Origin of the coronavirus was the seafood market of Wuhan city, Hubei province in China. The cases of someone suffering from COVID-19 can be traced back to the end of December 2019 in China. This is the most infectious disease and spread worldwide within three months after the first case reported. The World Health Organization renames Coronavirus as COVID-19. COVID-19 is the β-Coronavirus family virus, effect on the lung of human and common symptoms are cough, fever, fatigue, respiratory problem, and cold. The full name of the coronavirus is severe acute respiratory syndrome SARS-CoV. It spread on humans as well as animals and infected more than 183 countries with 2959927 confirm cases and 202733 deaths till 28 April 2020. 84 days data is used to predict confirmed and death cases for the next 10 days by using prophet and daily average based algorithm. Predicted confirmed cases are 2886183 and death cases 190540 till 25 April 2020. This study introduces the spreading pattern of COVID-19 in the top ten infected countries. After China, European countries are the most infected ones. In this study, data was analyzed on the attributes confirmed, active, recovered and death cases, and next ten days outbreak prediction. Some countries state-wise data confirmed active and death cases also analyzed.
INTRODUCTION

Coronavirus is not a new virus but the severe acute respiratory syndrome coronavirus, SARS nCoV is the new virus of the family Coronaviridae cases found in China (Dhama et al., 2020; Geller et al., 2012; Hui et al., 2020; Zhu et al., 2020; Li et al., 2020). World Health organization officially renames SARS-CoV (SARS-nCoV) or Novel coronavirus as COVID-19 on 11 February 2020 (WHO, 2020; COVID-19, 2020). Alpha coronavirus, Beta coronavirus, Gamma coronavirus, and Delta coronavirus are the four genera of the family Coronaviridae (Stanley Perlman 2020; Woo et al., 2010; Lim et al., 2016; Weiss et al., 2011). Bats are the source of COVID-19 virus and spread in humans as well as mammal (Richman et al., 2016; Cohen et al., 2020; Corman et al., 2020; Cavanagh, 2007). The six human coronaviruses that can infect people are 229E, OC43, HKU-1, NL-63, severe acute respiratory syndrome coronavirus (SARS-CoV), and Middle East respiratory syndrome coronavirus (MERS-CoV) (Fouchier et al., 2004; Vander Hoek et al., 2004; WHO, 2003; WHO 2020). Zhu et al. (2019), but the novel coronavirus is new virus. SARS-CoV and MERS-CoV are the infectious virus of the Beta-coronavirus family which can affect the respiratory system of humans (Kuiken, et al., 2003; Zaki et al., 2012), till now there is no vaccine and medicine developed for the treatment of COVID-19 only precaution are the safety measures. (Mizumoto and Chowell, 2020; Riou and Althaus, 2020; Shao and Wu, 2020). Incubation of coronavirus is 2 to 14 days (Tanu 2020; Zunyou et al., 2020). W. Xia et al., (2020), discuss the indication that the transmission of COVID-9 occurs during the incubation period. Ranjan (2020) used SIR model to predict the outbreak of COVID-19 in India on the daily bases and found consistence result with confirmed and death cases. Social distancing and lockdown is the weapon to fight with COVID-19. Tomar and Gupta (2020) predicted the confirmed cases in India for next 30 days by using long short-term memory (LSTM) algorithm and effect of precaution measures in spread of coronavirus. The research has been conducted on a sample of data collected from the kaggle and experiments with studies the cases of coronavirus worldwide, top infected countries of the world date-wise by using the python language in Jupyter notebook. “COVID-19” affects the 183 countries with 2056051 confirmed cases, 502045 recovered cases, and 1419829 active cases till 15 April 2020. This study indicates the spreading pattern of COVID-19 of top countries such as the United States of America, Italy, China, Spain, Germany, and Iran date-wise. It is analyzed that the countries’ wise and state wise data for the better understanding outbreak of COVID-19. It is shown the countries wise confirmed cases on the thematic Map. Predict the future confirmed case in the USA, China, and Rest of the World, find the accuracy of prediction. These countries medical facilities are highly rated and the most developed in the world (Tandon et al., 2000; Pouillier et al., 2000; WHO, 1999). In this study, the data was analyzed from 22 January 2020 to 15 April 2020.

