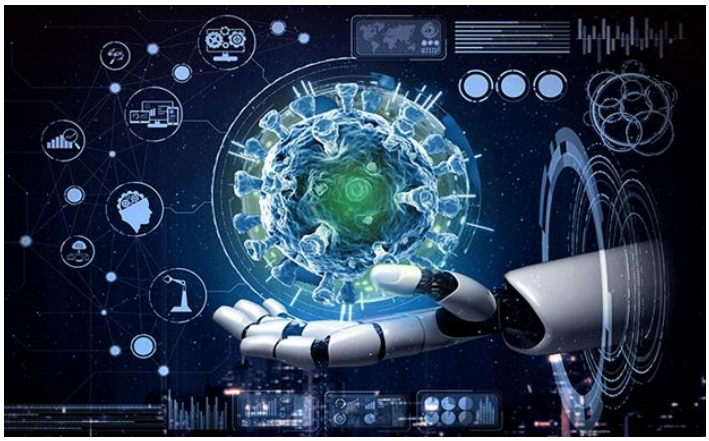
UNIVERSITY OF TORONTO

APS 1012: Managing Business Innovation and Transformational Change

Executive Summary

Machine Learning in Healthcare (COVID-19)



Submitted by: -

TEAM ONE

PASSION DRIVES

Executive Summary

In this era of technological advancements and innovations, artificial intelligence and data science carry an immense importance in every aspect of life [1] [2]. The use of artificial intelligence and data science in healthcare is revolutionizing the traditional roles of medical professionals and patient care. Automated systems are being utilized in most healthcare organizations around the world to overcome unprecedented and unexpected challenges. Smart solutions are being developed by researchers with the help of these sophisticated breakthroughs to provide excellent patient care and diagnose diseases in their early stages. Machine learning (ML) is one of these advanced technologies which aids in identifying and treating diseases and viral infections within the initial stage and provide more accurate data that can further play a large role in diminishing, controlling, and preventing disease.

As the world has been suffering from the wrath of COVID-19 in the past two years, this report sheds light on how ML is being used in other parts of the world to predict, treat, manage, control, and forecast COVID-19 infections and how the publicly funded Canadian health care system can benefit from ML innovations and reduce the impact of COVID-19 and future outbreaks on the already overwhelmed and fragile healthcare system.

COVID-19 case modelling, and predictions play a crucial role in deciding the public health policies, even lockdown which not only destroys the economy but also inflicts mental stress on the people. Machine learning enhances the capability of accurate modelling and projections which helps in taking appropriate and region wise steps and avoids unnecessary economic and social harm.

In the case of patient diagnosis, several models exist to diagnose if a patient is infected, based off different data such as chest tomography scans, x-ray scans, among others. Federated Learning (FL) models ensure ML models can be improved while still ensuring that patient privacy remains protected because no patient data would be shared within the network.

To determine a patient's prognosis, the ML model determines the prognosis based on information from various patients. Patient information must be thoroughly protected. Machine learning focuses on drug design, drug repurposing, and developing therapeutic vaccines.

Contact tracing reduces the infection rate by 5-15%. Automated contact tracing, which is more effective than manual contact tracing, can be implemented with a centralized, decentralized, or hybrid architecture. A hybrid approach is recommended to safeguard privacy while allowing easy updates to the modelling algorithm. Smartphone-based automated contact tracing should be augmented by machine learning algorithms, focused manual tracing, and public policy initiatives to maximize its effectiveness.

Lastly, ML can be implemented in conjunction with blockchain technology to securely forecast supply and demand for healthcare products. This assists various stakeholders by allowing them

to optimize route planning and coordinate their efforts to smoothly pass the product through the supply chain. Additional logistical applications highlighted in the report include customer-oriented AI, process automation, and industrial research and development.