

The *Intelligent Library*: Academic libraries and Artificial Intelligence

Draws on Cox, A.M. , Pinfield, S. and Rutter, S. (2018) The intelligent library: Thought leaders' views on the likely impact of artificial intelligence on academic libraries. *Library Hi Tech*. ISSN 0737-8831 (open access version: <http://eprints.whiterose.ac.uk/137254/>
<https://doi.org/10.1108/LHT-08-2018-0105>)

The impact of AI

- ▶ “For libraries the question is not so much what technology will be affected, but rather what technology, if any, will remain unaffected by AI” Fernandez (2016:22)
- ▶ “AI will transform library services, forever altering the mix of skills and tools needed to serve our users” Arlitsch and Newell (2017: 794).
- ▶ “Wide and deep effects” (JISC intelligent campus blog)

The background features a series of overlapping, semi-transparent blue triangles and polygons of various shades, creating a dynamic, geometric pattern on the right side of the slide. The text is positioned on the left side of the slide.

What is Artificial intelligence?

Defining AI

- ▶ Watson.... Siri.... The driverless car...
- ▶ “A cluster of technologies and approaches to computing focussed on the ability of computers to make flexible rational decisions in response to unpredictable environmental conditions” Tredinnick (2017: 37)
- ▶ “The bucket” of AI (Smith, 2016:221)
 - ▶ Big data
 - ▶ Analytics
 - ▶ Machine learning
 - ▶ Natural language processing
 - ▶ Data visualisation
 - ▶ Decision logic

Defining AI

- ▶ Narrow/ weak AI - strong/general AI
 - ▶ Current developments are generally in the zone of narrow/weak AI
- ▶ When and where? Has it already happened, is it happening now or is it something that will happen in the distant future? (Yes!)

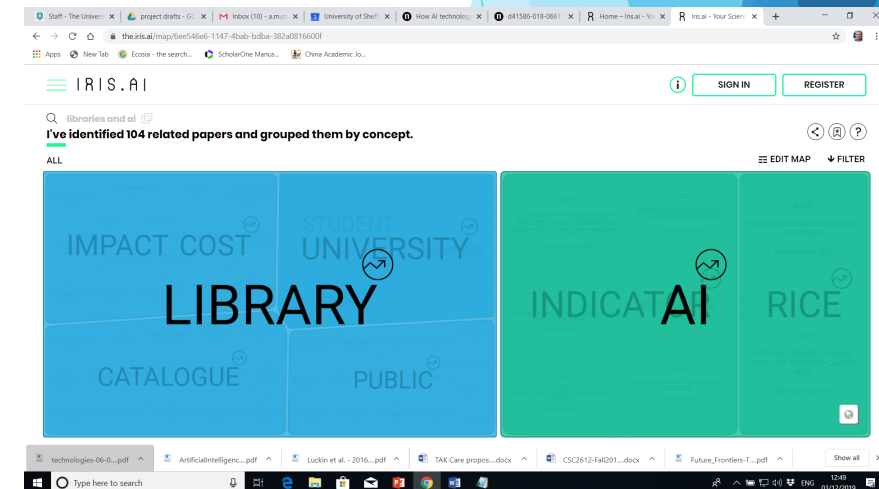
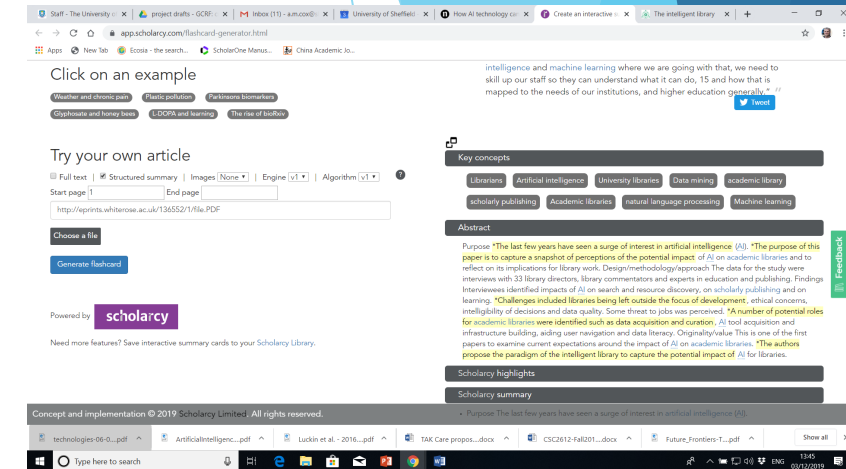
Applications of AI in libraries

Search

- ▶ Predictive text... speech recognition... improved image search... recommendations... personalisation... translation... spam filtering
- ▶ Search across diverse collections, improving metadata, re-presenting results in understandable forms, context sensitive search (Fernandez 2016)
- ▶ Intelligent agents and customisation
 - ▶ *“I think that will just grow massively in that research data will come to people’s finger tips because of certain searches and algorithms in the background that are finding them stuff that they need.” (Non-library participant)*
 - ▶ *“You could imagine providing a very distinct individual experience for each and every student and researcher based on AI.” (Library commentator)*
 - ▶ *“The assumption that the end goal is for human eyeballs to look at something will, perhaps not disappear, but reduce. Students and academics [are] using machines in the middle to bring back information in a condensed way. [...] That is going to have different implications on how you present the information, how you access it, how you licence it.” (Library commentator)*

