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Two-Eyed AI

A Reflection on Artificial Intelligence



A Reflection Paper prepared for the Canadian Commission for UNESCO

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Mi'kmaw Elder Albert Marshall

In conversation with Tom Johnson

August 2018

The artificial intelligence (AI) reality is now undeniable. Though the underpinning technical insights came together close to half a century ago and though AI has suffered from periods of disappointing hype, something has changed in the 21st century.

Massive computing capacities and digital data holdings have emerged in recent decades to breathe life into the ingenious, but iterative technique of backpropagation in neural networks¹ and to energize optimization algorithms. The combination enables elegant machine learning and generates simulations of human thinking that some see as approaching the supernatural.

What is Two-Eyed AI

Two-Eyed AI is a label for a framework that would guide the ethical implications development and application of artificial intelligence (AI) technologies. It draws on the Two-Eyed Seeing principle advanced by Canadian Indigenous leaders, notably Mi'kmaw Elders Albert and Murdena Marshall. Two-Eyed Seeing, Etuaptmu'k in the Mi'kmaw language, refers to learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing and from the other eye with the strengths of Western knowledges and ways of knowing. Two-Eyed AI echoes this approach with a call to consider ethical issues and their management in tandem with the advancement and deployment of AI systems.

But more than this, Two-Eyed AI would embrace integrated thinking, respectful multidisciplinary collaboration, and transcending combinations of interests for public good.

¹ <https://www.thecanadianencyclopedia.ca/en/article/artificial-intelligence>

At the close of 2018, almost all media stories and official reports on the subject of artificial Intelligence support the belief that the world sits at an inflection point and predict that AI will disrupt scientific disciplines, economies, and all sectors of society in the years to come. Some will profit from this phenomenon, many will see benefits in AI applications, and others will feel the impact in loss of employment and new forms of discrimination. All of us will experience an encroachment on personal privacy and autonomy.

With the specter of diverse impacts, the upsurge of AI has induced institutional and individual responses ranging from unbridled enthusiasm to feelings of intimidation. This latter reaction has prompted efforts to craft and institutionalize policies and programs for the ethical development and application of AI technologies.

Leading advocates for ethics in AI recognize a need for broad public engagement to ensure democratic and constructive debate and to produce equitable policies and processes. They also note that an informed and engaged public would produce more effective users of AI technologies as well as participants in the societal effort to manage its development. Yet the task of reconciling varied points of view, while trying to understand a rapidly evolving and complex technology, can easily overwhelm and confuse.

This paper suggests that Canadians considering this 21st century challenge may find power in an integrated perspective, one known as *Two-Eyed Seeing*. Crafted and advanced by Elders Albert and his late wife Murdena Marshall of the Mi'kmaw Nation, the Two-Eyed principle asks that we see issues and life from one eye with the best in Indigenous ways of knowing and from the other eye with the best in the Western or mainstream ways of knowing. The wisdom of this balanced approach and the mixing of two points of view aligns well with thoughtful strategies for navigating the AI reality and could offer a practical and visual framework for ethical policy development.

But more than just a useful metaphor or shorthand for the two-pronged approach to ethical AI, *Two-Eyed Seeing* calls for respectful collaboration and synergistic approaches. Through this, it also presents a vehicle for meeting the AI challenge from a position empowered by greater understandings and built on the best of our humanity.

The Rise of AI

The surge from two (2) to over one thousand (1,000) structured “Deep Learning” projects at Google in just five years (2011-2016) and government initiatives, such as the \$125 million [Pan-Canadian AI Strategy](#), attest to the rising interest in AI applications. These initiatives, along with the steady growth in big data and data analytics, raise hopes for intelligent reduction in energy use, new approaches to disease prevention and improved productivity.

But they also raise those human and societal issues ranging from privacy and equity to fraud and personal safety. Some ask, “Should a computer give medical advice? Is it acceptable for the legal system to use algorithms in order to decide whether convicts get paroled? ... and are (those suffering from mental illness) being targeted ... to exploit them at their most vulnerable?” (The Canadian Press, Dec 17, 2017).²

Many of these concerns flow from what has been labelled the “mosaic effect.”³ This is AI’s capacity to filter the digital exhaust we leave behind when blindly accepting terms and conditions, buying online, tweeting, and searching.

