Artificial Intelligence Methods for Diagnosis and Treatment of Covid-19

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Abstract:

Nowadays, Artificial Intelligence has a very significant role in the medical field. AI methods and tools can be used to diagnose and provide treatment to covid19 infected patients. Different AI technologies like Machine Learning (ML), Deep Learning (DL) including Recurrent Neural Network (RNN), Generative Adversarial Networks (GANs), Extreme Learning Machine (ELM), and Long /Short Term Memory (LSTM) is introduced in this paper. Numerous false reports, misinformation, fear regard to coronavirus, it is circulated regularly since the outbreak of the COVID19, so we collect valid data from medical reports, clinical data, and medical images.

Keywords: Artificial Intelligence, Deep Learning, RNN, GAN, ELM, LSTM, Diagnosis, Treatment.

1. Introduction:

The COVID-19 pandemic outbreak has put the whole world into a difficult situation, it appeared in December 2019. From mild, respiratory tract illness to severe pneumonia, cardiovascular complications, multiorgan failure, and death these are the consequences of this viral infection. Artificial Intelligence (AI) is crucial in developing and upgrading health care systems on a global scale. AI has put a lot of efforts towards solving the complex issues in a number of fields, including engineering, medicine, economy, and psychology. The big data facilitates the analysis and study of viral activity model in any country. Medical imaging and image processing techniques of artificial intelligence which is capable of helping medical methods and well-appropriated to serve health-care systems to fights against COVID-19. AI's image-based medical diagnosis is the fast and accurate diagnosis of COVID-19 can take place.

AI specialists' use AI platforms to help in making connections between various activities and speed up the processes to obtain optimum results. In this paper, there is findings of the most recent research focusing on COVID-19 challenges and how to diagnose and provide treatment to covid-19 infected patients.

## 2. Overview of AI- based approaches for covid19 challenges

The ideas that can enhance and speed up ANN-based methods to improve treatment methods and health management as well as recognition and diagnosis. The optimal effectiveness of AI tools during COVID-19 pandemic depends on the extent of human input. First step is to collect data from clinical reports, medical images, experimental treatments other various forms of information that can be transformed into data that can be understood by a machine and the medical experts collect and examine the information. Then preparing the data which are necessary for data mining during data understanding, data preparation and big data. Big data is collecting and analyzing the data such as patient, physical, and clinical. Data preparation is the process in which data are reformatted, corrected and combined to enriched data. Data understanding include understanding data attributes and identifying data volume and the total number of variables to summarize the data. Deep Learning (DL) is used for complex data processing that ML or traditional methods cannot do. DL methods do not require feature extraction process. DL networks work by layers of Artificial Neural Networks (ANN), ML algorithms are usually dependent on structured data.
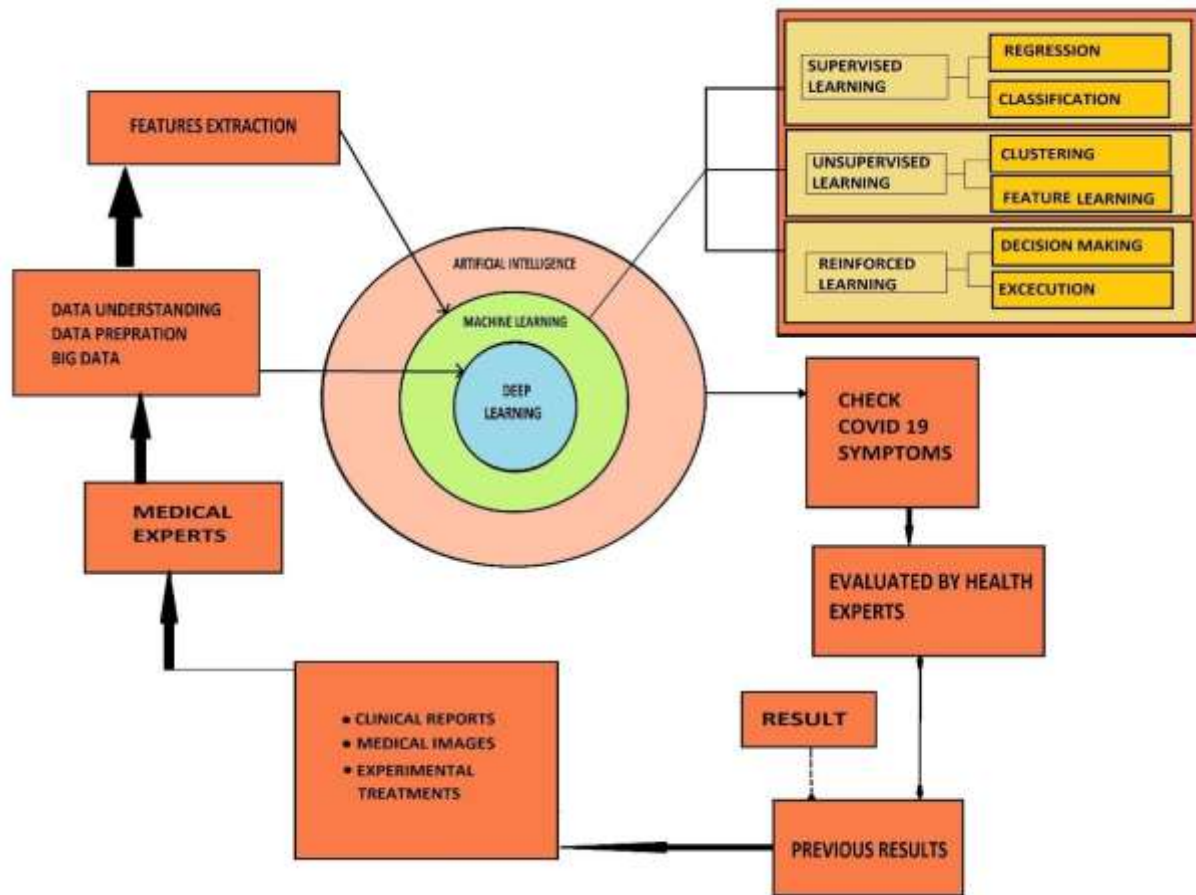
The figure: Overview of AI- based approaches for Covid-19 challenges present some applicable AI-based strategies that can support existing methods of dealing with COVID-19 in health care systems around the world.

