From algorithms to empowerment: teaching algorithmic literacy (AL) in university libraries

Presented by:

Christina Dinh Nguyen
University of Toronto Mississauga Library

April 2024

UNIVERSITY OF TORONTO

UKSG

“I wish to acknowledge the land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.”

- 12,500 undergraduate students; 900 graduate students
- Programs in core sciences, as well as communication, sociology, psychology, etc.
- Library has excellent information literacy program

Overview: guided brainstorming conversation

1. Information literacy (IL) > Digital literacy (DL) > Algorithmic literacy (AL)
2. The place of AL in university libraries
3. Pedagogical tools to teach AL
4. Co-learning and co-using algorithms

UNIVERSITY OF TORONTO

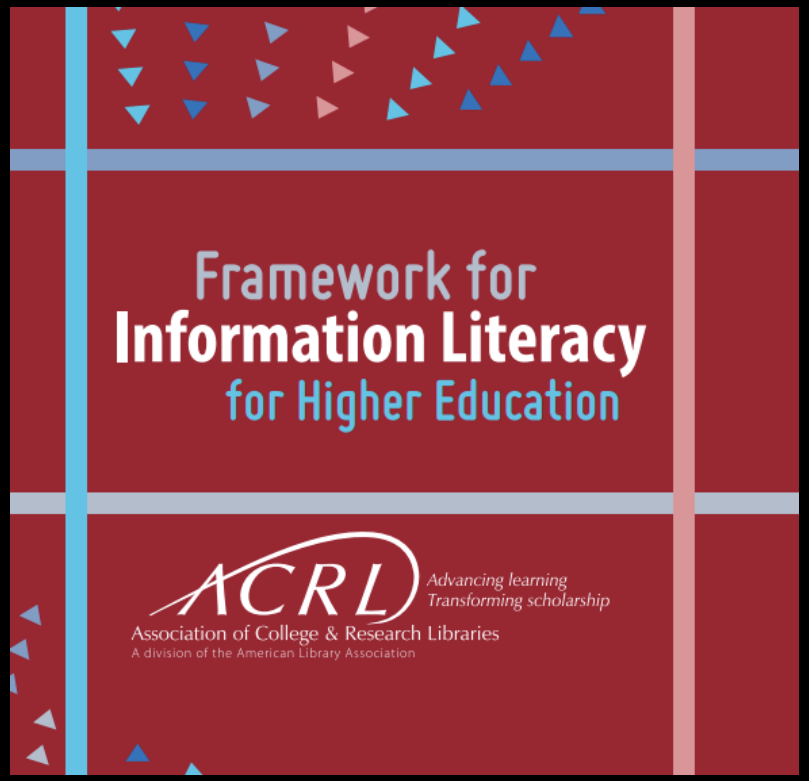
UKSG

1. Digital and algorithmic literacies

UNIVERSITY OF TORONTO

DEFY GRAVITY

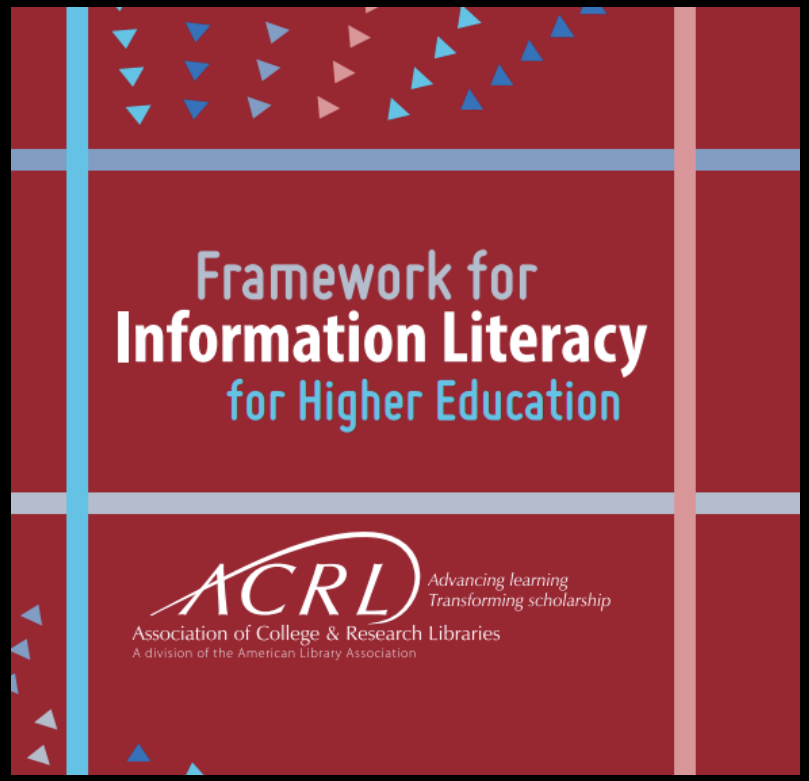
Breaking the framework down



- Critical thinking
- Ethical use of information
- Ability to navigate complex information environments

"Framework for Information Literacy for Higher Education." American Library Association - ACRL, 2016. https://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/framework1.pdf.

