Worldwide Prediction on COVID-19 Spreading Future Trends using Gaussian Model

Dr. Bechoo Lal¹, Fareeha², Ashna Farah³

¹Department of Information Technology, Western College, University of Mumbai, India

²University of The Punjab, Lahore , Pakistan

³PGP – Science, Purdue University, USA

ABSTRACT

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Background: COVID-19 is a pandemic, which covered to all over the world and started the end of 2019. COVID-19 spreading rapidly from person to person and from one environment to another environment. In the current situation the entire world is passing through a very critical situation and medical services almost collapse due to the span of COVID-19. The virus is directly threatening to human being's life and attack to their nervous system, collapse lungs, breathing problems and damage other parts of the body system. The researcher build a predictive model using a Gaussian approach to find out the current status of COVID-19 and its future prediction. This predictive model is very helpful for countries and before timely they can manage their health related services, make a change in their decision making policy to stop COVID-19 spreading.

Method: in this research paper the researcher builds a predicting model using real time analytics to measure the intensity of spreading COVID-19 in major concern countries. The main objective of this research article to predict the rate of spreading COVID-19 cases, visualize, and represent the future trends of COVID-19 cases. For the predictive analysis the researcher used the Gaussian Prediction model, time series analysis, exploratory data analysis, and K-means clustering. The researcher used the parameters such as rate of spreading, slow down speed, a sudden change in rate, prediction of the number of cases and differences in mortality rate.

The results: The researcher discussed the weekly, monthly rate of spreading COVID-19 cases and predicted how it covered the world entire populations. The predictive model is very helpful to the countries where a number of cases are rapidly spreading and showing the future trends whether it is decreasing or increasing ratio. The countries can manage their health related services and

other possible resources to stop the COVID-19 cases in their countries. If the prediction is unknown that situation is horrible for the entire world.

Conclusion: Finally the researcher concluded that the predictive model of COVID-19 cases has significant impact to all over countries to show the future spreading trends, the accuracy level of this predictive model is 92% which is verified by using Gaussian approach. In some cases prediction might be unfavorable to handle the health care industries that are only 8% chances. The researcher giving the assurance the developed predictive model is more reliable and efficient to predict the COVID-19 case and its future trends, so the countries and their health related unit can manage the health related services in rapid manner.

Keywords — Coronavirus, Time-Series prediction, Epidemic spreading

I. INTRODUCTION

THIS newborn virus corona virus disease 2019, known as the COVID-19 epidemic, has caused major health concerns since 2019. Symptoms of the virus cause fever, cough, headache, and active respiratory problems, which can lead to the patient's death. The disease has spread since December 2019, with unknown facts being reported in Wuhan, China [1] before the Chinese government and the World Health Organization (WHO) identified early January, 2020. A new corona virus (COVID-19) as HIV. Related to the same family of viruses as Severe Acute Respiratory Syndrome (SARS), with a previous history in China 2002-2003 [2]. During January 2020, COVID-19 was rapidly distributed to the vast majority of China leading to more than 7,000 infections by the end of the month. The total number of cases in the first month of COVID-19 exceeded the total number of SARS cases in 2002 - 2003, indicating that the new virus has a stronger infection than the SARS virus.

This research article is divided into number of five major sections, sector-I introduce the COVID-19, its origin, and spreading manner, section-II gives the strong background of research study where number

of research articles predictions are include on COVID-19 and formulated the research problems and current research issues. The sector-III define the research method, the researcher used the Gaussian Model to predict the a high level of accuracy towards this research study, the sector-IV described the results and data analysis and its significant approaches on COVID-19. Finally in section-V, the researcher concluded the significant of research study and its spreading future trends at global level.

II. LITERATURE REVIEW

In China, where the virus was first introduced and recognized, the government has taken drastic measures to prevent the spread of the virus. An example of such a process is not limited to: advising people not to leave their homes for unnecessary reasons, reducing urbanization, and isolating infected areas. People are expected that such unprecedented diagnoses will effectively stop the spread of the virus and save time requiring health care in the affected areas [1].