I took a particular interest in this matter last year when I had responsibility for ethics in research involving human participants at the National Research Council of Canada (NRC). My colleagues were concerned about the increasing use of AI to merge discrete data sets and create complete physical, biological, and personal information descriptions of research participants who had assumed anonymity. Researchers in the field told me that analysis of our search histories and social networks approaches the precision of fingerprinting as a means of identifying us.

The application of AI to this information thus threatens to annihilate the foundational principles around ethical human research: that being the protection of personal information and participation based on informed consent.

Work on Ethical AI Policies

With this backdrop, I consulted with experts in AI and ethics including Mr. Abhishek Gupta (<https://atg-abhishek.github.io/>) of Montreal. Mr. Gupta has been working to see that Canada builds upon the science and technology of AI under the rubric of Artificial Intelligence Ethics. Last year (2017), he established a Meetup group to foster a community of interest and more recently founded the Montreal AI Ethics Institute to mobilize resources and turn that interest into action.

Though Toronto, Edmonton, and other cities around the world can claim status as centres for AI development, Montreal has particular standing in the ethics arena. The University of Montreal and its partners gave a kick-start to multi-disciplinary AI ethics with *The Forum on the Socially Responsible Development of Artificial Intelligence* in November 2017. The event drew 400 expert participants who reviewed AI impacts on cybersecurity, liability, job markets, and human

² Valiante, Giuseppe · “Montreal seeks to be world leader in responsible artificial intelligence research,” The Canadian Press, Dec 17, 2017 <http://www.cbc.ca/news/canada/montreal/montreal-ai-labs-world-leader-2017-1.4453302>

³ Gupta, Abhishek, “The evolution of fraud: ethical implications in the age of large-scale data breaches and widespread artificial intelligence solutions deployment.” *ITU Journal: ICT Discoveries, Special Issue No. 1, 2 Feb. 2018* <https://www.itu.int/en/journal/001/Documents/itu2018-12.pdf>

health. The Montreal Forum concluded with the unveiling of a draft Declaration of ethical principles to guide AI developments and applications.

The [Montreal Declaration](#), however, is but one initiative aimed at policies and standards in AI. There are many, many others, and most are promoting similar ethical principles.

Other AI Ethics Initiatives

Amazon, Apple, DeepMind, Google, Microsoft, Facebook, IBM, eBay, and other private institutions collaborate in a non-profit organization (the Partnership on Artificial Intelligence to Benefit People and Society) with the stated goal of establishing “best practices on the challenges and opportunities within the field.” The Asilomar Conference (Future of Life Institute), the IEEE (Institute of Electrical and Electronics Engineers), the AI Now Institute at New York University, and information and telecommunications industry organizations as well as UNESCO (through its network of Chairs in Natural, Social and Human Sciences as well as its [World Commission on the Ethics of Scientific Knowledge and Technology](#) (COMEST)) have taken a stab at AI ethics issues. UNESCO’s new Recommendation on Science and Scientific Researchers (2017) also sets out principles relevant to the development and use of AI.

The new International Science Council (ISC), the product of a merger of the International Social Sciences Council (ISSC) and the natural sciences-focused International Council for Science (ICSU), held its first General Assembly in Paris this summer (July 2018) stressing a foundational interest in ethical practices across all disciplines. ICSU and ISSC had already collaborated with other world bodies on ethics issues in striking the [Open Data in a Big Data World Accord](#) at the inaugural Science International Conference. It would be hard to imagine a future agenda for the new merged organization that did not include human, social and ethical issues in AI.

Canada’s federal agencies and governments around the world are now contemplating regulatory and legal measures to protect the public while encouraging AI innovation. The European Union’s (EU) General Data Protection Regulation (GDPR), which came into effect this year, reflects concern over many issues linked to AI and big data.

These initiatives typically involve multiple stakeholders and draw in expertise from a variety of disciplines. Some, like the process flowing from the Montreal Declaration, also seek broad public input in a way that does not demand familiarity with technology, law, or social science.