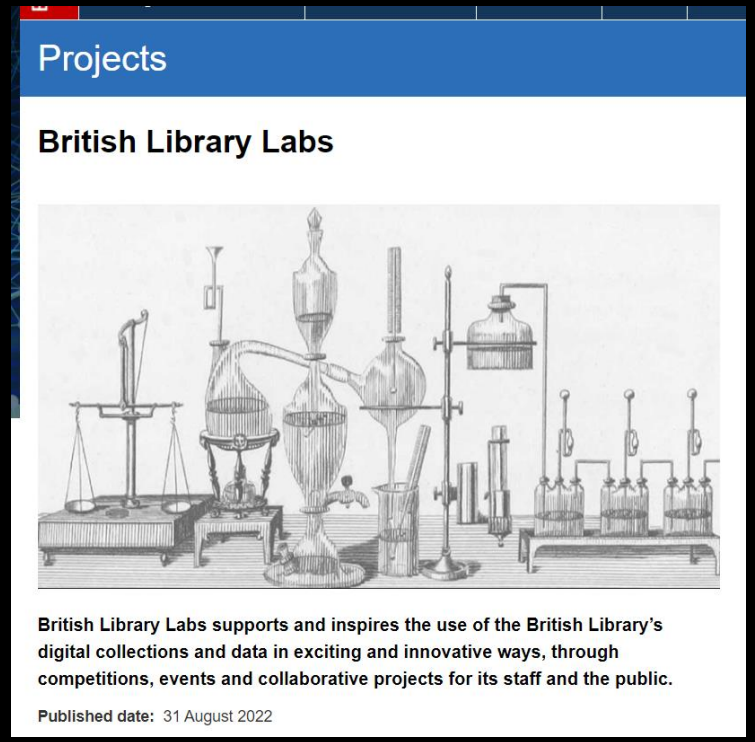
Breaking the framework down

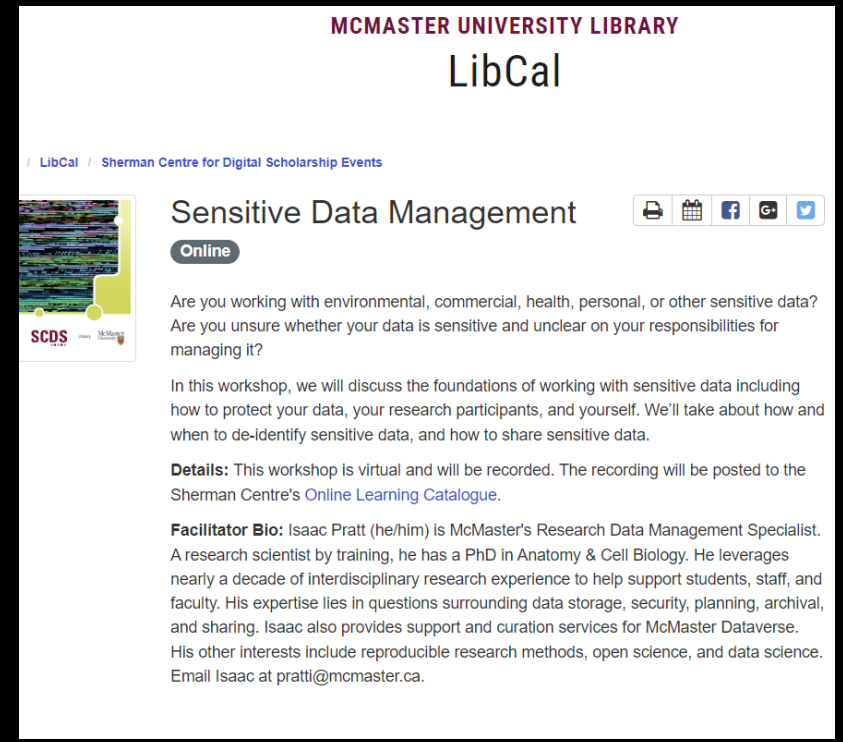


- Critical thinking
- Ethical use of information
- Ability to navigate complex information environments
- Information literacy > digital literacy

"Framework for Information Literacy for Higher Education." American Library Association - ACRL, 2016. https://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/framework1.pdf.

