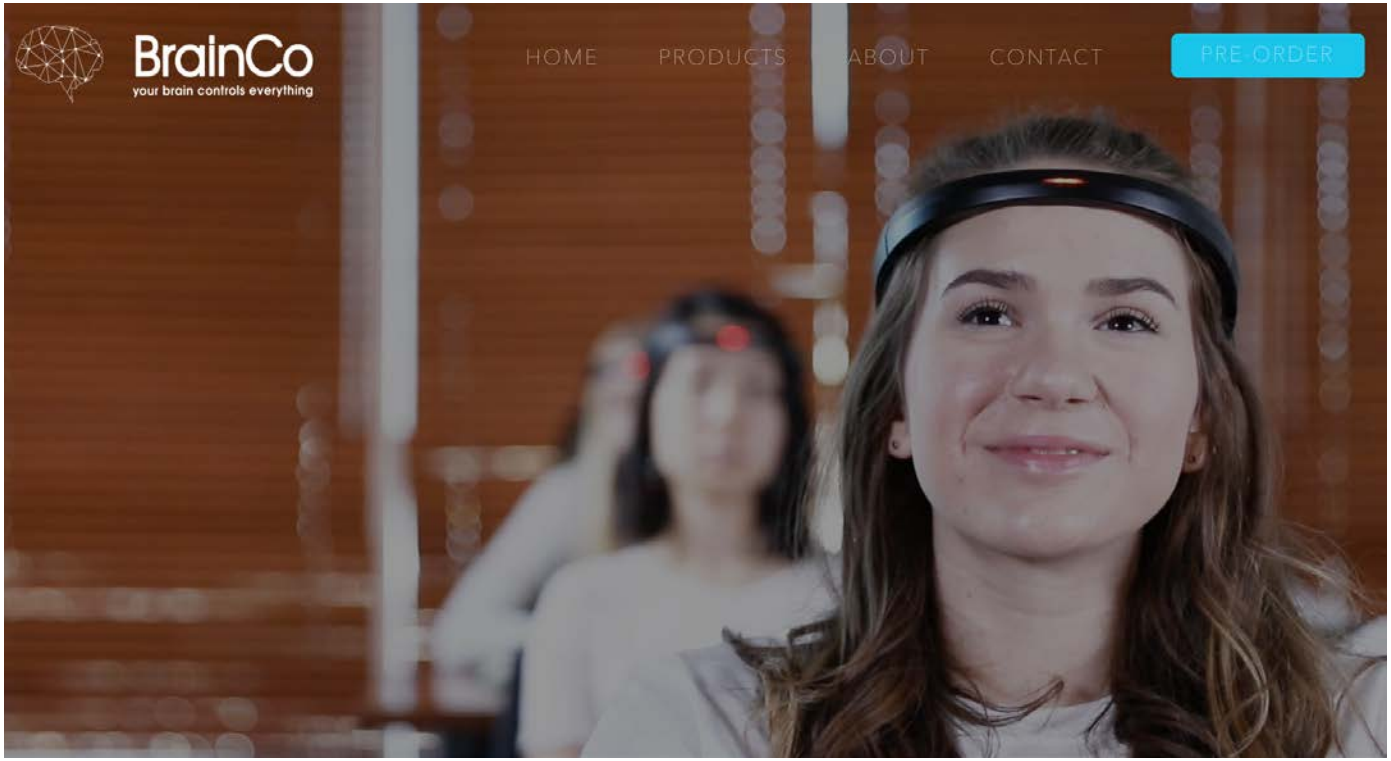

Image: retrieved from IBM. http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/crimefighting/transform/

# Education

- Learning analytics
- Personalised learning
- Socio-emotional learning and neurostimulation
- Teacher evaluation and rewards
- Assigning dropout prediction scores
- Matching teachers to ‘the right classes and students’
- Benchmarks performance against like universities
- Predicting maximum alumni givers

*(Edwards & Fenwick 2016, Williamson 2017)*






## FOCUS EDU

Focus EDU is the world's first integrated classroom system that improves education outcomes through real-time attention level reports.