3. AI-Based Methods to improve the medical imaging approaches for covid19

The first layer is the input layer related to the database contain patient disease details. The second layer is the selection layer, AI-based methods to select best possible image techniques in the light of past experiences of the system. If physician confirm the decisions made by this layer. The Third Layer contain the Magnetic Resonance Imaging (MRI), Computed Tomography Scan (CT Scan), positron emission tomography (PET), X-Ray image techniques are used. Fourth Layer - optimization and improving of the images and estimating the final result using convolutional neural network (CNN).
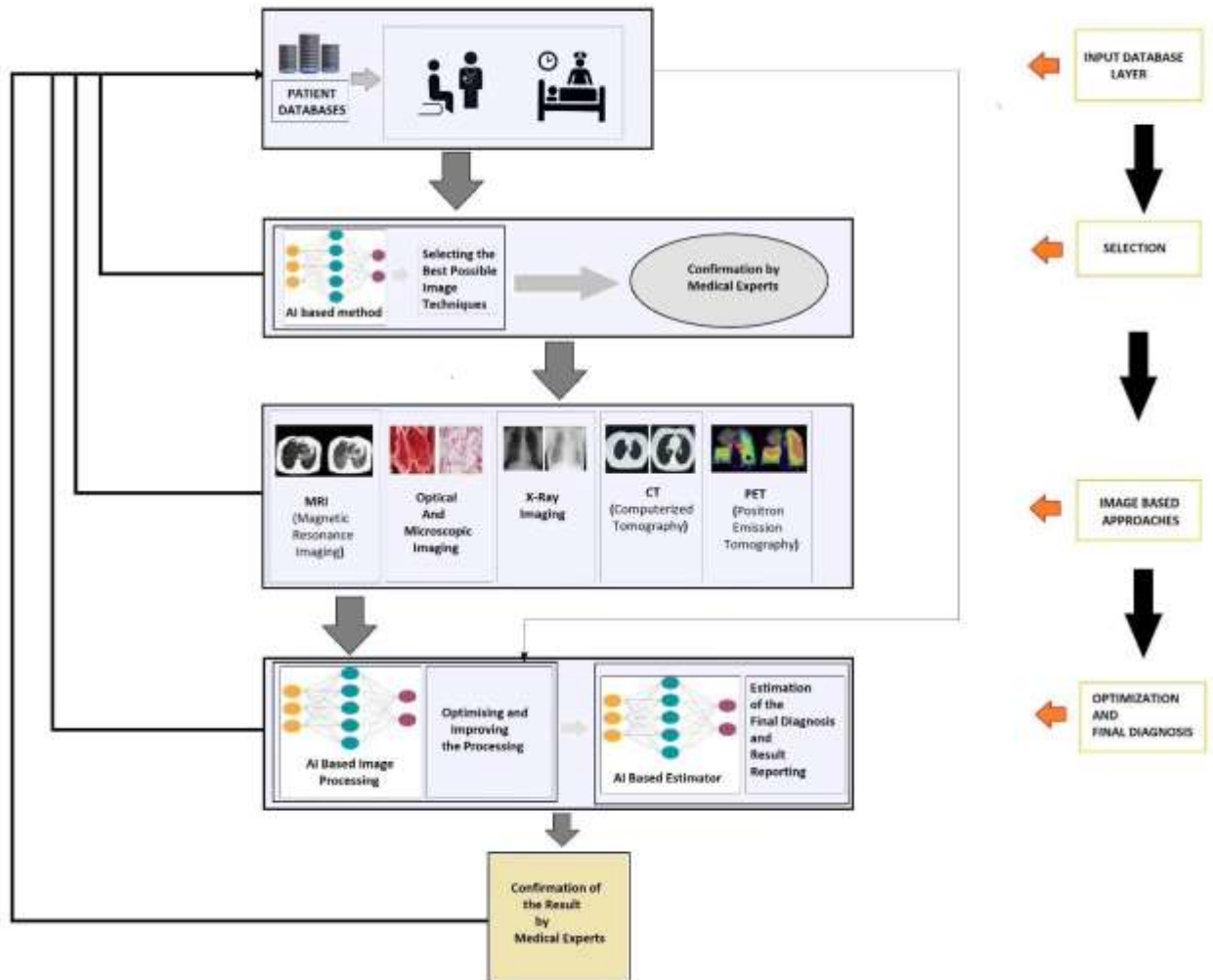
4. **Prediction of Covid19 Spread by RNN:**