Text and data mining

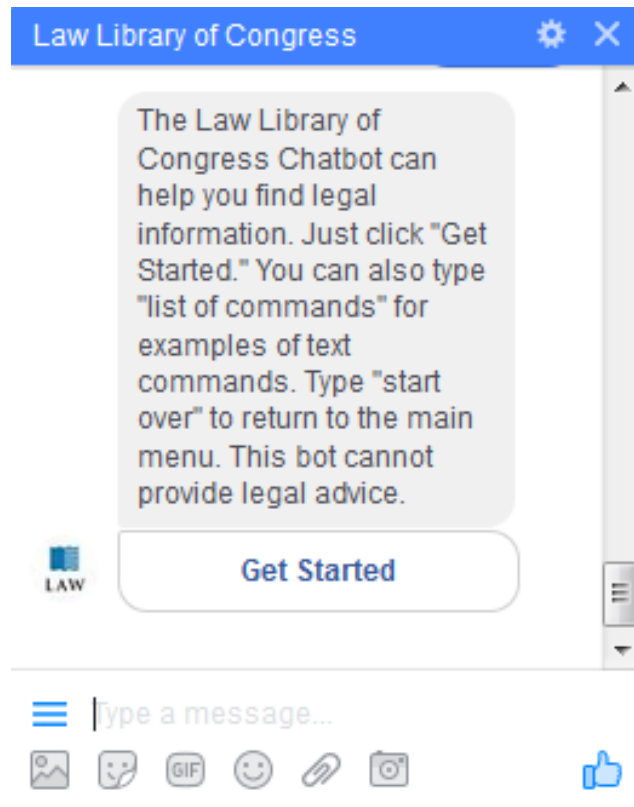
- ▶ *Estimated 250,000 research articles on Type 2 Diabetes*
- ▶ “Text and data mining (TDM) is the process of deriving information from machine-read material. It works by copying large quantities of material, extracting the data, and recombining it to identify patterns.” UK government
- ▶ An intermediary to make summaries of bodies of literature for you
 - ▶ <https://www.scholarcy.com/>
 - ▶ Iris.ai
- ▶ Ultimately tools to search the whole library as full text (/other forms of data)
- ▶ Tools to help the researcher to search for patterns in “big data”



Digital scholarship

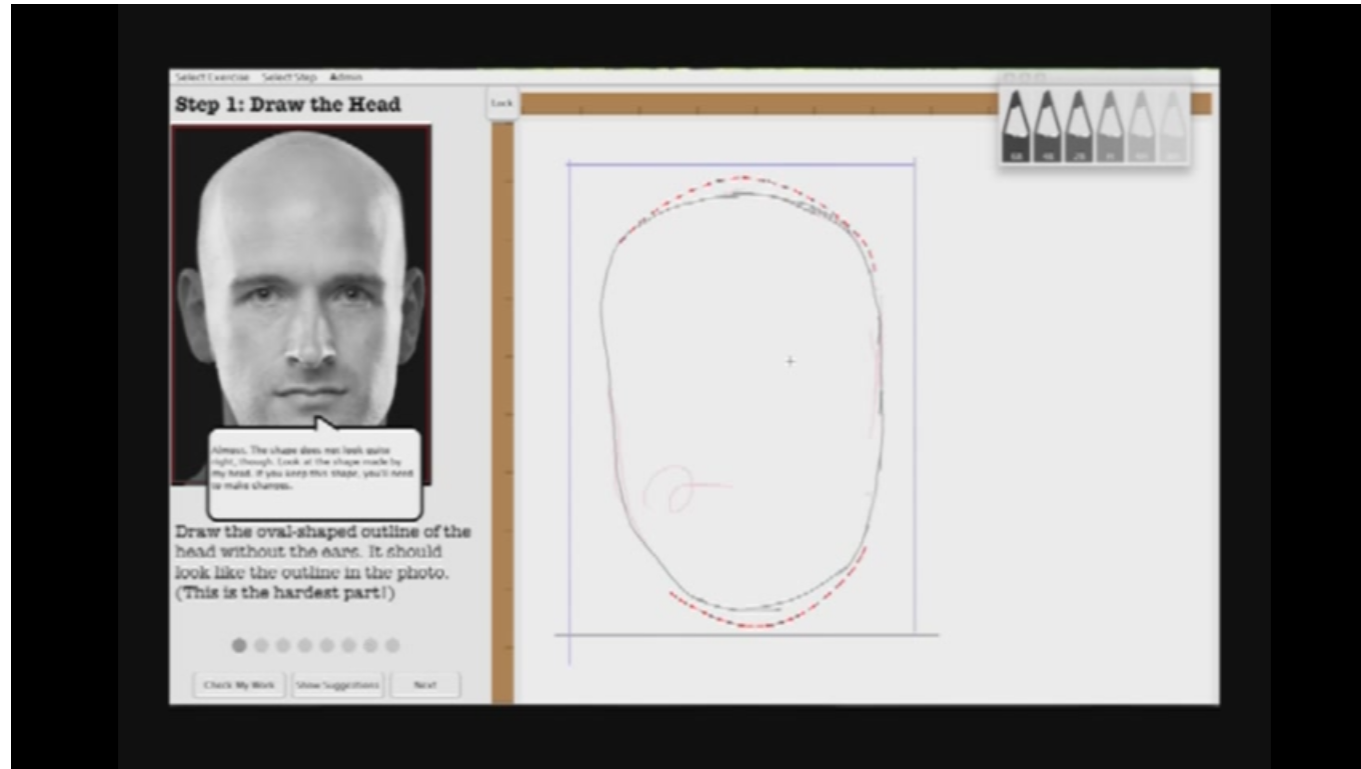
- ▶ *“AI is going to be super profound on scholarly communication, because it is going to replace quite a lot of what we do with peer review today and I am not just talking so much about the AI will be able to peer review the paper. We will see that for sure: especially checking validity of statistics, checking for coherence between figures and tables. [...] We are going to see a world in which a paper can be published as a preprint, people can comment online, about that paper, and the AI will be able to look at the authority or the credibility of those people what the people have said, and from that pull an initial sort of peer review out right.”*
(Non-library participant)
- ▶ *“I think all of these factors will spell the end of journals as a way of communicating science because why should I subscribe to one particular journal or several particular journals that are trying to do their own independent filters when I could just subscribe to a filtering service that is exactly tailored to my interest as a researcher?”* (Non-library participant)