My interest in human research and my conversations with experts last year led to the creation of an *NRC Working Group on Human Ethics and AI* and later the crafting of the [NRC Advisory Statement on Human Ethics in Artificial Intelligence and Big Data Research](#) (2017). The AI Ethics Institute in Montreal also intends to develop tools to guide the use and development of AI in specific circumstances, such as a checklist for mental health applications. Nevertheless, one characteristic that weaves through all efforts to address ethical issues in AI is a complementary desire to encourage innovation and the positive use of the technology.

Mr. Gupta, an ethicist with a background in engineering and business, sees great opportunity in the application of AI for public good. But he feels this can only be exploited if more people, communities, and institutions are comfortable with the technology and open to its use.

In this regard, he believes that if more of us were to learn about the limitations as well as the power of AI technologies, we would have a foundation to attack ethics issues in a constructive way and to pursue the application of the technology for human benefit.

Background on Two-Eyed Seeing

The intertwining of technology and human concern was also front and centre at the Canadian Commission for UNESCO (CCUNESCO) Annual General Meeting (AGM) held in Ottawa's Wabano Centre a week after my meeting with Mr. Gupta (June 2018). At the AGM, reconciliation between Canada's Indigenous and non-Indigenous peoples provided the focus. The Sciences Sectoral Commission spent a morning discussing how to enhance collaboration between Indigenous communities and scientists.

With specific and repeated references to climate change, speakers at the CCUNESCO event noted that not only are Indigenous Peoples and marginalized populations impacted directly and particularly by climate change, they also have unique takes on its challenges and thoughts on possible coping responses.

It was in these discussions that I learned that the integration of the Indigenous perspective on climate science and western approaches carries that label "Two-Eyed Seeing." The ideal is a marriage of the Indigenous skill at narrative storytelling, systems thinking, and seeing life in all things with western concepts of knowledge often founded on data and technology.

Fresh from my exchanges with the AI experts, I was struck by how much the arguments for Two-Eyed collaboration and engagement resonated with the pursuit of ethical AI. CCUNESCO has a special capacity to bring people from different backgrounds together in common cause and to bridge civil society and governmental partners. I thought that the CCUNESCO membership and networks might be well-placed to promote Two Eyed Seeing in the AI context.

Certainly, informed and engaged youth, Indigenous groups and other elements of civil society could add to the understanding and articulation of AI impacts and produce ethical policies not defined by technical, economic, or administrative imperatives alone. In addition to informed policy, such broad engagement could aspire to foster the application of AI tools to the benefit of nations, organizations, communities, and individuals.

Often, discussion of such AI opportunities focuses on complex, large-scale issues such as deforestation, pandemic disease, and conflict, suggesting the need for large, technically sophisticated research teams and massive resources. Many individuals and organizations thus think of AI as very specialized and inaccessible.

But AI systems have mundane applications, and many tools are available in open source. These tools lend themselves to practical projects that can help NGOs and other groups supercharge their capacities on the operational-level and in the everyday processes of administration and finance. In any case, AI will permeate our lives whether we take action to exploit it for public good benefits or not. We all need to learn more, but the greatest challenges and opportunities for ensuring that AI evolves to human benefit rest in the engagement of youth.

Indigenous Language Technologies

Examples of AI applications relevant to CCUNESO interests can be found in work on speech- and text-based technologies aimed at the revitalization and preservation of Indigenous languages. In Canada, Kanyen'keha (Mohawk) educators are collaborating with scientists at the National Research Council on projects confronting the complexity of words that often express what other languages do with entire clauses.

A specific AI opportunity rests in the thousands of hours of sound recordings of Indigenous language users. These recordings sit in archives and other research holdings but are difficult to access and use because they were not transcribed and lack metadata on what language is spoken, who is speaking, and when.

AI systems can also provide tools to automatically segment and label audio files while they're being recorded and build indexation software that makes it possible to search through recordings to find key words or phrases. Translation and inscription software to support Inuktitut translators also invites AI techniques.

But, once again, those involved note that such social benefit applications can only succeed with sensitivity to human concerns and to community interests pursued through respectful collaboration.

Will post-Millennials be The Artificials or The Ethicals?

The current cohort of young adults, Generation Y or the Millennials, is characterized by familiarity with digital technologies and is labelled as the generation that “buries its head in the hand.” These people grew up with technologies that research and remember for them.