MATERIALS AND METHODS

Fig. 1 depicts the general methodology of the given study. To perform the spreading pattern of COVID-19, data was collected from kaggle site and other sources, which contains 183 country data with 22270 rows and 8 columns. These eight columns are renamed as states, country, longitude, latitude, date, confirmed, recover, and deaths. Few countries give their data sate-wise i.e. China, Italy, Australia, France, US, United Kingdom, and others, but 9882 rows of state columns are NaN (Not a number or no value in cell), replace these NaN, with empty white space. This data undergoes various steps of pre-processing which makes it more sensible. Then, for data analysis calculate the active case worldwide by subtracting recover and death cases from the confirmed cases. 84 days of data are collected from 22 January 2020 to

Fig. 1: General methodology for the study
15 April 2020, ranking change with every upcoming day due to coronavirus infection. In this study, overall data is divided into 11 parts i.e. top ten infected countries till 15 April 2020 namely China, Italy, United States, Iran, Canada, United Kingdom, Australia, France, Spain and the last one is ‘rest of the world’ which internally contains 183 country data.

RESULTS AND DISCUSSION

For the data analysis, python language with package NumPy, Pandas, and Plotly were used. Fig. 2 shows the worldwide confirmed recovered, death and active cases which depicts on 6 March 2020, confirmed cases of COVID-19 crosses the 100 thousand in 45 days while from 12 March 2020, a sudden spike comes and confirmed cases of coronavirus reached to 3,55,955 within 16 days i.e. confirmed cases becomes 3.5 times and increasing rapidly. The recovered cases of coronavirus patients are slow but after 16 February, there is some improvement in recovered cases and total recovered cases on 15 April 2020 are 2056051. The death cases are very slow in coronavirus infected patient till 16 March 2020, however but after 16 March death cases are increases and total death cases on 15 April 2020 are 134177. China is the most infected country from coronavirus with total confirmed case 81397, recovered case 72362, and 3265 deaths as of 22 March 2020 after that starting from 15 April 2020; United States of America has become the country with highest number of confirmed cases, followed by Spain, Italy, and Germany. Infection of coronavirus started from china but there is a sudden spike in confirmed cases at the end of January, after 23 February 2020 china control the coronavirus infection and confirmed case are stable. There is an improvement in recovered cases after 9 February 2020 and a sudden decline in active cases after 18 February (Fig. 3). Figs. 4, 5, and 6 shows the confirmed, recovered active, and death cases of the Italy, USA, and Iran. Figs. 7, 8, 9,
Outbreak analysis of COVID-19

10 and 11 shows the confirmed, recovered active, and death cases of the Canada, the United Kingdom, Australia, France, and Spain respectively. In Italy, the USA, Iran, Canada, United Kingdom, Australia, France, and Spain infection started in the first week of March; it has reached at pandemic level within two weeks. These countries confirmed cases are 165155, 636350, 12322, 76389, 28208, 99483, 6440, 134582, 177644 and death cases are 21645, 28326, 405, 4777, 1006, 12894, 62, 17188, and 18708 respectively.
The recovery rate in these countries is very slow or negligible so that the line graph of confirmed cases and active cases overlapping each other. Iran shows improvement in coronavirus patients and 2,1679 patients recovered but after 15 March 2020 suddenly decline in active cases. The cases of coronavirus are continuously increasing in the world and conditions of these countries going to worsen due to infection. Even after better medical facilities are available in those countries still the recovery of coronavirus patients is very slow and the number of confirm cases increase every day.

Fig. 12 shows the confirmed (636122), recovered (177304), deaths (25819), and active (432999) cases in the Rest of the World. The rest of the world includes all the 173 countries excluding the above 10 countries. In the graph confirmed and active case lines are overlapping each other due to no improvement in the condition of patients. Fig. 13 shows the thematic map of the world with confirmed cases in the whole world. Choropleth maps function is used to show a better statistic over a geographical area. The darkness on the map depicts that these countries are with more than 5000, lighter color depicts, with fewer cases. Interactive thematic map shows the country name, confirmed case, and deaths cases. In this study, the state-wise effect of coronavirus is given in Table 1 for 7 countries (i.e. Australia, China, United States of America, Canada, Italy, France and the United Kingdom). It is shown that the 10 countries state-wise confirmed recovered and death cases but only seven countries state-wise data found. The recovered and confirmed cases are highest in china, but only seven countries state-wise data found. The recovered and death cases are highest in Italy worldwide.

