



Artificial Intelligence in Mental Health Services

Essay submitted to the
National Student Paper Competition

1,314 words

by
Mathieu Geneau
mathieu.geneau@gmail.com

Masters of Public Affairs

February 17, 2022

Artificial Intelligence in Mental Health Services

Every year, one in five people will experience a mental health issue, and 50% of Canadians will develop or have had a mental illness by the age of 40 (Canadian Mental Health Association n.d.). From 2000 to 2016, the prevalence of major depressive episodes was approximately 5.4%, anxiety disorder was 4.6%, and combined major depression and anxiety was 1.2% (Dobson et al. 2020). In addition, according to the Mental Health Commission of Canada (2012), the rate of approved disability claims in the federal public service for mental health reasons has doubled in 20 years.

The COVID-19 pandemic has also affected Canadians' mental health, with a decrease in the number of people reporting excellent or very good mental health (Statistics Canada 2020).

In Indigenous communities, the situation is even more critical, as First Nations, Métis, and Inuit people have higher suicide rates compared to the non-Indigenous population, although these rates vary among the communities (Statistics Canada 2019), while the impacts of residential schools contribute an intergenerational component (Hensel et al. 2019).

Improving access to mental health services is thus emerging as one of the main challenges today, which the federal government has recognized through the creation of a new department (hereinafter the "Department"), the Department of Mental Health and Addictions (Prime Minister of Canada 2021). This is an opportunity for the government to make a significant investment in one of the most promising solutions to this accessibility problem: artificial intelligence (AI) tools.

Use of artificial intelligence in the diagnosis and treatment of mental health disorders

AI can be defined as the [TRANSLATION] "field of study aimed at artificially reproducing the cognitive faculties of human intelligence in order to create systems or machines capable of performing functions generally associated with human intelligence" (Office québécois de la langue française 2017). A scoping literature review by Shatte, Hutchinson, and Teague (2019) identified four general categories of study related to the use of AI in mental health: (1) detection and diagnosis; (2) prognosis, treatment and support; (3) public health; and (4) research and clinical administration. This essay will cover only the first two categories.

With respect to detection and diagnosis, compared with physical health issues, mental health disorders have few specific biomarkers,¹ making their diagnosis rather subjective (Ćosić et al. 2020; Kalmady et al. 2019). Similarly, current diagnostic tools tend to take only a static picture of a person's mental state despite the dynamic and fluctuating nature of mental health disorders (Lovejoy 2019; Torous et al. 2018). Clinicians must also rely on patient reports, which may be biased and unreliable (Lovejoy 2019; Glenn and Monteith 2014b).

1 A biomarker can be defined as "an objective measure of a normal biological process, a pathological biological process, or a response to a therapeutic intervention" (Glenn and Monteith 2014b, 522 [free translation and references omitted]).

As a result, many believe that artificial intelligence tools could make the definition and diagnosis of mental health disorders more objective by combining a number of heterogeneous factors, such as the analysis of social media use,² gestures and facial expressions,³ voice inflection, eye-tracking and changes in respiration rate (Ćosić et al. 2020; Hariman, Ventriglio, and Bhugra 2019; Lovejoy 2019; Glenn and Monteith 2014b) to detect nonlinear relationships (Ćosić et al. 2020). This is critical, because early detection can prevent a disorder from becoming permanently established, which improves the prognosis, particularly in the case of schizophrenia and bipolar disorder (Glenn and Monteith 2014b).

As for prognosis and treatment, AI tools would facilitate patient treatment monitoring⁴ and promote adherence (Lovejoy 2019). The latter is an important issue, as it is estimated that approximately 40% to 70% of patients do not adhere to their medication regimen (Glenn and Monteith 2014b). AI would also make it possible to recommend a specific and personalized treatment plan, avoiding the trial-and-error process that further delays individuals' recovery (Lovejoy 2019).

AI also presents the opportunity to perform computer-assisted psychotherapy through a virtual chat box (Ćosić et al. 2020; Lovejoy 2019). It is true that some people might feel more comfortable confiding in a machine, since the machine cannot be biased, which decreases the influence of social stigma (Hariman, Ventriglio, and Bhugra 2019). These tools would also help address the lack of access to psychologists (Couturier 2021) and the limited number of mental health practitioners who travel to Indigenous communities (Hensel et al. 2019).

