



# Hybrid Optimization Enabled Neural Machine Learning Model for Covid-19 Prediction Across India

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## Abstract

*The detailed investigation of Covid19 prediction and analysis using machine learning algorithms is proposed in this paper. A recently identified coronavirus is the cause of the infectious condition known as coronavirus disease, or COVID-19. In December 2019, the newly detected coronavirus that causes this disease was initially identified. Over 7 million individuals contracted the sickness, and 0.40 million people died from it within that same year. In India, the first coronavirus case was reported on January 30, 2020, and between February 15, 2020, and July 19, 2021, 31,219,374 cases were impacted by COVID-19. Simply contacting an infected person, an item or thing contaminated with the coronavirus, or an infected person themselves can spread this disease. Simply contacting an infected person, an object or thing contaminated with the coronavirus, or an infected person's mouth, eyes, etc. can spread this disease. According to pathologists' investigations, the COVID-19 virus has striking similarities to the coronaviruses that cause Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). Algorithms for machine learning (ML) have demonstrated their value in predicting perioperative outcomes to enhance decision-making on future actions. Many application domains that need the identification and prioritisation of negative aspects for a threat have long employed machine learning algorithms. recovered, and COVID-19-related fatalities in India. Numerous prediction techniques are widely employed to address forecasting issues. The number of confirmed, recovered, and fatal COVID-19 cases in India is predicted using a machine learning algorithm.*

**Keywords:** Machine Learning, Prediction, Analysis, Covid19

## Introduction

Data mining is the procedure to explore and analyze meaningful patterns, rules, models and knowledge either with the set of structured or the unstructured data. However, the big data analytics technology is employed to acquire the meaningful information from the unstructured data such that the data mining method is the big data analytics model used in the data processing system. The data mining is the procedure of knowledge and the pattern discovering

with regards to OLAP technology, big data, data warehousing, and database [9]. The healthcare industries are the hoarding and the engendering large volume of data that is specifically used to scrutinize and forecast healthcare ratio in whole world. With the data mining methods, it is more feasible to acquire useful and the essential information from database called as CBIS and KDD [10]. With the increasing growth of Information Technology (IT) in the medical and the health services field, the medical facilities gained more attraction and so the usage of healthcare platforms in the treatment and the diagnosis of medical area is achieved. However, the growth of medical technology could results gradual increase in the lifespan of human and hence it causes rapid ageing in world wide. In general, the diseases are changed from acute to chronic type [11] [9]. The health care sciences and the data mining generate different reliable system to achieve early prediction process in related with the health care from medical diagnosis data. The data mining is depends on probability, statistics, machine learning and artificial intelligence [13] [14] [12].

The outbreak of Coronavirus (COVID-19) started when cases of pneumonia with unknown causes were reported in Wuhan, Hubei province, China, on December 31, 2019. It has since developed into a global pandemic [15] [7]. The disease is known as COVID-19, and the virus responsible for it is called SARS-CoV-2 [7]. The virus has a positive-sense single-stranded RNA structure, and it is challenging to treat due to its ability to mutate. Doctors around the world are conducting extensive research to find an effective treatment for the disease. At present, COVID-19 is the leading cause of thousands of deaths worldwide, with significant numbers reported in countries such as the USA, Spain, Italy, China, the UK, Iran, and others. There are many types of coronaviruses, and they are often found in animals. COVID-19 has been identified in humans, bats, pigs, cats, dogs, rodents, and poultry. The transmission of the virus is mostly through person-to-person contact. Healthy individuals can become infected through breathing in virus particles, touching surfaces contaminated with the virus, or coming into contact with mucous from an infected person [16] [8]. The COVID-19 pandemic is one of the most severe challenges in recent history, affecting global health negatively. The impact of this disease is especially severe on vulnerable groups, including older adults and individuals with chronic conditions like asthma. Therefore, it has become a major concern involving pharmaceutical companies, epidemiologists, local health authorities, and diagnostic systems. Accurately predicting the number of COVID-19 cases is essential for efficiently using medical resources and for improving strategies to manage infected individuals effectively [17]. In the recent decades, the deep learning and the machine learning methods are gained as attractive field of research in different appliances, such as industry and academia [17].