The recovery rate of china is 93.95% on the top and the recovery rate of Canada is nearly zero percent at the bottom. Iran, Italy, France, and Spain recovery rates are 65.37, 23.06, 23.38, 39.88 percent and ranks
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<td>3807</td>
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<td>278</td>
<td>3087</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P.A. Trento</td>
<td>3220</td>
<td>798</td>
<td>318</td>
<td>2104</td>
</tr>
</tbody>
</table>
second, third, fourth, and fifth place respectively (Fig. 14). The mortality rate of Italy is on top with 13.11 % and Australia at the bottom (Table 2). The formula used to calculate mortality and recovery rate is given using Eq. 1.

\[
\text{recovery rate} = \frac{\text{Death case}}{\text{Confirmed cases}} \times 100
\]

\[
\text{Mortality rate} = \frac{\text{Death case}}{\text{Confirmed cases}} \times 100
\]

**Outbreak prediction for the US, China and the rest of the World**

Machine learning is the subpart of artificial intelligence. It is not a computer programming but a set of rules by using statics function predicts the better output for given data in limited time. The prophet is the time series forecasting algorithm for future prediction and Implemented in Python and R. Python and R are the programing language that is used for machine learning and data analysis. It is open-source software developed by Facebook. It is an adaptive model which uses nonlinear data to predict for yearly, monthly, and daily excluding holiday (Taylor et al., 2017). Prophet easily handles missing data and outliers of the trend. The prophet is accurate and fast because it used a state-of-the-art platform for statistical modeling that provides forecast in very quickly. In this study, this algorithm was used for prediction of confirmed case for the United States of America, China and Rest of World for next 10 days shown in Table 3. “yhat” (“yhat” means Average Predicted confirmed and death cases) represent the predicted value, “lower” and “upper” represent the minimum and maximum value of prediction, and “y” represents the actual value. Table 4 shows the prediction of death cases for the United States of America, China, and the Rest of the World for the next 10 days by using Prophet Algorithm. Table 5 shows the prediction confirmed and death cases for the United States of America, China, and the Rest of the World for the next 10 days by using daily average growth. Daily average growth algorithm predicts the confirmed cases when government does not take safety measure such as social distancing and lockdown. If countries do not take
Outbreak analysis of COVID-19

Table 3: Prediction of confirmed cases for US, China and the World using prophet algorithm

<table>
<thead>
<tr>
<th>Date</th>
<th>Predicted for USA</th>
<th>Actual for USA</th>
<th>Change in % for USA</th>
<th>Predicted for China</th>
<th>Actual for China</th>
<th>Change in % for China</th>
<th>Predicted for World</th>
<th>Actual for World</th>
<th>Change in % for World</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-04-2020</td>
<td>669312</td>
<td>604070</td>
<td>+9.75</td>
<td>84104</td>
<td>83797</td>
<td>+0.36</td>
<td>215442</td>
<td>1995955</td>
<td>+7.36</td>
</tr>
<tr>
<td>17-04-2020</td>
<td>700158</td>
<td>632781</td>
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<tr>
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<td>83776</td>
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<td>2321808</td>
<td>2164078</td>
<td>+6.79</td>
</tr>
<tr>
<td>19-04-2020</td>
<td>760812</td>
<td>695353</td>
<td>+8.60</td>
<td>84117</td>
<td>84123</td>
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<td>2400819</td>
<td>2246258</td>
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<tr>
<td>20-04-2020</td>
<td>789669</td>
<td>723605</td>
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<td>83874</td>
<td>84239</td>
<td>-0.43</td>
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<td>+6.43</td>
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<td>818965</td>
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<tr>
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</tr>
<tr>
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<td>879123</td>
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<td>25-04-2020</td>
<td>940721</td>
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<td>2724808</td>
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</tr>
</tbody>
</table>

