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Future Prediction Using Supervised Machine Learning for COVID-19

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ABSTRACT: The spread of COVID-19 in the whole world has put the humanity at risk. The resources of some of the largest economies are stressed out due to the large infectivity and transmissibility of this disease. The capability of ML models to forecast the number of upcoming patients affected by COVID-19 which is presently considered as a potential threat to mankind. In particular, four standard forecasting models, least absolute shrinkage and selection operator (LASSO) Support vector Machine (SVM) have been used in this study to forecast the threatening factors of COVID-19.Three types of predictions are made by each of the models, such as the number of newly infected cases, the number of deaths, and the number of recoveries But in the cannot predict the accurate result for the patients. To overcome the issue, Proposed method using the long short-term Integrated Average (LSTIA) predict the number of COVID-19 cases in next 30 days ahead and effect of preventive measures like social isolation and lockdown on the spread of COVID-19.

Keywords: COVID-19, exponential smoothing method, future forecasting, Adjusted R2 score, supervised machine learning

1. INTRODUCTION

COVID-19, the pandemic that is spreading worldwide, has revealed the vulnerability of human society to severe infectious diseases and the difficulty of solving this problem in a globally interconnected complex system. COVID-19 affected more than 100 countries in a span of weeks. As a result, the whole human race should not only collaborate to overcome the epidemic but also reasonably arrange to return to work and production according to the actual situation of each region and carry out geographical risk assessment. Many attempts have been conducted to find a suitable and fast way to detect infected patients in an early stage. After making chest CT scans of 21 patients infected with COVID19 in China, Guan et al found that CT scan analysis included bilateral pulmonary parenchymal ground-glass and consolidative pulmonary opacities, sometimes with a rounded morphology and a peripheral lung distribution. Consequently, COVID-19 diagnosis can be represented as an image segmentation problem to extract the main features of the disease. The disease caused by the novel coronavirus, or Coronavirus Disease 2019 (COVID-19) is quickly spreading globally. It has infected more than 1,436,000 people in more than 200 countries and territories as of April 9, 2020.

Coronavirus disease 2019 (COVID-19) is a contagious respiratory and vascular disease, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). First identified in Wuhan, China, it is currently an ongoing pandemic. Common symptoms include fever, cough, fatigue, breathing difficulties, and loss of smell and taste Symptoms begin one to fourteen days after exposure to the virus. While most people have mild symptoms, some people develop acute respiratory distress syndrome (ARDS), which can be precipitated by cytokine storms, multi-organ failure, septic shock, and blood clots. Longer-term damage to organs (in particular, the lungs and heart) has been observed, and there is concern about a significant number of patients who have recovered from the acute phase of the disease but continue to experience a range of effects—known as long COVID—for months afterwards, including severe fatigue, memory loss and other cognitive issues, low grade fever, muscle weakness, and breathlessness.

2. BACKGROUND STUDY

Alaa A. R. Alsaeedy, A. A. R., & Chong, E [1] To introduce a new strategy to identify areas with high human density and mobility, which are at risk for spreading COVID-19. Crowded regions with actively moving people (called at-risk regions) are susceptible to spreading the disease, especially if they contain asymptomatic infected people together with healthy people. Methods: Our scheme identifies at-risk regions using existing cellular network functionalities— handover and cell (re)selection—used to maintain seamless coverage for mobile end-user equipment (UE).

Sear, R. F., Velasquez, N., Leahy, R., Restrepo, N. J., El Oud, S., Gabriel, N., Johnson, N. F. [2] A huge amount of potentially dangerous COVID-19 misinformation is appearing online. Here we use machine learning to quantify COVID-19 content among online opponents of establishment health guidance, in particular vaccinations (''anti-vax''). We find that the anti-vax community is developing a less focused debate around COVID-19 than its counterpart, the pro-vaccination (''pro-vax'') community.

Hu, S., Gao, Y., Niue, Z., Jiang, Y., Li, L., Xiao, X.... Yang, G. [3] An outbreak of a novel coronavirus disease (i.e., COVID-19) has been recorded in Wuhan, China since late December 2019, which subsequently became pandemic around the world. Although COVID-19 is an acutely treated disease, it can also be fatal with a risk of fatality of 4.03% in China and the highest of 13.04% in Algeria and 12.67% Italy (as of 8th April 2020). The onset of serious illness may result in death as a consequence of substantial alveolar damage and progressive respiratory failure.