Some current digital literacy schemes



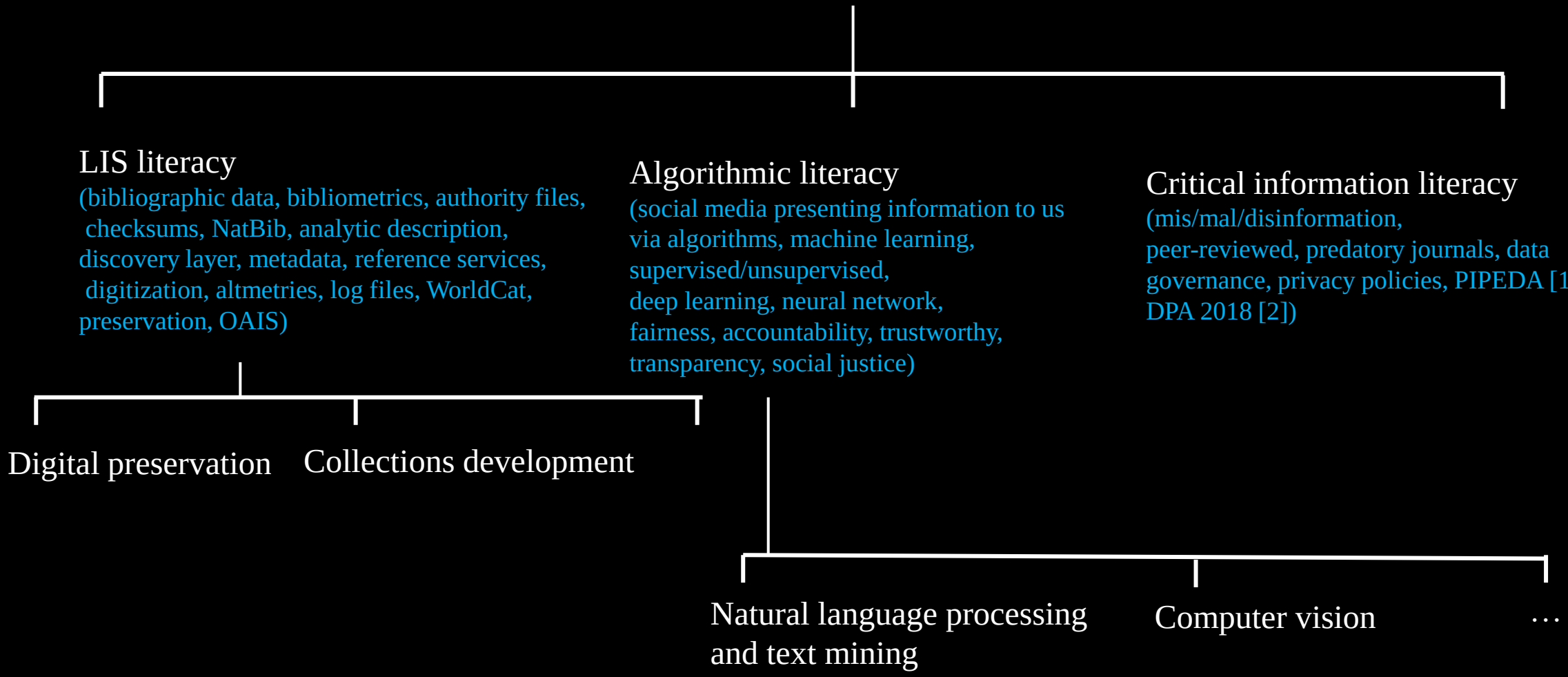


"BL Labs." British Library Labs. Accessed March 27, 2024. https://labs.biblios.tech/.

"Li Koon Chun Finance Learning Centre Events Calendar." Workshops | University of Toronto