Chatbots



- ▶ From responding to customer queries... to conducting reference interviews... to interacting with staff across many systems

Intelligent tutors

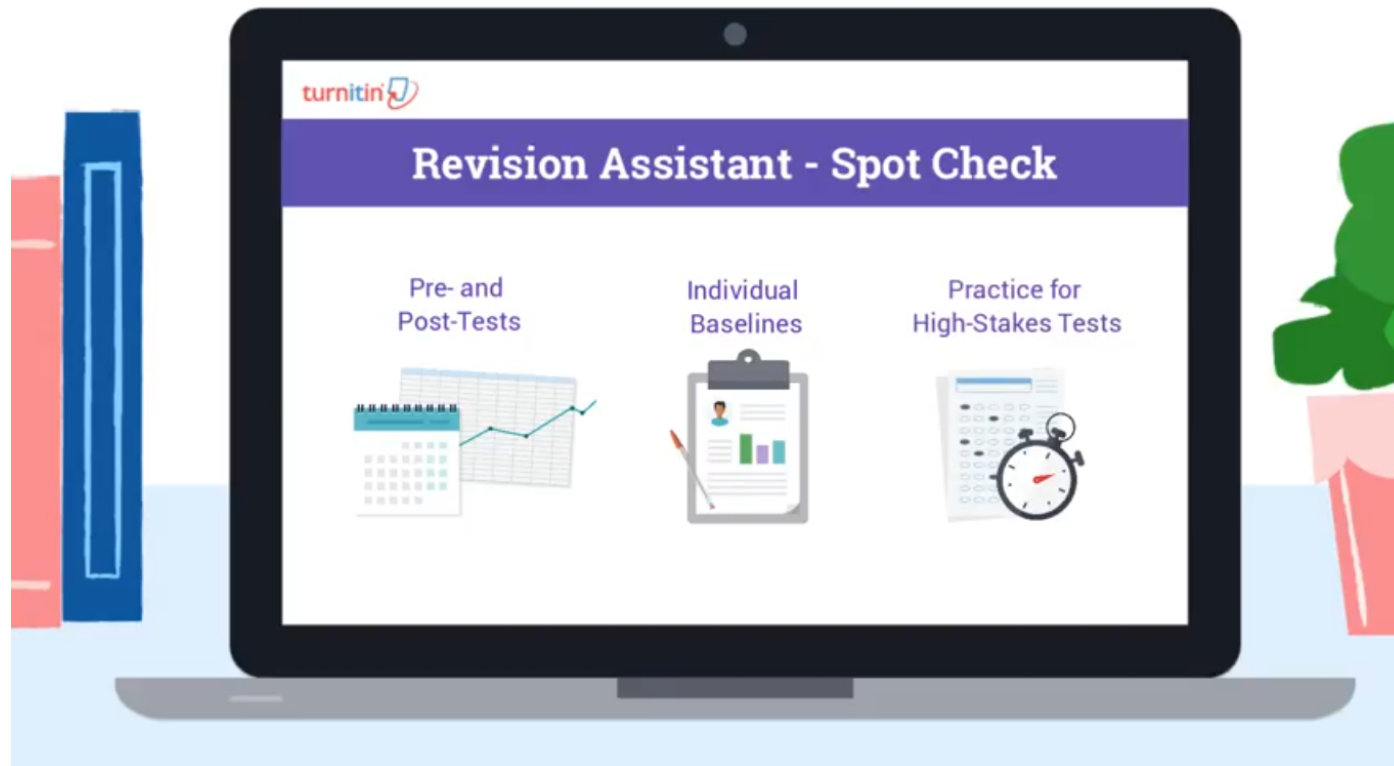


- ▶ <https://www.youtube.com/watch?v=IW7Q1xk7EKY>

AIEds (Pearson)