A Recurrent Neural Network (RNN) is a type of neural network that contains loops, allowing information to be stored within the network. RNN use their reasoning from previous experiences to inform the upcoming events.

Finding solutions for high-risk groups who face Covid-19 is the mainly considered. The real time epidemiological data in have been put together in an organized manner to predict the infection spread. RNN can predict the spreading of Covid-19 infection through clinical and geographical big data. The quantification of qualitative inputs such as country and location is a huge amount of data that can be used to assure the spread of Covid-19 across the world.
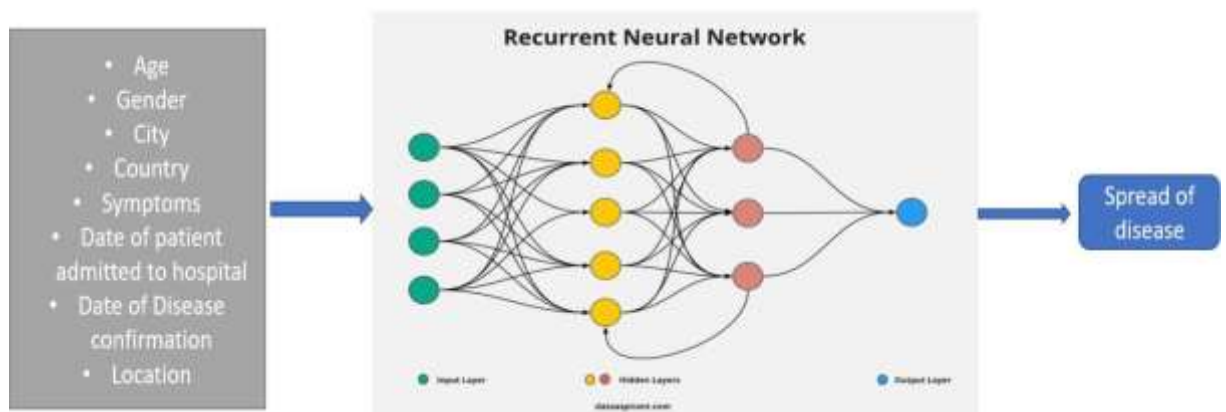
RNN can propose epidemiological model of the virus in different locations and improve the accuracy and speed of recognition and classification of the issues caused by the virus. RNN is a deep learning approach that have succeeded to present promising results.