More generally, AI tools would optimize the workload of psychiatrists. Automatic language processing, which could provide clinicians with a summary of the patient's record, and voice and video analytics that document the patient's condition would thus allow them to focus on their interactions with the patient (Lovejoy 2019). The time saved could also enable them to see more patients, which would improve access to mental health services.

Challenges of using artificial intelligence in mental health

In order to unlock the full potential of AI, it is first necessary to address the challenges it presents. This is where the Department can play a fundamental role. Moreover, since this involves investing in tools that can be used in the delivery of care by the provincial governments, as well as partially regulating their use, the actions proposed below are less open to criticism regarding the division of powers and are more a matter of federal spending authority (Brun, Tremblay, and Brouillet 2014).

2 Hariman, Ventriglio, and Bhugra (2019) report, for example, that Facebook has developed an algorithm to detect suicidal statements or behaviours in users.

3 Lovejoy (2019) notes the example of video analysis that detected autism spectrum disorders and attention deficit disorder with or without hyperactivity with a 96% accuracy rate.

4 For example, the U.S. Food and Drug Administration has authorized the marketing of a new version of the antipsychotic drug Abilify that contains a sensor to record when it is taken (Hariman, Ventriglio, and Bhugra 2019).

First, the majority of research findings on the use of AI come from an experimental setting (Chan et al. 2017; Glenn and Monteith 2014b). Trials in a real-world setting remain necessary to analyze the clinical utility of the models developed (Hariman, Ventriglio, and Bhugra 2019; Shatte, Hutchinson, and Teague 2019). Similarly, the quality of AI tools depends on the quality of the data used to develop the models (Shatte, Hutchinson, and Teague 2019; Torous et al. 2018). Therefore, the Department should facilitate collaboration between clinicians and researchers by developing a platform for accessing and sharing reliable, high-quality data (Shatte, Hutchinson, and Teague 2019).

Second, AI presents ethical and privacy issues (Shatte, Hutchinson, and Teague 2019; Lovejoy 2019; Chan et al. 2017). Applying AI to mental health would indeed require the collection and processing of a very large amount of personal information. A data breach would cause significant harm, especially because of the persistent social stigma (Lovejoy 2019). Moreover, as Glenn and Monteith (2014a) note, a breach of a predicative model would have the same effect as an outright disclosure from a medical record, since the model itself could identify the presence of a mental illness. This privacy issue is accentuated because information security is also the responsibility of users, and many people find it challenging to configure the security settings of applications (Glenn and Monteith 2014a, 2014b).

The issue of consent also raises special concerns, as the large amount of data that may be processed would most likely require separate consents, and mental health disorders may transiently affect the ability to consent (Lovejoy 2019; Glenn and Monteith 2014b). The Department should therefore work with the provinces to initiate a process of reflection to develop a national policy on data security and consent for the use of AI in mental health.

Finally, many private companies are already developing mobile applications specifically related to mental health (Hariman, Ventriglio, and Bhugra 2019). The quality and security of these applications vary widely, making it necessary to develop rigorous reviews and government certification, similar to the approval process for a drug (Lovejoy 2019). The Department's website could contain a directory listing all of the approved applications, similar to the National Health Service in the United Kingdom (Lovejoy 2019).

Conclusion

In short, the Department should prioritize the establishment of financial assistance programs for the development of AI in the field of mental health, in light of the difficulty of accessing specialized services in a context where the need for them is growing. In addition, it should develop policies to guide the creation of algorithms, their testing and their implementation, including their quality and security with respect to personal information.

Bibliography

Canadian Mental Health Association. n.d. “Fast Facts.” *Fast Facts - CMHA National*. Accessed November 11, 2021. <https://cmha.ca/find-info/mental-health/general-info/fast-facts/>.

Brun, Henri, Guy Tremblay, and Eugénie Brouillet. 2014. *Droit constitutionnel*. 6th ed. Cowansville, QC: Yvon Blais.

Chan, Steven, Haley Godwin, Alvaro Gonzalez, Peter M. Yellowlees, and Donald M. Hilty. 2017. “Review of Use and Integration of Mobile Apps Into Psychiatric Treatments.” *Current Psychiatry Reports* 19 (12): 96. <https://doi.org/10.1007/s11920-017-0848-9>.

Mental Health Commission of Canada. 2012. *Changing Directions, Changing Lives: The Mental Health Strategy for Canada*. Calgary, Alberta. Mental Health Commission of Canada.