It is likely that members of the next generation will know nothing other than a world in which technology also collects data, learns, and seemingly thinks for them. How the post-Millennials will use these tools and how they will respond to the challenges will be defined by how they are introduced to them in schools, in their homes, and on the street. Risks lie in the seduction of new technologies and the easy, unquestioning acceptance of them. Those with an interest in the ethics and social implications of AI want young people to be engaged with human considerations from the beginning.

For this reason, groups like the Montreal AI Ethics Institute hope to stage open sessions and conduct presentations in high schools and CEGEPs with the humble ambition of having the students reflect on the ethical issues and possibly pause when they are confronted with AI applications in the future. These students include the next generation of engineers, computer scientists, lawyers, and policy makers. If they have the instinct to simply stop and think about it, this impulse could have a material impact on ethics in AI.

CCUNESCO (with its Associated Schools Network and links to innovative learning formats like the Manitoba-led Canadian Ethics Bowl) would be a natural ally in this effort. It aligns well with the UNESCO ambition to build the next generation global citizenry: one that embraces both the potential of new technology and the value of ethics in science.

Two-Eyed AI

In considering this, I was again conscious of coherence with the concept of Two-Eyed Seeing and of the power of Indigenous models for engagement, such as the approach of conveying information as a narrative with experiential references. With these notions in mind and the help of CCUNESCO staff, input was sought from Indigenous colleagues Melanie Goodchild, Research Fellow at the University of Waterloo and new Chair of the CCUNESCO Sciences Sectoral Commission, and Tom Johnson, a CCUNESCO Executive Committee Member and Executive Director of the Eskasoni First Nation Fish and Wildlife Commission.

Ms. Goodchild noted that the Two-Eyed Seeing concept resonates with other efforts to integrate science and technology with Indigenous ways of knowing. In fact, the broader Indigenous perspective and its link to artificial intelligence were explored in an eloquent article by lawyer and ethicist Karina Kesserwan, published by *Policy Options* earlier this year.

Ms. Goodchild also cited the work of Professor Daniel R. Wildcat, a Yuchi/Muscogee scholar and author of *"Red Alert: Saving the Planet with Indigenous Knowledge."* In the book, Wildcat suggests, in fact, that, "By looking at the convergences now emerging between Western science and technology and Indigenous life ways, knowledges and practices, we can develop a richer and ultimately more realistic measure for the value of technology." In order for these two multifaceted traditions to come together, however, Wildcat and others also stress that participants will need to create places, the ethical space, where this integration is respectful and honest.

Mr. Johnson had similar thoughts on overall merit of Indigenous knowledge. But for a perspective on AI and a framework based on the Two-Eyed Seeing (Etuaptmu'k) principle, he contacted Albert Marshall himself. Now in his eighties, Mr. Marshall is an active and thoughtful elder in Mr. Johnson's Mi'kmaw Eskasoni community.

Over tea at Mr. Johnson's home, the two men considered the notion with reference to those AI applications and pondered the possibility of a speech-to-text app for translating Mi'kmaq to English and vice versa. Through this, the two men also saw merit in an indigenous perspective and the Two-Eyed Seeing principle as a tool and framework for AI issues – one eye seeing human ethics concerns and the other seeing the technological potential.

But, for me, their discussion and feedback were most valuable in making the specter of AI just a little bit less intimidating in a way consistent with Mr. Gupta's references to the limitations as well as the power of AI technologies. Mr. Marshall said that a lot of the wisdom that he has projected regarding the Two-Eyed Seeing concept comes from his ancestors. He said sometimes this knowledge can manifest as intuition or "operating on instinct."

"Some of these teachings have formed the basis of who we are and why we do what we do," Mr. Johnson explained. "Years of learning from these lessons form your character and how you perceive your environment". He equated it to a form of supernatural intervention in daily life as revealed in using the Mi'kmaq language, which is verb-based and grounded on simple sentence structures, free word order, and subtle pronunciation.

Mr. Marshall cited the example of:

- Kesalul I Love you
- Kesa'lul I hurt you
- Ke'sa'lul I will throw you in the fire

Another issue that he mentioned was the concept of animacy within Indigenous languages, something also referenced in the Policy Options article. Every word about an object that is spoken in the Mi'kmaw language is either animate or inanimate. Many speakers who learned the language later in life have difficulty in determining what is either animate or inanimate.