Zhang, Y., Li, Y., Yang, B., Zheng, X., & Chen, M. [4] A Corona Virus Disease 2019(COVID-19) cases in Wuhan were cleared, and the epidemic situation was basically controlled. Such public safety infectious disease includes influences great pressure on the national economy. At present, some countries and regions in the world are still in epidemic situation, and there is an urgent need to judge the infection situation and travel risk in the region.

Abdel -Basset, M., Mohamed, R., Elhoseny, M., Chakrabortty, R. K., & Ryan, M [5] The many countries are challenged by the medical resources required for COVID-19 detection which necessitates the development of a low-cost, rapid tool to detect and diagnose the virus effectively for a large numbers of tests. Although a chest X-Ray scan is a useful candidate tool the images generated by the scans must be analyzed accurately and quickly if large numbers of tests are to be processed. COVID-19 causes bilateral pulmonary parenchymal ground-glass and consolidative pulmonary opacities, sometimes with a rounded morphology and a peripheral lung distribution. In this work, we aim to extract rapidly from chest X-Ray images the similar small regions that may contain the identifying features of COVID-19

H. Liu, F. Liu, J. Li, T. Zhang, D. Wang and W. Lan [6] The ongoing outbreak of COVID-19 pneumonia is globally concerning. We aimed to investigate the clinical and CT features in the pregnant women and children with this disease, which have not been well reported. Methods: Clinical and CT data of 59 patients with COVID-19 from January 27 to February 14, 2020 were retrospectively reviewed, including 14 laboratory-confirmed non-pregnant adults, 16 laboratory-confirmed and 25 clinically-diagnosed pregnant women, and 4 laboratory-confirmed children.

J. Chen, L. Wu, J. Zhang, L. Zhang, D. Gong, Y. Zhao, et al., "Deep learJ. Chen, L. Wu, J. Zhang, L. Zhang, D. Gong, Y. Zhao, et al., [7] The deep learning model showed a comparable performance with expert radiologist, and greatly improved the efficiency of radiologists in clinical practice. For model development and validation, 46,096 anonymous images from 106 admitted patients, including 51 patients of laboratory confirmed COVID-19 pneumonia and 55 control patients of other diseases in Renmin Hospital of Wuhan University were retrospectively collected.

F. Shan, Y. Gao, J. Wang, W. Shi, N. Shi, M. Han, et al., [8] CT imaging is crucial for diagnosis, assessment and staging COVID-19 infection. Follow-up scans every 3-5 days are often recommended for disease progression. It has been reported that bilateral and peripheral ground glass opacification (GGO) with or without consolidation are predominant CT findings in COVID-19 patients. However, due to lack of computerized quantification tools, only qualitative impression and rough description of infected areas are currently used in radiological reports. In this paper, a deep learning (DL)-based segmentation system is developed to automatically quantify infection regions of interest (ROIs) and their volumetric ratios w.r.t. the lung.

L. Li, L. Qin, Z. Xu, Y. Yin, X. Wang, B. Kong, et al., [9] Coronavirus disease has widely spread all over the world since the beginning of 2020. It is desirable to develop automatic and accurate detection of COVID-19 using chest CT. Coronavirus Disease 2019 (COVID-19) has widely spread all over the world since the beginning of 2020. It is highly contagious and may lead to acute respiratory distress or multiple organ failure in severe cases. On January 30, 2020, the outbreak was declared as a "public health emergency of international concern" (PHEIC) by World Health Organization (WHO).

T Ai, Z Yang, H Hou, C Zhan, C Chen, W Lv, Q Tao. [10] Chest CT is used in the diagnosis of coronavirus disease 2019 (COVID-19) and is an important complement to reverse-transcription polymerase chain reaction (RT-PCR) tests. A number of cases of "unknown viral pneumonia" related to a local seafood wholesale market were reported in Wuhan City, Hubei Province, China. A novel coronavirus (severe acute respiratory syndrome

coronavirus 2, or SARS-CoV-2) was suspected to be the cause, with Phinolophus bat as the alleged origin.

PROPOSED METHODOLOGY

Machine learning methods proved to be effective for prediction due to automatically extracting relevant features from the training samples, feeding the activation from the previous time step as input for the current time step and networks self-connections. It is a very effective prevention and treatment method to continue to increase investment in various medical resources to ensure that suspected patients can be diagnosed and treated in a timely manner. Least Absolute Shrinkage and Selection operators (LASSO), and Support Vector Machine (SVM) these two algorithms used in machine learning.