Couturier, Catherine. 2021. “Le trop difficile accès à un psychologue.” *Le Devoir*, February 13, 2021. <https://www.ledevoir.com/societe/sante/594966/le-trop-difficile-acces-a-un-psychologue>.

Ćosić, Krešimir, Siniša Popović, Marko Šarlija, Ivan Kesedžić, and Tanja Jovanovic. 2020. “Artificial intelligence in prediction of mental health disorders induced by the COVID-19 pandemic among health care workers.” *Croat Med J.* 61: 279-88. <https://doi.org/10.3325/cmj.2020.61.279>.

Dobson, Kathleen G., Simone N. Vigod, Cameron Mustard, and Peter M. Smith. 2020. “Trends in the prevalence of depression and anxiety disorders among working-age Canadian adults between 2000 and 2016.” Published by Statistics Canada. *Health Reports* 31 (12): 13-25. <https://www.doi.org/10.25318/82-003-x202001200002-eng>.

Glenn, Tasha, and Scott Monteith. 2014a. “Privacy in the Digital World: Medical and Health Data Outside of HIPAA Protections.” *Current Psychiatry Reports* 16 (11): 494. <https://doi.org/10.1007/s11920-014-0494-4>.

———. 2014b. “New Measures of Mental State and Behavior Based on Data Collected From Sensors, Smartphones, and the Internet.” *Current Psychiatry Reports* 16 (12): 523. <https://doi.org/10.1007/s11920-014-0523-3>.

Hariman, Keith, Antonio Ventriglio, and Dinesh Bhugra. 2019. “The Future of Digital Psychiatry.” *Current Psychiatry Reports* 21 (9): 88. <https://doi.org/10.1007/s11920-019-1074-4>.

Hensel, Jennifer M., Katherine Ellard, Mark Koltek, Gabrielle Wilson, and Jitender Sareen. 2019. “Digital Health Solutions for Indigenous Mental Well-Being.” *Current Psychiatry Reports* 21 (8): 68. <https://doi.org/10.1007/s11920-019-1056-6>.

Kalmady, Sunil Vasu, Russell Greiner, Rimjhim Agrawal, Venkataram Shivakumar, Janardhanan

C. Narayanaswamy, Matthew R. G. Brown, Andrew J. Greenshaw, Serdar M. Dursun, and Ganesan Venkatasubramanian. 2019. "Towards artificial intelligence in mental health by improving schizophrenia prediction with multiple brain parcellation ensemble-learning." *NPJ Schizophrenia* 5 (1): 2. <https://doi.org/10.1038/s41537-018-0070-8>.

Lovejoy, Christopher A. 2019. "Technology and mental health: The role of artificial intelligence." *European Psychiatry* 55 (January): 1-3. <https://doi.org/10.1016/j.eurpsy.2018.08.004>.

Office québécois de la langue française. 2017. "Fiche terminologique - intelligence artificielle." *Office québécois de la langue française*. http://gdt.oqlf.gouv.qc.ca/ficheOqlf.aspx?Id_Fiche=8385376.

Prime Minister of Canada. 2021. "Prime Minister welcomes new Cabinet." *Prime Minister of Canada*. <https://pm.gc.ca/en/news/news-releases/2021/10/26/prime-minister-welcomes-new-cabinet>.

Shatte, Adrian B. R., Delyse M. Hutchinson, and Samantha J. Teague. 2019. "Machine learning in mental health: a scoping review of methods and applications." *Psychological Medicine* 49 (9): 1426-48. <https://doi.org/10.1017/S0033291719000151>.

Statistics Canada. 2019. "Suicide among First Nations people, Métis and Inuit (2011-2016): Findings from the 2011 Canadian Census Health and Environment Cohort (CanCHEC)." *The Daily*, June 28, 2019. <https://www150.statcan.gc.ca/n1/daily-quotidien/190628/dq190628c-eng.htm>.

Statistics Canada. 2020. "Impacts on Mental Health."

Torous, John, Mark E. Larsen, Colin Depp, Theodore D. Cosco, Ian Barnett, Matthew K. Nock, and Joe Firth. 2018. "Smartphones, Sensors, and Machine Learning to Advance Real-Time Prediction and Interventions for Suicide Prevention: a Review of Current Progress and Next Steps." *Current Psychiatry Reports* 20 (7): 51. <https://doi.org/10.1007/s11920-018-0914-y>.