Tom Johnson noted that while pieces of fruit are similar objects spawned from living things, some like an orange are animate whereas an apple is inanimate. A fork is inanimate, and a spoon is animate. Other Indigenous languages, of course, have their own unique features.

Tom Johnson said that the decisions to determine whether an object is either animate or inanimate can only be made by a consciousness achieved from extended time or life immersed in a Mi'kmaq language and a cultural environment defined by the teachings of one's ancestors. Noting that he had learned these things from the late Murdena Marshall, Mr. Johnson said that only through this can a tribal consciousness develop and be shared.

I know from my former science colleagues that many Indigenous words pose difficulties for standard software and AI applications because mobile apps lack language-specific word-handling capabilities or the capacity to follow a community's understandings. It is difficult to imagine how an AI system could ever fully match the authentic kind of knowing that manifests as instinct and intuition.

Conclusion

The sum of the feedback from Ms. Goodchild, Mr. Johnson, and Mr. Marshall thus convinced me of the merit of Two-Eyed Seeing in the development of AI, but not merely as a catchy label and two-pronged framework for managing ethical concerns and technological opportunities. It also reminds us of the value of different ways of knowing, of the limitations on the technology as well as its potential, and of the benefits of a systems approach and community knowledge that synthesizes and transcends.

Mr. Marshall said, “knowledge (jijitaqen) is dynamic: it is alive and fluid and always morphing to the scenario at hand – (so) even though AI has the ability to comprehend trillions of calculations per second, it lacks the human ability to have feeling and the supernatural component to aid in decision making.” But if we can harness these capacities under the Two-Eyed principle and develop AI for human benefit, we may very well touch the hem of something that simulates supernatural intelligence.

Many thanks to Dr. Albert Marshall, Ms. Melanie Goodchild, Mr. Thomas Johnson, Mr. Abhishek Gupta, and Professor Liette Vasseur as well as the staff at CCUNESCO for their guidance and input on this reflection.

Options for Encouraging Two-Eyed AI

- Educate broadly through public fora, interest groups, and exchanges in an empowering way that draws on two-eyed principles and recognizes concerns, but demystifies technology.

- Undertake targeted AI public engagement and education efforts with Indigenous and other groups based on the Two-Eyed principles.
- Engage with a range of AI Ethics groups and AI technology development interests to give voice to marginalized groups and to advocate for open, democratic ethics policy development and processes.
- Promote the application of AI technologies in mission-driven research aimed at social good and encourage interaction between NGOs, non-profits, and Indigenous groups and AI researchers and technical experts to identify opportunities and develop tools.
- Help educators and institutions in exposing students at all levels to AI ethics issues and in the development of pedagogy and age-appropriate tools to this end.
- And in the pursuit of AI applications and in a steadily increasing technological world, celebrate humanity, human contact, sharing and socialization as integral to what we are, particularly when confronting mental health and other societal issues.

Links

- Alisomar AI Principles : <https://futureoflife.org/ai-principles/>
- COMEST’s Report on [Robotics Ethics](#) (2017)
- “How can Indigenous Knowledge shape our view of AI” Kesserwan, Karina, Policy Options Feb 2018: <http://policyoptions.irpp.org/magazines/february-2018/how-can-indigenous-knowledge-shape-our-view-of-ai/>
- “[Human decisions: Thoughts on IA](#)”, UNESCO (2018)
- Montreal Declaration on Responsible AI: <https://www.montrealdeclaration-responsibleai.com/>
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- Partnership on AI: <https://www.partnershiponai.org/>
- The Forum on the Socially Responsible Development of Artificial Intelligence: <http://nouvelles.umontreal.ca/en/article/2017/11/03/montreal-declaration-for-a-responsible-development-of-artificial-intelligence/>
- Two-Eyed Seeing and other Lessons Learned within a co-learning journey of bringing together indigenous and mainstream knowledges and ways of knowing (C. Bartlett, M. Marshall, and A. Marshall), Journal of Environmental Studies and Sciences (as submitted and accepted July 2012): <http://www.integrativescience.ca/uploads/articles/2012-Bartlett-Marshall-Integrative-Science-Two-Eyed-Seeing-JESS.pdf>
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