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To Explore and Forecast of Corona Virus-19 using Machine Learning Algorithms

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Abstract:
Early prediction of patient mortality risks during a pandemic can decrease mortality by assuring efficient resource allocation and treatment planning. This study aimed to develop and compare prognosis prediction machine learning models based on invasive laboratory and noninvasive clinical and demographic data from patients' day of admission. Three Support Vector Machine (SVM) models were developed and compared using invasive, non-invasive, and both groups. The results suggested that non-invasive features could provide mortality predictions that are similar to the invasive and roughly on par with the joint model. Feature inspection results from SVM-RFE and sparsity analysis displayed that, compared with the invasive model, the non-invasive model can provide better performances with a fewer number of features, pointing to the presence of high predictive information contents in several non-invasive features, including SPO_2, age, and cardiovascular disorders. Furthermore, while the invasive model was able to provide better mortality predictions for the imminent future, non-invasive features displayed better performance for more distant expiration intervals.

I Interdiction

The SARS-COV-2 pandemic has tremendously strained economic and healthcare infrastructures worldwide, leaving a trail of more than 1.6 million deaths behind as of December 22, 2020 [1]. With no effective treatment and the possibility of emerging new viral strains, an average global death rate of around 6000 per day could lead to the death of approximately 2.2 million individuals in one year. Even though strict social distancing and preventive measures are still in effect, the global mortality and prevalence curve of the disease shows little improvement [1]. More focus on early clinical interventions could be helpful in reducing mortality rates. Critical patients will need timely intensive care unit (ICU) admission and ventilators. In China, it has been reported that about 54% of critical patients were unable to receive timely ICU care, and 30% of patients who died did not receive mechanical ventilation in time [2]. With large patient loads, exhausted medical personnel, and insufficient medical resources, expedited identification of patients that have high mortality risks becomes a key factor in decreasing patient deaths.

Physicians are often unable to accurately predict the prognosis of COVID-19 patients upon their admission until later stages of the disease. Furthermore, the course of COVID-19 can take unpredictable turns where the

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condition of a seemingly stable patient deteriorates rapidly to a critical state [3]; this could catch even the most skilled physicians off guard. To enhance clinical prediction, Artificial Intelligence (AI) models could be valuable assistants since they can detect complex patterns in large datasets [4, 5]; a capability the human brain is inept at. AI tools have been recruited to fight COVID-19 [6] on various scales, from epidemiological modelling [7, 8] to individualized diagnosis [9, 10] and prognosis prediction [1–4]. Although several COVID-19 prognostic models have been proposed [5], no comprehensive study has evaluated and compared the prognostic prediction power of non-invasive and invasive features.

The aim of this study was three-fold; first, to develop a mortality prediction model from patients' first day of admission routine clinical data; second, to investigate the possibility of predicting COVID-19 mortality outcome using non-invasive patient features; third, to provide a direct comparison of mortality prediction powers between non-invasive and invasive features. Patient data was divided into invasive laboratory tests and non-invasive demographic and clinical features. Three machine learning models were developed to investigate and compare the prediction power of the aforementioned feature groups; two using each of these groups and one using bothIt has been reported that many COVID-19 patients experienced their first exacerbation period 24 to 48 hours after admission [6]. Accordingly, we based our model on data from the first day of patients' admission to provide a tool that can be beneficial in real-life scenarios.

