What Do Artificial Intelligence (AI) and Ethics of AI Mean in the Context of Research Libraries?

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The Context

The Association of Research Libraries (ARL) seeks to understand and engage the research library community and others in the research and learning ecosystem on the ethical implications of AI in the context of knowledge production, dissemination, and preservation. Furthermore, it seeks to inform the adoption of AI in research library operations, to help shape the research library workforce, and to advise and, as appropriate, help catalyze the services and programs that research libraries offer. With so much underway in the field of AI, there is a need for research libraries to act, starting with clarifying AI ethics policies, principles, and practices. This issue of *Research Library Issues (RLI)* opens up a conversation that ARL will continue to focus on in partnerships, and in formal and informal forums, particularly in the context of advocacy and public policy, institutional policies, research and learning community practices, and leadership development.

For the purpose of this issue of *RLI*, artificial intelligence is "the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages."[1] "Artificial intelligence" is not a new term. The first use of the term is attributed to John McCarthy at the 1956 Dartmouth Conference.[2] The concept of machine thinking is often attributed to Vannevar Bush's seminal work in 1945, "As We May Think," summarized so well by the editor as a paper that **"calls for a new relationship between thinking man and the sum of our knowledge"** [emphasis added].[3] And, Alan Turing is well known for his work during the Second World War on Enigma and the Bombe machine in laying the groundwork for machine learning.

The term "artificial intelligence" and its three primary related concepts (neural networks, machine learning, and deep learning) are used to varying degrees in the literature today. The presence of the term "artificial intelligence" in Google Books shows a distinct spike in the late 1980s and early 1990s, with increasing use of the term "machine learning" more recently, and, mildly, "deep learning" (see Figure 1). As access to large data sets grew, the potential for artificial intelligence, and therefore funding, also grew. Interestingly, there is a noticeable increase in the term "misinformation" during the rise in the mention of "machine learning." It isn't possible from this view alone to determine why there is a precipitous drop in the use of the term "artificial intelligence" in the 1990s, although one could hypothesize that, by then, we were all more aware of the different threads in artificial intelligence, and so used the distinctions like "machine learning" more often. Alternatively, it could be that with the growing interest in the field, publication moved from books to more timely forms of information sharing, such as journal articles. Though causality cannot be proven in any way through the Ngram Viewer, the rise in use of the word "misinformation" is not surprising, and reinforces the significant opportunity for and responsibility of our field.
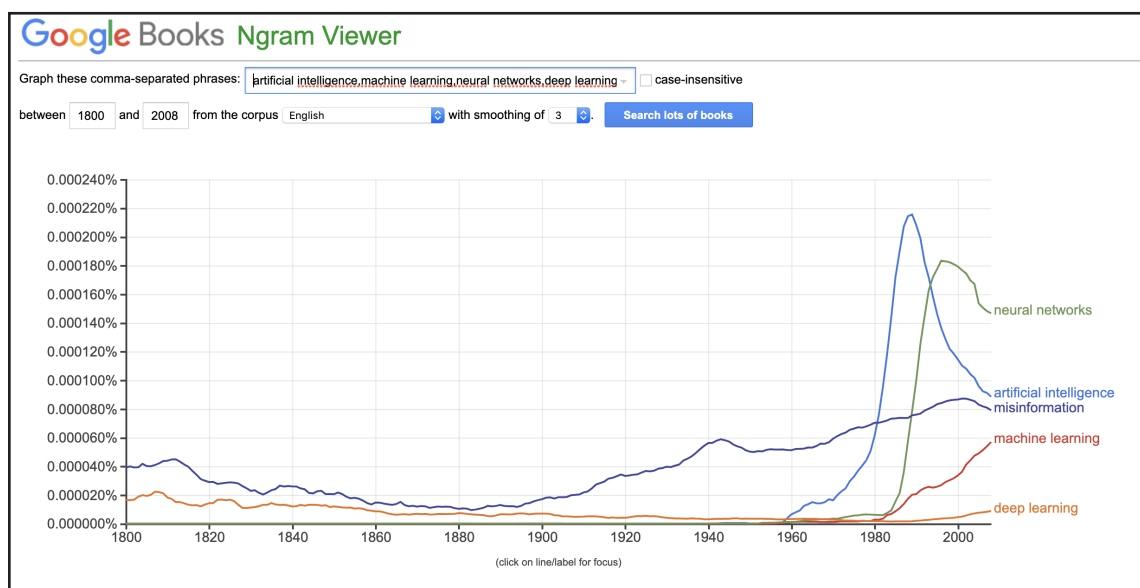

