The Recent Studies Utilizing Computer Technologies for Covid 19 Transmission, Diagnosis and Infection Control

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ABSTRACT: In March 2020, the extreme serious respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes COVID-19, was declared a universal pandemic. It is an RNA-type virus that affects humans and animals and causes a wide range of respiratory infections. It also leads to human pneumonia. The development of the virus recognition system relied heavily on computer programs. Numerous experiments and research have been conducted in computer science in order to identify any treatments and explore the effects of the disease. As a result, the most important research and strategies for detecting covid19 will be outlined in this article, to use them in the future to stop this global epidemic.

Keywords: COVID-19, Diagnosis, classification, virus spread.

1. INTRODUCTION

Now 2021. The world is still in a state of anticipation, and scientists are constantly working on a vaccine to end the (Coronavirus) epidemic. In December 2019, an unexpected case of viral pneumonia has been identified in Wuhan, China. The virus is known as Novel Coronavirus (2019-nCoV) on January 12, 2020, by the World Health Organization (WHO), it is the seventh recognized kind of coronavirus that humans can infect. COVID-19 is an unforeseen virus through the following characteristics. First, the virus has a vigorous camouflage ability. It can be present without symptoms, and sometimes it makes the affected person look-alike healthy, or it might present within various other symptoms as the affected person appears to have a popular respiratory disease. As well as a long transition period. The average transmission time for Coronavirus is about 20 days, and it reaches 37 days for some patients. It also travels in many ways. The procedure for the CoV-2019 transition is the same as many other infectious diseases. Besides the conventional droplet transport, as well involves transmission by blood, oral, air and hands. Also noted the high rate of recurrence. Since the beginning of the spread of the new Corona virus, COVID-19, many cases have appeared of recovered patients who have tested positive again. After re-examination, and even resulted in death after relapse. Diversity also appeared in the virus. Due to their rapid genetic recombination, new strains are mutated, which foreshadows the potential development of novel coronaviruses. Each recombination has the potential to cause increased toxicity and injury,
rendering the original treatment approaches and medications ineffective. Scientists in Iceland have discovered forty different types of new coronaviruses. Ultimately, it is very contagious. Data from scientific studies showed that there is a bond between 2019-nCoV protein and angiotensin-converting enzyme 2 (ACE2) is ten to twenty times greater than SARS. Consequently, the prevalence of COVID-19 is significantly higher than that of SARS. [1].

2. THE MOST IMPORTANT STUDIES

2.1 SIRD model

[2] The research study Sensitivity of the (SIRD) model to generate COVID-19 based on the number of data days that have passed. In MATLAB, the optimization algorithm (lsqcurvefit) is used to obtain SIRD paradigm parameters. The results of the SIRD paradigm indicate that after forty days, the peak of infection on a given day can be accurately forecasted as shown in Figure (1). The SIR model is the most basic in epidemiological researches, which is shown through a bunch of ordinary differential equations (ODEs) presented by Kermack and McKendrick [3]. Details of three groups of ODE can be discovered in various posts according to sensitive cases (S), affected cases active (I), and cases removed (R) (including treatment and death) [4, 5]. The analysis of the Sensitivity in the SIRD paradigm on the peak contagious day referred that the paradigm is not very precise with error ranges of 22-79% for infection, 4-113% for active subjects, 17-77% for cure, 57-1220% for the deceased, and infected gross total 20-71%.

![Figure (1): Using refined population size estimates on peak infection day using optimized SIRD model for 20, 40, 60, 80, 100, and 116 COVID-19 data cases (19 June 2020)](image)

Therefore, the SIRD model is a helpful tool for rapid and approximate estimation of the peak day of the COVID-19 epidemic, however, it is not an accurate method. The most advanced versions of the SIR model or their new models with more controls are required to find extra accurate predictions.

2.2 Mathematical modeling

[6] This research aims to use mathematical modeling to investigate the major effect of quarantine on the COVID-19 epidemic. Different instances of transmission from person to person and their primary reproductive number were formulated to analyze the dynamics of the Coronavirus pandemic. Moreover, The research also demonstrates the effectiveness of quarantine in minimizing transmission following a lockdown in many countries. An informative graph such as Figure (2) was included to represent the quarantine notice versus infection reduction using Matlab and Simulink programming.
Studies on the dynamics of the novel coronavirus have concluded that lockdown or self-quarantine can play a role in controlling transmission of the coronavirus.

These graphs in Figure 3 and Figure 4 show the gradual reduction in the number of susceptible and exposed people after the imposition of lockdown.

2.3 The partial differential equation (PDE)

In this study, a PDE-based coronavirus representation was plotted using the MATLAB software. The results showed that the method (PDE) is a suitable way to represent the shape of the Coronavirus. In addition, the data of the Corona virus radius and height are used to obtain four equations. These equations were used to predict the future of Covid-19 modeling, so this method (PDE) will produce a smooth border surface to describe any form of the virus. The research indicates that the PDE method can produce complex geometric surfaces.

