DIAGNOSIS AND TREATMENT USING COVID-19 DEEP LEARNING APPROACHES AND ARTIFICIAL INTELLIGENCE

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Abstract:
The COVID-19 outbreak has put the whole world in an unprecedented difficult situation bringing life around the world to a frightening halt and claiming thousands of lives. Due to COVID-19's spread in 212 countries and territories and increasing numbers of infected cases and death tolls mounting to 5,212,172 and 334,915 (as of May 22 2020), it remains a real threat to the public health system. This paper renders a response to combat the virus through Artificial Intelligence (AI). Some Deep Learning (DL) methods have been illustrated to reach this goal, including Generative Adversarial Networks (GANs), Extreme Learning Machine (ELM), and Long /Short Term Memory (LSTM). It delineates an integrated bioinformatics approach in which different aspects of information from a continuum of structured and unstructured data sources are put together to form the user-friendly platforms for physicians and researchers. The main advantage of these AI-based platforms is to accelerate the process of diagnosis and treatment of the COVID-19 disease. The most recent related publications and medical reports were investigated with the purpose of choosing inputs and targets of the network that could facilitate reaching a reliable Artificial Neural Network-based tool for challenges associated with COVID-19. Furthermore, there are some specific inputs for each platform, including various forms of the data, such as clinical data and medical imaging which can improve the performance of the introduced approaches toward the best responses in practical applications.

I.INTRODUCTION

The The novel Coronavirus designated SARS-CoV-2 appeared in December 2019 to initiate a pandemic of respiratory illness known as COVID-19 which proved itself as a tricky illness that can emerge in various forms and levels of severity ranging from mild to severe with the risk of organ failure and death. From mild, self-limiting respiratory tract illness to severe progressive pneumonia, multiorgan failure, and death [1][4]. With the progress of the pandemic and rising number of the confirmed cases and patients who experience severe respiratory failure and cardiovascular complications, there are solid reasons to be tremendously concerned about the consequences of this viral infection [5]. Determining appropriate approaches to reach solutions for the COVID-19 related problems have received a great deal of attention. However, another huge problem that researchers and decision-makers have to deal with is the ever-increasing volume of the date, known as big data, that challenges them in the process of fighting against the virus. This justifies how and to what extent Artificial Intelligence (AI) could be crucial in developing and upgrading health care systems on a global scale [6]. AI has been recently attracted increasing research efforts towards solving the complex issues in a number of fields, including engineering [7][9], medicine [10][13], economy [14], and psychology [15]. Hence, a critical situation like this necessitates mobilization and saving medical, logistic and human resources and AI can not only facilitate that but can save time in a period when even one hour of the time save could end in saving lives in all locations where Coronavirus is claiming lives. With the recent popularity of AI application in clinical contexts, it can play an important role in reducing the number of undesired deletions as well as improving the productivity and efficiency in studies where large samples are involved [16], and higher degrees of accuracy in prediction and diagnosis are intended [17]. Utilizing big data can also facilitate viral activity modeling studies in any country. The analyses of results enable health care policymakers to prepare their country against the outbreak of the disease and make well-informed decisions [18]. Nevertheless, while treatment strategies, crisis management, optimization and improvement diagnosis methods, such as medical imaging and image processing techniques could take benefit from AI which is potentially capable of helping medical methods, it has not been desirably employed and well-appropriated to serve health-care

systems in their fights against COVID-19. For instance, one area that can take special advantage of AI's useful input is image-based medical diagnosis through which fast and accurate diagnosis of COVID-19 can take place and save lives [19]. Appropriating AI techniques to deal with COVID-19 related issues can fill the void between AI-based methods and medical approaches and treatments. AI specialists' use of AI platforms can help in making connections between various parameters and speed up the processes to obtain optimum results.

In this paper, our team relies on the findings of the most recent research focusing on COVID-19 and its various challenges to generalize and suggest a variety of strategies relevant but not limited to high-risk groups, epidemiology, radiology and etc. As the paper unfolds, it explores and discusses the potentials of AI approaches to overcome COVID-19 related challenges.

