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AN EXTENDED MODEL FOR PREDICTING COVID-19 PANDEMIC VICTIMS USING ARTIFICIAL INTELLIGENCE

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ABSTRACT
Artificial Intelligence technologies have demonstrated the potential to tackle and contain this disease. Research findings continues to reveal a gap for real time monitoring of the COVID-19 patients triggering unveiling lack of technologies like AI integration for predicting victims or similar plague. This study aims at designing an extended model for predicting COVID-19 victims using artificial intelligence by assessing the applications of Artificial intelligence technologies in COVID-19 pandemic timely response, finding current Artificial Intelligence technologies used in fighting COVID-19 and proposing a model for predicting outbreak's victims using artificial intelligence. Researcher used the population of Kigali International Airport Command Post made of 50 task force due to the small number for sampling. Researcher formulate and pilot a questionnaire, which will serve to collect data relevant to all objectives of this study. The study presented an assortment of findings start with demographic findings. A great number (52%) of the respondents employed in this study were female and most of them (64%) were in middle age between 29-39 years old. The percentage of 66% had a bachelor degree. Different models have been used in predicting COVID-19. They mainly extract 3D features from the segmented 3D lung region using CT images. The obtained volumes were fed into the proposed DeCoVNet (3D deep Graphical processing unit to Detect COVID-19). The researcher has designed the model for predicting Covid-19 pandemic victims using artificial intelligence. The researcher used different methods to design the model. Many applications have been developed using Machine Learning in various fields such as healthcare, banking, military equipment, space etc. The model simulation indicated how the procedure of predicting Covid-19 pandemic victims using artificial intelligence was done. The dataset that was used to train the model to predict COVID-19 was gathered from an open source data shared by RBC/Airport Command Post. The data set contained information about patients with COVID-19 and these data have been used to train the model. Furthermore, the dataset that was used to train the model to predict COVID-19 was gathered from an open source data shared by RBC/Airport Command Post, which contained information about patients with COVID-19 positive and these data have been used to train the model. The study also recommend using model for predicting covid-19 pandemic victims using artificial intelligence.

Keywords: *Authentication method, Triple-DES algorithm and Delivery of Big Data*

1. Introduction

COVID-19 is an infectious disease caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a global pandemic. With high transmissibility, a case fatality rate greater than 1%, and no effective antiviral therapy or vaccine, the mainstay of pandemic management has been containment and mitigation (Sera , Topol, & Harriette , 2020). At the beginning of the pandemic, an AI system (Health Map) from Boston Children's Hospital was used to identify different information about the pandemic that was available online to detect, visualize and monitor any new outbreaks.
This website helped in identifying the new unknown pneumonia that was reported to start from Wuhan, China. The first AI epidemiologist to warn against a new outbreak was a Canadian tech Blue Dot whose algorithm scours foreign language news reports and gave a warning about a danger zone. (Musanabaganwa, et al., 2020).

The recent Coronavirus 2019 originated in Wuhan, China in December 2019 and has been diagnosed as an unexplained pneumonia that causes severe pneumonia and difficulty breathing. Some patients based on other problems. Later, the virus develops high virulence and spreads rapidly from person to person. The World Health Organization (WHO) says the epidemic is spreading across many countries. Many technologies use technology to treat and prevent these diseases. The COVID19 transformation process has begun to use technology at different levels of management and observation in the healthcare process. Communities will be strengthened to be aware of safeguards such as relationship management, health information being shared via SMS or on the Internet.

2. Literature review

Artificial Intelligence or generally known as machine intelligence, is intelligence possessed by machines, in distinction to the natural intelligence displayed by humans and alternative animals. A number of the activities that it's designed to try and do is speech recognition, learning, designing and downside determination (Ziyad, 2019). With its success in areas like disease diagnosis, treatment, patient monitoring, drug discovery, epidemiology, etc, there is a great hope that Artificial Intelligence can be a vibrant area of research to tackle the challenges human faces currently according to (Tayarani, Yao, & Xu, 2015).

