Intelligent Trust-based Artificial Intelligence for Identification of COVID-19

Dr. Saravana Kumar
AssociateProfessor, Department of Wireless Communication, Institute of ECE, Saveetha School of Engineering, Chennai, India

Dr. A.Ahila
Associate professor, Department of ECE, Sethu Institute of Technology, Kariapatti, Virudhunagar. India.
akhilaamarnath27@gmail.com

Dr. K.C.Gayathri
Assistant professor, Chettinad school of physiotherapy, Chettinad Academy of Research and Education (CARE). Chettinad Health City, Kelambakkam, Chennai,603103,Tamilnadu, India.,
gaybhava@gmail.com

Dr. T. Subbulakshmi
School of Computer Science and Engineering , Vellore Insitute of Technology, Chennai, Tamilnadu, India, subbulakshmi.t@vit.ac.in

Dr Melanie Elizabeth Lourens
Deputy Dean, Faculty of Management Sciences, Durban University of Technology, Durban, KwaZulu-Natal, South Africa, Melaniel@dut.ac.za, Orcid number: 0000-0002-4288-8277

Dr. Sunil Devidas Bobade
New Horizon Institute of Technology and Management, Thane, India 400615,
Email: sunilbobade@nhitm.ac.in, ORCID: 0000-0001-8650-2826

Abstract

AI has the potential to be a highly effective weapon in combating the COVID-19 virus. Since the outbreak began, many individuals have expressed a desire to employ AI, and they want it done as soon as possible. This article provides an early, and inevitably biased, look at how artificial intelligence may aid in the battle against COVID-19, as well as the existing limitations. AI might be effective in the battle against COVID-19 in a variety of ways, including early warnings and alarms, monitoring and prediction, data dashboards, diagnosis and prognosis, medicines and cures, and social control. AI might also be utilized in the following six ways: COVID-19 has yet to be affected by AI. Its use is constrained by both a scarcity of data and an abundance of data. To overcome these constraints, it will be necessary to strike a balance between data privacy and public health, as well as engage in extensive human-AI interaction. These issues will not be resolved in time for the present pandemic to be alleviated. Meanwhile, a large amount of data regarding who is infectious will need to be collected in order to save lives, train AI, and protect companies from losing money.

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Introduction:

Artificial intelligence (AI) is becoming more and more popular in the field of healthcare [1]. AI is the process of making complex algorithms that can do a lot of different things quickly and well. There are a lot of different types of artificial intelligence in healthcare, but the main goal is to help policymakers and doctors make good treatment decisions [2]. AI, on the other hand, is quickly being used to diagnose illnesses, screen cancer patients, pick therapies, cut down on pharmaceutical errors, and improve productivity [3–6]. AI has also played a bigger role in COVID-19 research, especially when it comes to diagnosis, classification, detection, severity, and risk of death [7, 8, 9]. AI was used in the past to track the spread of coronavirus and to find people who were at risk. In addition, it has been very good at predicting how many people will get sick at a given time based on detailed analysis of previous data [10]. It looks at publication patterns, author and journal contributions, country productivity, and information about research alliances and partnerships [11–13]. Bibliometric analysis can be used to look for trends and patterns in the most popular publications in a wide range of industries, including health care [14].. This is the first study to look at AI applications and hot topics in COIVD-19 research in a way that is based on numbers. Our study shows how important scientific knowledge is by highlighting gaps and setting the stage for COVID-19 AI research in the future.