The present section focuses on the introduction of some applicable AI-based strategies that can support existing standard methods of dealing with COVID-19 in health care systems around the world. With the aim of foregrounding the enhanced effectiveness of these strategies and techniques, their formation has been informed by and based on the most recent AI-related published medical updates as well as the latest updates on COVID-19. Therefore, this section presents ideas that can enhance and speed up ANN-based methods obtaining process to improve treatment methods and health management as well as recognition and diagnosis. However, the optimal effectiveness of AI tools during COVID-19 pandemic depends on the extent of human input and collaboration in different roles humans play. The knowledge of capabilities and limitations of AI, however, stays with data scientists who play an important role simply because they are the ones who code AI systems [19]. Different steps in the application of AI-based methods employed to overcome COVID-19 challenges are presented in the flowchart shown. The first step is the preparation of the data which are necessary for data mining during data understanding, data preparation and big data. The data under discussion here consist of medical information, such as clinical reports, records, images and other various forms of information that can be transformed into data that can be understood by a machine. Objectives of data understanding include understanding data attributes and identifying main characteristics such as data volume and the total number of variables to summarize the data. Before processing and analysis comes data preparation that is the process through which raw data are refined and converted. In other words, it is a process in which data are reformatted, corrected and combined to enriched data. Collecting, analyzing and leveraging the data such as consumer, patient, physical, and clinical data ends in big data. It is at this stage that human intervention, as a part of machine learning methods, takes place and experts investigate and analyze the data to extract the data with finest structures, patterns and features. Humans' contribution at this stage is important because their knowledge and potentials are not available to an ML solution that unlike humans is able to deal with huge data sets far beyond the extent that humans could handle or observe in a simultaneous manner. Moreover, Deep Learning (DL) methods could be employed in cases where enormous or complex data processing challenge ML or traditional means of data processing. DL methods, demonstrates, are not dependent on human intervention. As a subset of machine learning, DL consists of numerous layers of algorithms that provide a different interpretation of the data it feeds on. However, DL is mainly different from ML because it presents data in the system in a different manner. Whereas DL networks work by layers of Articial Neural Networks (ANN), ML algorithms are usually dependent on structured data. Unlike supervised learning which is the task of learning a function mapping an input to an output on the basis of example input-output pairs, unsupervised learning is marked by minimum human supervision and could be described as a sort of machine learning in search of undetected patterns in a data set where no prior labels exist. In conventional medicine, alternatively called as allopathic medicine, biomedicine, mainstream medicine, orthodox medicine and Western medicine, medical doctors and other professional health care providers such as nurses, therapists, and pharmacists use drugs, surgery or radiation to treat illnesses and eliminate symptoms.

AI could be extensively applied for COVID-19; however, we aim at finding the best possible solutions COVID-19 related issues that have put the biggest challenges ahead of health care systems. Accordingly, these solutions have been categorized into 3 parts, including high-risk groups, outbreak and control, recognizing and diagnosis. Fig. 2 is a flowchart that shows various applications of ANNs in

diagnosis and tracing the symptoms in 5 layers. Although the process has been specifically designed for COVID-19 related problems, it has the potential for use in other medical imaging analyses. The input layer as the initial layer is related to the database and is designed for database access. A high-speed channel is used to couple this layer with the main (front-end) computer (s). While the database server is loosely coupled through the network, the database machine is tightly coupled to the main CPU. Taking advantage of a good number of microprocessors with database software database machines can send huge packets of data to the mainframe. The next layer, selection layer, is designed by an intelligent ANN-based selector and has the task of adopting the best possible imaging techniques in the light of past experiences of the system. If physicians confirm the decisions made by this layer, the recommended techniques in the third layer take the required images. Consequently, one or several imaging techniques may be suggested according to the previously obtained results. For each patient, Magnetic Resonance Imaging (MRI), Computed Tomography Scan (CT Scan), positron emission tomography (PET), Optical and Digital Microscopic Imaging Techniques and applications in Pathology and X-Ray imaging are the techniques that may be used in the process. The conventional optical microscope has come to be the dominant tool in pathological examinations. PET scan that, in some cases, detect disease before it can be detected by other imaging tests, is a valuable imaging test to determine the extent and quality of body tissues and organs' functions [20][22]. In the PET scan, a radioactive drug (tracer) is utilized to investigate this functionality [23]. The fourth layer is dedicated to the optimization and improvement of the images. To realize a classification network that facilitates discrimination between COVID-19 and Infiuenza-A viral pneumonia, a DL technology was used for network structure, and the classical ResNet was used to extract features [24]. The fth layer is reserved for ultimate diagnosis based on the system's saved information and is a layer in which learning algorithms should be done by an ANN method. DL technologies, such as a convolutional neural network (CNN), are supposed to be the right option for achieving these goals. The reason is that this type of network is significantly capable of nonlinear modeling and has extensive use in medical image processing and diagnosis process [25][28].

