

# *An Analysis and Forecasting of Covid-19 Spread in Tamil Nadu based on Additive Model for Non-Linear Pattern*

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**Abstract** - Coronavirus2019 has been seen as an overall pandemic and spreads all over India. Tamilnadu is one of the most affected states in India. The study of the spread of this disease is essential to foresee the requirement in improving the health care facilities. A couple of assessments are being driven using distinctive models to foresee the probable progression of this disease. To report the present scenario, the research uses exploratory data processing and uses time series forecasting approaches to estimate the future trend. Here, the spread of the disease is analyzed in Tamil Nadu and employed Prophet Model to forecast the transmission of COVID-19 in the forthcoming months. Results show that the spread of the disease will be gradually reduced and the state will be back to normal in the forthcoming months.

**Keywords**—Covid 19; Tamil Nadu; Analysis; Prediction; Spread

## I. INTRODUCTION

COVID-19 is caused by a newly discovered coronavirus that socially and economically impacts the entire world like an infectious disease. The people infected with COVID-19 will undergo respiratory illness. Respiratory disease from mild to moderate recovers without needing additional care. Severe respiratory conditions are faced by older adults and people with health complications. As of 5 November 2020, there are 48,419,721 confirmed cases globally. There are 1,230,753 confirmed deaths and 34,670,216 recovered cases across 216 Countries, areas, or territories. In India, there are 8354855 confirmed cases. There are 124732 confirmed deaths and 7702905 recovered cases in India[15][16]. All states and Union territories of India are affected by Covid-19. Maharashtra is the highly affected state in India with around 1698198 confirmed cases. Lakshadweep, one of the union territories in India has remained zero positive cases. Tamil Nadu is the fourth affected state in India with 734429 positive cases. There are 11244 confirmed deaths and 704031 recovered cases. The following table shows the total cases, recoveries, death, and active cases from the most affected district to the least affected district in Tamil Nadu state[5].

Chennai is the highly affected district in Tamil Nadu with 201848 positive cases. There are 3674 confirmed deaths and 191787 recovered cases in Chennai. Mayiladuthurai district has remained zero positive cases in Tamil Nadu state[10][15]. Many experiments have been carried out from the point of view of regression using forecasting models such as ARIMA[2][3] and other statistical techniques[8]. These are typical methods that provide fast predictions and forecasts on time series results [1]. Based on their broad reception in the research community and fast execution, those techniques have been chosen.

The goal of the study is to examine the outbreak situation of COVID-19 in Tamil Nadu and to measure trends in the near future. The scope of this research is restricted to the construction of forecasting models and uses prediction methods based on time series that can be easily employed in these critical circumstances.

The future days meets a variety of crucial requirements consisting of health care infrastructure, technologies, and superior devices in case of growing inflamed cases. The clinical requirement consists of a specified wide variety of beds, medicines, ventilation, testing kits for the remedy of patients, and other accessories required for healthcare professionals and workers.

A structured scheme needs to be devised for developing new clinical resources and various essential requirements. It would be helpful in the health care industry to treat patients safely and securely. Consequently, adequate optimal methodology and computational analysis are required to predict the transmission and infectious risk to uphold and monitor the spread of the coronavirus and to protect public health. This article aims to analyze the spread of the Covid-19 and forecasts the upcoming trend in Tamil Nadu.

## II. LITERATURE SURVEY

A model proposed in [6] is useful for predicting the prevalence of COVID-19 by using the Artificial Neural Networks model and regression methods. Covid-19 Kaggle

data used for identifying the disease and the growth rate of COVID-2019 in India. MLP method gave better performance by the predicted results and comparing with John Hopkins university data.

A logistic model that fits the epidemic trend is proposed in [14]. The FBProphet model uses data before June 2020. The predictive model based on machine learning generates the transmission of infectious diseases curve and predicts the development of infectious disease across the global countries. The forecasting method with the logistic model determines the growing point of COVID-19. They faced some difficulties in forecasting and further suggested the need for a proper machine learning model, the Prophet model used in the study.

A Support Vector Regression method is proposed in [13] to analyze novel corona virus-related tasks like identifying the transmission of disease in various regions, analyzing the rate of growth, and how countries reduce the rate of the severity of the disease. Also, analysis is done to predict the end of the outbreak of the disease. A study is also made to analyze the speed at which the virus is transmitted. Also, a correlation analysis is conducted by associating the Coronavirus and weather conditions. The machine learning model analyzes the dataset of few countries in Asia, Europe, and the US. The support vector regression model result is high compared with other regression models for proving efficiency and accuracy. This system warns people whether or not to avoid humidity and high temperatures. They used Pearson's correlation method for understanding the relationship between coronavirus spread and weather conditions.

An advanced mathematical model is proposed in [12] to analyze and predict the development of the epidemic. They identified the best 5 distributed dataset among different dataset in around the world and applied to the machine learning model. The ML models are used to identify the possible impact of COVID-19 globally [10]. Inverse Weibull function is more compatible with the covid-19 dataset compared to other methods. The methods include Gaussian, Beta, Fisher-Tippett, and Log-Normal functions.

