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REVIEW OF METHODS USED FOR COVID-19 TIME SERIES FORECASTING OF DAILY CASES, DEATHS CAUSED AND RECOVERED CASES

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ABSTRACT
The COVID-19 has been declared as a global pandemic by WHO, it has been considered as the most hostile disease, impacting more than ninety percent countries of the world. This virus was started from a lone human being in Peoples Republic of China, it is now growing globally. Some of the studies predicted that this virus will hang about with us everlastingly. India as a second most crowded country in the world is also under threat. Consequently, it has become truly important to investigate the possible blow of COVID-19 in India and to forecast how it will act in the upcoming days. This paper deals with the literature review of the various research works done by researchers all over the world for use of mathematical and statistical method to predict the Covid-19 new case, death cases and recovered cases. The work presented here is an attempt to find the most suitable and accurate method to obtain the objective as stated above.

Keywords: COVID-19, Pandemic, Forecasting, Linear Regression, Epidemic

INTRODUCTION
On 11th March 2020, World Health Organization (WHO) affirmed that the worldwide COVID-19 outbreak is a pandemic since the pace and rate of diffusion of the virus was high. From the 118 countries, there was around 1, 25,000 cases were reported. Furthermore, the no of cases announced outside the China had approximately increased 13-folds in 2 weeks and number of affected countries had more or less tripled.
At present, investigative works on modeling and the gauging of novel COVID-19 pandemic close by and globally has turn out to be a hotly debated issue. Some current works on this matter led to modeling and forecasting the no of established cases with the curve judgment models like Box-Jenkins (ARIMA) and Brown/Holt linear exponential smoothing to the no of COVID-19 epidemic cases in chosen countries The mathematical modeling was used in various countries in the world including Canada, Italy, Turkey, South Africa, India etc. the methods specifically used are, transmission moderation procedures, least-squares and fitting of the Logistic models, fractional model etc. The utilization of iterative techniques for forecast of virus dissemination is fairly novel and to the finest of our knowledge.

LITERATURE REVIEW
We have reviewed about twenty articles on using different methods for forecasting Covid-19 scenarios. The short review in the tabular form has been shown below; by using this table one can understand the exactness of methods employed.
All publications that are necessary to employ in this study are considered once these inclusion and exclusion processes have been applied. These publications were culled from a variety of sources such as IEEE explorer, Elsevier, science direct, Springer, MDPI, Wiley, Taylor and Francis, Hindawi, Google Scholar, Plos One, OMIC, and others. The dataset utilized, method employed, as an input type of text as well as

image is used, anticipated outcomes, and utilization levels are all retrieved from each publication examined for the review.

Table No. 1: Machine learning articles describing the dataset, the author's identity, the nation of publishing, the method used in the study, and the findings for analyzing the COVID-19 disease

Sr. No.	Author	Country	Data set used	Method used	Task and Algorithm	Results
1	Raji P et al	India	Data from kaggle website is used	Performed linear regression and polynomial regression.	Performed linear regression and polynomial regression.	Concluded that the other methods of analysis are not up to the mark of linear regression
2	A.R. Appadu et al	India	They used data from India, South Korea, South Africa, Italy and German, from 15 February 2020 to 31 May 2020.	used forecasting methods like Euler's iterative method and the cubic spline interpolation method	They constructed an original iterative method, which is based upon cubic spline interpolation method and Euler's technique	They conclude that method is very competent for forecasting and to explain the original dynamics of the epidemic
3	Samit Ghosal et al	India	India Covid Data	Performed a linear regression examination	Test of statistical implication	By means of auto-regression method and with week 5 death count as put in the linear regression model predicted week 6 death counts in India to be 467.
4	Rath S et al	India	India Covid Data	did a comparison of Linear Regression and the Multiple linear Regression model	by means of this Multiple Linear Regression replica as on July month, the estimate value of 52,290 lively cases are predicted for the month of 15th August in India and 9,358 active cases in Odisha	They concluded that this model acquired extraordinary correctness in COVID-19 acknowledgment. A strong connection factor determines the association among the reliant (active) with the autonomous variables
5	Nasrullah et al	USA	dataset from John Hopkins University depository	designed and developed a forecasting replica that can forecast the number of cases and deaths because of the epidemic	the model was urbanized on the basis of this information, and then it is experienced by forecasting the number of deaths and cases for the next 7 days	They concluded that such type of methodologies for forecast of number of cases and fatalities are important, so that the rational and early on steps can be taken to keep away from economic sufferers and human life can be cosseted by building wise decisions by means of modeling based upon these data-driven methods