Mississauga Library. Accessed March 27, 2024. https://utm.library.utoronto.ca/flc/workshops.

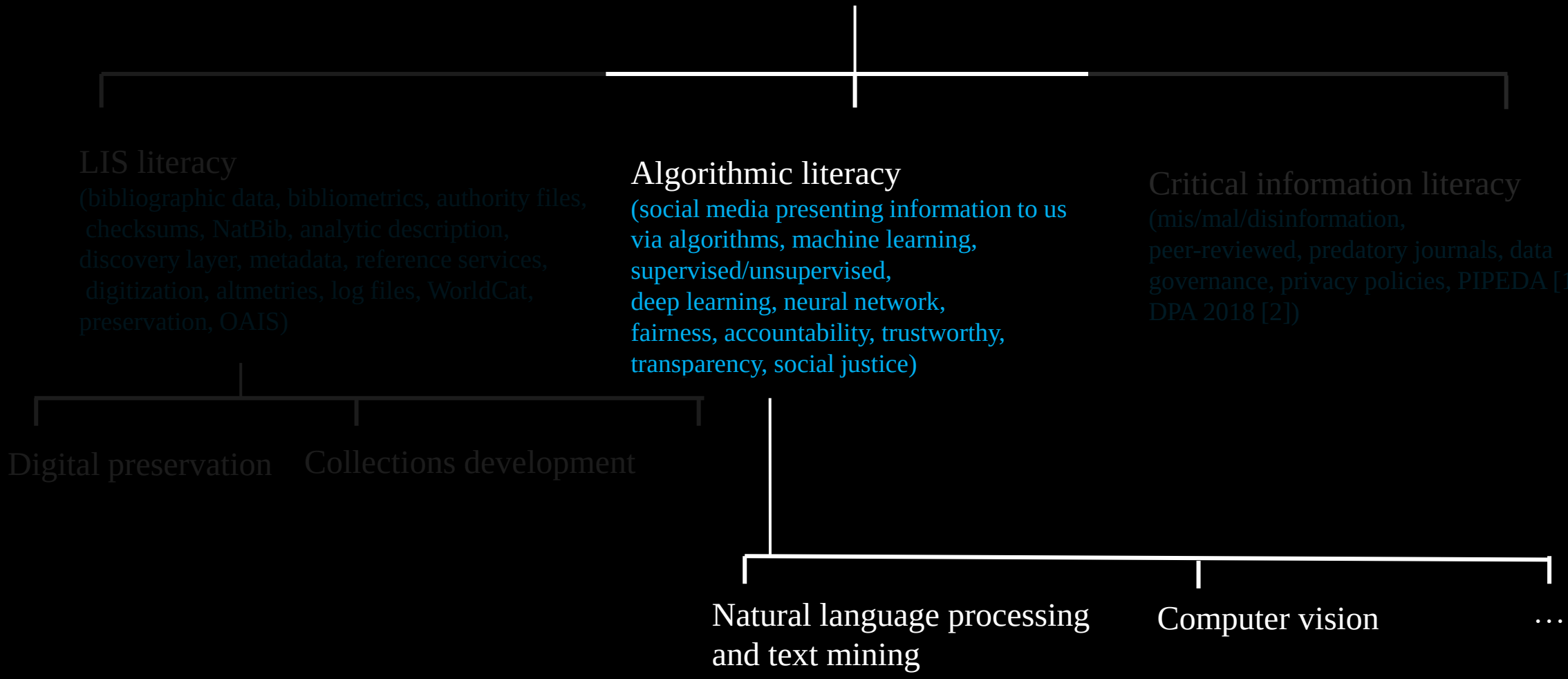
"Sensitive Data Management." McMaster University Library LibCal. Accessed March 27, 2024. https://libcal.mcmaster.ca/event/3738755.