Deep learning has become increasingly popular in predictive modeling and data analysis over the past few decades and is regarded as one of the most significant technological advancements. It serves as a leading and developing tool within the field of computer vision. As a result, this data-driven approach has seen improvements in classification performance, especially when dealing with large datasets. Additionally, deep learning has demonstrated impressive results in various computer vision tasks, as it is capable of learning predictive features directly from the data within large datasets. In recent years, deep learning techniques have been recognized as effective tools for decision-making and prediction across multiple fields, including computer vision, natural language processing, gesture recognition, robotics, and healthcare systems. Deep learning has proven useful in predicting the spread of viruses and can potentially aid in addressing the challenges posed by the COVID-19 pandemic [3]. The application of deep learning approaches has enabled AI to be used in a variety of applications, such as image detection, data classification, and image segmentation [18] [8]. Deep learning, a key area of research in artificial intelligence (AI), allows for the development of end-to-end models that produce reliable results using input data, without the need for manual

feature extraction. Deep learning techniques have been successfully applied to solve a range of problems, such as arrhythmia detection, skin cancer classification, breast cancer detection, brain disease classification, pneumonia detection from chest X-ray images, fundus image segmentation, and lung segmentation [7].

### Literature Survey

This section depicts a review of the literature on various existing COVID-19 prediction techniques. These research papers are taken and reviewed according to the recent published years based on COVID-19 prediction methods.

Authors	Methods	Advantages	Disadvantages
Abbasimehr, H. and Paki, R. [1]	Deep learning method and Bayesian optimization.	The hyper parameters were selected in this algorithm, which increased the performance of prediction.	This method failed to acquire informative features, and to integrate them with the deep learning methods.
Babukarthik, R.G. et al. [2]	Genetic Deep Learning Convolutional Neural Network (GDCNN).	This method showed better nominal rate for the identification of disease in the unbalanced environment.	It failed to use large sized database for obtaining higher classification accuracy.
Ayris, D. et al. [3]	Deep Sequential Prediction Model (DSPM).	It accurately predicts the disease spread.	It required number of data for training the model in order to enhance the prediction performance.
Abdul Waheed et al. [4]	Auxiliary Classifier Generative Adversarial Network (ACGAN).	It increased the classification performance.	The training process was not effective.
Shahid, F. et al. [5]	Long Short Term Memory (LSTM), Gated Recurrent Unit (GRU) and Bidirectional (Bi-LSTM).	It achieved higher performance in finding the recovered and death cases.	It failed to consider the features from the data for better accuracy.
Huang, C.J. et al. [6]	Deep Neural Network (DNN).	This method predicted the confirmed cases more accurately.	It reduced the explosion of circulation from space correlation.
Tulin Ozturk et al. [7]	DNN.	It provided accurate diagnostics for binary classification.	However, it failed to validate the model by incorporating more images.
Mesut Togacar et al. [8]	Support Vector Machine (SVM)	It minimizes the interference in every image in a dataset and provides efficient features with stacking technique.	Not included different structuring techniques in order to enhance the dataset.

### Challenges

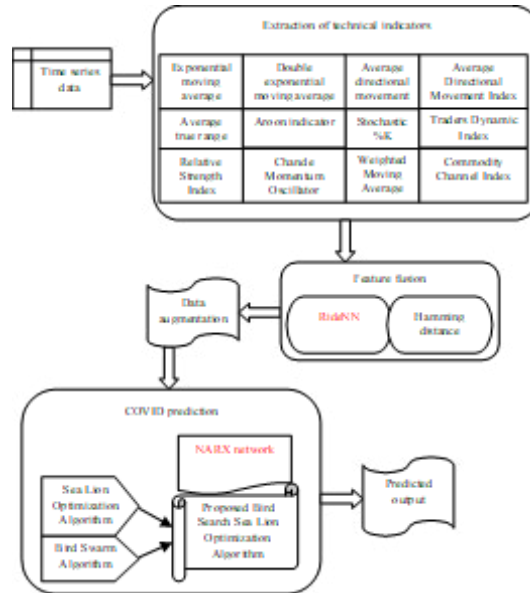
The challenges faced by existing COVID-19 prediction techniques are described as follows,

