

## Analyzing the Impact of COVID-19 Epidemic on Economy through Machine Learning

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**ABSTRACT :** The world was severely impacted by the Corona Virus outbreak that started in December 2019. Globally, the endemic coronavirus (COVID-19) is spreading quickly. The virus that causes the lethal condition that COVID-19 is known as SARS-CoV-2. By the end of January 2020, it also arrived in India, where it had a big impact. Later, it has been determined that more than two million individuals has infected with this virus, and more than 7.24,000 have died because of the illness. The majority of governments, including those in India, implemented a number of steps to slow the spread of COVID-19, including lockdowns, social exclusion, the closing of malls, gyms, schools, universities, and places of worship, among other things. Every industry in India has affected by this lockdown, including the economy, retail sector, tourism industry, etc. This research uses a machine learning approach to investigate the impact that epidemic similar to Covid-19 has on the Indian economy. To understand the effects of the Corona Virus on the Indian economy, statistical information from reputable and reliable information sources was gathered. The numerous regression models have been used for analysis based on this reliable data.

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### I. INTRODUCTION

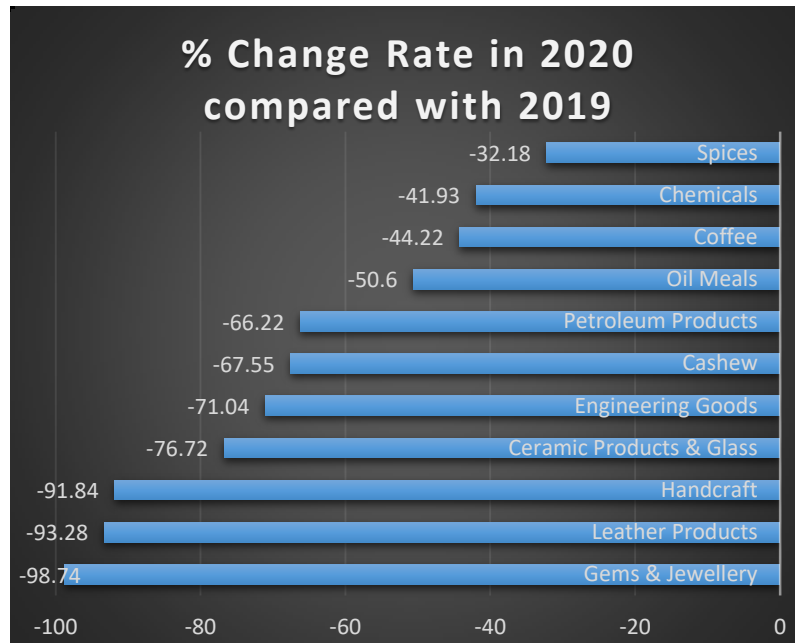
The SARS-CoV-2 virus had a significant impact on the globalised world's economy, environment, health, and social structure [1][2]. Even the richest and most developed nations find it challenging to support the ridiculously high costs associated with containing and treating this dangerous disease [3]. The COVID-19 pandemic has had a significant impact on nearly all international market sectors, including bitumen, the stock market, gold, and materials[4]. Leading research institutions and big businesses are working quickly to produce pharmaceutical medications for the treatment and prevention of this terrible disease. The COVID-19 is now a major menace on a worldwide scale. On March 11, 2020, the World Health Organisation classified COVID-19 as a pandemic [5]. The majority of governments have already put in place a number of measures to stop the spread of the sickness because there is no vaccine established to cure the virus [6]. Social seclusion and total lockdown are two of the tactics used to prevent public gatherings of individuals. During the lockdown, all schools, gyms, retail centres, restaurants, airports, trains and public transportation were shut down completely. Except for the police, healthcare professionals, dairy employees, and other emergency service personnel, citizens are not permitted to leave their homes [7][8]. The COVID-19 had negative repercussions on society, including overcrowding in the healthcare system, a slump in the economy, famine among the poor, a slowdown in the stock market, losses in the retail sector, and a decline in the tourism industry [9].