6	Apurbalal Senapati et al	India	India Covid Data	used a mathematical replica which was not explored previous in the COVID-19 forecasting's.	a variation of the linear regression method is the "piece-wise linear regression	They stated that, the model perform superior in local data i.e. in a minute partition from mathematical point of view
7	Alemayehu Siffir Argawu	Ethiopia	accessible data from 12th May to 10th June 2020 in the Ethiopia	Pearson's correlation analysis as well as the linear regression model to forecast COVID-19 fresh cases and fresh deaths	variables like the day numbers, the new laboratory tests number, and the number of fresh cases from A city considerably predicted the COVID-19 fresh cases	They found that there was a noteworthy positive correlation among COVID-19 fresh cases and latest deaths with dissimilar related variables.
8	Furqam Rustam et al	USA	Available dataset	ability of ML models to predict the number of forthcoming patients exaggerated by COVID-19	In particular, four typical forecasting model, such as the linear regression (LR), support vector machine (SVM), least absolute shrinkage and selection operator (LASSO), and exponential smoothing (ES) have been used in this learning to predict the intimidating factors of COVID-19.	The results show that the ES performs finest among all the used models followed by LR and LASSO which performs fine in forecasting the new established cases, death rate as well as recovery rate, while SVM performs poorly in all the prediction scenarios given the available dataset.
9	Muhammad Hammad Memon	USA	Available dataset	used CNN for the automatic withdrawal of characteristics and the LSTM complex for the final categorization of images	HHO algorithm was used to pick the most favorable parameters of CNN and the LSTM neural network	The projected method can identify the disease with an accurateness of 99.37%. The outcome showed the dominance of the projected method over other techniques accessible in the literature.

10	Prajoy Podder et al	India	A dataset of the 5644 samples and 111 attributes collected at the Hospital is considered.	diverse ML classifiers were used for 2 cases, one for the forecast of COVID-19 patients, and one more for the forecast of intensive care unit (ICU) prerequisite	57 attributes were used for COVID-19 exposure, while the 67 attributes were considered for ICU prerequisite forecast	Outcome showed that COVID-19 finding can be predicted with an accurateness of 94.39% and recall of 92% by means of stacking ensemble with random forest (RF), XGBoost (XGB) and logistic regression (LR). Results in addition show that ICU prerequisite can be predicted with an correctness of 98.13% and recall of 99% using stacking ensemble with RF, extra trees and LR.
11	Abolfazl et al	USA	Total database of 57 candidate from the US Centres for Disease and Control and Johns Hopkins University	Machine Learning algorithm	Artificial Neural Networks, Classification	the results showed that the supplied model (logistic regression) demonstrated that these components and factors define the presence/absence of the COVID-19 hotspot in a geographic information system
12	Yigrem.et al.	Southern Ethiopia	Total 244 samples	Machine Learning algorithm	Logistic Regression, Classification	Concluded that there is a strong association between COVID-19-related stress and health-care employees. As more than half of the study participants reported coronavirus disease-related stress.
13	Christopher et al.	Germany	Total 368 independent variables	Machine Learning algorithm	Naive Bayes and Classifications	Their findings suggest that avoiding needless travel and social isolation can be effective approaches to limit contamination
14	Joep et al.	Netherlands	Total 319 patients	Gradient Boosting algorithm	Logistic regression and classification	Conluded that RT–PCR should remain the gold standard of testing. Since up to 9% of RT–PCR positive patients are not diagnosed by chest CT or our machine-learning model
15	Lamiaa et al.	Egypt	5000 cases of COVID-19	Machine Learning algorithm	Linear Regression model	The results demonstrated that the specified models, such as exponential, 4, 5, and 6 degree polynomial regression models, are brilliant
16	Luca et al.	Italy	85 dataset of chest X-rays	Machine Learning algorithm	K-nearest neighbours' classifier	The experiment demonstrates that the proposed technique is efficient in distinguishing between COVID-19 disease and other lung diseases.
17	Vaid S et al	Canada	JHU CSSE database	machine-learning model to uncover	Text data is used as input	Good prediction rate

				hidden patterns		
18	Ahamad MM et al.	Bangladesh	Patient COVID-19 data	Extreme Gradient Boosting, Decision Tree, Random Forest (RF), SVM, Gradient Boosting Machine	Text data is used as input and Random Forest, XG Boost, Gradient Boosting Machine and SVM is used	XGB outperformed other proposed methods
19	Shaban WM et al.	Egypt	CT images COVID-19 dataset	Enhanced KNN	Image data is used as input and Genetic Algorithm (GA) and K-Nearest Neighbour (EKNN) classifier is used	Good detection rate
20	Samuel J et al.	USA	COVID-19 dataset	LR, Naive Bayes (NB), Linear Regression (LiR), KNN	Text data is used as input and Logistics regression (LR) and K-Nearest Neighbour (KNN) is used	NB outperformed other techniques

SUMMARY

The study done here in this work shows that the forecasts are of great aid for the governments and authorities to take appropriate actions and build decisions to minimize the COVID-19 crisis. The Review has been done with the help of material available such as research papers, articles etc. Linear regression and polynomial regression, Logistics regression (LR), Genetic Algorithm (GA), Machine Learning algorithm, Gradient Boosting algorithm have been discussed with its advantages and limitations. Through which we can conclude that there are many methodologies were used to forecast the Covid-19 cases, deaths etc. However we found that these methods are having their own advantages and limitations and we landed on the final conclusion that linear regression methods are the best and provide accurate results.

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