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COMPREHENSIVE STUDY OF COVID-19 USING DATA ANALYSIS AND FBPROPHET

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ABSTRACT

SARS-CoV-2 (n-coronavirus) is a global pandemic that has killed millions of people all over the world. In severe situations, it can induce Pneumonia and Severe Acute Respiratory Syndrome (SARS), which can lead to death. It's an asymptomatic sickness that makes life and work more difficult for us. This research focused on the current state of the coronavirus pandemic and forecasted the global situation, as well as its impacts and future status. We used the FbProphet model to forecast new covid cases and deaths for the month of August utilising various information representation and machine learning algorithms. We hope the findings will aid scientists, researchers, and laypeople in predicting and analysing the effects of the epidemic. Finally, we conclude that the virus's second wave was around four times stronger than the first. We also looked at the trajectory of covid-19 instances (monthly and weekly) and discovered that the number of cases rises more during the weekdays, which could be due to the weekend lockout.

I. INTRODUCTION

The World Health Organization declared the Coronavirus Pandemic to be a worldwide health disaster of concern in 2020 in the month of March. This epidemic, which first originated in Wuhan City of China in December 2019, has wreaked havoc across the globe. On the 30th of January 2020, the first case in a long time was accounted for, with the total number of cases exceeding 4 million. Over 80,000 people have died as a result of the pandemic, with 3 million people recovering. Proactive measures adopted by experts include a long-term lockdown of the country, rapid separation of cases, and application-based tracking of contaminated people. For a better understanding of COVID-19's progress on the world, a focus on development and development of occurrences in India could not be ignored.

A compartmentalised model, SIQR expanded as Susceptible -Infectious -Quarantined-Recovered , is used to understand something similar. In the country, the recovery rate and doubling rate of absolute disclosed positive cases both exceeded 75% and 25 days, respectively. It's also been observed that the pace at which new cases are detected (up to 6 million tests per day) has a strong correlation with the rate at which new instances are discovered. Using the SIQR to show successful multiplication number, scourge multiplying rate, and contaminated to isolated not really settled to truly look at the pandemic's transient development in the country. The compelling proliferation figure, which peaked in the first 15 days of April, is gradually accumulating to 1. It is also estimated that using this approach for every well-known instance in India, there could be 10–50 undiscovered cases. This model, like every numerical model, includes a few presumptions. To increase robustness of this model, a technique consisting of a weighted border can be devised that can keep an individual with a strong safe framework from becoming equally helpless against the sickness.AI computations can also be utilised to load our model with data from multiple countries, allowing for more accurate and precise inspection and prediction.

The Covid illness (COVID-19) epidemic, which began in China quickly spread to other countries, with many cases reported all over the world. 56,342 positive cases had been identified as of May 8, 2020 in mainland India. India, the world's second-largest country by population, will have hurdles in avoiding the spread of the serious respiratory disease Covid 2 among its populace. To deal with the current flare-up, a variety of approaches would be critical, including computational showcasing, factual apparatuses, and quantitative investigations to control the expansion as well as the rapid advancement of another therapy. The Indian Ministry of Health and Family Welfare has expressed alarm about the current outbreak and has taken important steps to limit COVID-19's spread. The federal and state governments are taking a few steps and establishing a few wartime conventions to attain this purpose. In addition, on March 25th, 2020, a 55-day lockdown across the country was imposed by the Indian government to prevent the spread of the disease. This directly affects the country's

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economy, as it has effectively shut down modern regions, as people are now wary of doing business in the affected areas.

II. LITERATURE SURVEY

As of 29-Aug-20, we evaluated COVID-19 advancement in the three most impacted states of India, Tamil Nadu, Andhra Pradesh and Maharashtra and constructed a prediction model to estimate COVID-19 spread behaviour in the coming months. Using the Susceptible-Infectious-Removed (SIR) model and the FbProphet model, we used time series data for India to forecast peak infectives and peak infective dates for India and the three most hit states. In this article, we also did a comparison analysis of the prediction results from the SIR and FbProphet models. We concluded from this research that, if a total of 5.2 % of India's populace gets infected by Covid, the pandemic's nationwide spread will peak by the end of November 2020. And, until vaccination is available, with festivals approaching, there is a strong chance of a comeback in the number of cases in states that have already hit their peak. There is a considerable chance of a recurrence in the number of cases if social distance and other control measures are not carefully followed in the coming months.