II.LITERATURE SURVEY

1) Clinical Features Of Patients Infected With 2019 Novel Coronavirus In Wuhan

AUTHORS: C. Huang et al

Coronaviruses are enveloped non-segmented positive-sense RNA viruses belonging to the family Coronaviridae and the order Nidovirales and broadly distributed in humans and other mammals.1 Although most human coronavirus infections are mild, the epidemics of the two betacoronaviruses, severe acute respiratory syndrome coronavirus (SARS-CoV)2, 3, 4 and Middle East respiratory syndrome coronavirus (MERS-CoV),5, 6 have caused more than 10 000 cumulative cases in the past two decades, with mortality rates of 10% for SARS-CoV and 37% for MERS-CoV.7, 8 The coronaviruses already identified might only be the tip of the iceberg, with potentially more novel and severe zoonotic events to be revealed. In December, 2019, a series of pneumonia cases of unknown cause emerged in Wuhan, Hubei, China, with clinical presentations greatly resembling viral pneumonia.9 Deep sequencing analysis from lower respiratory tract samples indicated a novel coronavirus, which was named 2019 novel coronavirus (2019-nCoV). Thus far, more than 800 confirmed cases, including in health-care workers, have been identified in Wuhan, and several exported cases have been confirmed in other provinces in China, and in Thailand, Japan, South Korea, and the USA.

2) An Anfis Approach To Modeling A Small Satellite Power Source Of Nasa

AUTHORS: M. B. Jamshidi, N. Alibeigi, A. Lalbakhsh, and S. Roshani.

Before launching satellites into space, a wide variety of practical and comprehensive tests must be done on their different subsystems. Because, the cost spent for designing and manufacturing satellites is much higher than these investigations. One of the prominent sectors of these devices is their power supplies. In this paper, a neuro-fuzzy based black-box technique for modeling a li-ion battery used in a small satellite of the National Aeronautics and Space Administration (NASA) is presented. The dataset was extracted from a range of particular tests on 18650 lithium-ion cells by scientists of NASA. The proposed approach includes an Adaptive Neuro-Fuzzy Inference System (ANFIS) model with a Fuzzy Inference System (FIS)

generated by a subtractive clustering algorithm to estimate and predict the capacity of the cell for next cycles. The results indicated the proposed method can be considered an efficient and reliable technique for estimating parameters of batteries.

3) A Novel Multiobjective Approach For Detecting Money Laundering With A Neuro-Fuzzy Technique

AUTHORS : M. B. Jamshidi, M. Gorjiankhanzad, A. Lalbakhsh, and S. Roshani

Using the computational inelegant methods in processing financial data is a practicable action to reduce a wide variety of crime in this domain. In this paper, a new intelligent multiobjective to recognize money laundering in banks and currency exchanges is presented. The introduced approach is based on Adaptive Neuro-Fuzzy Inference System (ANFIS) which is set up by MATLAB software. The proposed method can replace conventional methods to detect the risk of money laundering in suspicious banking transaction. In addition, this approach can be used in banking systems as an online technique to analyze the data of customers' accounts. Also, the probability of money laundering's risk for each exchange is processed and monitored. One of the main advantages of the system is categorizing customers for different customers. The results illustrate the accuracy of this system in filtration of accounts infected by money laundering is acceptable.