WATCH VIDEO

# What are the key issues of these transformations for higher education?

- for individual professionals
- for the professions as professions
- for organisations as employers
- for professional and regulatory bodies
- for structure of labour market

# Opportunities

- expanding the boundaries of ‘routine’ decision-making
- abundant sources of diverse real-time, fine-grained, formerly difficult-to-access data
- new connectivities and relationships
- ever-more-accessible information

Image: Retrieved from https://archidose.blogspot.com.au Hill, J. (2015, March 27). Hybrid solitary... semi-social quintet... on cosmic webs...[blogpost]. A Daily Dose of Architecture.

# Issue 1 - digital data and decisions

- problems framed and solved through technical calculation
- context of data collection often unavailable
- ethical and political dimensions removed
- ambiguities and tensions removed

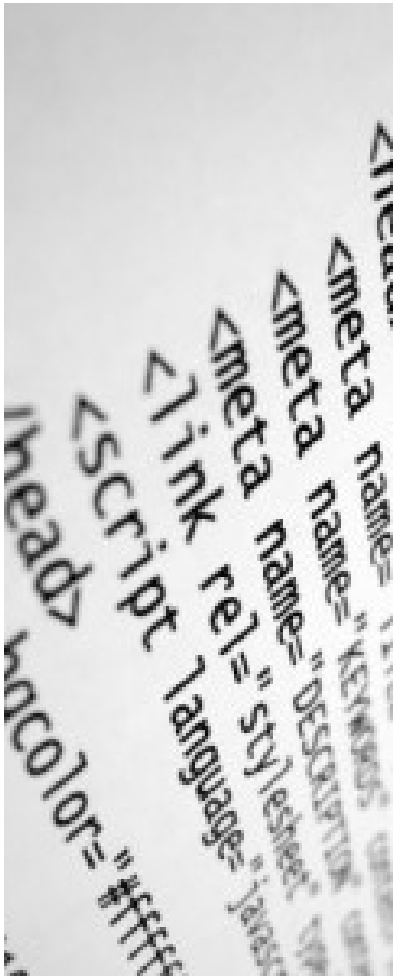



Image: Retrieved from https://www.designcontest.com. Grace. (2012, March 13). Knowing When To Code Your Own Web Design [blogpost]. *Design Content*.

# Issue 2 - reliance on comparison & prediction

- runaway feedback loops
- deference to precedent
- built in biases
- entrenching existing inequalities

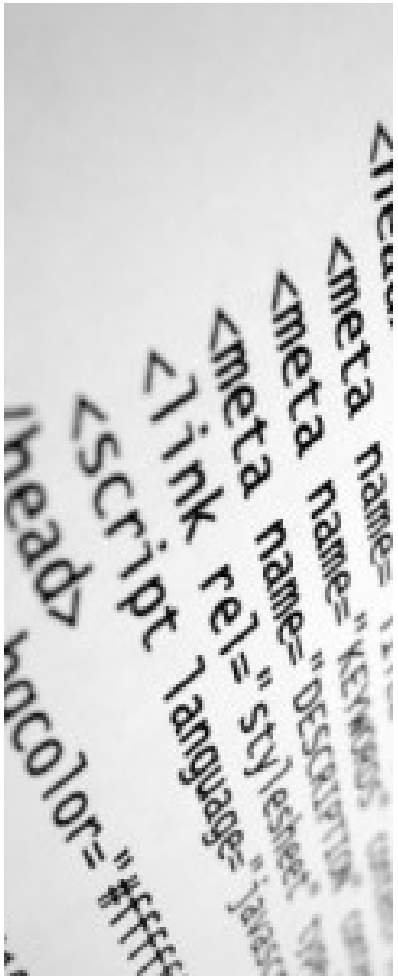



Image: Retrieved from https://www.designcontest.com. Grace. (2012, March 13). Knowing When To Code Your Own Web Design [blogpost]. *Design Content*.