Figure 1

More specifically, the prevalence of AI in this Fourth Industrial Revolution[4] is captured in the World Economic Forum's transformation map (see Figure 2).[5] AI is prevalent in almost all we do, albeit not equally across geo-political boundaries, industries, scientific fields, or educational institutions.

Figure 2

Amid other organizations' predictions, the World Economic Forum projects that by 2022 (three short years from now), the average percentage of tasks carried out by machines vs. humans will change from 29% vs. 71% in 2018 to 42% vs. 58%. Among the declining human skills predicted are "reading, writing, math and active listening."[6]

In higher education, AI is used and is expected to be used in recruiting students, personalizing the student experience,[7] and assisting with learning and instruction.[8] How this is playing out as a trend in higher education, and what it means for research libraries, is not entirely clear, though reports on education technology trends in 2019 highlight growth in immersive learning, adaptive learning, and remote proctoring, as well as the much-discussed issues related to learning analytics. The 2019 EDUCAUSE survey on emerging technologies is due later this fall and may produce more findings we could include in

this discussion. A study by ARL, CNI, and EDUCAUSE over the next 18 months seeks to shed light on the critical technologies shaping research and learning (including AI), and the implications for research libraries as collaborative partners in the research enterprise.[9]

AI Ethics Initiatives in 2019

There are significant AI ethics initiatives underway in 2019 both globally and nationally. This is a critical and opportune time for research libraries to assess and actively engage in informing the principles and practices of AI institutionally, in public policy, and in the research and learning community.

Following an initial draft in December 2018, in April 2019 the European Commission's High-Level Expert Group on Artificial Intelligence established seven essentials for achieving trustworthy artificial intelligence. The essentials are: human agency and oversight; robustness and safeness; privacy and data governance; transparency; diversity, non-discrimination, and fairness; societal and environmental well-being; and accountability.[10] On May 22, 2019, the Organisation for Economic Co-operation and Development (OECD) issued the "Recommendation of the Council on Artificial Intelligence,"[11] adopted by 42 countries, including Canada and the United States. On June 9, 2019, the G20 agreed on guiding principles for adopting artificial intelligence.[12] Although the principles among these bodies are not identical, they are more similar than different. Recently, France, Germany, and Japan agreed to jointly fund AI research that respects privacy and transparency.[13]

Closer to our members from Canada and the United States, on May 14, 2019, the Canadian Minister of Innovation, Science and Economic Development announced the Advisory Council on Artificial Intelligence. The purpose is to "advise the Government of Canada on building Canada's strengths and global leadership in AI, identifying opportunities to create economic growth that benefits all Canadians,

and ensuring that AI advancements reflect Canadian values."[14] This followed a statement with France.[15] Further, Canada developed AI superclusters, including higher education institutions, to promote the development and use of AI.[16] The US National Institute for Standards and Technology (NIST) issued a request for information in May 2019 following the February 2019 United States Executive Order on "Maintaining American Leadership in Artificial Intelligence." NIST's charge is to "create a plan for federal engagement in the development of these standards and tools in support of reliable, robust and trustworthy systems that use AI technologies."[17] In June 2019, the Office of the President issued *The National Artificial Intelligence Research and Development Strategic Plan: 2019 Update*, including a section on ethics.[18] All of the above reinforces the undeclared but understood race for AI leadership in today's world.