III. EXISTING SYSTEM:

In the existing system with the progress of the pandemic and rising number of the confirmed cases and patients who experience severe respiratory failure and cardiovascular complications, there are solid reasons to be tremendously concerned about the consequences of this viral infection. Determining appropriate approaches to reach solutions for the COVID-19 related problems have received a great deal of attention. However, another huge problem that researchers and decision-makers have to deal with is the ever-increasing volume of the date, known as big data that challenges them in the process of fighting against the virus. This justifies how and to what extent Artificial Intelligence (AI) could be crucial in developing and upgrading health care systems on a global scale.

DISADVANTAGES OF EXISTING SYSTEM:

- The progress of the pandemic and rising number of the confirmed cases and patients then the existing model does not work.
- Problem that researchers and decision-makers have to deal with is the ever-increasing volume of the date, known as big data, that challenges them in the process of fighting against the virus.
- Image-based medical diagnosis is not possible.
- **Algorithm**: Back-Propagation (BP) algorithm

IV. PROPOSED SYSTEM:

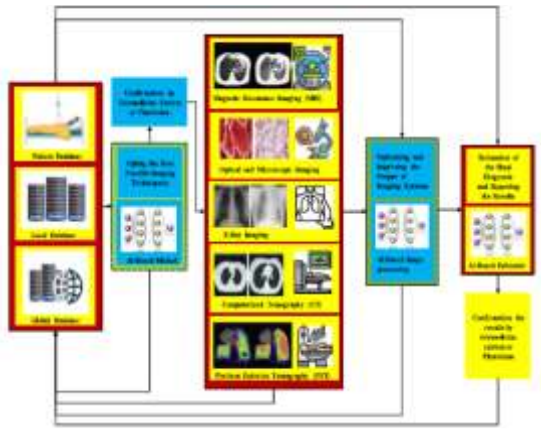
The proposed System focuses on the introduction of some applicable AI-based strategies that can support existing standard methods of dealing with COVID-19 in health care systems around the world. With the aim of foregrounding the enhanced effectiveness of these strategies and techniques, their formation has been informed by and based on the most recent AI-related published medical updates as well as the latest updates on COVID-19. Therefore, this section presents ideas that can enhance and speed up ANN-based methods obtaining process to improve treatment methods and health management as well as recognition and diagnosis. However, the optimal effectiveness of AI tools during COVID-19 pandemic depends on the extent of human input and collaboration in different roles humans play.

ADVANTAGES OF PROPOSED SYSTEM:

- The input layer as the initial layer is related to the database and is designed for database access. A high-speed channel is used to couple this layer with the main (front-end) computer (s).
- Image-based medical diagnosis is possible the user has to give the CT scan image to the model, then our model will predict where the person viral infected or not.
- LSTM networks are very advantageous for learning sequences with longer-term patterns of unknown length.

Algorithm: LSTM, ANN

V.SYSTEM ARCHITECTURE:



MODULES:

- **User**
- **Admin**
- **Clinical Process**
- **CT Scan Test**

MODULES DESCRIPTION:

User:

The User can register the first. While registering he required a valid user email and mobile for further communications. Once the user register then admin can activate the customer. Once admin activated the customer then user can login into our system. First user can get the current covid status in USA. In the programmatically url "http://covidtracking.com/api/states/daily.csv" will get the current status of covid data from USA. I the daily.csv will get the results of how many patient are infected on the day. How may recovered on the day. After user can get the clinical reports weather what drug they are used. The user will invoke the algorithms by making sub process call. The user will train the model by infected xray imagesand normal images. Once the model trained then it is ready for testing.

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Admin:

Admin can login with his credentials. Once he login he can activate the users. The activated user only login in our applications. The admin can set the training and testing data for the project dynamically to the code. The model covid19_pneumonia_detection_cnn.model is available under the media folder. So that the user can test by browser. We used ANN model to predict the given CT scan images weather covid patient or not.