- Data
- Estimation Process
- Data-Driven Methods to Predict Covid-19
- Data Preprocessing
- Prediction of Accuracy
- Classification

a) DATA:

The data information includes the cumulative confirmed cases, the cumulative number of deaths, newly confirmed cases, and the cumulative number of cured cases provinces. We also used the data on the recent diagnoses in South Korea, Iran, and Italy, it includes the data, and here, the data comes from official notifications from various countries. All data are from the daily case report and the update frequency of data is one day.

b) ESTIMATION PROCESS:

In different control stages, the Basic reproduction number changes greatly and it affects the intensity of control directly. In addition, the incubation period of the virus affects the speed of transmission directly. These two parameters need to be estimated. Current literature shows that the uncontrolled Basic reproduction. Therefore, we chose the valuation range in the corresponding range. For the controlled Basic reproduction number, the range of valuation was selected in the range of [0, 1.5].

c) DATA-DRIVEN METHODS TO PREDICT COVID-19:

The data has been used (when the first case of COVID-19 was reported in India) with 80% data is used for training and rest 20% for forecasting and validation purposes. The resulting plot showing the total number of confirmed cases, the observed data is the data used for training purposes, official data (green line) indicates the official data available and forecasted data indicates the forecast of a total number of confirmed cases. From this graph, it is observed that the forecasted number of total confirmed positive cases closely matches with the available official data.

d) DATA PRE PROCESSING:

Data Preprocessing is a technique that is used to convert the raw data into a clean data set. The dataset is often incomplete, inconsistent, and/or lacking in certain behaviors or trends, and is likely to contain many errors. Data preprocessing is a proven method of resolving such issues.

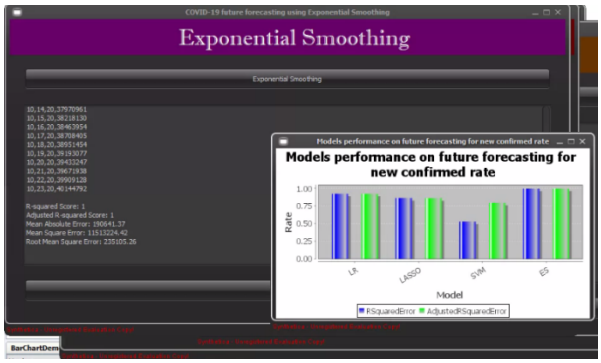
e) PREDICTION OF ACCURACY:

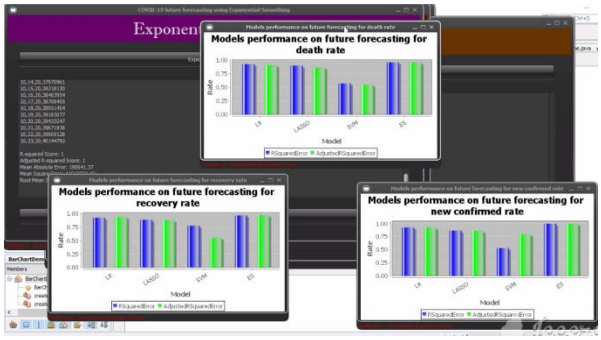
This technique is suitable to use predictive neural networks or characteristic data as such infection event or non-event binomial effects. The prediction accuracy of various measurements can be used for different purposes. They include the rate at which normal (non-predicted prediction correctly predicts sensitivity (non-infectious disease), accuracy (predicted percentage of predicted trend), positive predictive value, negative predictive value (correctly predicted infection rate is)), the ratio is Expected predictions are a measure of the likelihood that the increase in the entire process exceeds the accuracy of the individual).

f) CLASSIFICATION

The classification technique predicts the target class for each data set point. With the help of the classification approach, a risk factor can be associated with patients by analyzing their patterns of diseases.

OUTPUT AND DISCUSSION:





CONCLUSION

A data-driven forecasting/estimation method has been used to estimate the possible number of positive cases of COVID-19 in India for the next 30 days. The number of recovered cases, long short-term Integrated Average (LSTIA) daily positive cases, and deceased cases has also been estimated by using and curve fitting. The effect of preventing measures as social isolation and lockdown has also been observed which shows that by these preventive measures, the spread of the virus can be reduced significantly. Although this method often requires sufficient data to support it, in the early stages of epidemic transmission, this method can still be used to more accurately predict the indicators of epidemic transmission in the short term, so as to provide intervention control at all levels of the departments and policy implementation provides short-term emergency prevention programs. The prediction results of three different mathematical models are different for different parameters and in different regions. In general, the fitting effect of Logistic model may be the best among the three models.

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