Digital literacies



[1] Canadian Personal Information Protection and Electronic Documents Act
[2] UK Data Protection Act 2018

Digital literacies



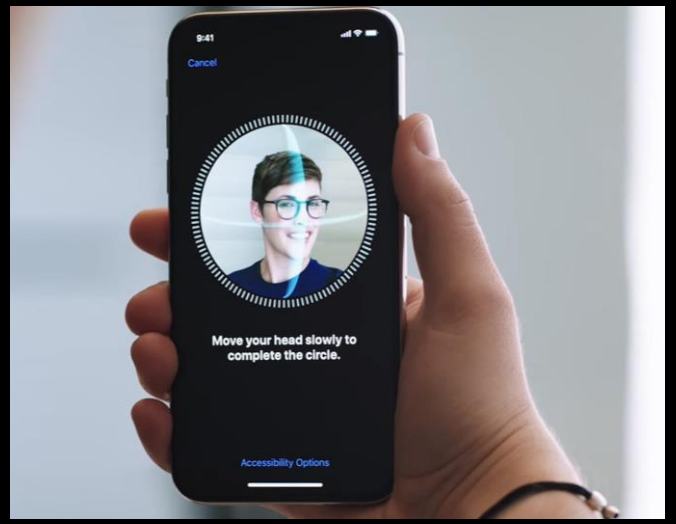
https://tinyurl.com/algoliteracy

“Question 1: What specific skills do you identify as something students need to have, under the branch of algorithmic literacy?”

This file will be shared after the presentation with all attendees.

Why and what algorithmic literacy?

We *know* that algorithms surround us. So what?



Google Scholar

python™

Why and what algorithmic literacy?

“The danger lies not so much in delegating cognitive tasks [to machines], but in [...] not knowing about the precise mechanisms of that delegation.” [1]

A population that is well-informed and algorithmically literate is better equipped to understand and *use* the complexity of algorithms (incl. AI).

∴ a recognized problem and need -> a pedagogical strategy -> unique contribution libraries can provide.

[1] de Mul, Jos & van den Berg, Bibi (2011). Remote control : human autonomy in the age of computer-mediated agency. In Mireille Hildebrandt & Antoinette Rouvroy (eds.), Law, human agency, and autonomic computing: the philosophy of law meets the philosophy of technology. New York, NY: Routledge.

2. But why the library?

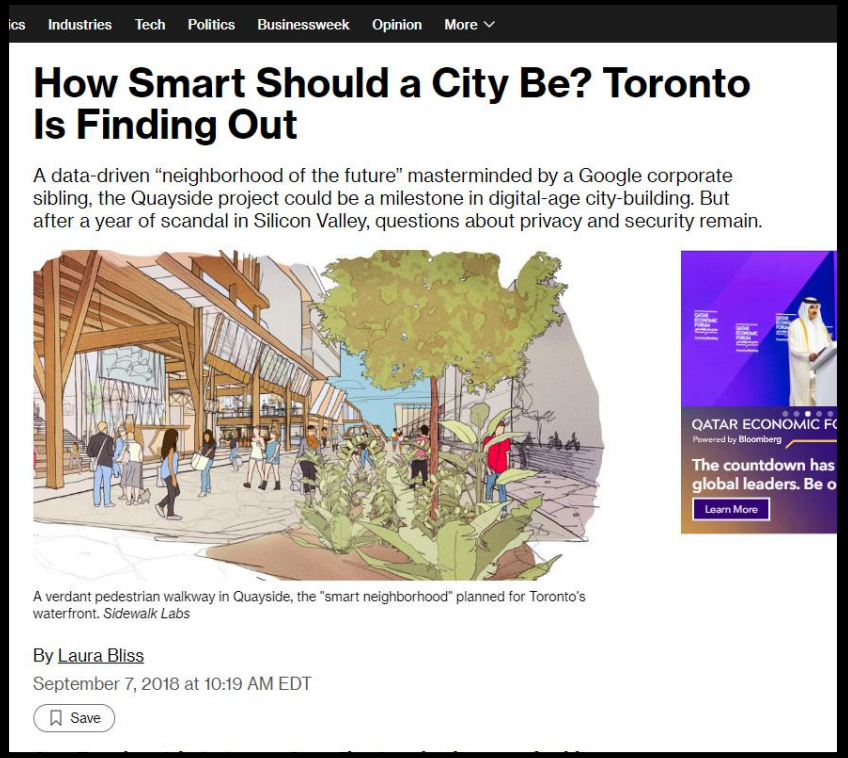
Central dogmas of algorithmic literacy.