5. Visualization and Detection of New Covid19 by GAN:

Generative Adversarial Network (GAN) are a special type of neural network model in which two networks are trained at the same time while one is focused on generating images, and the other performs discriminating.
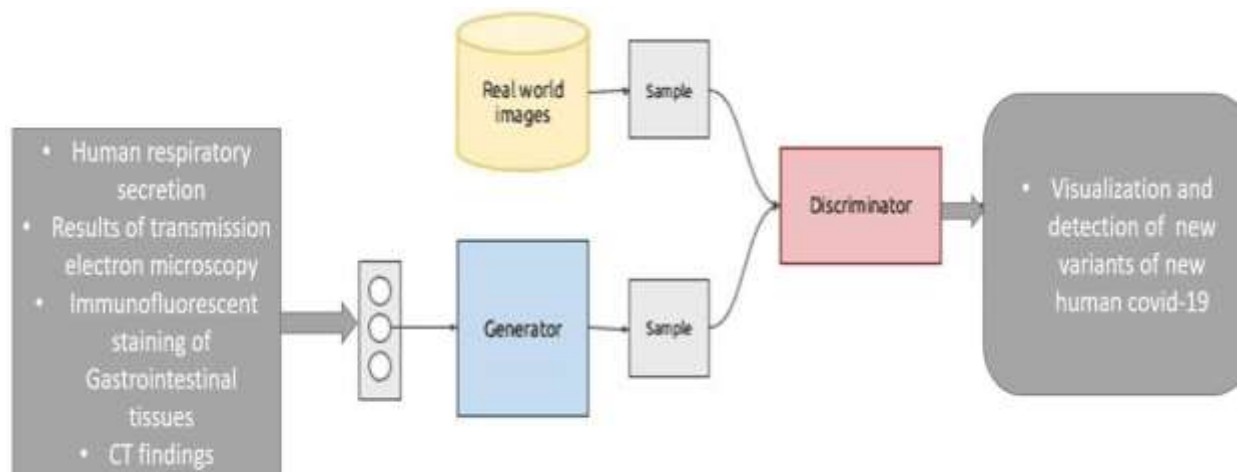
Sometimes it show negative RT-PCR but positive CT features, which may be a significant signs of Covid-19.The image classification model facilitates discrimination of various infections in terms of their appearance and structure. The human respiratory secretions from human airway somatic cell is collected to see and detect new human Coronavirus that has been unidentified by traditional approaches. The negative covid-19 result in respiratory tract but positive in feces which is an indication of viral gastrointestinal infection and the possibility of faecal-oral transmission that can still take place after viral clearance in the respiratory tract. Images of immunofluorescent staining of rectum, duodenum, stomach and oesophagus. The fluorescent staining images are the output of laser scanning microscopy. It can predict the viral gastrointestinal infection. Extraction of the feature from these images to assist patients within the process of their treatment. GAN is used for text-to-image synthesis, super resolution, and image-to-image translation also video generation, visual tracking, and feature learning.

6. Drug Recommendation by ELM:

Extreme Learning Machine (ELM) is a neural network , learning speed in ELM is a greatly faster and obtains better generalization performance. It does not have back-propagation (BP) algorithm. ELM model predict suitable drugs based on individuals who are involved with covid19 cardiovascular complications. This means that training the supervised model happens through the application of the real data in the network. Following the training process, new data can be predicted through a test or verification procedure. ELM is capable of reducing the risk of possible cardiovascular complications considering various forms of viral infection from previous cases. ELM can suggest the simplest possible drugs for cardiac complications.

7. Treatment methods by LSTM:

Long /Short Term Memory (LSTM) network is a model that take inputs to predict the best treatment as precisely as possible. The LSTM is capable of maintaining long memory and LSTM networks are very

advantageous for learning sequences with longer-term patterns of unknown length. Training the model the mild, moderate and advanced phase of COVID-19 infection can be considered as inputs and predict the treatment. LSTM neural networks solve the matter of disappearing gradient in Recurrent Neural Networks (RNNs). LSTM NN has been popular and increasingly utilized in robot control, speed recognition, handwriting recognition, act recognition.

8. Conclusion:

Focusing on the possibility of the ANN application for analyzing COVID-19-related infection problems, such as high-risk patients, control of the outbreak, recognizing and radiology, we used RNN, LSTM, GAN and ELM to suggest several AI-based methods. 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. So , AI speeds up the methods to conquer COVID-19 and save more lives.

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