In December 2019, the Covid sickness 2019 (COVID-19) began in Wuhan, Hubei Province, China. With almost 28 million cases and 0.95 million deaths, this flare-up has triggered a worldwide pandemic. India saw its first confirmed case on January 30, 2020. Currently, over a million persons have been positively identified, with 77,589 deaths and near about 3 million recoveries [1].The Government of India imposed a harsh cross-country lockdown in four stages, commencing on March 25th and lasting for almost two months, ending on May 31st. Moreover, the country had begun a gradual unlocking process that included the launch of projects, rail lines, public transports, shopping malls, and education centres. In terms of the number of positive cases, India is second only to the United States, with over 90,000 instances being reported every day [1].Despite the large number of positive cases reported every day, the number of deaths per million of the population is extremely low (56 for every million of the population) [1]. Clinical specialists, strategy producers, and other partners may benefit from a detailed numerical analysis of the pandemic's progression in the country. In this study, the COVID-19 instances in India are examined using a numerical presentation, comprising cases up until August 22, 2020.

In the general public, numerical conditions are commonly employed to demonstrate the nature and impact of the global pandemics. The SIR model [2] is a widely used numerical model for analysing and forecasting the progression of a disease. Its version SIQR [3] is regarded as the finest exhibiting approach for COVID-19, where irresistible confinement plays a large role. Using the preceding pattern, The SIQR method can be used to establish boundaries for assessing the development and progression of cases in a district. This demonstrating method of dealing with the infection's consequences is used in only a few impacted nations, such as Brazil [4] and Italy [5].

Studies on the establishment of control laws [6] and the impact of lockdown on the transmission of illness [7] have been taken into account, particularly in India. Despite this, none of the studies have looked at how far the disease has progressed in terms of epidemiological boundaries. Using the SIQR paradigm, the current study looked into the evolution of COVID-19 in India. Boundaries and indicators that measure worldly development and disease development are established.

III. PROPOSED METHODOLOGY

FbProphet:

Definition :

Time-series forecasting tool FbProphet was released as open source by Facebook in 2017.It works on the principle of additive model. The FbProphet's non-linear trends are based on yearly, monthly, and daily seasonality, as well as other factors.Hence,

$$S + I + R = S_0 + I_0 + R_0 \quad (1)$$

The SIR model aims to answer some key concerns about the epidemic.

Question 1: Is the sickness contagious?

I0 is the initial number of infected people. However, we want to know if this number will continue to rise.

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Because dS/dt is now less than 0,thus we expect for "S" to drop over time.So,

$S \leq S0 dI/dt < I(\beta S0 - \gamma)(2)$

Disease spreads if,

$dI/dt > 0$ ie if ,$S0 > \gamma/\beta = 1/q(3)$

Definition of contact ratio: The percentage of infected individuals in contact with the general population throughout their infectious period.. We define the parameter R = S0/ here, as we did earlier in this study. Base reproduction ratio (R0) measures how many secondary infections a single initial infection causes in the community. As a result, if R > 1, the sickness will spread.

Question 2: What is the maximum number of infectious agents on any given day, referred to as the peak?

Facebook Prophet doesn't only predict the upcoming trends, it assists with identification and filling in of missing variables. FbProphet model equation:

$$y(t)=g(t)+s(t)+h(t)+\varepsilon t(4)$$

To analyse time-series non-periodic trends g(t) is employed. The periodicity of a weekly or annual change is indicated by s (t). h(t) refers to the influence of an irregular day or days, such as a holiday .Unobserved factors are referred by the error term t. Only non-periodic time-series alterations have been considered in this study.

