

Hybrid Artificial Intelligence-Based Models for Prediction of Death Rate in India Due to COVID-19 Transmission

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ABSTRACT

COVID-19 prediction models are highly welcome and necessary for authorities to make informed decisions. Traditional models, which were used in the past, were unable to reliably estimate death rates due to procedural flaws. The genetic algorithm in association with an artificial neural network (GA-ANN) is one of the suitable blended AI strategies that can foretell more correctly by resolving this difficult COVID-19 phenomena. The genetic algorithm is used to simultaneously optimise all of the ANN parameters. In this work, GA-ANN and ANN models were performed by applying historical daily data from sick, recovered, and dead people in India. The performance of the designed hybrid GA-ANN model is validated by comparing it to the standard ANN and MLR approach. It was determined that the GA-ANN model outperformed the ANN model. When compared to previous examined models for predicting mortality rates in India, the hypothesized hybrid GA-ANN model is the most competent. This hybrid AI (GA-ANN) model is suggested for the prediction due to reasonably better performance and ease of implementation.

KEYWORDS

ANN, Artificial Neural Network, COVID-19, Genetic Algorithm, Hybrid Model, MLR, Pandemic, Prediction

INTRODUCTION

COVID-19 is a novel coronavirus that causes a highly contagious illness. It was found in Wuhan, China, at the end of 2019. The WHO (World Health Organization) declared the virus a global hazard in January 2020. The virus affects people in a variety of ways. Older persons and other persons with chronic illnesses are more vulnerable to severe disease (Worldometers-COVID-19). As a result, governments,

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health systems, and their limited resources have been put under a lot of strain. The global death rate is gradually increasing which is a cause for concern. Transmission is divided into four phases based on the dissemination technique and the time frame. Each nation implemented various methods to counteract the spread of the disease, including sitting at home, face masking, reducing travel, shunning social gatherings, handwashing routinely, and sterilizing the environment (Sujath et al., 2020). The WHO received reports of 290,959,019 confirmed COVID-19 cases as of January 4, 2022, with a total of 5,446,753 fatalities. 8,693,832,171 vaccination doses have been distributed since January 2, 2022.

The spread of the disease poses significant hazards to human life and civilization. There is currently no precise remedy for the pandemic, and several antiviral drugs, plasma transfusions, and other medications have been examined in the clinical field with caution (Muhammad et al., 2020). The coronavirus outbreak in India has affected societal functioning. Everyone was advised to social distancing to escape the dreadful transmission. Cases that have been confirmed are those that have come back from overseas in the early stages, followed by local transmission. A lot of infections are caused by the present COVID-19 outbreak due to severe acute respiratory syndrome worldwide (SARS-CoV-2). Governments and public healthcare systems are under tremendous stress as infection and death rates rise exponentially. Identifying significant mortality determinants is necessary to maximize patient treatment strategies. The COVID-19 death rate was also thought to be strongly correlated with hospital capacity; the higher the death rate, the lower the hospital capacity. As a result, individuals at increased mortality risk must be prioritized (Sujatha and Chatterjee, 2020; Du et al., 2020; Chen et al., 2020, Aljameel et al., 2021; Ko et al. 2020). A total of 28 blood biomarkers, as well as gender and age attributes, were selected using analysis of variance (ANOVA) and available data. An assembly strategy was utilized to achieve a specificity value of 0.91, sensitivity of 1, and accuracy value of 0.92 by combining a deep neural network and Random Forest models to increase the number of patient points and the researchers also developed an online web tool (BeatCOVID-19) that forecasts mortality using blood test data which could benefit from data upgrades (Khan et al., 2021; Dharmodharavadhani et al., 2020). Planning for considerable increases in the capacity of standard hospital beds and intensive care unit (ICU) beds in the event of a pandemic is essential to enable patient identification and speedy isolation procedures (Phua et al., 2019).

The artificial neural network (ANN) is a technique for modelling epidemiological events, anticipating epidemic peaks, and assessing disease risk and scope (Pal et al., 2020; Torrealba-Rodriguez et al., 2020; Castro et al., 2020; Braga et al., 2021). The main advantage of ANN is that it itself learns by analyzing correlations between the inputs and output variables and solving the complicated nonlinear issue (Schmitt et al., 2018). This is due to neurons' extensive and concurrent processing and noise tolerance (Egrioglu et al., 2014). In addition, unlike manual ways, the ANN aims at developing learning technique through pattern recognition so that it can learn from data and predict outputs. The ANN method's ability to incorporate many predictor factors concurrently, like incidence curves and information on demographic, which is another benefit that enables researchers to understand better the dynamics of viral transmission in cities over time (Adiga et al., 2020; Zeng et al., 2016; Wang et al., 2020; Tamang et al., 2020). Tamang et al. (2020) showed that ANN is an effective method for processing massive amounts of data by modelling the frequency of COVID-19 events in India, the US, France, and the UK (Saba and Elsheikh, 2020). Another application of short-term ANN prediction, an artificial intelligence (AI) based model, was used to predict the domination of the COVID-19 epidemic in Egypt (Grasselli et al., 2020). This AI-based study performed well compared to the traditional Autoregressive Integrated Moving Average (ARIMA) traditional regression method, which shows high agreement with preliminary data in predictions that were confirmed up to 17 days in advance.

AI is a promising alternative to conventional methods like deterministic, linear, and nonlinear regression and conceptual models that successfully address complex issues and are employed by numerous researchers across a wide range of fields (Miranda et al., 2022; Venaik et al., 2022; Yadav et al., 2022a). The desired tasks have been carried out using artificial intelligence (AI) techniques based

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