- In [3], DSPM was developed for early COVID-19 prediction, but still this approach failed to integrate Non-parametric Regression Model (NRM) and DSPM features for refining prediction of developed scheme.

- In [4], ACGAN was developed for predicting COVID-19, but still this method failed improve the quality of the synthetic Chest X-Ray (CXR) images by training a Progressive Growing GAN.
- The DNN architecture was developed in [7] for COVID-19 prediction using X-ray images. The DNN is further required to be placed in a cloud to provide diagnosis instantly and to help rehabilitate affected patients immediately. This should reduce the clinician workload significantly.
- Due to the lack in the availability of data for the covid patients, the detailed study to report the solution for automatic detection with X-ray image is not available [19].
- Recently, the common way to find the infected cases is to undergo swab and to analyze the material using chain reaction. A major issue here is that the swab is carried out only for the patients who have the symptoms and so the people with asymptomatic cases are not detected [20].

### **Proposed methodology**

The primary intension of this research is to design and develop a method for COVID-19 prediction using Deep learning model. The main contribution of this research will be development of COVID-19 prediction model based on Deep LSTM [21] and proposed optimization algorithm. The major processes performed for developed COVID-19 prediction approach are elaborated in this section. This prediction model mainly includes four stages, namely extraction of technical indicators, feature fusion, data augmentation and prediction. At first, input time series data will be acquired from a database, and it will be passed to indicator extraction phase. Then, the indicators, such as Exponential Moving Average (EMA), Double Exponential Moving Average (DEMA), Weighted Moving Average (WMA), Average Directional Index (ADX), Traders Dynamic Index (TDI), Relative Strength Index (RSI), Average Directional Movement Index (ADMI), Average True Range (ATR), Chande Momentum Oscillator (CMO), Stochastic %K, Aroon indicator, and Commodity Channel Index (CCI) will be extracted from input time series data. After the extraction of features, feature fusion will be performed using Rider Optimization Algorithm-based Neural Network RideNN [22] and hamming distance. Once the feature fusion will be completed, then data augmentation will be executed for enlarging the amount of training data in order to obtain better performance. Finally, COVID-19 prediction will be done using Nonlinear Autoregressive with Exogenous Input (NARX) network [21], which will be trained by developed optimization algorithm, named Bird Swarm Sea Lion Optimization (BSSLO) algorithm. However, the developed BSSLO approach will be newly designed by integrating Bird Swarm Algorithm (BSA) [23] and Sea Lion Optimization Algorithm (SLnO) [24]. Figure 1 depicts the block diagram of COVID-19 prediction based on proposed BSSLO-based Deep LSTM. The implementation of the developed BSSLO-based Deep LSTM will be carried out in PYTHON tool using Novel Coronavirus (COVID-19) Cases Data [25], The Global Burden of Latent Tuberculosis Infection A.



**Fig. 1 Block diagram of COVID-19 prediction based on proposed BSSLO-based Deep LSTM**

### Conclusion

The performance of the developed COVID-19 prediction approach will be evaluated by means of three performance metrics, such as Mean Square Error (MSE), Root Mean Square Error (RMSE), Mean Absolute Error (MAE). Here, experimentation will be carried out to find the number of confirmed, recovered, and death cases in global. Moreover, the performance metrics will be compared with that of existing works in order to reveal the performance of the proposed BSSLO-based Deep LSTM technique.

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