RESEARCH PROPOSAL

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TYPE OF RESEARCH

Applied, Interdisciplinary Research Concerning Application of Artificial Intelligence and Machine Learning to Pharmacy Informatics During COVID Times.

TITLE

Large Scale Real-World Study on Improving Therapeutic Supply Shipment Times During COVID-19 Pandemic Response in Indian e-Pharmacy Using Artificial Intelligence and Machine Learning With Pre-Lockdown and Post-Lockdown Comparisons.

ABSTRACT

It is said that, "that which cannot be measured cannot be improved." In this day and age of COVID-19 and the speed with which it is ravaging countries across the globe, it is fair to say that, "that which cannot be forecast and predicted well in advance, cannot be acted upon." On one hand, the world is facing a pandemic with unprecedented challenges in terms of discovering COVID-19 therapies and COVID-19 vaccines. On the other hand, governments and institutions around the world are grappling with the unparalleled distribution problem of delivering COVID-19 therapeutic supplies and vaccines to the population. As researchers, we strongly believe that Artificial-Intelligence and Machine Learning are key to solving the myriad of problems within the COVID-19 ecosystem. In this research, we are focusing on the COVID-19 therapeutic supply shipment problem. More specifically, we are particularly focusing on the sub-problem of predicting in advance shipment times of essential medicines and vaccines during the COVID-19 pandemic response. To this effect, we would research into and publish papers on real-world solution to the problem mentioned above.

KEYWORDS

COVID-19, Corona Virus, Pandemic Response, Medicine Shipments,
e-Pharmacy, Real-world Study, Artificial Intelligence, AI, Machine Learning.

INTRODUCTION

In this research proposal, we are presenting applied, interdisciplinary research concerning application of Artificial Intelligence and Machine Learning to solve the therapeutic supply shipment problem during COVID-19 pandemic response. COVID-19 first appeared in the month of December 2019. It was determined to be caused by the novel Corona virus, named as SARS-CoV-2. The disease causes symptoms such as shortness of breadth, dry cough, fever, fatigue, or sometimes even loss of taste and smell. In a lot of patients the disease is asymptomatic, causing no symptoms. The complications of the disease include pneumonia, respiratory failure, Cytokine release syndrome, viral sepsis, Acute respiratory distress syndrome, Kawasaki disease, among others. The usual onset of the disease is between 2 to 14 days, and it can last from 5 days to more than a couple of quarters. Diagnostic methods include CT Scans of patients and rRT-PCR testing of nasopharyngeal swabs. Since the SARS-CoV-2 virus is easily killed by household soap, COVID-19 disease is said to be prevented by washing hands frequently, and keeping unwashed hands away from the face. Wearing face masks, practicing physical distancing and quarantine are effective controls.

The disease which originated in Wuhan, China, quickly reached pandemic proportions affecting almost all the countries of the world. Within a year, it affected a total of more than 70 Million humans and killed more than 1.6 Million of them. SARS-CoV-2 virus spreads from one infected person to other persons mainly through small droplets and aerosols, which get transmitted when an infected person, say person A, who is in close proximity with an uninfected person, say person B, coughs or sneezes. When person B comes in contact with these small droplets and aerosols and these get into his eyes, nose or mouth. An average of 1000 SARS-CoV-2 virions can initiate new infections. This happens regularly when people interact closely and for longer periods of time within closed settings such as offices, restaurants, mass gatherings, etc. As of January 2021, no effective drug has been developed to inhibit the SARS-CoV-2 virus. Therefore, treatment choices are mainly focused on management of symptoms, isolation of patients and supporting them with care until their test results return negative multiple times.

DRUG DEVELOPMENT

Various antiviral medicines/drugs are being researched into for possible cures for COVID-19. As of December 2020, more than 500 therapies are in various stages of preclinical or clinical research. These include RNA-based compounds, cell-based compounds, anti-virals, antibodies, anti-inflammatory agents, anti-malarial drugs, interferon, antibiotics, among others. The World Health Organization (WHO) started the solidarity project in March 2020 to test and repurpose hundreds of potential drug candidates, already approved as safe for other diseases. The project aims to provide insights and answers into key clinical questions such as the

potential of drug candidates to reduce hospitalization time, mortality rate, number of ICU admissions and the number of cases requiring ventilation. Remdesivir, Dexamethasone, and Baricitinib, have already been proven to have clinical benefits in randomized controlled trials.

NEED FOR AI AND ML TO PREDICT COVID-19 DRUG SHIPMENT TIMES

About 15% of COVID-19 patients go on to develop severe complications, thereby overwhelming hospitals and health-care institutions. It is therefore important to predict shipment times of drugs, vaccines and COVID-19 therapeutic supplies well in advance. This helps in planning and optimizing the e-pharmacy supply chain network, thereby ensuring that the drugs, vaccines and COVID-19 therapeutic supplies reach the right place at the right time, consequently saving lives.

We are basing this research in India for the following reasons. Firstly, India is one of the largest hit countries of the world in terms of the cumulative number of cases of COVID-19. Secondly, India is the second most populous nation in the world, making COVID-19 drug and vaccine supply chain distribution, a problem of unimagined scale. Thirdly, COVID-19 being a global pandemic, makes it imperative that if India isn't able to control the COVID-19 situation within its borders well, then it would become a liability to the whole world because of the interconnectedness of India and the rest of the world nations. The above mentioned reasons all compound together to result in a myriad of most unprecedented and ginormous problems facing the COVID-19 ecosystem in the history of mankind. Tough situations call for tough application of thought. As authors, we therefore took to modern-day Artificial Intelligence and Machine Learning technologies to bring sanity to this pool of COVID-19 problems.

We wanted to do our part, and hence we picked the therapeutic supply shipment problem during the COVID-19 pandemic response. Partly overwhelmed by the speed of spread of the COVID-19 disease among the population on a daily basis, we came to realize that if we need to control this COVID-19 pandemic, we cannot just passively observe and act, but we need to forecast, predict outcomes, stay ahead, and act proactively. That led us to Artificial Intelligence and Machine Learning. Just like we started off this proposal saying that, "that which cannot be forecast and predicted well in advance, cannot be acted upon," we would apply Artificial Intelligence and Machine Learning to predict the shipment times of essential medicines and vaccines during the COVID-19 pandemic response.