IV. RESULTS

The seroprevalence of changing age and sex was 8.5 % (95 % CI 7% -10.7 %). Individually, the uncorrected seroprevalence was 16.2 % (95 % CI: 9.3–25.9) and 10.8 % (95 % CI: 5.5–18.3) among members with hypertension and diabetes, respectively. The seroprevalence was 6.2 % (95 % CI 4.2–8.18) when we modified to the test execution. For each RT-PCR confirmed case, the investigation looked for 7 (95 percent CI 1:4.5–1:9) undiagnosed contaminated people. As of October 22, 2020, the disease fatality rate (IFR) was 12.38 per 10000 contaminations. Positive status was mostly associated with a history of self-revealed indicators and instruction (p 0.05).

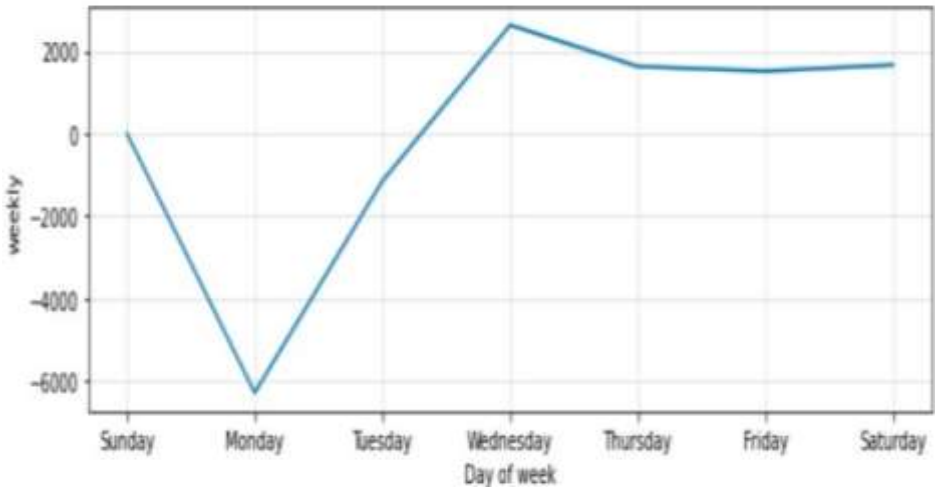

Fig 1: Illustration of Weekly affected covid cases

Weekly Covid Cases:

Fig 1 graph tells us that the number of covid cases increase during the weekdays, which can be associated with the effectiveness of weekend lockdowns.

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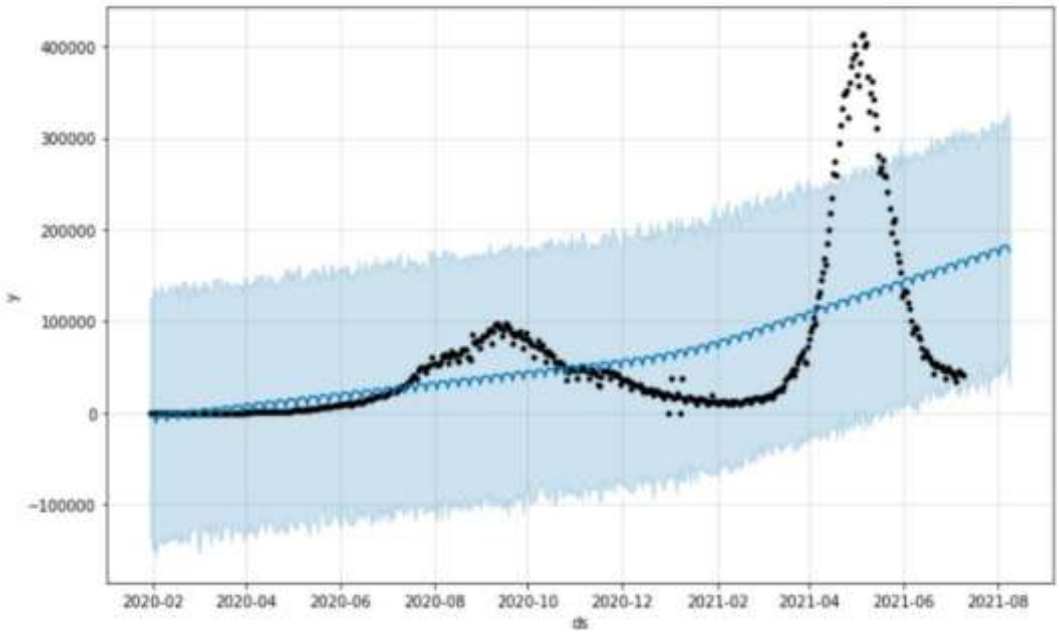