In [9], the authors proposed the development of a genetic programming (GP) based model prediction for covid cases transmitted in the three affected states in North India. The explicit formulas are presented to the predictive models and the inability of the predictive variables is also studied. The statistical parameters and metrics are evaluated and used to verify developed models. Based on the results, the models based on GEP employ simpler link functions, which are more suitable for the forecasting of COVID-19 cases in India.

### III. ANALYSIS AND PREDICTION

Several models were used in existing studies. Still, there is a scope to analyze the current scenario using simple methods to know clearly about the status of the disease. In this article, the spread of Covid 19 in Tamil Nadu is analyzed and forecasting for the next 30 days is performed.

#### A. Dataset Description

Covid 19 data from December 31st, 2019 to October 16th, 2020 was collected from Kaggle [4]. It consists of Date, Time, State, Confirmed cases, Cured cases, Active cases, and deaths information for all the states of India. Districtwise details are taken from the Tamil Nadu Government website and analyzed [5].

#### B. Covid-19 Tamilnadu Analysis

From the dataset, State Tamilnadu is filtered and analyzed. The visual representation of total cases reported and the number of cured cases are given. The figure below shows that 96% of the total reported cases were cured. From this, it is understood that most of the people affected by corona are recovered.

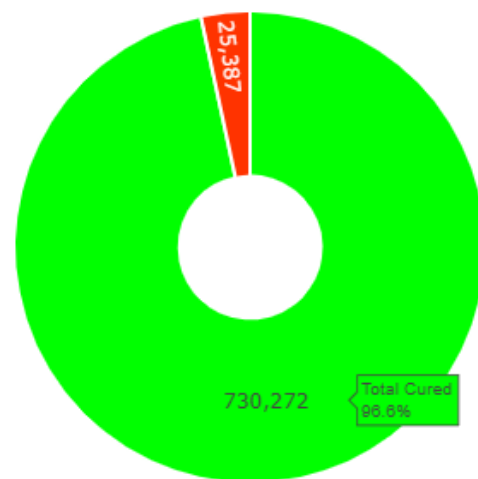


Fig. 1. Total active cases vs Total cured cases

The following is the graphical representation of the COVID-19 mortality rate in Tamil Nadu from March 2020 to November 2020.



Fig. 2. Covid-19 Mortality Rate in TamilNadu

The following figure shows the number of death cases for each day from March 2020 to November 2020. The high number of deaths during April and September is also shown here. It is clear that the death rate has been low and still being abated for the past few months.

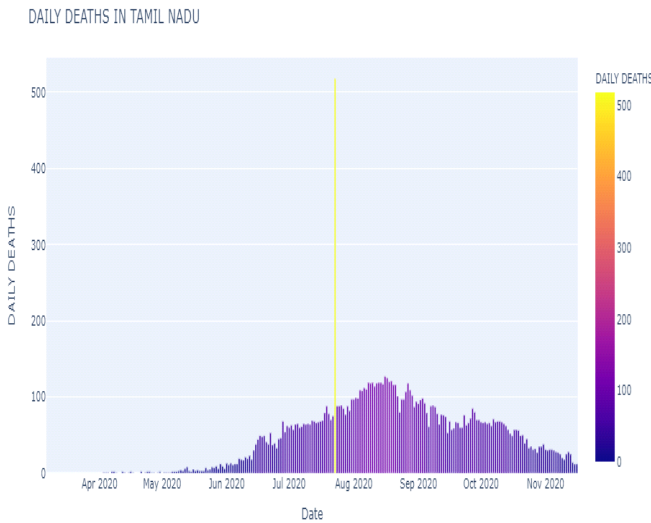


Fig. 3. Daily Deaths in Tamil Nadu

From the above figures, the daily deaths were very low during March, April and May Months in which reported cases are low. Then, it was increased during June, July, and August because the reported cases are high in these months. But the death rate is continued to be low which is always less than 1.5% of affected cases.

The following is the graphical representation of the COVID-19 recovery rate in Tamil Nadu from March 2020 to November 2020. It is observed that recovery rate has been increasing since July.

COVID-19 Recovery Rate in Tamil Nadu

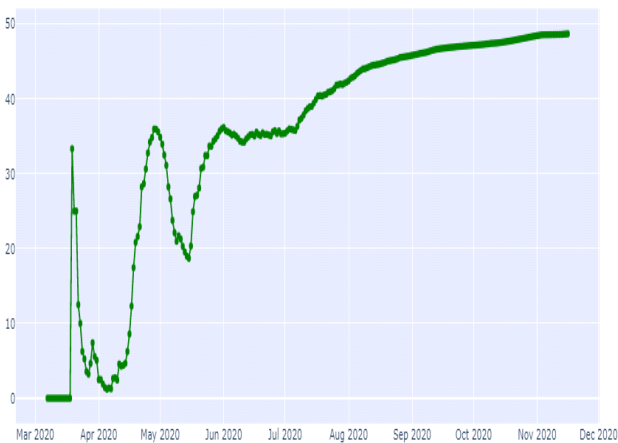


Fig. 4. Recovery Rate in Tamil Nadu

From the above figure, it is proved that the recovery rate is being consistently increasing and about 96% of the affected people were recovered.