# Issue 3 – non transparency

- much data accumulation & calculation is automated. Much is invisible.
- faulty decision processes hard to challenge
- security of data used to train AIs

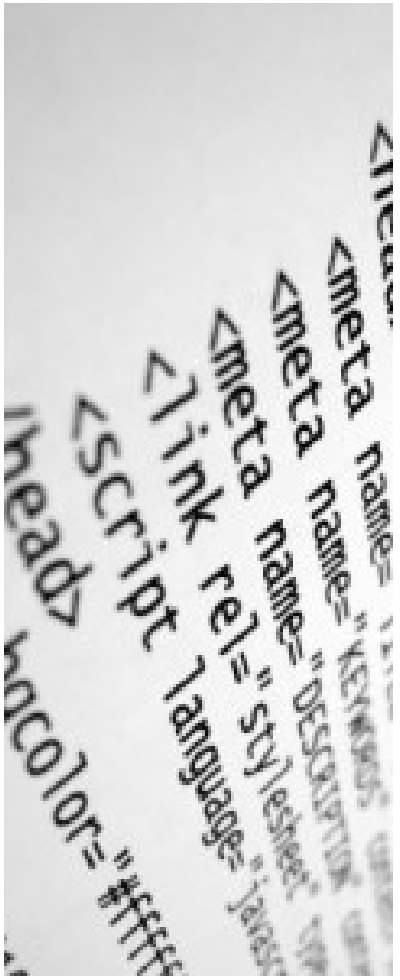



Image: Retrieved from https://www.designcontest.com. Grace. (2012, March 13). Knowing When To Code Your Own Web Design [blogpost]. *Design Content*.

# Issue 4 – privatised knowledge work

- algorithms invisible, kept private (IP)
- monopoly of single corporations
- AIs trained with behaviorism
- little regulation
- accountability?

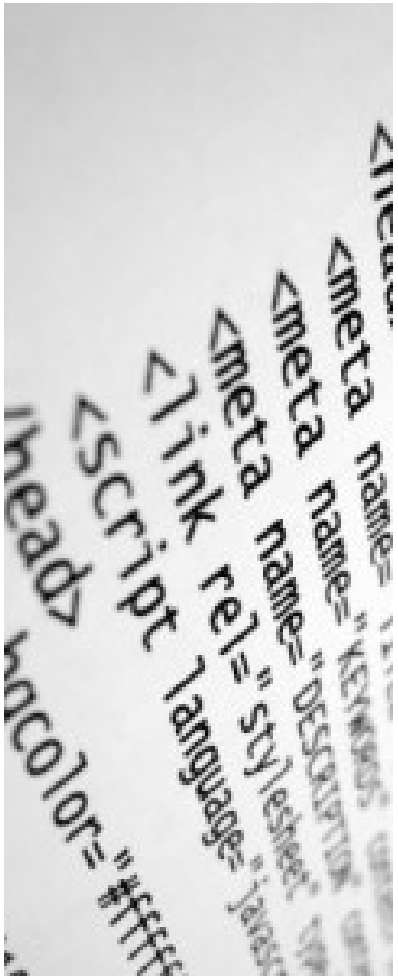



Image: Retrieved from https://www.designcontest.com. Grace. (2012, March 13). Knowing When To Code Your Own Web Design [blogpost]. *Design Content*.