2.1 Machine Learning

According to (Jebril, 2020) Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

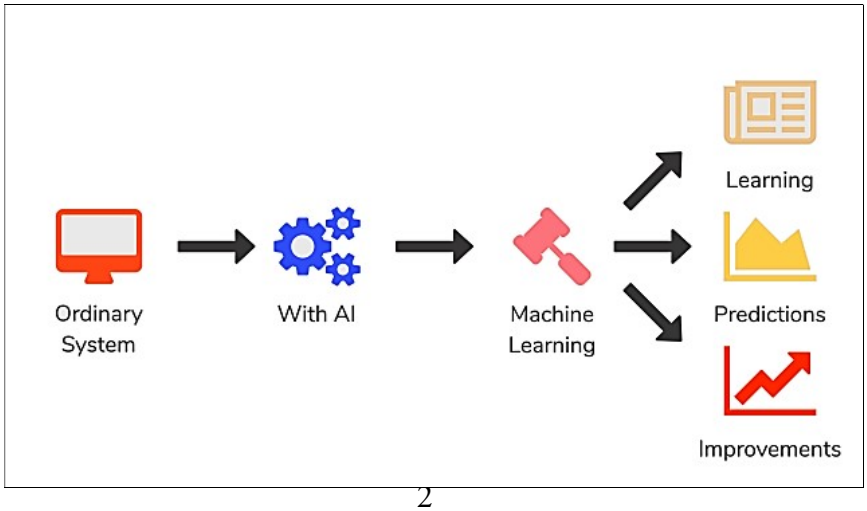

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Figure 2.2: Machine learning process

Machine learning that can be used improve the performance of healthcare systems when identifying covid-19 cases. Transfer learning in machine learning refers to storing knowledge gained while solving one problem and applying the achieved knowledge on another related problem. Since there is not many datasets, transfer learning has been attractive in dealing with covid-19 images (Mohammad & Tayarani, 2020). Through the use of statistical methods, algorithms are trained to make classifications or predictions, uncovering key insights within data mining projects (IBM, 2021).

2.2 Artificial Neural Networks in predicting COVID-19

ANI synthesis methods, datasets, validation approach. Yet, studies shows that access, analyze, and summarize the unresolved problems and shortcomings of current AI techniques for COVID-19 are limited. In the existing review studies, only individual parts of AI techniques, rarely the full solution, are reviewed and examined.

2.3 Covid-19

Figure 2.3: Covid-19

The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing global pandemic of coronavirus disease 2019 (COVID-19), which is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus was first identified in December 2019 in Wuhan, China (Sera, Topol & Harriette, 2020).

2.4 Graphical Processing Unit in predicting COVID-19

Different models have been used in predicting COVID-19. They mainly extract 3D features from the segmented 3D lung region using CT images. The obtained volumes were fed into the proposed DeCoVNet (3D deep Graphical processing unit to Detect COVID-19).

2.5 Convolutional Neural Networks

Convolutional neural networks, are effective approaches for representation learning using multilayer neural networks and have provided excellent performance solutions to many problems in image classification, object detection and natural language processing. A deep residual network is a type of CNN architecture that uses the strategy of skip connections to avoid degradation of models. However, the applications of CNN for clinical diagnoses remains limited due to the lack of interpretability of the CNN model and the multi-modal properties of clinical data. Some studies have demonstrated excellent performance of CNN methods for the detection of COVID-19 with CT images. AI algorithms allow the effect of the climate to be incorporated into

the projections. AI is not without limitations and requires training with COVID-19 datasets (Abu Adnan Abir, Shama, Adnan, Abdun Naser, & Aman Maung, 2020).

3. METHODOLOGY

Research Design; Study population

Research Design: For this study, a prediction study approach was adopted to examine the link between the predictor variable (the independent variables) and the criterion variable (dependent variable). This research approach will be suitable and fitting to our study because the researcher had to collect data based on current situation of predicting Covid-19 pandemic victims using artificial intelligence.
Study population: Akhil (2017) defined population as whole collection of cases where the sample is to be taken from. The study dedicated on the task force of 50 people in total.

4. ANALYSIS AND FINDING

4.1 Experiment

An experiment is conducted with the results achieved from the SLR (Systematic Literature Review) to reach the goals of RQ1 where we identify the suitable machine learning technique for prediction of COVID-19.

4.2 Software Environment

Python

Python is a high level and effective general use programming language. It supports multi-paradigms. In this thesis, the following python libraries were used (Guido, 2007).

• Pandas - It is a python package that provides expressive data structures designed to work with both relational and labelled data. It is an open source python library that allows reading and writing data between data structures (McKinney, 2015).

• Numpy - It is an open source python package for scientific computing. Numpy also adds fast array processing capacities to python (McKinney, 2012).

• Matplotlib - It is an open source python package used for making plots and 2D representations. It integrates with python to give effective and interactive plots for visualization (McKinney, 2015).

• Tensorflow - It is a mathematical open source python library designed by Google Brain Team for Machine intelligence.

• Sklearn - It is an open source python machine learning library designed to work alongside Numpy. It features various machine learning algorithms for classification, clustering and regression.

Dataset

The data set that was used to train the model to predict COVID-19 was gathered from an open source data shared by RBC/Airport Command Post. The data set contained information about hospitalized patients with COVID-19 and these data have been used to train the model. Textual data was encoded with integer values for experimental setup. They are the attributes that were considered in the dataset for the machine learning model.