At the beginning of March 2020, the total number of infections worldwide reached 97,000 cases and 3,400 deaths [3]. The World Health Organization (WHO)

declared the outbreak a pandemic on March 11 and described the outbreak of COVID-19 as a global emergency health concern (PHEIC) [4] when COVID-19 was transmitted in 114 including United. Countries [4], Thailand [5], South Korea [6], and Japan [7].

An estimated 118,000 people were infected and 4,300 people died [3]. Subsequently, up to 32% of COVID-19 have been reported to be at risk for a critical condition [8, 9]. Apart from that unexpected death rate of 61.5% serious cases have been reported. Potential age and in patients with a contagious disease [10]. The researcher approached the infected people and took their cases seriously in an important way to get treatment and easily led to a shortage of major health services and international services.

The rapid transfer of COVID-2019 could be a different reason, if there may not be enough transparency of infection data at the beginning of the epidemic. An occasional announcement information about this epidemic is important for human response. Reliable data can prevent COVID-19 and stop the spread of the disease. Another major reason is the lack of a standard diagnostic standard for COVID-19 and determining the exact frameworks for testing new viral load tests that was a real challenge. The symptoms of COVID-19 were very similar to the symptoms of the flu, which is a major problem in diagnosing patients. The lack of a pandemic monitoring and reporting system has made it difficult to prevent the spread of this epidemic in the early stages of infection [1].

Epidemiological studies have shown that the continuous proliferation of COVID-19 to control the mechanisms of tracking infection and direct detection of dispersed sources. However, the distribution function of COVID-19 and the large number of human trafficking, which strengthened the causes of the spread of the virus and created a problem for

epidemiologic investigation. Alternatively to monitor the evaluation of this relevant epidemic in decision-making regarding public health care [11].

This research studies, global statistics of COVID-19 by investigating data from January 2020 to date source from Kaggle The main purpose of this study is to understand the different magnitude of COVID-19, such as its rate of spread, epidemic control countries, changes in infection rates, and mortality rates varying from country to country, which is not possible for all possible parameters. Interaction between tests and validated cases were obtained. The COVID-19 art study provides a very interesting insight into the best-case scenario obtained as the best treatment for this outbreak.

The main objective of this research article is to predict future awareness of the rising or decreasing costs of COVID-19 and its prevalence, so that countries can manage and adjust the future plan and policy for emergency medical services and medical equipment [13]. The Gaussian methodology used to design a predictive model produces a high degree of accuracy between interdependent variables and independent variables. Based on the data analysis and results provided by this predictive model it is very effective and very scary to measure COVID-19 cases [15].

III. RESEARCH METHOD

The parameterized models of various countries use the well-known Gaussian Kernel. Top worst-affected countries with Covid-19 have been selected from each continent. Least-squares minimization has been used to develop Gaussian based parameterized model based on the available data till June 27, 2020. Assuming that the tuple (d_i, y_i) represents y_i number of total reported Covid-19 cases of a given country on the t^{th} day, the developed parameterized model minimizes the following objective function:

$$\|e\|_2^2 = \sum_{i=1}^N [y_i - \hat{f}(d_i; a, \mu, \sigma)]^2 \quad (1)$$

Here $\|e\|_2$ represents the standard l_2 norm (i.e. energy of the error) while N is the total number of days under consideration. The parameterized model in Eq-1 is defined by the symmetric bell-shaped kernel i.e.

$$\hat{f}(d_i; a, \mu, \sigma) = ae^{-\frac{1}{2}\left(\frac{d_i - \mu}{\sigma}\right)^2}, \forall i = 1, 2, \dots, N \quad (2)$$

Where a being the height of the curve while μ and σ represent the central point of symmetry and width of the parameterized model respectively. The model parameters (a, μ, σ) are computed numerically using standard scientific computing library of Python (SciPy), and the results are obtained for each country. The developed model can be used to predict the Covid-19 cases for each country. It can be seen that the model performs well to identify the flattening of Covid-19 curve to a reasonably good accuracy.