- ▶ Personalise learning material in relation to cognitive or affective state of learner
- ▶ Dialogue with learner
- ▶ Summarise online discussions and moderate them
- ▶ Support assessment
- ▶ Offer timely feedback
- ▶ Monitor the students' whole body as an aspect of embodied learning

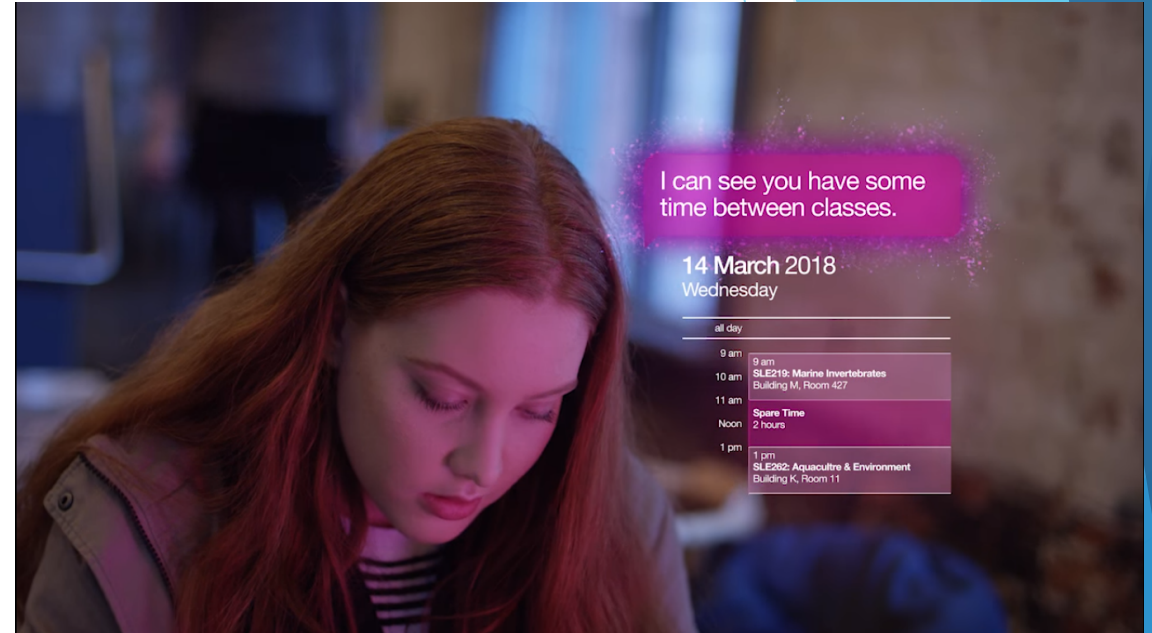
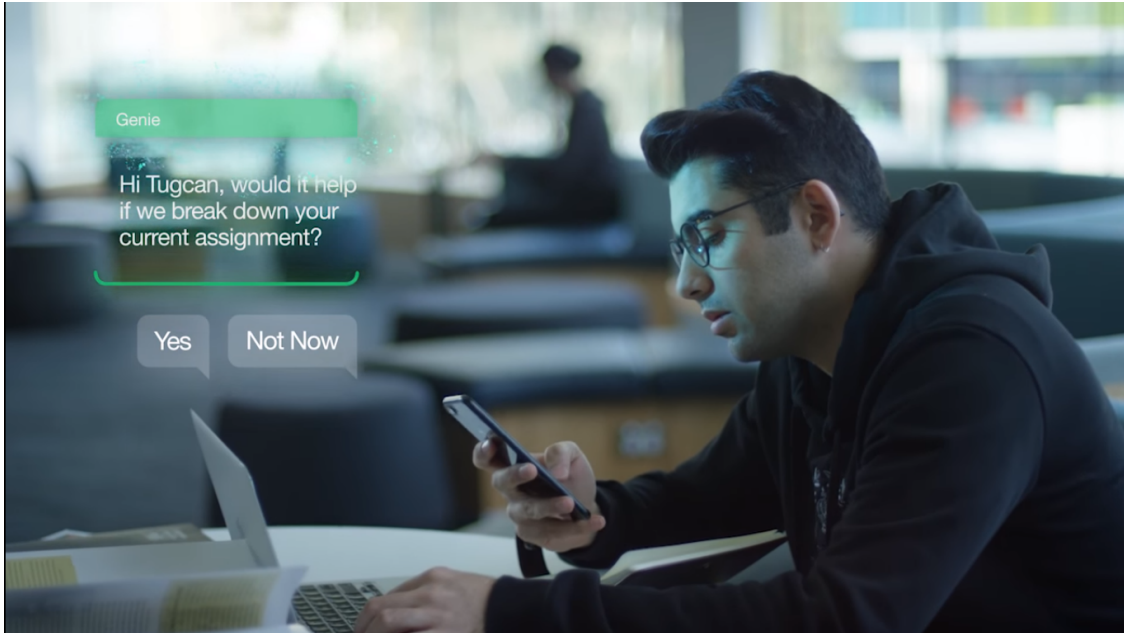
Revision assistant (Turnitin)



