Chapter 17
Predicting Novel Coronavirus Trends Using Machine Learning

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ABSTRACT

2020 began with the advent of disruption brought on by a new virus called SARS-CoV-2. The coronavirus pandemic i.e. COVID-19, according to the World Health Organization (WHO), is putting a lot of strain on even the strongest healthcare systems in the entire world. Our current study explores supervised learning methods in machine learning, such as SVMachine, K-nearest neighbor, Naïve Bayes, Decision Tree, Random Forest, Logistic Regression, and a newly developed algorithm called XGB classifier. Specifically, the prediction of COVID-19-related deaths and recoveries is the focus of our proposed approach. A GitHub repository served as the source of the dataset used in this investigation. In this paper our aim is to enhance our comprehension of the pandemic's consequences through the application of machine learning techniques.

I. INTRODUCTION

A global health emergency never before experienced had an impact on nearly every aspect of society, ranging from social and economic stability to public health, as a result of the late-2019 SARS-CoV-2 (severe acute respiratory syndrome) outbreak (Rana et al., 2022). The World Health Organization (WHO) formally proclaimed the COVID-19 pandemic in March 2020 due to the outbreak's devastating impact on the population and its rapid global expansion (R. Kumar, Khannna Malholtra, et al., 2023). The virus is incredibly deadly and widespread, as shown by the roughly 100 million confirmed cases that had been documented globally by April 2021—all within a year. In this situation, machine learning (ML), which is a branch of artificial intelligence (AI), became an essential tool since previous epidemiological models were unable to represent the complexity of the problem adequately. Machine Learning algorithms were invaluable in navigating the crisis with its ability to handle massive volumes of data and generate

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predictive insights. Due to the overwhelming volume of people demanding emergency attention many of the world's healthcare systems collapsed as the epidemic grew (Kanojia et al., 2022).

The lack of hospital beds, ventilators, and personal protective equipment (PPE) exposed flaws in the global health system, placing undue pressure on medical facilities (R. Kumar et al., 2024). In addition to the healthcare issue, the pandemic caused large-scale economic collapses. Enforced lockdowns, travel restrictions, and supply chain delays caused huge disruptions to the tourism, retail, and manufacturing industries (Gupta et al., 2023).

These incidents impact to a significant amount of financial instability, as well as job losses and somehow lower salaries. In light of these concerns, governments and healthcare authorities found that it is essential to have access to fast and accurate information (Komkowski et al., 2023). In order to foresee critical patterns, like the number of future cases, the need for healthcare resources, and the results of public health campaigns such as mask protocols, social distancing, and vaccination efforts, real-time data was essential for managing the pandemic. Accurate forecasting models were essential in guiding policy decisions, distributing resources in the best possible ways, and forecasting potential outcomes of various mitigation strategies (Negi et al., 2021).

Prediction of these trends are helpful for healthcare systems to prepare for surges in patient volume and enabled governments to adjust public health policy to balance epidemiologic control with lowering social and economic impacts (Shah et al., 2023). Ultimately, our ability to predict and respond to these key patterns would determine how far the pandemic's destructive consequences might be curbed. A vast amount of data, including travel habits, social media usage, hospital resources, test results, and infection counts, was generated during the pandemic (K. D. Singh et al., 2022). Throughout the pandemic, real-time forecasts and emerging insights were made possible by machine learning's ability to assess these diverse datasets and adapt to new information. Scientists and policymakers developed models using Machine Learning (ML) to address critical issues such as the timing and locations of potential future outbreaks, the length of PCR persistence in a particular area, and the effect of public health interferences, for example, immunization campaigns, lockdowns, and travel restrictions on viral transmission (Ram, Bisht, et al., 2022). The distribution of healthcare resources was also improved by Machine Learning (ML) models, which enabled governments to modify restrictions in response to anticipated future trends and hospitals to prepare for spikes in patient volume (Josphineleela et al., 2023). Machine learning was crucial in determining who was more prone to contract COVID-19 and other diseases like diabetes, heart disease, liver disease, and breast cancer in addition to forecasting the number of cases (Mishra & Wazid, 2023). By looking at temporal data trends, Machine Learning (ML) assisted in tracking the virus's path and aided in developing predictive models that enhanced public health actions. In medical research, Machine Learning is a vital tool as it mines large datasets for meaningful information (Y. Singh et al., 2022; Tiwari et al., 2023). This is mainly valid when it comes to enhance clinical judgment, care planning, and patient outcomes (Pandey et al., 2022). Machine learning-driven predictions helped for proactive measures which is meant to mitigate the pandemic's effects on communities.

There were some difficulties in predicting COVID-19 trends, because of the virus's novelty, changing human behavior, and the emergence of new strains, long-term forecasts were challenging (Suresh et al., 2023). Other obstacles which include privacy issues, algorithmic bias, poor data quality, and difficulty interpreting complex models. Notwithstanding these challenges, machine learning has made significant progress in understanding the virus's mechanism of propagation. Incorporating machine learning into forecasting efforts helped public health stakeholders better navigate the complexities of the pandemic and implement workable remedies to protect public health (P. Kumar, Bhatnagar, et al., 2023; P. Sharma