II Related Work

According to data obtained by the World Health Organization, the global pandemic of COVID-19 has severely impacted the world and has now infected more than eight million people worldwide. Wearing face masks and following safe social distancing are two of the enhanced safety protocols need to be followed in public places in order to prevent the spread of the virus. To create safe environment that contributes to public safety, we propose an efficient computer vision based approach focused on the real-time automated monitoring of people to detect both safe social distancing and face masks in public places by implementing the model on raspberry pi4 to monitor activity and detect violations through camera. After detection of breach, the raspberry pi4 sends alert signal to control center at state police headquarters and also give alarm to public. In this proposed system, modern deep learning algorithms have been mixed with geometric techniques for building a robust modal which covers three aspects of detection, tracking, and validation. Thus, the proposed system favors the society by saving time and helps in lowering the spread of corona virus. It can be implemented effectively in current situation when lockdown is eased to inspect persons in public gatherings, shopping malls, etc. Automated inspection reduces manpower to inspect the public and also can be used in any place. [1] Corona virus disease 2019 has affected the world seriously. One major protection method for people is to wear masks in public areas. Furthermore, many public service providers require customers to use the service only if they wear masks correctly. However, there are only a few research studies about face

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mask detection based on image analysis. In this paper, we propose Retina Facemask, which is a high-accuracy and efficient face mask detector. The proposed Retina Facemask is a one-stage detector, Many research papers are targeting pandemic evolution prognosis based on official statistics. The earliest data comed form China, but, for some countries (including China) there are worries that the official data does not reflect the reality in the field as the data can be manipulated by limiting testing [18] or by restricting its release [20] therefore projections based on incorrect or incomplete data could lead to erroneous conclusions. In this regard notable is the paper [25] that is proposing a prediction for Coronavirus-19 evolution but is not only based on data from China but also uses historical epidemic data. The results show that there is some "unreasonable data" found in the official statistics, and the authors tries to make the prediction by analyzing the remainder of the data.

III Methodology

The Systematic Literature Review (SLR) can be characterized by covering many previous studies and depicts the comprehensive results depending on a specific strategy. SLR is widely used to summarize the research evidence rather than narrative reviews and expert commentaries. SLR follows a rigorous approach in collecting the literature in order to get accurate information [9][6][10][4][3]. SLR should have a protocol where it can be followed to collect and extract data, and then synthesis of the extracted data and Systematic Literature Review Steps [9]Formulating the systematic review questions Synthesis of the extracted data Data extraction Study selected.

Impact of Mass Events on infected cases During the lockdown period, there were two mass events reported in India. One was related to the exodus of the laborers to their respective states in India [3] and the other was a religious event which happened in New Delhi at a mass level [4]. There are around 25% citizens living below poverty line and have to depend on the daily wages to feed their families. Once the lockdown was announced, the fate of these 1.3 billion people was under scanner and that is why even the government of India came up with a package of more than 22 billion USD to help these workers and laborers. All the respective state governments also came up with the different infrastructural setup for providing food and money to the needy citizens. Some agencies reported that in providing food security, India and the neighboring nations depending on India may fall short of food [5] while the others reported loss of millions of job [6] during the lockdown due to such mass exodus. However, the numbers of infected cases were not impacted much by this mass movement as majority of workers were not carrying any infection with them during their movements from workplaces to their native places. Figure 6. Graph showing the average number of days for the infected

cases to double with or without cluster events As seen from Figure 6, the average number of days to double the infected cases from corona virus without any cluster event was estimated to be 7.1 as per the health ministry, while it is 4.1 after Delhi's religious event took place [7]. This event resulted in formation of clusters in the whole country as people who attended this event went to different parts of the country without following any rules of getting quarantine.

IV Conclusion

Prediction of mortality prognosis during the COVID-19 pandemic is an important concept that can reduce disease mortality rates by giving us insights into where and with whom to intervene. The prognostic prediction capacity of laboratory biomarkers is distinct from those of clinical and demographic data. To investigate these differences in this study, predictor features obtained from patients' first day of admission were divided into invasive laboratory tests and non-invasive demographic and clinical data. Three prognostic machine learning models were developed using the aforementioned invasive and noninvasive biomarker groups; two using each of these groups and one using both. The models displayed optimal prediction performance, making them valuable assistive tools in different settings for clinical decision making and resource allocation. Furthermore, the implemented non-invasive model can be used for rapid triage of patients without the need for additional costs or waiting time of laboratory or imaging tests.

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