# What does this mean for professional work in future?

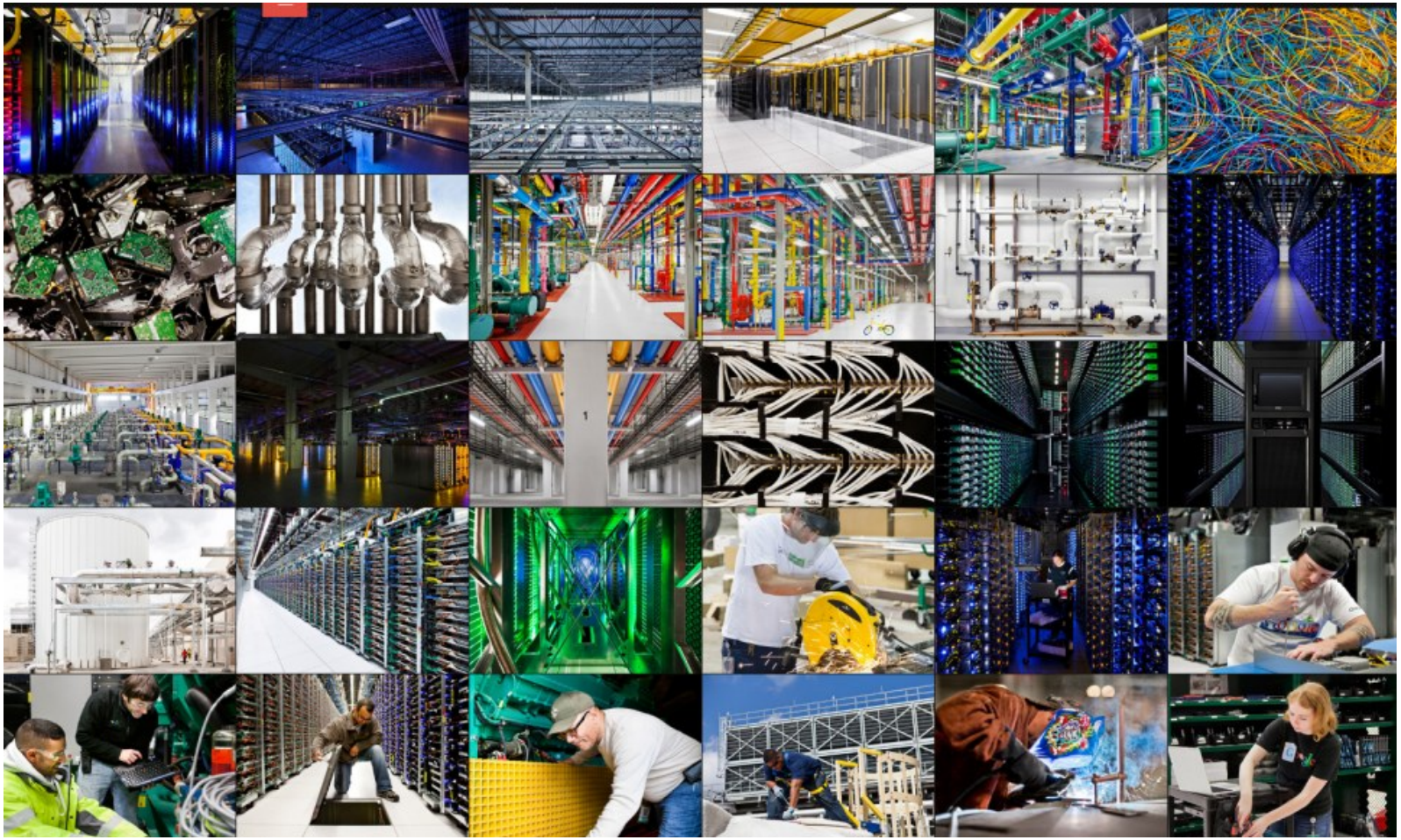
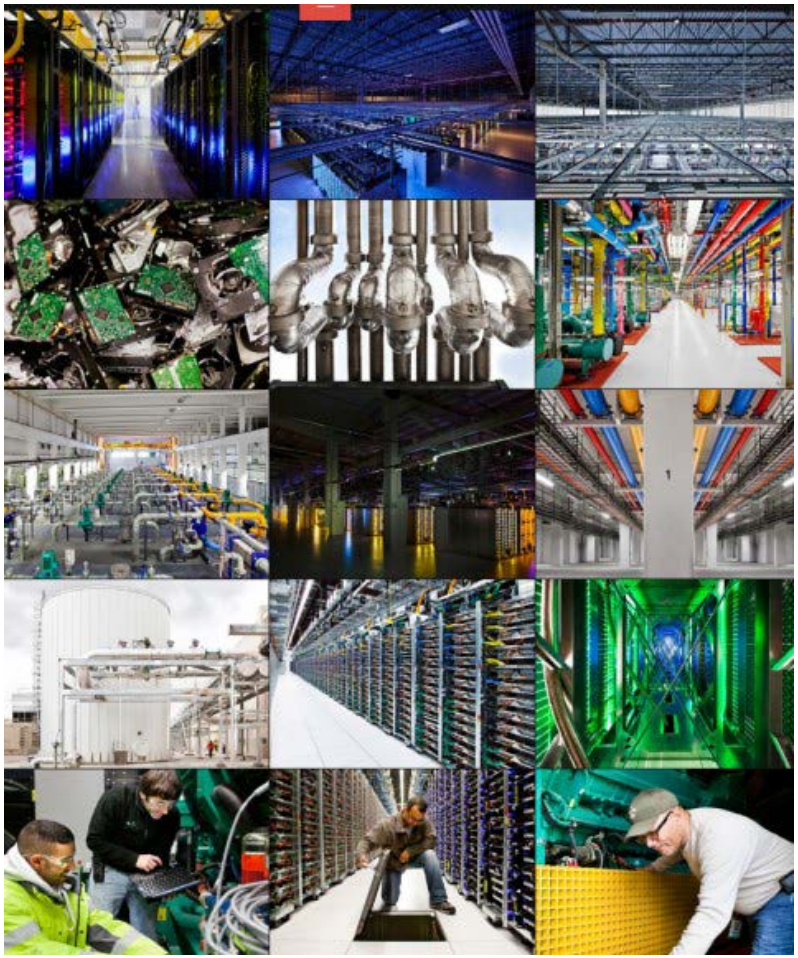