In India, the lockdown was enforced in four phases to prevent the spread of COVID-19. Phase 1 of lockdown went from March 25, 2020, until April 14, 2020(21 days)[10]. Phase 2 of lockdown was from April 15, 2020, until May 03, 2020 (19 days). Lockdown Phase 3 was from May 04, 2020, to May 17, 2020 (14 days). The last phase of lockdown was from May 18, 2020, to May 31, 2020 (14 days). During this lockdown, all places of worship were closed [11][12]. There was the prohibition of social, cultural, entertainment, and religious activities. The work from home is allowed for commercial and private firms. Only essential services like Bank, hospitals, pharmacies, grocery stores, and other essential services were permitted to operate[13][14]. The various effects of the COVID-19 pandemic on society are examined in this study piece.

### II. IMPACT OF COVID-19 ON INDIAN ECONOMY

Almost economic activity around the nation has come to an immediate standstill due to the closure. Even after the lockdown was lifted, the power imbalance between supply and demand persisted. It will take some time for the Indian economy to get back to normal. The Ministry of Statistics reports that India's growth decreased to 3.1% in the final quarter of the fiscal year 2020 [15]. From 6.7% in March 2020 to 26% in April, the jobless rate increased. During this lockdown, 140 million individuals lost their jobs, while others saw their incomes reduced. The Indian economy was projected to suffer daily losses of \$4.5 billion during the first phase of lockdown (25

March–14 April 2020). The estimated economic damage for the entire lockdown is close to \$2.8 trillion. It has significantly affected the small and large business in the country [16]. **Figure 1.** Impact of COVID-19 on Export of India in April 2020[14]



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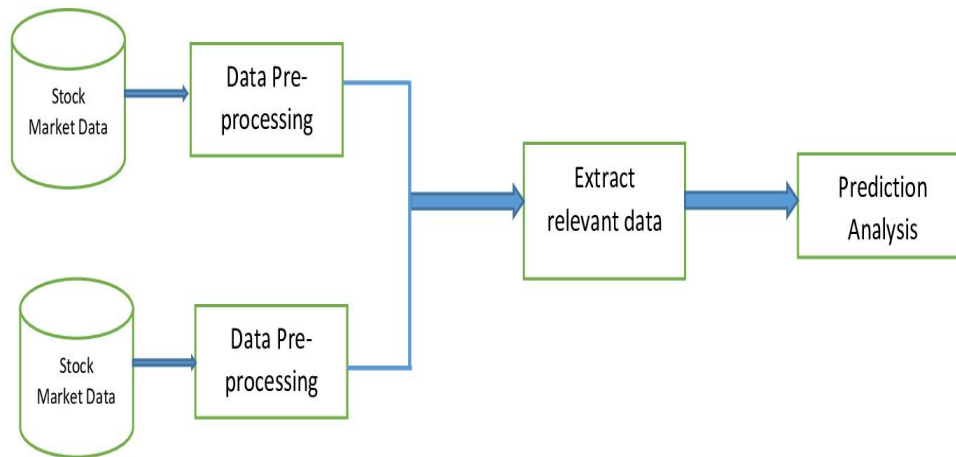
Exports and imports are also impacted by this coronavirus epidemic. In April 2020[17], the Ministry of Commerce & Industry, Government of India, issued press releases relating to India's export and import. This paper states that India's export and import decreased to 36.65% and 47.36%, respectively, in April 2020 from the prior year. According to Figure 2, the export of gems and jewellery decreased by 98.74% in April 2020, while exports of leather and leather products increased by 93.28%, handicrafts exports increased, and exports of ceramic items decreased by 91.84% and 91.67%.

### III. IMPACT OF COVID-19 ON STOCK MARKET

The International Monetary Fund (IMF) has already stated that the Corona Virus epidemic is having a negative impact on society and that a financial crisis has started. Covid-19 sparked a crisis that spread to the Indian stock market as well as the world stock market [18]. This raises concerns over the current global economic downturn and crisis. Numerous well-known companies in India, including BHEL, Tata Motors, UltraTech Cement, Grasim Industries, and L&T, have stopped operations or drastically decreased their services. The Bombay Stock Exchange's Sensex saw a significant decline from January 2020 to March 2020. On March 23, 2020, amidst a lockdown, the stock market records its greatest losses ever. Young start-ups have been hit by the reduction in funding during COVID-19. Companies that supply goods globally have scaled back their activities in India. The COVID-19 on the stock market has been analysed in the following section using a machine learning technique.