Declarations and recommendations are not limited to government bodies. The report of the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems on ethically aligned design bases its recommendations on the principles of human rights, well-being, data agency, effectiveness, transparency, accountability, awareness of misuse, and competence. In their words:

> Whether our ethical practices are Western (e.g., Aristotelian, Kantian), Eastern (e.g., Shinto, 墨家/School of Mo, Confucian), African (e.g., Ubuntu), or from another tradition, honoring holistic definitions of societal prosperity is essential versus pursuing one-dimensional goals of increased productivity or gross domestic product (GDP). Autonomous and intelligent systems should prioritize and have as their goal the explicit honoring of our inalienable fundamental rights and dignity as well as the increase of human flourishing and environmental sustainability.[19]

The Montreal Declaration for the responsible development of AI is being implemented with input from the general public.[20] Harvard University and MIT have a joint initiative to provide evidence-based

research to decision-makers in the private and public sectors, in order to advance the use of AI for public good.[21] Several institutions of higher education offer AI ethics courses to undergraduates and graduate students; examples include Stanford University,[22] Vanderbilt University,[23] University of Arizona,[24] as well as courses through edX, Coursera, and Udacity. Computer science program accreditation by ABET requires understanding of professional, ethical, legal, security, and social issues and responsibilities—including as ethics relate to AI.[25] In fact, an "AI ethics" online course search in Google returns over 35,000 results.

AI Ethics and Research Libraries

In this global and national context of AI investments and adoption, this issue of *RLI* focuses on the relation of AI ethics and the role and potential roles of research libraries. A limited sampling highlights the broadening adoption of AI in research libraries. The University of Oklahoma[26] and other examples are highlighted in a 2019 issue of *Library Technology Reports* edited by Jason Griffey that opens with this compelling statement: "This issue of *Library Technology Reports* argues that the near future of library work will be enormously impacted and perhaps forever changed as a result of artificial intelligence (AI) and machine learning systems becoming commonplace."[27]

Now is the time for research libraries to collectively understand and address a host of ethical questions for research institutions, public policy, and more specifically for research library leaders in institutional and public policy, so that research libraries will continue to serve as trusted advisors to our users, and as responsible collectors, disseminators, and preservers of knowledge. To help frame our thinking, we invited three individuals to share their expertise and recommendations with us.

Sylvester Johnson, the founding director of the Center for Humanities and the assistant vice provost for the humanities at

Virginia Tech, focuses on the role of ethics in innovation in the first article in this issue. AI, like other influential technologies, can be a force for innovation, and is known to have harmful as well as helpful implications. Johnson highlights the undeniable moment in which technologies are raising fundamental ethical questions about humanity, including how we want to inhabit the world that we are creating. With information at the core, he lays out opportunities and challenges for research libraries.

Within the broad context of policy and principles, there is an opportunity for research libraries to make a difference today— explainable artificial intelligence (XAI). In the second article, **Michael Ridley**, Librarian Emeritus at University of Guelph, PhD candidate at Western University, and postgraduate affiliate at Vector Institute, defines XAI, and then situates it in the context of privacy, opacity, and trust. He advances our understanding of XAI by outlining strategies, techniques, and processes. He concludes by squarely putting the opportunity on research libraries "to shape the development, deployment, and use of intelligent systems in a manner consistent with the values of scholarship and librarianship" with XAI as one of the most important ways to do so.

Geneva Henry, dean of Libraries and Academic Innovation at The George Washington University, ties it all together for us with an article on the role of the research library in formulating and implementing institutional policy based on the needs of the users, and in the context of public policy. Starting out with an assessment of national investments in AI, Henry emphasizes the role of policies that promote ethically responsible practice. Her article outlines ways in which research libraries are answering and could answer the key question posed by Brundage and Bryson: it "is not whether AI will be governed, but how it is currently being governed, and how that governance might become more informed, integrated, effective, and anticipatory."[28]

I hope you will discover new knowledge and urgency in the articles published here. Please contact me or any of the authors with questions or suggestions.

Endnotes

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