



MILA AND ITS PARTNERS RALLY THE SCIENTIFIC COMMUNITY TO DEVELOP NOVEL DATA-DRIVEN SOLUTIONS TO ASSIST WITH COVID-19 OUTBREAK

In light of the challenges that COVID-19 presents to our society, Mila is bringing its machine learning expertise to the scientific community together with its partners across different disciplines to help find potential solutions.

The primary objective of the Mila AI taskforce is to bring together an interdisciplinary team of researchers in machine learning, bioinformatics, immunology, virology and vaccine design to create open source, data-driven tools that could be deployed in current and future outbreaks.

"The COVID-19 crisis gives us an opportunity and a profound motivation to act selflessly and together for the common good, collaborating with the only objective to quickly save as many lives as possible," says **Yoshua Bengio, scientific director of Mila**. "Let us remember that spirit when, hopefully, we go back to more normal lives. That spirit is also the spirit of science, where the focus is on the joy of understanding, sharing and discovering solutions together."

Many researchers and partners in our network are interested in participating in projects to fight COVID-19. In an effort to coordinate, they have identified at least 5 primary research axes against which they are already progressing:

Omic profiling of COVID-19 progression mechanisms

[Guy Wolf](#) (UdeM) and [Irina Rish](#) (UdeM), professors at Mila, are leading this project which leverages data analysis tools to provide mechanistic understanding of the COVID-19 disease progression in order to assess risk of given medical/patient profiles, as well as to help identify binding targets for antiviral agents and potential vaccines. The researchers are looking for proteomic and transcriptomic data together with meta information that will enable them to disentangle the impact of age, gender, and other biomedical factors on the interaction and severity of the COVID-19 disease. One example of an active research question is to understand the apparent resilience of young children to severe infection, which is somewhat atypical for such epidemics.

Data-efficient deep learning to better model emerging biology

Led by [Sébastien Giguère](#) from [InVivo AI](#). The COVID-19 outbreak offers a solemn reminder of how little we know about emerging biology. Novel algorithms are needed for these types of data poor environments. Launched in 2018, InVivo AI is developing novel algorithms capable of learning from small and noisy datasets. In light of the COVID-19 outbreak, the startup is leveraging their platform to learn models of pathways in the immune system to better predict immune response. The team is working on modeling

proteasomal cleavage, TAP transport, antigen binding to MHC, antigen processing to the cell surface and recognition of MHC-antigen complexes by T-Cells and B-cells, with the goal of providing insight into immunogenic regions of the virus.

Machine learning for therapeutics discovery

The teams of [Yoshua Bengio](#) (UdeM), [Jian Tang](#) (HEC Montréal), graduate student [Maksym Korablyov](#) (UdeM), and the Mila startup [InVivo AI](#), has developed a deep reinforcement learning system which can quickly evaluate billions of candidate molecules. The approach can gradually modify the molecular structure by adding or removing building blocks in order to converge toward new molecular structures that can bind a target protein. The Mila team is looking for collaborators with expertise in deep reinforcement learning and in drug discovery to help with their research.

Mapping the Landscape of AI + COVID-19

[Sasha Luccioni](#) (UdeM), postdoctoral researcher at Mila and her team are working with researchers from [UN Global Pulse](#) to map the landscape of current and proposed research papers that use AI to counter the COVID-19 pandemic. The article, which will be published on March 23rd, covers the many facets of the crisis, including molecular modeling, epidemiology and diagnosis, in order to pinpoint the most impactful ways in which AI can be used and the approaches that are being explored.

Data Mining of COVID-19 Related Tweets

Led by [Reihaneh Rabbany](#) (McGill), professor at Mila, this research project aims to analyse mentions of COVID-19 in Twitter, in order to discover temporal and spatial trends as well as common mentions and keywords linked to the phenomena surrounding the global pandemic.

“This is an exceptional situation that requires exceptional means, and AI can contribute greatly to many of the efforts deployed to mitigate this crisis,” said **Valérie Pisano, President and CEO of Mila**. “Mila’s resources will be made available to support this effort led by researchers, start-ups and organisations here in Québec and around the world.”

Among Mila’s partners contributing to this effort, [Element AI](#) is sharing access to its computing resources (GPUs, CPUs, Storage) to facilitate and accelerate ongoing research and investigations by Mila and InVivo AI.

Even though several researchers have already demonstrated their interest and have begun to get involved in the projects, **we are seeking additional collaborators from all areas of computer science and health sciences to strengthen these projects**. *To join the effort, you are encouraged to reachout at covid19research@mila.quebec.*

Researchers who are working on a project involving COVID-19 and who would like support from the AI community are also encouraged to contact the same email address.

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About Mila

Founded in 1993 by Professor Yoshua Bengio, Mila rallies the highest academic concentration of research and development in deep and reinforcement learning. Since 2017, Mila is the result of a partnership between the Université de Montréal and McGill University with École Polytechnique de Montréal and HEC Montréal. Mila is a unique space for innovation in artificial intelligence that uses interactions with industry and fosters the emergence of start-ups while integrating the social impacts of the technology into its projects. <https://mila.quebec/>

About InVivo AI

Founded in 2018, InVivo AI is developing novel computational methods for drug design. In collaboration with both industry and academic partners, InVivo AI leverages their technologies to design drug-like molecules predicted to satisfy key criteria, enabling rapid and cost effective iteration towards novel drug candidates. <https://www.invivoai.com>

About Element AI

Element AI is a global developer of AI software that helps people and machines work smarter, together. Founded in 2016 by serial entrepreneurs including JF Gagné and A.M. Turing Award recipient, Yoshua Bengio, PhD, Element AI turns cutting-edge research and industry expertise into software solutions that exponentially learn and improve. Element AI maintains a strong connection to academia through research collaborations and takes a leadership position in policymaking around the impact of technology on society. <https://www.elementai.com>