### IV. RESEARCH METHODOLOGY AND DATA ANALYSIS

This study's objective is to ascertain how the Covid-19 epidemic has affected the Indian stock market [19]. The suggested methodology is divided into different stages, including data collection, pre-processing, feature extraction, and data analysis using different regression models. Figure 2 displays the overall technique.



**Data Collection :** From March 1, 2020, to July 31, 2020, the Sensex rate was retrieved from the stock exchange website. The Ministry of Health and Family Welfare (MOHFW) provided the COVID-19 infection count for the same time frame. Tables 1 and 2 list the various properties of each dataset.

**Data Pre-processing :** Data preprocessing is a crucial step. The goal is to prepare the data for analysis in a better way. To ensure that high-quality data is effectively utilized by machine learning models, data must be pre-processed. Because stock market data for weekends and holidays was not accessible, instances of missing values were removed from the Sensex dataset. Techniques for cleaning and noise reduction have also been used to COVID-19 data collecting. For both data sets, the date property was transformed to a standard format. Our stock market dataset has 103 observations with five attributes after applying all pre-processing processes, and the COVID-19 dataset has 103 observations with ten attributes.

**Table 1.** Different Attributes of the SENSEX Data Set

Attribute Name	Description
Date	Date of the particular day
Open	The opening rate of a given day forSensex
High	Sensex best price in a day
Low	Sensex lowest price in one day
Close	The closing rate of a given day for Sensex

**Feature Extractions :** Important features extracted from datasets that had been pre-processed. The opening price information for the Sensex for each day has been derived from the stock dataset. Total\_cases for each day have been derived from the COVID-19 dataset.

**Table 2.** Different Attributes of the COVID-19 Data Set

Attribute Name	Description
iso_code	Code for a particular countryLocation
Date	Date of a particular day
total_cases	Complete case count total_deaths
total_deaths	Total death rate
Population	The population of a country as per the2019 census

**Data Analysis :** COVID-19 created a crisis for the global stock market as well as for the Indian stock market. This also causes concern about the global economic crisis and recession. Figure 4 shows the patients infected from COVID-19 from March 2020 to July 2020 in India. It is clear that by the time the cases of COVID-19 are increasing exponentially.

### V. DIFFERENT TECHNIQUES FOR PREDICTION AND FORECASTING

Future events are predicted and anticipated using a variety of ML approaches. Support vector machines, linear regression, logistic regression, naive Bayes, decision trees (random forest and ETC), K-nearest neighbour, and neural networks (multilayer perceptron) are some ML approaches used for prediction [[20], [21], [22]]. Similar to the naive approach, moving average, simple exponential smoothing, Holt's linear trend model, Holt-Winters model, seasonal autoregressive integrated moving average exogenous model (SARIMAX), and autoregressive integrated moving average model (ARIMA) are some ML techniques used to forecast future events. Depending on the accuracy outcomes, each technique is used differently and has special characteristics. For prediction or forecasting, the model with the highest accuracy is picked during the model review phase. Similar to how we chose to use the ETC for symptom-based COVID-19 prediction and the ARIMA forecasting model to predict the number of confirmed COVID-19 cases in India. Because these methods had the highest accuracy scores out of all the classifier and forecasting techniques we tested when assessing model performance. Fig. 3 shows a flowchart of the ML process. It defines how data are collected and pre-processed, and then are divided into a training dataset and test dataset for training and performance evaluation.

**Linear Regression :** Depending on the accuracy outcomes, each technique is used differently and has special characteristics. For prediction or forecasting, the model with the highest accuracy is picked during the model review phase. Similar to how we chose to use the ETC for symptom-based COVID-19 prediction and the ARIMA forecasting model to predict the number of confirmed COVID-19 cases in India, we did so because these methods had the highest accuracy scores out of all the classifier and forecasting techniques we tested when assessing model performance.