Table 4: Prediction of death cases for US, China, World using prophet algorithm

<table>
<thead>
<tr>
<th>Date</th>
<th>Predicted for USA</th>
<th>Actual for USA</th>
<th>Change in % for USA</th>
<th>Predicted for China</th>
<th>Actual for China</th>
<th>Change in % for China</th>
<th>Predicted for World</th>
<th>Actual for World</th>
<th>Change in % for World</th>
</tr>
</thead>
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<tr>
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<td>28724</td>
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<tr>
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<td>30242</td>
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<td>-0.47</td>
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</tr>
<tr>
<td>19-04-2020</td>
<td>31727</td>
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<tr>
<td>20-04-2020</td>
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<td>160514</td>
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</tr>
<tr>
<td>21-04-2020</td>
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<tr>
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<tr>
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<tr>
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<tr>
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<td>190540</td>
<td>187844</td>
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</tr>
</tbody>
</table>

Table 5: Prediction of confirmed and death cases for US, China, World using average daily growth

<table>
<thead>
<tr>
<th>Date</th>
<th>Prediction of confirmed cases on the bases of average daily growth</th>
<th>Change in % with actual confirmed case world</th>
<th>Prediction of death cases on the bases of average daily growth</th>
<th>Change in % with actual death case world</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>China</td>
<td>World</td>
<td>USA</td>
<td>China</td>
</tr>
<tr>
<td>16-04-2020</td>
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<tr>
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<tr>
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<tr>
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</tbody>
</table>

Precaution measure then confirmed and deaths cases are much more than predicted confirmed cases by daily average algorithm. Prophet algorithm provides better predicted result because it includes the fluctuation with time series data. Calculate the daily average growth of confirmed and deaths cases and predict the future confirmed and deaths cases. Graphs related to outbreak prediction are given in the appendix.
CONCLUSION

The proposed study focuses on analyzing the effect of COVID-19 on the top ten infected countries of the world. These countries not only included the most economically developed countries like the USA but also covered the most populated countries of the world like China. In the current study, authors tried to map the current conditions in terms of COVID-19 spreading after so many steps taken by the different governmental agencies of the top ten infected countries with the predicted value for the next ten days. This analysis can help government agencies for better decision-making. The researcher also analyzes the state-wise infection in five countries China, Australia, the United States of America, the United Kingdom, and Italy. China is having the highest confirmed case and recovered case. The infection of COVID-19 starts spreading worldwide at the end of February but in china, in the mid of February confirmed cases of COVID-19 become stable and sudden spike comes in recovered cases. After China, Italy, the US, Spain, and Iran are the most infected ones. Algeria has the highest mortality rate of 15.56% and Canada at the bottom with 0% in the world but in top ten countries mortality rate of Italy in on top and Australia at bottom. China has the highest recovery rate of 93.95% and Bhutan has the least nearly 0 % till 15 April 2020. In this study, a machine learning data-driven Prophet Time series forecast algorithm has been used to predict the outbreak analysis of COVID-19 in the United States of America, China, and the rest of the world for the next ten days i.e. 16/04/2020 to 25/04/2020.

AUTHOR CONTRIBUTIONS

D. Yadav performed literature review, data collection, analyzed and interpreted the data, prepared the manuscript text, and manuscript edition. H. Maheshwari performed the experiments, compiled the data and manuscript preparation. U. Chandra helped in the literature review, analyzed and interpreted the data, performed some of the remaining experiments and helped in reviewing and editing the manuscript.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy has been completely observed by the authors.

ABBREVIATIONS

COVID-19  Coronavirus
Eq.  Equation
Fig.  Figure
LSTM  Long short-term memory
NaN  Not a Number or Null Value
SIR  Susceptible-Infectious-Recovered
UK  United Kingdom
USA  United States of America
WHO  World Health Organization
Yhat  Actual Predicted value

REFERENCES

Kuiken, T.; Fouchier, R.A.; Schutten, M.; Rimmelzwaan, G.F.;