COVID-19 Related Works

This part will talk about how COVID-19 has been looked at by different scientific fields, like medicine and engineering.Most of the early medical research on COVID-19 focused on describing the disease's symptoms, classifying it, and figuring out how long it takes for the disease to spread. Wang et al. [31] also found that the elderly are more likely to die from COVID-19 [32] because they have other health problems. Even so, the virus doesn't just affect the elderly. It can also affect children and teenagers, as well. As a result, COVID-19 can spread to everyone. In addition, Zhuang et al. [34] found that many people who are infected with COVID-19 don't show any symptoms.COVID-19 has a long incubation period of 4–14 days and a lot of people who aren't sick, which leads to a lot of infections. As a result, figuring out how many people will be affected by COVID-19 is very important. This means that researchers have to focus on the disease's engineering side, which is COVID-19 case prediction, in this case. Conventional statistical methods are often used to make predictions. They used statistics to figure out how many COVID-19 cases there would be in Italy, like Remuzzi & Remuzzi [36] and Tuite et al [37]. Countries and territories like Iran [38,39], Spain [38,39], and France [40] have also said that COVID-19 cases will rise. Calculations such as Logistic Growth and the Susceptible-Infected-Recovered (SIR) model were used to forecast future COVID-19 cases in China and Saudi Arabia, among other nations [10, 11]. As a consequence, the author examined the accuracy of six different time series forecasting techniques. ARIMA, the Holt–Winters additive model (HWAAS), TBAT, Facebook's Prophet, DeepAR, and N-Beats were all evaluated. In a similar research, an ARIMA model was employed to forecast the spread of the virus. The model incorporates ARIMA features such as the population of the nation, the number of affected persons, and polynomial functions. [26] builds a novel mathematical model for forecasting China's COVID-19 pandemic. The suggested model, which is called the -SEIHRD model, takes into account the percentage of people who have been identified as having been infected.Another study looks at how COVID-19 social media posts are recorded and analyzed. That's because search engine patterns for COVID-19 keywords can be very helpful in predicting and tracking the virus's spread, and this is why. The author came up with a way to figure out how many new COVID-19 cases there might be based on a lag series of social media search indexes. A dry cough, a fever, and pneumonia are some of the symptoms of COVID-19 that are found in the social media search indexes. [15]: In another study, the author looked at and kept track of new COVID-19 cases by looking at daily trend data for keywords like "coronavirus" and "pneumonia" from Google Trends, Baidu Index, and Sina Weibo Index search engines. The author used an automated Python programming method to get data on Weibo posts on COVID-19, like this: The data was analyzed scientifically and qualitatively in order to find patterns and highlight important people. The author has talked about many ways to use social media to predict COVID-19 outbreaks [27 - 28].A big problem with statistical methods and mathematical models is that they can't handle very many data points. As a result, it is hard to predict how many COVID-19 cases there will be. People who use data analytics may be able to reduce this problem, which is shown in the next section, Prior research has shown that data analytics can be used to make predictions. As a result, academics are told to use data analytics in the COVID-19 field. The author used data analytics to figure out how many patients COVID-19 would have in Taiwan. The study's flaw is that it looked at

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historical data on COVID-19 patients and only looked at a few characteristics, like travel and work. [18] was another study that used both geographic information systems (GIS) and data analytics to find the COVID-19 infection network. COVID-19 prediction systems have also been built in research using machine learning and artificial intelligence. The author used Neural Networks with a deep architecture and the NAdam training process to make a model that could predict how COVID-19 new cases would turn out, and it worked. The study's main flaw is that it only looks at one dataset, the total number of COVID-19 occurrences that have been certified. It doesn't look at other factors, like how many times COVID-19 has been used.

As shown above, the majority of data analytics research has looked at data from COVID-19 cases that have been proven to be true. Other studies have looked at things like temperature and gender. Many important extraneous elements that help spread disease have not been looked at at all. There are a lot of factors that affect how many people live in a country or territory, how old they are, how much money is spent on public and private health care, how much CO2 is in the air, and how many people have come to the country or territory. As a result, it is hard to predict how many COVID-19 cases there will be.

3. Research Gaps and Contribution

If you want to know what other people have found out about this topic, look at this summary of some of the findings. As a start, no previous research has taken into account both the history of COVID-19 cases and the majority of other factors that affect how quickly the virus spreads. Second, no study has used data analytics to predict how many COVID-19 cases there will be in the future. As a result, the governments of the countries that have been hit have had a hard time trying to modernize their healthcare systems. As a result, we tried to fill in this gap in our study by coming up with a data analytics method that takes into account all of the above characteristics at the same time[46-50].

This publication was made possible by the help of these people. People who have been infected with COVID-19 already have a strategy called [17,18], but it isn't as strong as ours. This strategy is mostly based on the history of COVID-19-infected people. Our method takes into account both historical COVID-19 case data and the vast majority of other factors that can affect disease spread. There are so many variables that we came up with a neural network-based nonlinear autoregressive exogenous input (NARX) method to account for them all, so we did that. This method was made because it is very good at dealing with things that change over time, like the number of COVID-19 occurrences[51-72].