Image: Retrieved from http://www.dailymail.co.uk. Prigg, M. (2012, October 18). Inside the internet: Google allows first ever look at the eight vast data centres that power the online world. *Daily Mail Australia.*



- routine tasks automated
- fast-changing new technologies to diagnose, prescribe, plan
- partition of ‘professional job’ into networks – human/nonhuman
- more technicians, para-pros
- new specialists: knowledge engineers, process analysts, data scientists part of these networks
- more contractors, ‘I-Pros’
- users accessing many online and smart device services
- 1:1 human professional service becomes too costly to support
- professionals no longer gatekeepers to expert knowledge

- What configurations of people and technologies will form to provide professional services?
- What specific forms of expertise will be required of different practitioners?
- What unique capability can the (human) expert contribute?

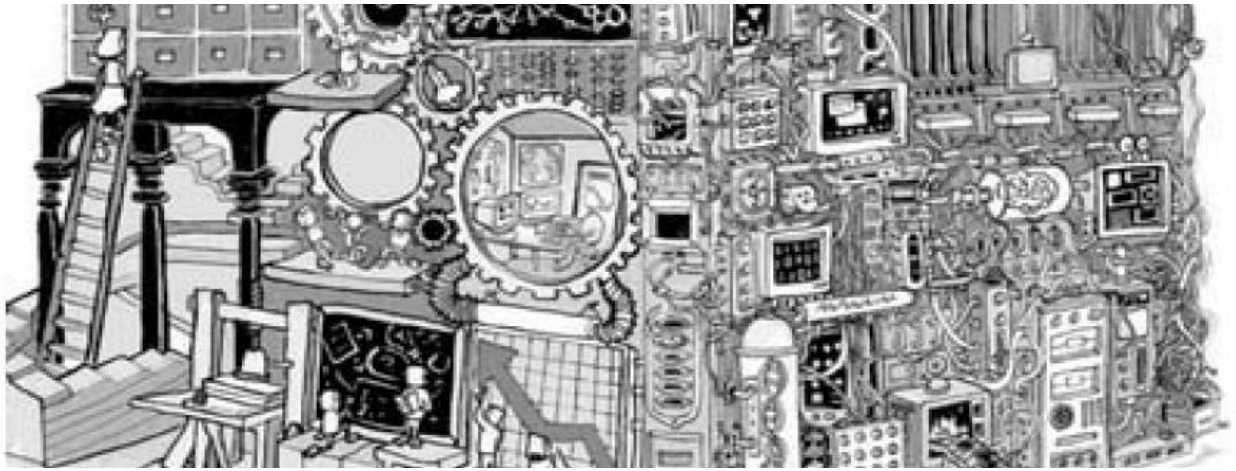
Image: Retrieved from https://imgur.com QADA. (2014, February 25). Gas ! Gas ! GAS !!!!!. *Imgur.*

# What are the implications for professional education?

# Role of higher education

- inform debates and policy through research, teaching and public engagement.
- develop professional education that enables people and organisations to anticipate and shape - not simply adapt to - digital futures.
- recognise how trends in other professions are also reshaping academic practices.