In 1989, the method (PDE) was used mainly in computer graphics, as it was widely used as a surface modeling method in many areas, including improvement, design, graphics, and design analysis [8]. This method produces a borderline surface, $\chi (u, v)$ generated by solving the fourth degree of elliptic PDE.

$$\left( \frac{\partial^2}{\partial u^2} + \alpha^2 \frac{\partial^2}{\partial v^2} \right) \chi (u, v) = 0 \quad (2, 1)$$

To utilize the PDE method for designing a body part of the coronavirus, The design procedure is divided into some steps. First, the upper part (first patch) is created by designing the lower part of the circuit (second patch) and by using the same method as the bottom is constructed by designing the upper circuit. Gathered the upper and lower circles to get the shape of the corona virus body. Since the shape of the Coronavirus has many burrs and all the spikes hold a different center as shown in Figure 6.
2.4 Open-source computer simulation programs

[10] Using Simulink and MATLAB, this research developed an open-source toolkit for modeling, simulation, and predicting coronavirus COVID-19 outbreaks. The programs are simply adaptable to the current paradigms, are structurally basic, generalized, and can be used to simulate infections worldwide using the country’s name only. Several styles, including the SIRD, SIR, SEIR, and SEIRD, have been added. To achieve smooth and accurate tracking and measurement, rate functions can be thought of as multiple sigmoid Branches. The initial parameter values to be calculated are determined automated using certain effective data parameters. Several inferential statistics were used to find the best times for the sigmoid functions. Additionally, a neuro-inference method that adapts was utilized to produce typical outputs depending on some of the system's training tasks.

2.5 Fuzzy Inference System (FIS)

[11] At present, the set of Covid 19 tests is very limited and takes a long time, So, this research suggested an approach that depends on some rule-based systems that are used in conjunction with simulation tools in Matlab to make preliminary forecasts about whether or not an individual has COVID-19, reducing the overall cost. The system is built on fifteen standards that have been established following the recommendations of the World Health Organization and other medical institutions, By using cutting-edge systems that depend on the neural network techniques toreduce virus spread. Machine results are positive and can be exploited to prevent testing and keep the time, that's important for the salvation and continued spread of human life. Figure (9) Includes a model and its prayers with all elements.
The components of the proposed rule based are below:

A. The foundation for knowledge, which stores the know-how in the model.

B. The heuristics engine is the system's heart. It acts based on the user's feedback. The heuristic motor operates on a match solution Race.

C. Fuzzifier used to adjust the clever input, Which adds coronavirus symptoms to weak values between 0 and 1. A triangle Fuzzifier is employed in this research.

D. The defuzzifier can be used to transform the brittle fuzzy output to brittle output. [12, 13, 14, 15]

Contagion Coronavirus stays 14 days in the human body, but it may be likely that there are no signs at an early stage of infection. This model forecasts a coronavirus of 0.837 percent in the range of 0-1.0. MATLAB has been used to simulate this model to train the model to provide more precise data in the future.

2.6 X-ray imaging to extract significant biomarkers

[16] The purpose of this research is to assess the performance of modern neural network architectures for the classification of medical images suggested in recent years. X-rays were adopted in this study, as the data set was divided into two parts, the first containing 1427 images. It varies between covid19, a bacterial disease, and images of normal conditions, and the second part consisted of a group of covid19 images and bacterial, viral pneumonia. An X-ray is an easier, faster, inexpensive, and less hurtful method than a CT scan. Failure to recognize and treat COVID-19 pneumonia promptly may lead to an increased death rate.

In this article [16], the method of Transfer Learning was specifically adapted. In recent, deep Learning has proved to be an excellent tool for extracting vast amounts of high-dimensional information from medical images. Convolution Neural Network (CNN) called MobileNet was used and trained to analyze the relevance of the extracted features for the classification task[17].

![Diagram](image-url)
The classification of Dataset_2 by MobileNet v2

In this study, the findings suggest that scratch training CNNs can display biomarkers connected to COVID-19, although the highest-ranking precision implies further analysis of the possible X-ray imaging.

CONCLUSION

Covid-19 is an evolving epidemic disease that will seriously endanger the health of many people around the world within a short period. It affects lung cells directly which can lead to permanent injury, including death if not properly detected early.

Researchers have faced several major hurdles in limiting the global spread of COVID-19 and in systematic design to detect and predict disease spread due to virus evolution. In this research, a review of studies completed to diagnose COVID-19, determine the shape of the virus, and reduce transmission of infection was performed using a set of technologies available by computer systems and a series of Matlab code.

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