Fig 2: Illustration of Monthly affected covid cases

Monthly Covid Cases:

Black line: Actual Cases

Blue Line: Mean Value Of predicted Cases

Blue Background: The Range of predicted cases

This graph tells us the new covid cases, as we can tell from the graph that the first wave hit its maximum during 2020-09, and the second wave hit its maximum on 2021-05, the second wave was almost 4 times stronger than the first wave. We also predict the new cases for the next month i.e. 2021-08, the blue background give the upper and lower limit of the expected cases, the graph resonates with the actual cases and seems to break only when the cases hit their maximum, but it gives us an idea that the upcoming wave will be significantly stronger than the previous wave.

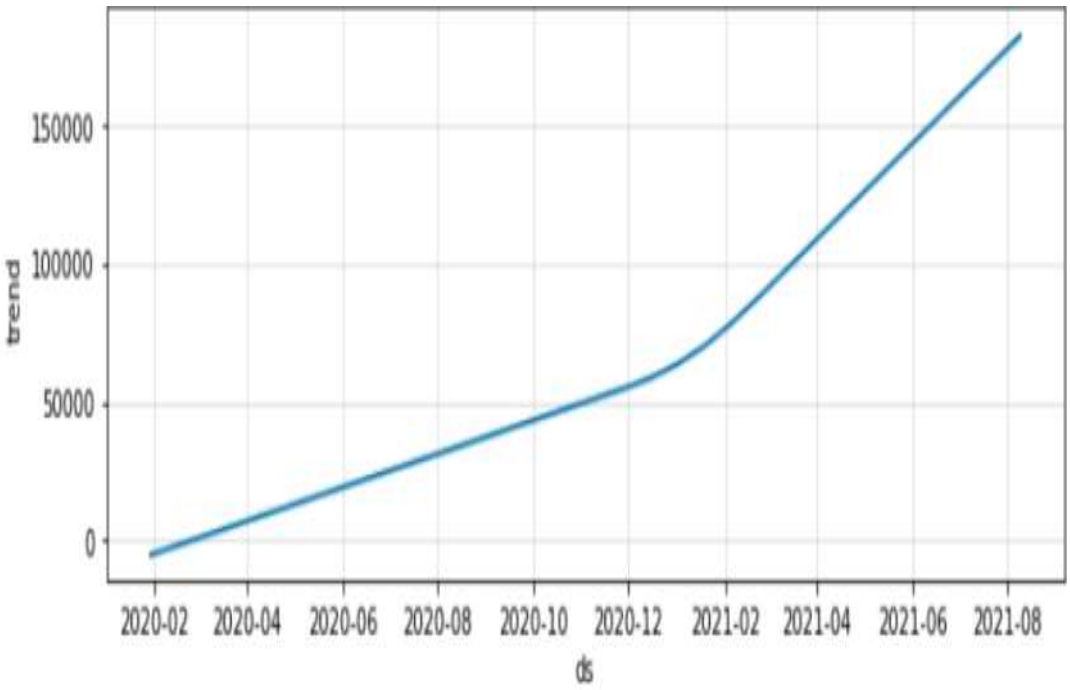

Fig 3: Illustration of Monthly New affected covid cases in integer

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This graph tells us the monthly trend of new cases.