Image: Retrieved from http://knowledgeinfrastructures.org. Anon. (N.D.). Introduction. *Knowledge Infrastructures: Intellectual Frameworks And Research Challenges*



## 1. Learn to use new AI tools – effectively & responsibly.

- where and when are they most beneficial
- know how to complement the machine with human intuition, common sense, and creativity
- not simply accepting or relying on machine

Image: Retrieved from https://www.guggenheim.org. *Self-Portrait: A Subjugated Soul, 1985/89.* Artist: Cai Guo-qiang

## 2. Learn to ask critical questions about specific tools

- the right to understand algorithmic processes
- the process of challenging automated diagnostics and decisions
- questioning how AIs were trained, with what data
- questioning cultural biases that algorithmic processes may reflect and amplify

Image: Retrieved from https://www.goodreads.com. Dix, A., Finlay, J.E., Abowd, G.D., Beale, R. (2003). Human-Computer Interaction (3rd Edition). [book cover].

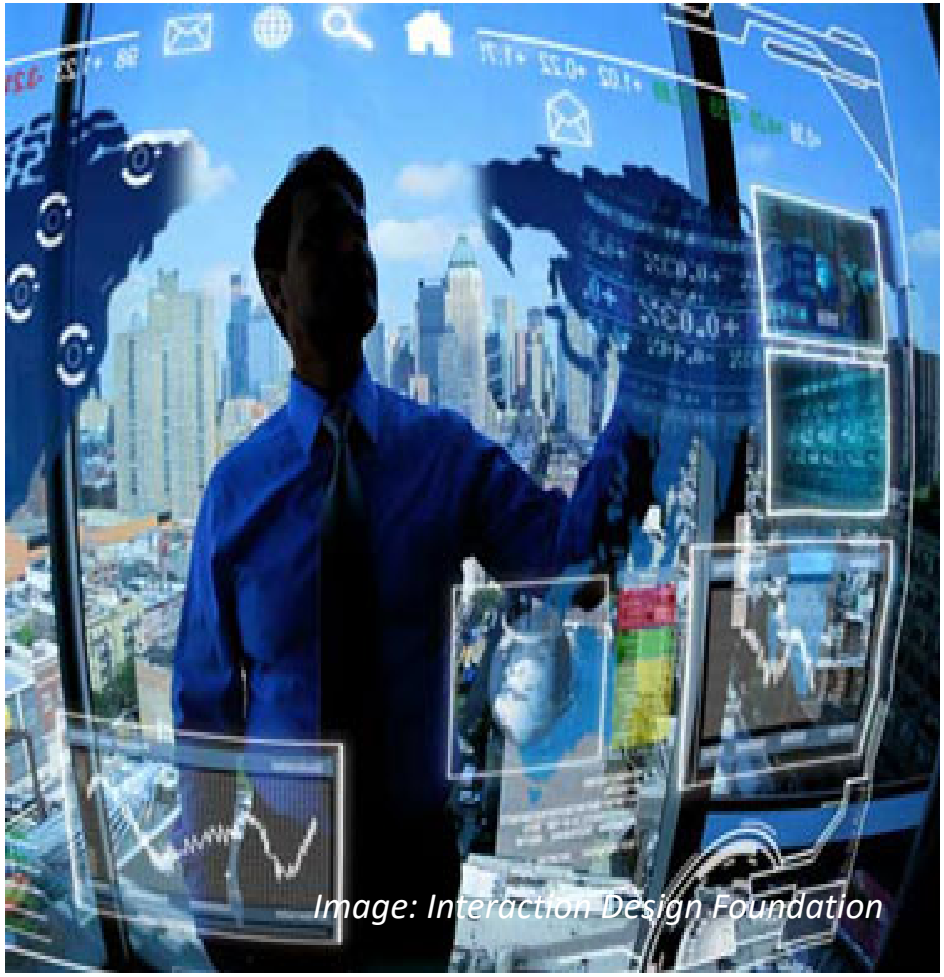
# 3. Learn to work collaboratively to design digital tools and develop effective uses in practice

- humanities and social sciences (students and faculty) with software/AI/data specialists
- computing students with practitioners and student professionals
- understanding the limits as well as possibilities of new technologies

Image: retrieved from http://writersense.blogspot.com.au Writer Sense (2017, November 20). Point of View.