The following figure shows the number of recovered cases for each day from April 2020 to November 2020. The recovery rate is increasing since July but the number of recoveries has been less in November due to less number of cases.

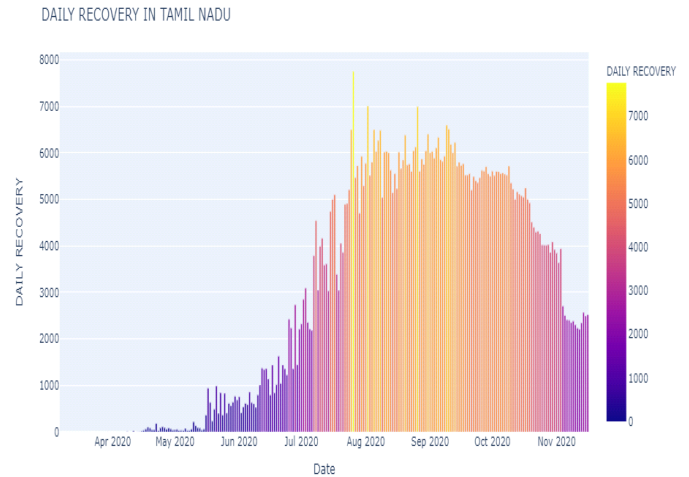


Fig.5. Daily Recovery in Tamil Nadu

From this, it is observed that a high cases during August 2020 in which the recovery rate is almost equal to reported cases and recovery rate is increasing steadily for the past few months.

The following figure gives the representation of the number of total reported cases in each district of Tamil Nadu from heavily affected to least affected (left to right). Chennai is the most affected district and districts like Myladudhurai, Perambalur is less affected.



Forecasting of Deaths in Tamilnadu for Next 30 Days

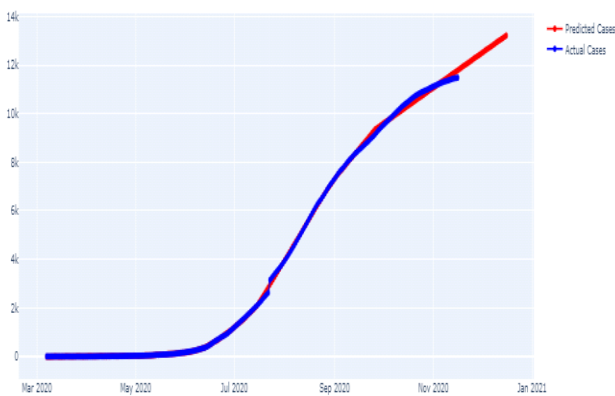


Fig.9. Forecasting of deaths in Tamil Nadu for next 30 days

It is predicted that the cases will continue to increase slowly till January 2021.

The following figure shows the prediction of the number of cases to be cured for the next 30 days. The black line shows the prediction and the red line shows the actual cured cases.

Forecasting of Cured in Tamilnadu for Next 30 Days

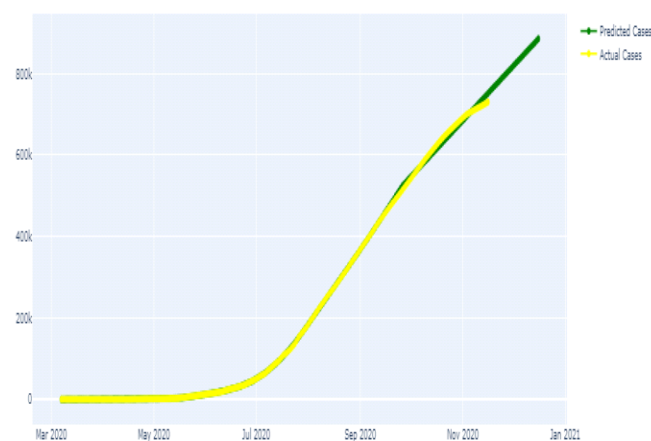


Fig.10. Forecasting of Cured in Tamil Nadu for Next 30 days

The cured case is also predicted to increase the recovery rate in the upcoming months.

## V. CONCLUSION

During the initial stages of spread, the Government found it difficult to control the disease. Then, with the increasing tests and healthcare facilities, lockdown and people's awareness

helped a lot and now it is possible to keep the spread of the disease in control. This article analyzed the affected, recovered, and death cases from March to November 2020. Also, the forecasting of affected, recovered, and deaths for December 2020 is presented. The forecasting and prediction of COVID-19 will help Government authorities and health care officials to plan and be ready to tackle the coming situation.

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