- ▶ <https://www.youtube.com/watch?v=exfEbxQHGdc>
- ▶ <https://www.turnitin.com/products/revision-assistant>

Deakin Genie

“Always with you, always for you”

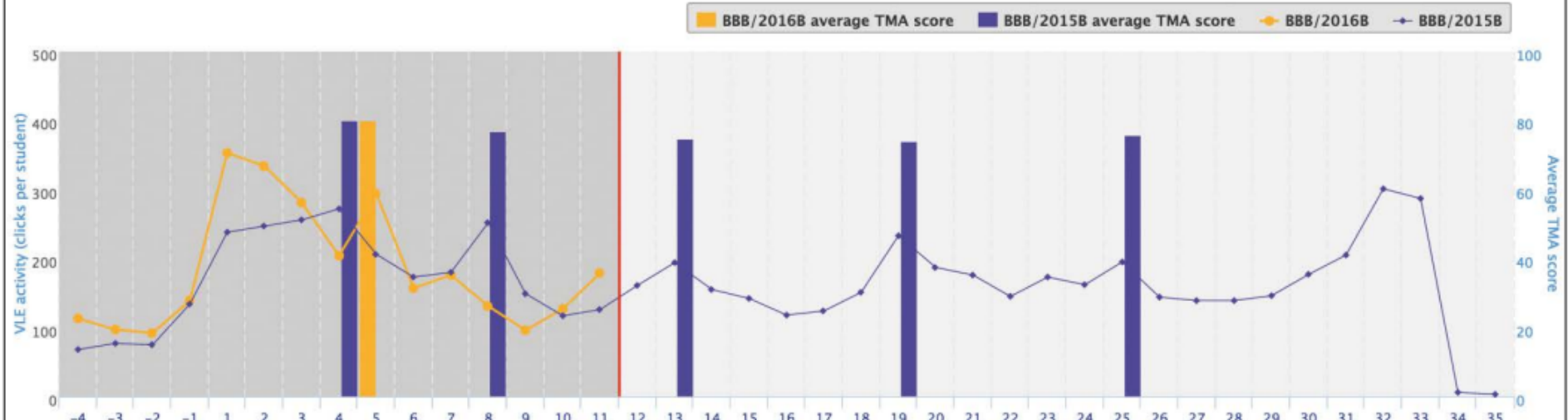


► <https://www.youtube.com/watch?v=zsRPuU53E74>

BBB 2016B - Week 11

Time machine (choose week):

11



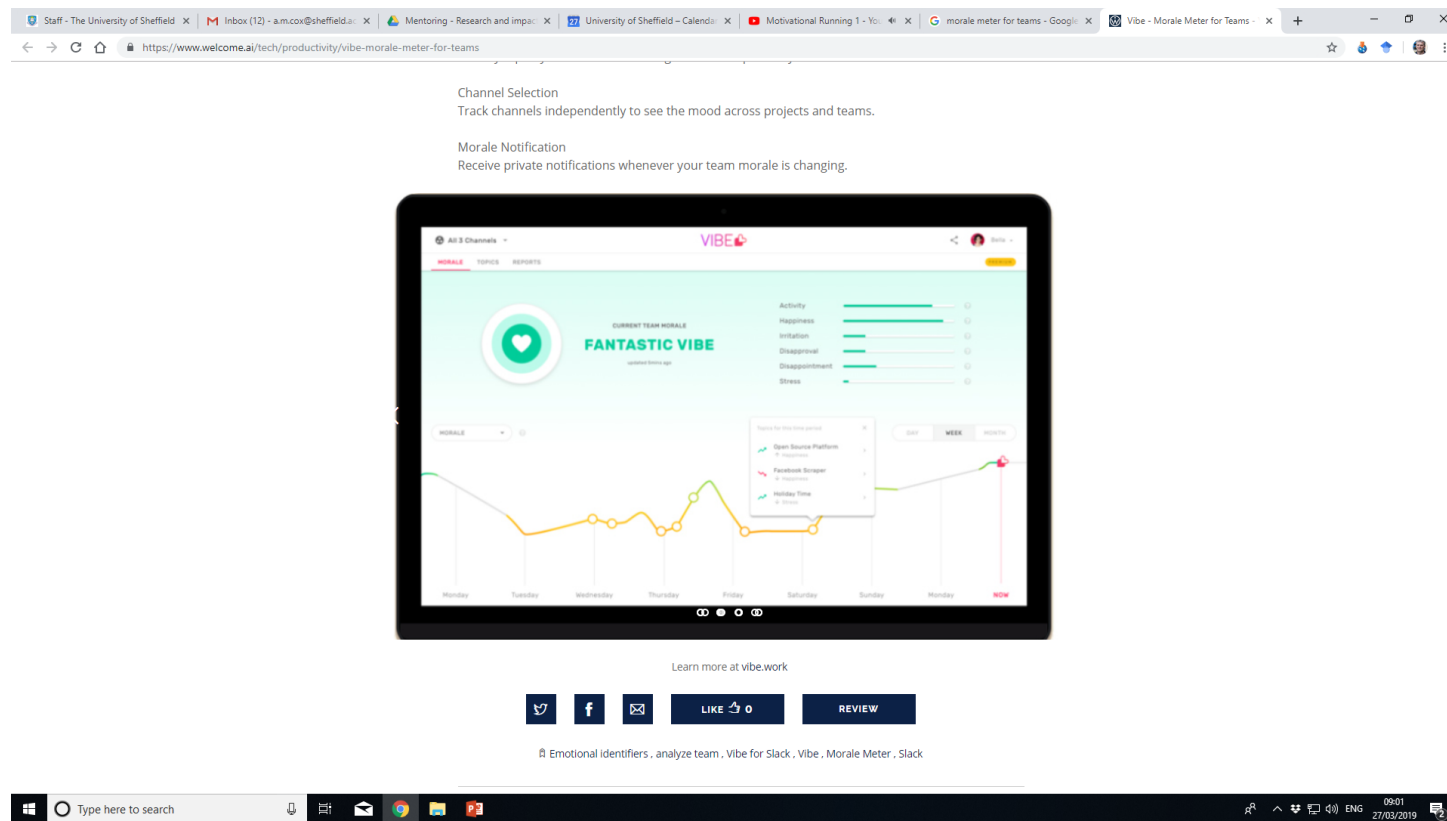
Registered students	VLE active students	Students at risk for next TMA	Last TMA average result	TMA submissions
1,098	930	136	80	792
	↑8.1% Previous week	↓20.9% Previous week	↓0.9% Previous presentation	↑421.1% Previous week