- Recognise and evaluate the workings of algorithms
- Recognise and evaluate their application in systems
- Create and use algorithmic methods and tools to solve issues across a range of fields.
- Analyse how algorithms affect social, cultural, economic, and political environments.
- Position the individual as an active actor in algorithmic decision-making.

...

Why? Both in research and in practice

- Algorithms in predictive policing
- Facebook's news feed algorithm
- Amazon's hiring algorithm
- Automated grading of exams (#ibscandal) [1]
- Biased word embeddings in language models (gender, disability, etc.) [2] [3]
- Toronto's Sidewalk Labs plan for a data-driven neighbourhood: surveillance, data privacy, and data collection



[1] Fitzgerald, S. (2022). Covid-19 and the International Baccalaureate: a computer-assisted discourse analysis of the #ibscandal. *Https://Doi.Org/10.1080/00071005.2022.2056575*, *71*(2), 129–148. https://doi.org/10.1080/00071005.2022.2056575

[2] Bolukbasi, T., Chang, K. W., Zou, J., Saligrama, V., & Kalai, A. (2016). Man is to Computer Programmer as Woman is to Homemaker? Debiasing Word Embeddings. *Advances in Neural Information Processing Systems*, 4356–4364. https://arxiv.org/abs/1607.06520v1

[3] Hutchinson, B., Prabhakaran, V., Denton, E., Webster, K., Zhong, Y., & Denuyl Google, S. (2020). Social Biases in NLP Models as Barriers for Persons with Disabilities. *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics*, 5491–5501. https://aclanthology.org/2020.acl-main.487.pdf

Why (cont.)? Funding shows the future.

- Horizon Europe and Digital Europe programmes will invest 1 billion Euro/year in AI futures of Europe, including building trustworthy AIs. [1]
- The UK government released a white policy paper in March 2023 to implement a pro-innovation approach to AI regulation. It recognizes that UK's AI industry contributed £3.7 billion to the economy in 2022. [2]
- Canadian government released the Pan-Canadian Artificial Intelligence Strategy, phase 2, in 2021 – 2022, with an investment of $443 million for that fiscal year to mobilize AI research within Canada. [3]

[1] "Coordinated Plan on Artificial Intelligence." Shaping Europe's digital future. Accessed April 4, 2024. https://digital-strategy.ec.europa.eu/en/policies/plan-ai.

[2] "A Pro-Innovation Approach to AI Regulation." GOV.UK. Accessed April 4, 2024. https://www.gov.uk/government/publications/ai-regulation-a-pro-innovation-approach/white-paper.

[3] *Government of Canada launches second phase of the Pan-Canadian Artificial Intelligence Strategy - Canada.ca*. (2022). https://www.canada.ca/en/innovation-science-economic-development/news/2022/06/government-of-canada-launches-second-phase-of-the-pan-canadian-artificial-intelligence-strategy.html

https://tinyurl.com/algoliteracy

“**Question 2:** Tell me about your academic library’s mission, staffing, and goals for teaching algorithmic literacy.
How will you engage with faculty? How will AL be integrated into their courses?"