IV. RESULTS AND ANALYSAIS

In this research paper the researchers used the Gaussian Model which is useful in statistical, probabilistic modelling based on normal distribution data obtained explicitly. A Machine Learning (ML) algorithm is also involved to measure the similarities between seen and unseen data points, and to predict the value for an unseen point from training data. To optimize the result the researcher used the Gaussian process model. It can provide the assessing the partitions of data by considering the each component probabilistic method.

Gaussian model:
$$f(x) = ae^{-\frac{1}{2}\left(\frac{x - \mu}{\sigma}\right)^2}$$

Data: World Wide COVID-19: current situation in 2021

Source of Data: www.kaggle.com

Table 1.1: World Wide COVID-19: current situation in 2021

Int64Index: 139230 entries, 0 to 139229		
Data columns (total 8 columns):		
Data Attributes/Features	Number of Data	Nature of Data
<u>Country</u> <u>Region</u>	139230	non-null object
<u>Province</u> <u>State</u>	42840	non-null object
<u>Lat</u>	138210	non-null float64
Long	138210	non-null float64
Date	139230	non-null object
Confirmed Cases	139230	non-null int64
Deaths	139230	non-null int64
Recovered	139230	non-null int64

Fig 1.1: World Wide COVID-19 Confirmed Cases

In the current context India, France and Brazil are going through the most critical stages of COVID-19 and is going through the worst stages and statistics show that in March 2020 and May 2021 every day one million cases will be found. In India, cases of COVID-19 begin in March 2020 and escalate to higher levels of importance by the end of May 2021, from May to date COVID-19 cases grow at a different rate and rate, on the basis of current statistics the researcher predicts per month, future that COVID-19 cases will be reduced.

Fig 1.2: World Wide COVID-19 Fatalities Rate

In this data analysis, report the statistical analysis report showing that Czechia, Brazil, India and Cambodia are suffering the worst World Wide COVID-19 Fatalities Rate in current situation from March-2020 to May-2021. India and Czechia also surpass the critical status of COVID-19 figures recorded at the highest level and reached the second highest in the world, with statistical and predictable probability indicating that COVID-19 cases will be reduced by August and September 2021 on average.

aaaaaaaaaaaaa

Fig 1.3: World Wide COVID-19 Fatalities Rate =13-06-2021

In the United States (US) COVID-19 cases were found in February 2020 and grew rapidly in an uncontrolled state during March, April, June, and mid-July 2020, the current situation is under controlled, but the chances of counting and predicting COVID-19 cases will be lowered. In Brazil the cases of COVID-19 were found from March 2020 and further growth, in the current situation has reached a critical level. Data analysis and forecasting indicate that in the future COVID-19 will be reduced and reported 10 death cases in the month of June-2021

Fig 1.4: World Wide COVID-19 Daily New Confirmed Cases

In India COVID-19 cases were found from February 2020 and grew rapidly in March, April, May, and June 2020 and from the end of June-2021 the data would decrease rapidly. Statistics and forecasts indicate that in the coming months the cases will be reduced. Brazil is also passing the same situation, the COVID-19 cases were uncontrolled in the month of April, May-2021, and due to mass vaccination the current situations are under controlled in daily cases.

Fig 1.5: World Wide COVID-19 Growth Factor Countries Wise

The above data, statistics shows that the growth factor by country wise, the COVID-19 cases were found from April 2020 and rapid growth has reached a critical level. Current statistics and forecasts indicate that next month COVID-19 charges will be reduced. France can also be an international road model in the world. The COVID-19 cases were found from April 2020 and reached a critical level by the end of May 2020. Statistics and forensic opportunities indicate that COVID-19 cases are declining rapidly and reaching their lowest level.