## 4. Learn how to integrate digital tools and data into networks of specialists

- how to integrate data flow across work groups & systems in transparent and responsible ways.
- how to maximise human and AI expertise working together
- how to supervise AI tools



# 5. Ask critical questions about digital analytics:

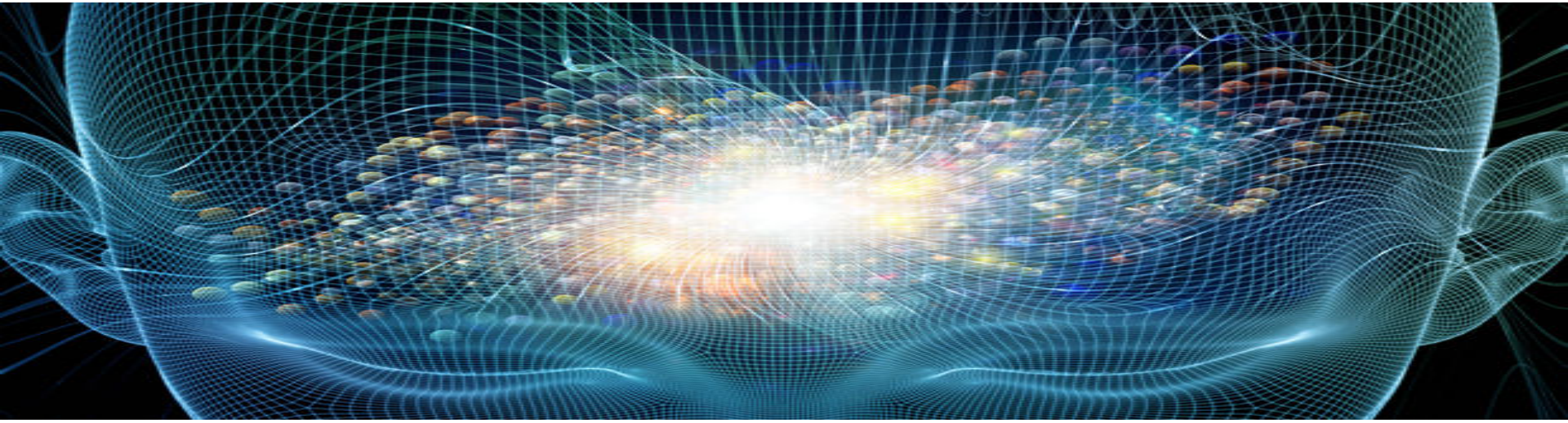


Image: retrieved from https://www.csoonline.com. Kolochecnko, I. (2017, July 31). How artificial intelligence fits into cybersecurity. [blogpost] *CSO*.

- How do learning machines conceptualise and operationalise space, bodies, etc? How do they render the world measurable, navigable, usable, conservable?
- How are digital tools and analytics changing professional knowledge and social practices?
- How can pressing ethical issues and bias problems be addressed?

## 6. Learn new issues of responsibility


- when capability is distributed
- when bad things happen
- professional involvement in oversight and regulation of use of AI.

# What unique capacities will human specialists contribute to the new human/nonhuman networks of service?


Image: Retrieved from https://9to5google.com. Lovejoy, B. (2013, September 6). MyGlass Android companion app now acts as remote control for Google Glass. *9to5Google.*

# Professional practice

**Balancing conflicting demands of 'duty'**

- patients/clients
- the professional body
- employer
- evidence-based practices
- society

**"legitimate compromises"**

rarely a rational application of rules and knowledge

judgments at the edge of knowledge

responsible obligation to society

Image: Retrieved from http://www.mullerover.com. Muller, C. (2010, July 8). It's Not You, Cleveland, It's Me [Blogpost]. *Mullerover.*

# 8. Focus more curricula and assessment on developing these unique capacities

Image: Retrieved from http://www.daviddimichele.com/ Artist: DiMichele, D. Pseudodocumentation: Broken glass 2007.

- Empathy and the capacity for relationships
- Moral and ethical judgement
- Decision-making in unfamiliar or ambiguous situations
- Listening effectively and forms of touch
- Wise judgement


Image: Retrieved from http://www.businesscloudnews.com Davies, j. (2016, April 6). What the buzz is DevOps?. *BCN*.

# Reference and resources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