This file will be shared after the presentation with all attendees.

3. Practical pedagogy

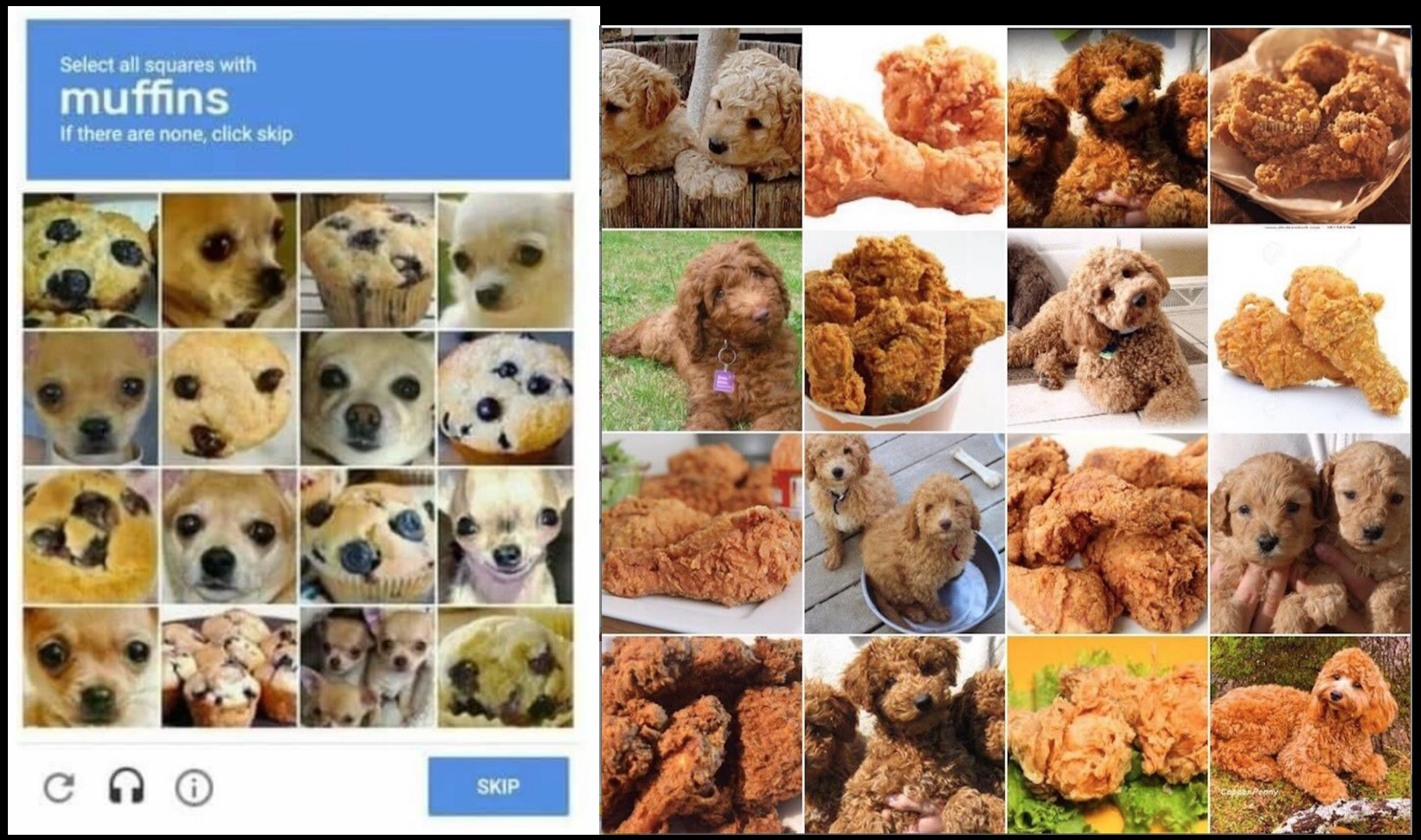
Practical pedagogical methods and tools

Small-to-medium scale	Large scale, long-term approaches
Interactive one-off workshops – e.g. text and data mining UKSG 2023 breakout session from U. Birmingham, 'A TDM journey'	Provide access to tools and resources (e.g. datasets) ProQuest TDM Studio, JSTOR Constellate, Gale Digital Scholar Lab, Canada Open Data and APIs
Collaborative projects algorithmicliteracy.org has useful resources on how to teach AL to young adults through projects	Host events and discussions (colloquiums, expert talks) Digital humanities lighting talks, digital humanities praxis workshops
Hackathons Ethics4NextGen AI Hackathon, Helsinki Digital Humanities hackathon (has distinct inclusive goal of teaching algorithmic skills even to non-technical participants)	Financial support for undergraduate skill development – library collaborates with other departments and university initiatives Digital humanities skills development funds for undergraduates
Embedding required concepts in courses/modules	Advocate for data protection and privacy practices Not just on social media, but in the research data students create during their studies, e.g. institutional research repositories and intellectual licenses
Scaffolding (e.g. certificate) workshops Allows you to target a wider base of students and bring them into the library	Asynchronous/reusable online learning resources to use those tools and resources Map and Data Library at University of Toronto hosts: Using JSTOR Constellate, Managing your data using version control in GitHub. University of Toronto's SciNet hosts: writing bash scripts, intro to neural network programming McMaster University's Sherman Centre for Digital Scholarship hosts: Computational text analyses bootcamp, scraping Twitter tweets using your own algorithm

Practical topics

- Sensitive data management
- Preserving digital scholarship projects in algorithmically fair ways
- Creating data management plans for your software and code (algorithms)
- Recognizing how academic databases present information to you
- Using social media ethically and/or being an ethical influencer on social media