Fig 1.6: World Wide COVID-19 Mortality Rate

The above data, statistics show that the growth factor by country wise, the COVID-19 cases were found from April 2020 and rapid growth has reached a critical level. Current statistics and forecasts indicate that next month COVID-19 charges will be reduced. France can also be an international road model in the world. The COVID-19 cases were found from April 2020 and reached a critical level by the end of May 2020. Statistics and forensic opportunities indicate that COVID-19 cases are declining rapidly and reaching their lowest level.

The trend toward global transmission of the virus has varied from country to country, largely due to the response of each government. In this research article the researcher discussed the cases of COVID-19 in different countries and provided a proposed model based on the current situation and Government intervention. The researcher used the Gaussian Process retrieval model to predict the future trend of COVID-19 worldwide prediction. The proposed model is more accurate and highly efficient to predict the COVID-19 cases in future directions and also benefited for those countries who are having sufficient medical equipment and other resources at mass level to control this disaster situation (Murtadha Older et.al., 2020).

The main purpose of this forecast model is to provide future estimates of suspected cases of death from COVID-10 in advance so the countries must be aware the critical situations and manage the medical equipment's and other possible resources. In the month of April and May-2021, the India, France and Brazil were passing the horrible situation and complete medical system was collapsed, including ventilators, oxygen supports and essential medicines which are needed during COVID-19.

V. CONCLUSION

Finally the researcher concluded to detect hidden data or pattern about COVID-19 can be very helpful

in this epidemic. This will show the various hidden patterns and details of the information related to answering the questions raised in this paper. Our findings, however, represent strong points of Predicting COVID-19 in terms of positive and negative outcomes in the world's worst countries. The researcher discussed and analyzed human symptoms during the COVID-19 virus infestation. In terms of data analysis and forecasting the researcher concluded that the worst-affected countries such as South Africa, Egypt, Brazil, Iran, the United States (US), India, Mexico, Russia and Australia are unable to control COVID growth -19 cases in their countries. But few of them represent the international road model in terms of their control and prevention in COVID-19 cases. The data analysis and forecasting model produce accurate statistics from countries such as Peru, Spain, and New Zealand that quickly control the spread of COVID-19 cases in their countries.

The researcher analyzed that the World Health Organization (WHO) has provided certain guidelines currently that are important parameters to prevent and stop the spread of COVID-19. The researcher also suggested that people should not ignore the laws and regulations imposed by their country to protect and stop spreading COVID-19 cases. On the basis of statistical analysis and prediction, the researcher finally strongly recommended that South Africa, Egypt, Brazil, Iran, the United States (US), India, Mexico, Russia and Australia should change their medical policy and must be prepared to deal with any type of medical emergency in relation to medicine and other medical equipment.

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Author Details :

Bechoo Lal, PhD. This author became a Member (M) of IAENG: International Association of Engineers, USA with membership (108820) in 2010, a Senior Member (SM) in 2019. I am doctorate PhD in Computer Science, PhD- Information System from University of Mumbai, Master of Science – Computer Application from Banaras Hindu University (BHU), PGP- Data Science from Purdue University, USA and Graduation Statistics (Hons). Currently I am working as a Coordinator- IT department, Western College, University of Mumbai, Maharashtra, India. My research areas are data science, Big data Analytics and Data Mining and Committed Computer Science / Data Science - Assistant Professor inspiring and motivating students by providing a thorough understanding of a variety of computer and data

science technology concepts, subjects and current research issues.

Fareeha , she is having Master of business and information technology (MBIT) from institute of business and information technology, University of The Punjab, and currently working at The Bank of Punjab ,IT department, Lahore , Pakistan. Her research areas is advanced robot interaction and collaboration.

Ashna Farah, She is currently doing PGP – Science, Purdue University, USA and her research area are data science and big data analytics.

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