10 ▾

Export Hide columns ▾

Student PI ^a	TMA	Justification	Number of votes [Not Submit]	Next TMA prediction	Final result
A0000245	88	Forum VLE activity in week 10 ≥ 0 , Forum VLE ac... ▾		Submit	Pass
A0001074	98	Forum VLE activity in week 10 ≥ 0 , Forum VLE ac... ▾		Submit	Pass
A0001886	82	questionnaire VLE activity in week 8 ≥ 0 , Forum ... ▾		Submit	Pass
A0002323	82	Forum VLE activity in week 10 ≥ 0 , Homepage V... ▾		Submit	Pass
A0002528	44	no summary VLE activity in week 8, Homepage VL... ▾		Not submit	At risk

MORALE METER FOR TEAMS



The Smart or Intelligent campus

- ▶ Monitor room usage
- ▶ Provide relevant digital resources based on space
- ▶ Adapt spaces for disability
- ▶ Help students navigate to a free study space
- ▶ Monitor attendance
- ▶ Adjust room temperature to optimise learning
- ▶ Nudge students to go and have a coffee break with a discount on a coffee
- ▶ Monitor well-being or satisfaction through facial recognition
- ▶ Deep institutional KPIs

Learnometer

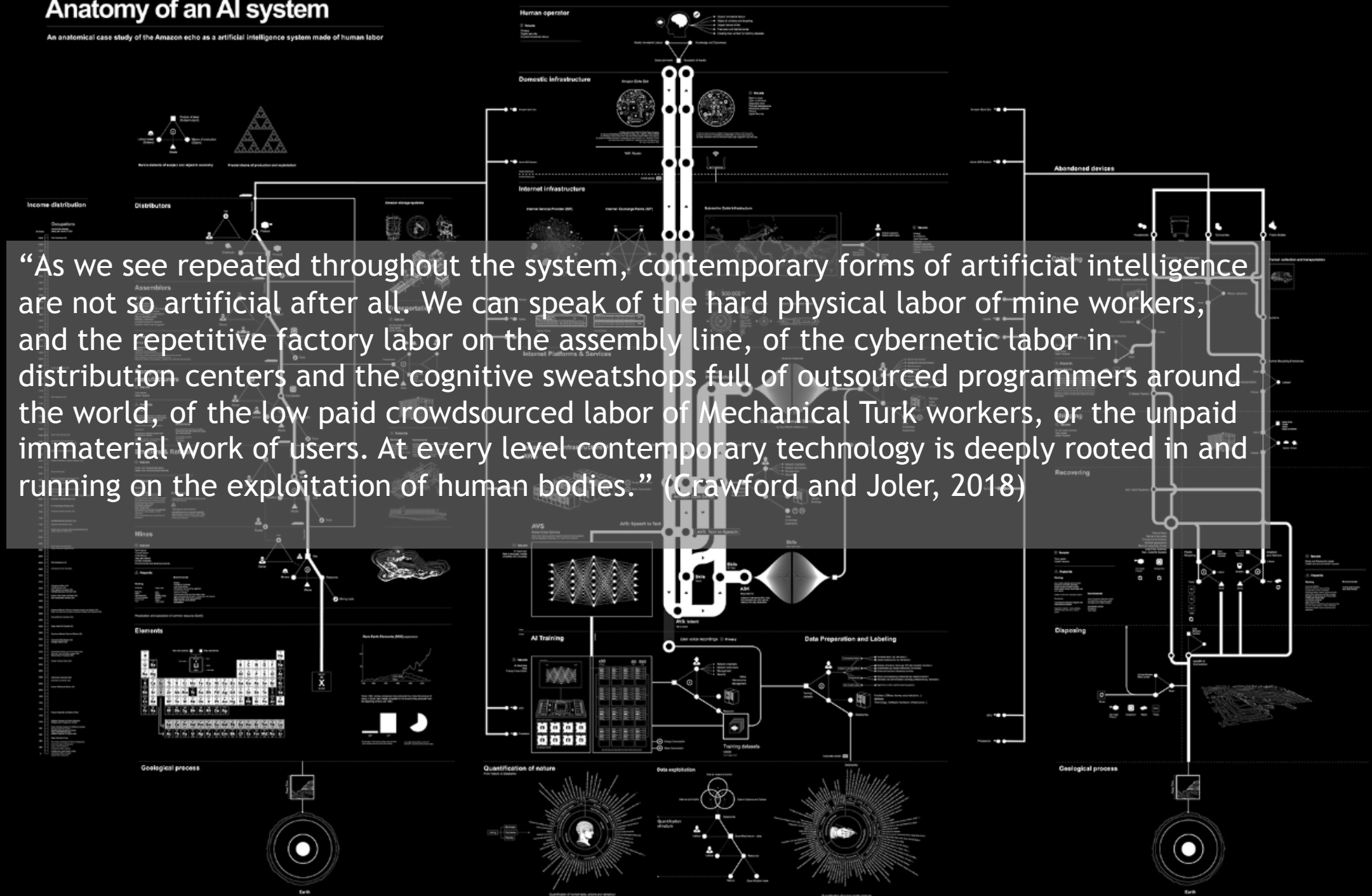


Issues around “algorithms”

- ▶ Accuracy
- ▶ Validity
- ▶ Transparency, accountability and intelligibility - lack of legal control
- ▶ Privacy, dataveillance and self censorship
- ▶ Security issues
- ▶ Fairness and ethics - algorithmic bias
- ▶ Development costs *and their implications*
- ▶ Understanding the infrastructure
- ▶ Redistribution of power between suppliers, within society, between state and society & between countries

Anatomy of an AI system

An anatomical case study of the Amazon echo as a artificial intelligence system made of human labor



The job market: utopia and dystopia

Susceptibility to computerisation	Emerging jobs related to Data and AI
Telemarketeers (99%)	Data scientist
Insurance Claims and Policy Processing Clerks (98%)	AI trainer
Umpires, referees and other sports officials (98%)	AI interaction designer
Booking keeping, accounting and auditing clerks (98%)	Machine learning engineer
Motion picture projectionists (97%)	Intelligence designer
Secretaries and admin assistants (96%)	Data curator
Library assistants (clerical) (95%)	Data evangelist
Cooks, short order (94%)	Digital knowledge manager
Retail salespersons (92%)	Cognitive copywriter
Tour guides and escorts (91%)	Data Journalist
<i>Source: Frey and Osborne (2017)</i>	Source: https://enterpriseproject.com/article/2017/12/8-emerging-ai-jobs-it-pros