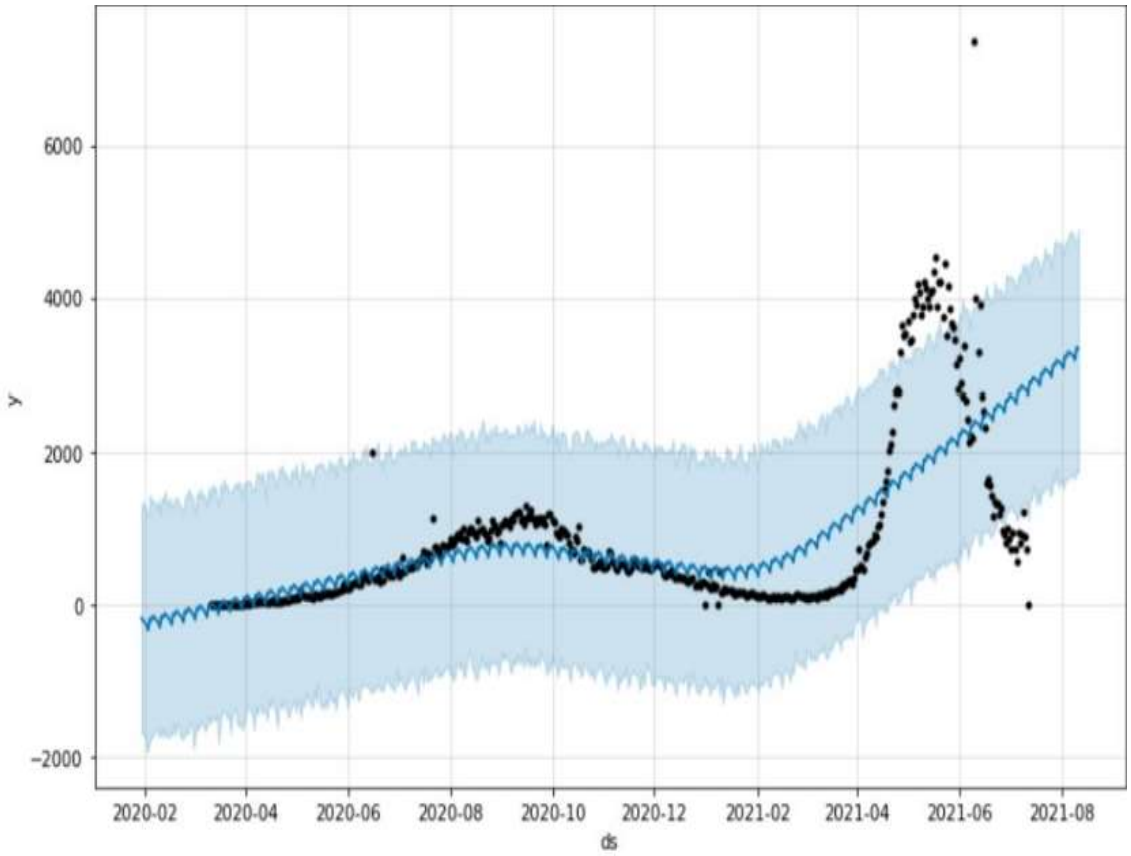

Fig 4

Monthly Covid Deaths:

Black line: Actual Deaths

Blue Line: Mean Value Of predicted Deaths

Blue Background: The Range of predicted Deaths

This graph tells us the new covid deaths, as we can tell from the graph that the first wave hit its maximum during 2020-09, and the second wave hit its maximum on 2021-05, the second wave was almost 4 times stronger than the first wave. We also predict the new deaths for the next month i.e. 2021-08, the blue background give the upper and lower limit of the expected deaths, the graph resonates with the actual deaths and seems to break only when the deaths hit their maximum, but it gives us an idea that the upcoming wave will be significantly stronger than the previous wave, this graphs compliments the cases graph, both graphs cumulatively tell us that when cases increased by 4 times the deaths also increased in the same ratio for the both 1st wave and 2nd wave, and that the worst hit period was for about one month.

More Results from the data(INDIA): (12 July)

Total number of people fully vaccinated : 74854865

People Vaccinated (1 dose): 306612781

Median Age : 28.2

Population : 1.380004e+09

People vaccinated per hundred = 22.22

Total vaccinations per hundred = 27.64

Hospital beds available per thousand = 0.53

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V. CONCLUSION

COVID-19 has rendered a large portion of the provincial population in the region of southern India powerless.. To maintain the health of this people, it is vital to strengthen general health measures and provide early access to the antibody. Lower population density, good housing, adequate ventilation, and limited urbanisation, in conjunction with governmental, private, and neighbourhood health authorities, are key components in preventing future respiratory pandemics from arising, according to the study.

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