This isn't the only way we use our method to figure out how many COVID-19 cases there are in a wide range of countries, including the top five countries in the world that have been affected by the virus. This is good because it gives a lot of information about COVID-19 in different parts of the world.

Most studies haven't predicted how many people will get COVID-19. We don't use data from previous research to predict how many COVID-19 events there will be in the future. Through the use of these projections, both the government and the people in the affected countries can take the necessary steps to start pre-epidemic activities.

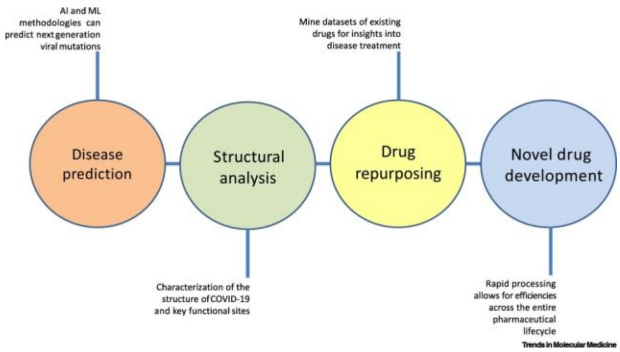

Figure 1: Artificial Intelligence for COVID-19 Diagnosis.[14]

SARS-CoV-2, which causes Coronavirus Disease 2019 (COVID-19), was first found in December 2019 and quickly spread to most cities and countries around the world [16-18]. SARS-CoV-2 is mostly spread by respiratory droplets when people are close together [19]. The upper respiratory tract infection symptoms could be minor, or they could be severe, like sepsis and shock. People who are vulnerable, like the elderly and those with other health problems, could die from it [19, 21]. Since March 16, 2021, SARS-CoV-2 has spread to over 200 countries and caused a lot of damage. There have been more than 120 million confirmed cases and 2.6 million deaths. COVID-19's rise in frequency, combined with a high death toll, put a strain on already overcrowded hospital resources. Effective technologies must be used to improve the efficiency of healthcare systems and speed up the diagnosis, treatment, and monitoring of COVID-19 [22]. Research says that artificial intelligence is a good thing because it allows more scaling up, increases processing power, and can even outperform people in some healthcare operations [23].

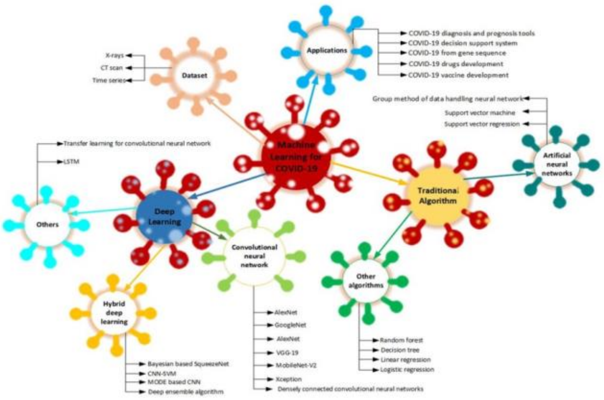

Figure 2: Taxonomy of the machine learning algorithms adopted in fighting COVID-19[15].

Data Abstraction and Quality Assessment

From each study, we took the title, first author, and publication date, as well as the experimental design (algorithm, sample size), and the most important results (sensitivity, accuracy and specificity of AI for diagnosis and prognosis evaluation; prediction of epidemic; drug repurposing and development). We took the most discriminative model from a study that used a lot of different models.

SZ, JH, and LZ used PROBAST (prediction model risk of bias assessment tool) to look at the risk of bias in the studies they looked at. PROBAST divides people, predictors, outcomes, and analysis into groups. Among these are the number of patients who were enrolled, whether the same predictors and outcomes were found for all of them, if the clinical decision rule was developed before it was used, and if a meaningful accuracy measure was used. There are a total of twenty signal questions that can help people make decisions about the risk of bias in prediction models [25].

The research was broken into four groups: diagnostic, prognosis, epidemic prediction, and the discovery of new medicines. We looked at the AUC, accuracy, sensitivity, and specificity of the classifications in the diagnostic and prognostic domains to see how well they worked. We only talked about epidemic patterns, medical progress, and vaccine breakthroughs because we didn't have the right criteria.