The background features abstract, overlapping geometric shapes in various shades of blue, ranging from light sky blue to deep navy blue. These shapes are primarily located on the right side of the frame, creating a modern, layered effect. The rest of the background is a solid, very light blue.

What is the Intelligent library?

Eleven issues raised by the paradigm of “the Intelligent Library”...

1. **What is a library or a collection? And how is it searched?** The library may increasingly be seen as data, accessed through AI, the scope of the collection as framed by the AI;
2. **How are services are delivered?** for example by chatbots and other intelligent agents;
3. **What do users expect of libraries?** ... shaped through expectations learned in other areas;
4. **What is information literacy?** The ability to navigate a new space of AI tools and data, and data literacies, including critical awareness of how to protect one's own privacy;

Eleven issues raised by the paradigm of “the Intelligent Library”...

5. **Who are users?** Some users will be AI tools; human access to content will be remediated through content being summarised and partially analysed for them by machines;
6. **What do libraries know about users and so how is the library managed?** because of management decisions based on use data, combined with other learning and research analytics;
7. **How does the library work with other internal and external partners and competitors** especially IT services and new third-party commercial services?

Eleven issues raised by the paradigm of “the Intelligent Library”...

8. **How library services are evaluated** again through wider and deeper data?
9. **What skills librarians need:** be that for licensing, evaluation of data analysis and visualisation tools or using such tools themselves?
10. **Can the library community operate effectively at different levels beyond the institution** in order to design and deliver services which will serve international communities of scholars and students?
11. **Do we need librarians?** (because of chatbots, automated metadata creation tools etc) **or libraries?** (because of alternative intermediaries) at all, at least as currently conceived?

The background features a series of overlapping, semi-transparent blue triangles and polygons of various shades, creating a dynamic, geometric pattern on the right side of the slide.

What is our role in AI and what skills/knowledge/attitudes are required?