- How to balance your digital news consumption and be aware of algorithms around information consumption e.g. tools like AllSides Media Bias Chart (https://www.allsides.com/media-bias/media-bias-chart), PolitiFact, FactCheck.org, BBC Verify, MediaBias ratiings.
- Indigenous data sovereignty (choosing inclusive databases)

Use humour.


Select all squares with
muffins
If there are none, click skip
SKIP

Use ethics.

Fairness
Accountability
Transparency
Ethics

Three levels of algorithmically-induced moral damage

1. Vicious cycle (“self confirming equilibrium”)
2. Subconscious manipulation (“nudging”)
3. Coercion (“social credit scoring”)

Christian, Brian. 2020. *The Alignment Problem: Machine Learning and Human Values*.
Dubber, Markus D, Frank Pasquale, and Sunit Das. 2020. “The Oxford Handbook of ETHICS OF AI.” In . United States: Oxford University Press, Incorporated.

Some of the contents of this slide are ideas originally proposed by Dr. Michael Ryall, at the Rotman School of Management, University of Toronto.

4. Co-learning and co-using

Co-learning and co-using for librarians

Algorithmic challenges	Library expertise
“When we talk about AI, getting really clear about what we mean is step one” – Genevieve Bell	in-house data analytics and data science skills
“Formidable femalr tech critics – Jane Abbate, Lillian Edwards, Maria Farrel…” – John Naughton	generalist analytics positions
“It’s going to take people coming together driving for justice” – Joy Buolamwini	In house data analytics and data science skills
Uncleaned datasets with bias, error, and ‘dirty’ data. “Error-riddled datasets are warping our sense of how good AI really it.” – Karen Hao	Data and informatics specialists

Annemaree Llyod describes the opacity and ubiquity of algorithms as “a wicked problem for librarians and archivists who have a vested interest in **equitable access, informed citizenry, and the maintenance of public memory.”**

https://tinyurl.com/algoliteracy

“Question 3: How has your library embraced co-learning to enhance algorithmic literacy among staff, considering the unique challenges and opportunities within your specific library context? What resources have you used?”

This file will be shared after the presentation with all attendees.

Thank you. Questions?

Contact me at: christinadinh.nguyen@utoronto.ca
Slides and notes shared here: https://github.com/TorontoYYZ/uksg2024

P.S., thank you, UKSG, for sponsoring my place in 2023!