Predicting the Prognosis of COVID-19

During the COVID-19 outbreak, it's important to be able to predict how quickly a patient's condition will get worse while they're in the hospital. This will help make sure that patients get the right treatment. We used AI to make a number of models that correctly identified COVID-19-related lung abnormalities and used chest CT images to figure out how bad the illness was and how long it would last. People who had COVID-19 at the time of their hospitalization were able to predict how likely they were to get critical illness based on their clinical, laboratory, and radiological characteristics at the time of their stay. Another study looked at geographic, travel, health, and demographic data from COVID-19 patients to make a model that predicted how bad and how likely the cases were to end up. There were a lot of AI models that were able to predict COVID-19 that was critical with an accuracy of 74.4–95%, a sensitivity of 72.8–98.0%, a specificity of 55–96.87%, and an AUC of 0.66–0.997%. Identifying the prognosis of COVID-19 patients and starting treatment as soon as possible may improve their prognosis and reduce COVID-19 mortality, which could be good for them.

Methodology

In this line of reasoning, (t) is very important because it shows how many beds are available. The number and length of time COVID beds have been occupied has changed many times in response to NIV and MV needs. We found that 18 percent of COVID patients need non-invasive ventilation (NIV), while 6 percent need mechanical ventilation (MV). Some of these inpatients need these therapies for four to six days on average, based on the group average. Critical care patients are expected to make up

24% of these, based on COVID bed occupancy rates. We also expect any changes in COVID inpatient levels to show up in four to six days.

Mathematically, the baseline estimate for total critical care, denoted $\hat{y}(t)$ is given by

$\hat{y}(t) = \alpha Nx(t - TN) + \alpha Vx(t - TV) + AN + AV$, (1)

Discussion:

There are no extra steps for measuring admissions, discharges, or the length of stay (t). For example, if there are fewer admissions, more discharges, or a shorter stay, or any combination of these, then this could happen. In this way of thinking, you're being very clever. Even if the underlying medical condition changes quickly, the number of beds may stay the same. When admission cohorts, lengths of stay, and discharges are taken into account, as well as how they change over time, this simple link becomes more complicated. The graph of bed occupancy as a function of time looks like it should be correct. A follow-up article will give a theory to go along with this quick communication. Not only that, brute force numerical optimization of the model's parameters led to results that were very similar to those that were found in the clinic. The results are good, and the trust is already using the technique to make better operational decisions that protect critical care patients and make sure there is enough supply to meet short-term demand changes[27].

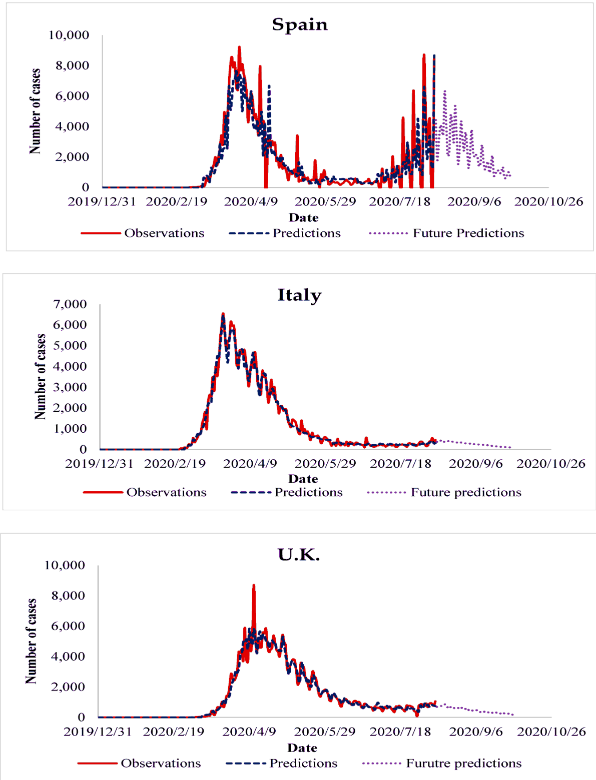

Figure 3: Predictions of COVID-19 in European Countries

Limitations

This method is "deductive" in the sense that the predicted time horizon is entirely based on how long it takes for inpatient clinical improvement to happen. If there was no change in time, future needs would be determined by the number of inpatients in the future (which would be probabilistic). Because of the way the system is set up now, the anticipated time horizon is based on how long it takes to get things done.

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