Possible roles

- ▶ Providing content
- ▶ Procuring content for AI
- ▶ Data quality control
- ▶ Procuring AI tools
- ▶ Data curation, eg of derived data
- ▶ Explaining how to navigate the infrastructure
- ▶ Teaching critical data literacy - including data ethics
- ▶ Designing data infrastructure
- ▶ Designing AI tools
- ▶ Data analysis and writing algorithms
- ▶ *“You will have to be very good at understanding the implications of the licences, contracts that they sign with some of these providers. You will need to be very good at understanding what it is that we can do with the derived outputs from these materials as institutions will want to potentially monetize some of those outputs.” (Library commentator)*
- ▶ *“The curatorial role is absolutely essential... it is more important than ever because there is just more content.” (Non-library participant)*
- ▶ *“Navigating skills are still needed.” (Library manager)*
- ▶ *“Shouldn’t we be the bastions of information literacy and information privacy in an AI world?” (Library commentator)*

Possible roles

- ▶ Providing content
- ▶ Procuring content for AI
- ▶ Data quality control
- ▶ Procuring AI tools
- ▶ Data curation, eg of derived data
- ▶ Explaining how to navigate the infrastructure
- ▶ Teaching critical data literacy
- ▶ Designing data infrastructure
- ▶ Designing AI tools
- ▶ Data analysis and writing algorithms

3 interlinked clusters of skills

- ▶ Procurement of content and tools as an extension of collection management (a translation of collection management roles)
- ▶ Advice and training (a translation of digital literacy roles)
- ▶ Design of tools and infrastructure (transformational role)

The background features abstract, overlapping geometric shapes in various shades of blue, ranging from light sky blue to deep navy blue. These shapes are primarily located on the right side of the frame, creating a modern, layered effect. The rest of the background is a solid, very light blue.

Your questions and comments

University of Rhodes Island opens AI lab... based in the library (2018)

- ▶ “Having the lab in a library sends a strong message to our community and to others in academia, government and business. The library values intellectual freedom, access and social justice and is a hub for active learning, across the university,”

Library Receives \$1M Mellon Grant to Experiment with Digital Collections as Big Data

<https://www.loc.gov/item/prn-19-098/library-receives-1m-mellon-grant-to-experiment-with-digital-collections-as-big-data/2019-10-04/?loclr=twndi>

Strategies to deal with new roles

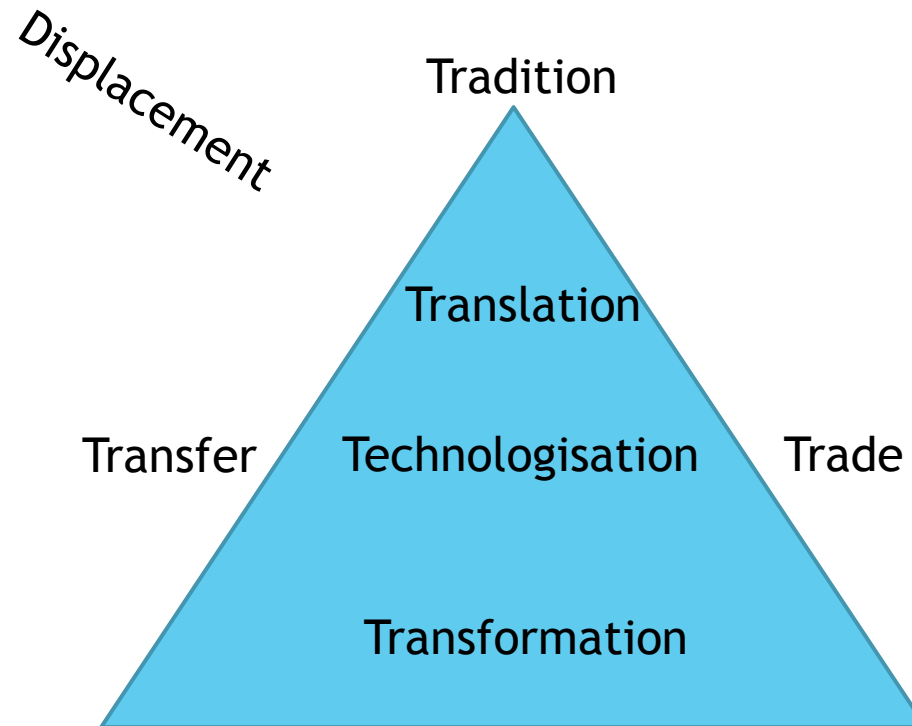
Package of options

- ▶ Translation
- ▶ Retraining
- ▶ Reorganisation
- ▶ **projectisation**
- ▶ Recruitment
- ▶ Collaboration
- ▶ Technology
- ▶ Outsourcing
- ▶ Displacement

Issues

- ▶ Are staff willing?
- ▶ Do staff have the capability?
- ▶ How does this help ?
- ▶ Can we offer competitive salaries?
- ▶ With whom?
- ▶ Inherent in AI
- ▶ What role do we retain?
- ▶ What is the risk?

Responses to new roles: 7Ts



Teacherbot (Bayne 2012)

- ▶ An “automated teaching presence” for a MOOC
- ▶ Known affectionately as “botty”
- ▶ Explicitly a tool, often clunky and makes comments that are wide of the mark
- ▶ <http://www.teacherbot.ed.ac.uk/teacherbot-faq/>

Ethical guidelines: examples

- ▶ European Commission's High-Level Expert Group on Artificial Intelligence
<https://ec.europa.eu/digital-single-market/en/news/draft-ethics-guidelines-trustworthy-ai>
- ▶ <http://instituteforethicalaiineducation.org/>