Clinical Process:

This is an effort to compile a repository of the clinical characteristics of patients who have taken a COVID-19 test. By sharing our schema and data, we hope that we can 1) accelerate information sharing among frontline healthcare providers and 2) facilitate studies on COVID-19 signs, symptoms, stages, and care plans. The repository is maintained as CSV file. Further, a patient's reported age differs from their actual age by a reasonable randomized amount to protect their privacy. The data includes clinical characteristics (epidemiologic factors, comorbidities, vitals, clinician-assessed symptoms, patient-reported symptoms), in addition to radiological and laboratory findings. It does not include treatment plans, complications, and clinical outcomes, which is collected at inpatient facilities. Details about each field are available in the data dictionary. The data includes both positive and negative test results for symptomatic and asymptomatic patients. The data does not include results for patients with severe symptoms. It is important to note that our data collection is clinically-driven and therefore not systematic. This means that overall positive rates are descriptive of the Carbon Health patient population and cannot be generalized to the unobserved population. We provide functions to identify symptom severity to aid in accounting for the various admission criteria that affect positive rates.

CT Scan Test:

The We will be using Tensorflow 0.14.0 with Python3 for detecting Covid-19 Pneumonia signs from CT Scan Images by a CNN(Convolutional Neural Network) Model. The model have a uniform dataset of 764 Images of CT Scan which consist 349 Images of Covid-19 Pneumonia affected patients and remaining shows normal patient scans. The dataset was taken from the following (https://github.com/UCSD-AI4H/COVID-CT/tree/master/Images-processed). You can go through our [dataset](Classes/ct_scans_png_dataset.rar) where we have indexed all the images and converted them into same format(PNG). We have used tensorflow library for training a binary classification model of CT Scans using Convolutional Neural Network. The graph of model is as follows:

SYSTEM REQUIREMENTS:

HARDWARE REQUIREMENTS:

- System : Intel Core i9.
- Hard Disk : 1 TB.
- Monitor : 15'' LED
- Input Devices : Keyboard, Mouse
- Ram : 32 GB.

SOFTWARE REQUIREMENTS:

- Operating system : Windows 10.
- Coding Language : Python
- Tool : PyCharm, Visual Studio Code
- Database : SQLite

VII. CONCLUSION

The introduced conceptual structures and platforms in the research field of AI-based techniques, which are suitable for dealing with COVID-19 issues, have been studied in this paper. Different techniques have been developed, incorporating COVID-19's diagnostic systems, such as RNN, LSTM, GAN, and ELM. The geographical issues, high-risk people, and recognizing and radiology were the main problems with COVID-19 and have been studied and discussed in this work. Also, we showed a mechanism for selecting the appropriate models of estimation and prediction of desired parameters using a number of clinical and non-clinical datasets. Considering these platforms assists AI experts to analyze huge datasets and help physicians train machines, set algorithms or optimize the analyzed data for dealing with the virus with more speed and accuracy.We discussed that they are desirable because of their potential for creating a workspace while AI experts and physicians could work side by side. However, it should be noted while AI speeds up the methods to conquer COVID-19, real experiments should happen because a full understanding of advantages and limitations of AI-based methods for COVID-19 is yet to be achieved, and novel approaches have to be in place for problems of this level of complexity. Succeeding in the combat against COVID-19 toward its eventual demise is highly dependent on building an arsenal of platforms, methods, approaches, and tools that converge to achieve the sought goals and realize saving more lives.

Further Enhancement

More Contactless Interfaces and Interactions There was a time not too long ago when we were impressed by touch screens and all they enabled us to do. COVID-19 has made most of us hyper-aware of every touchable surface that could transmit the disease, so in a post-COVID-19 world, it's expected that we'll have fewer touch screens and more voice interfaces and machine vision interfaces. Prior to the pandemic, we saw the rollout of contactless payment options through mobile devices. However, with the increase in people wanting to limit what they touch, an option to pay for goods and services that does not require any physical contact is likely to gain traction. Machine vision interfaces are already used today to apply social media filters and to offer autonomous checkout at some stores. Expect there to be an expansion of voice and machine vision interfaces that recognize faces and gestures throughout several industries to limit the amount of physical contact.

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