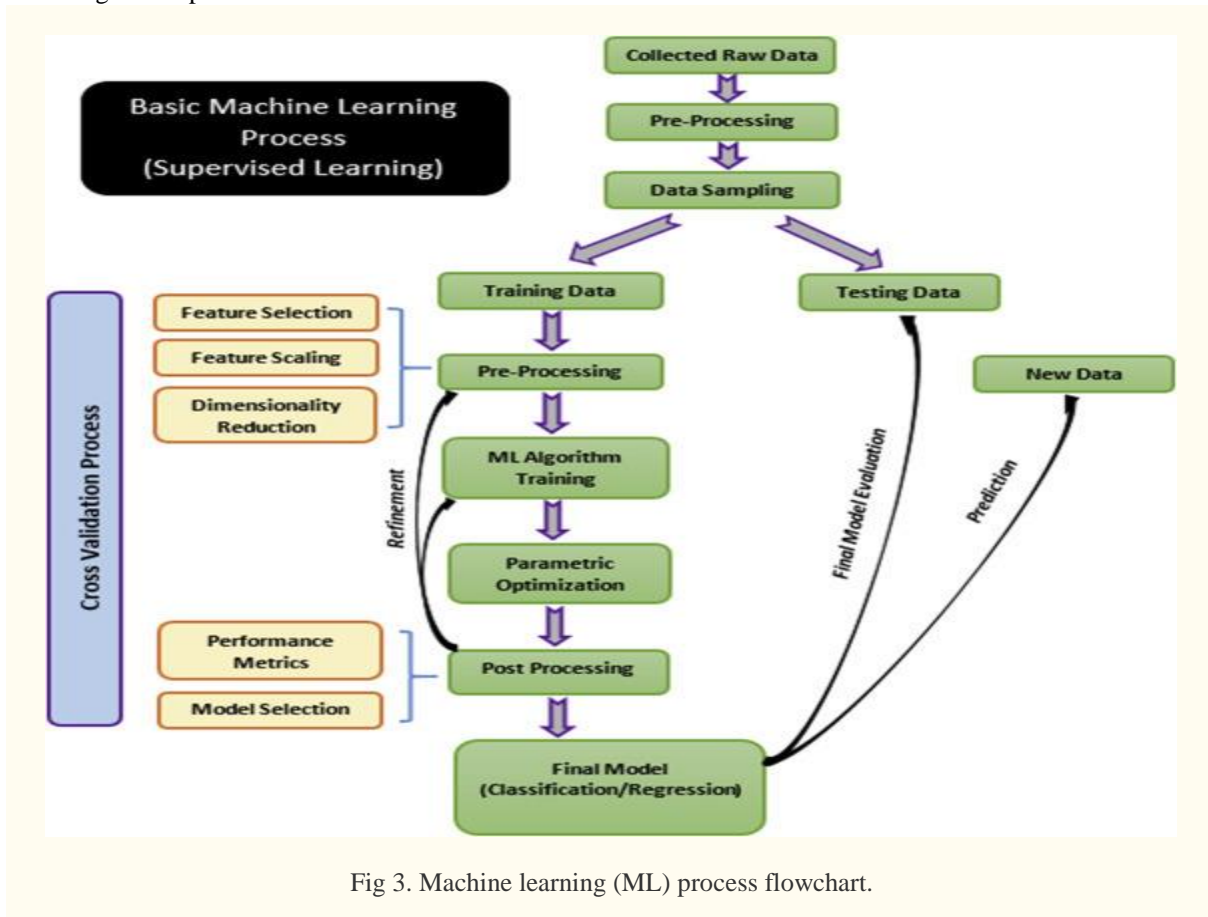


Fig 3. Machine learning (ML) process flowchart.

**Decision Tree :** A widely popular supervised learning algorithm that pertains to machine learning is the decision tree algorithm. The algorithm splits the pertinent data level by level in accordance with the provided rules to define each branch of the decision tree, much like the classification process. The decision tree typically has a root node, several internal nodes, and an ultimate node. The fundamental concept of the decision tree is that multiple rules can be used for more detailed classification at each bifurcation node [23].

## VI. CONCLUSION

According to the WHO, the COVID-19 disease originated in Wuhan, China, in December 2019 and has since spread worldwide. The illness has spread around the world and a serious threat to human health. The number of those behind bars is growing daily as a result of the disease's rapid spread. Every element of life has been severely influenced by COVID-19. This study concludes regarding COVID-19's economic effects in India. Using various regression models, we applied machine learning to estimate the opening SENSEX rate. The rising number of COVID-19 instances directly affected the stock market.

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