4.4 Results of model simulation by Python

The outcomes of an extended model for predicting covid-19 pandemic victims using artificial intelligence were tested with the Python programming language. In this research, the command-line interface has been used to test the prediction of covid-19 pandemic victims.

4.4.1 Interface for system execution

This is the command-line interface to execute the program. At this stage, user of the system used the command-line interface to run the program by locating the python (predict.py) file's path, as indicated in the figure below.

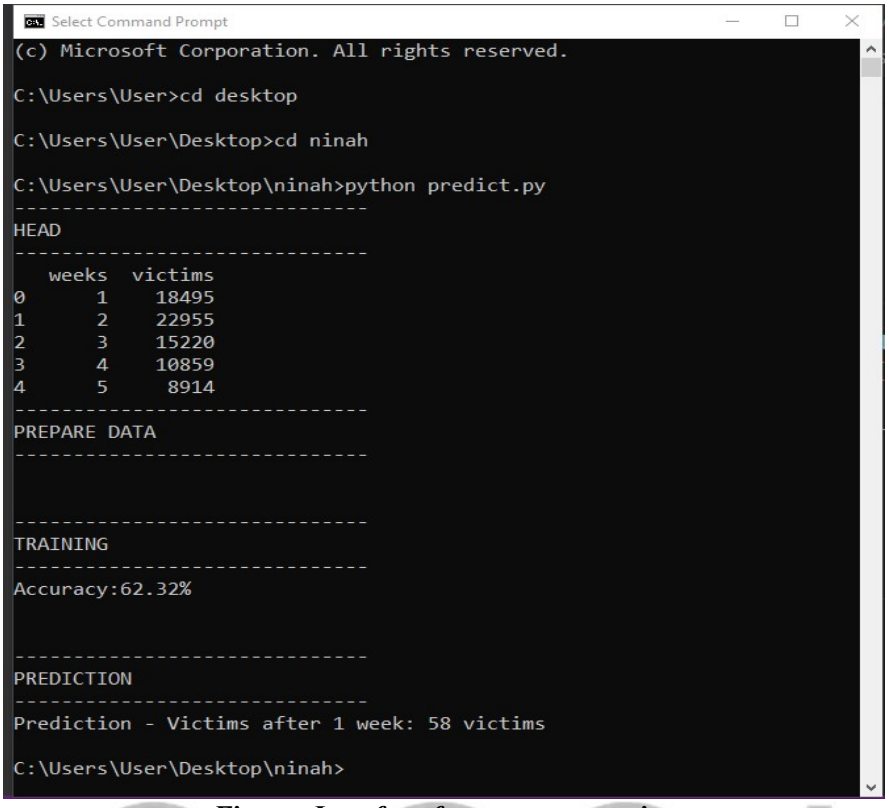

Figure: Interface for system execution

From the Figure 4.3, the CLI or Command-Line Interface has been used to execute this prediction system. A user was required to navigate to the location of the python file and execute it. After the system prepares data and trained to it, it displays the prediction of the covid-19 pandemic victims along with the prediction graph.

4.4.2 Prediction using Multiple Linear Regression degree 2

The Prediction using Multiple Linear Regression can be tested on various degrees such as 1 for linear regression, 2 for quadratic regression, 3 for cubic regression, and so forth. As the degree changes, the best-fit line is affected considerably.

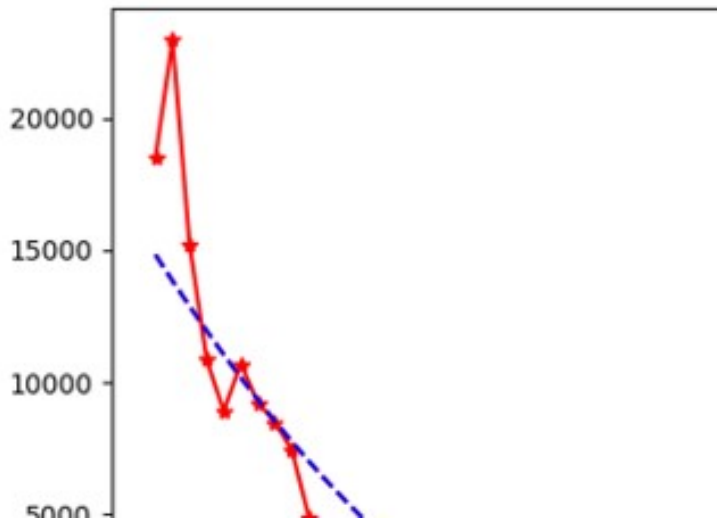

Figure: Graph for prediction using ML degree 2

As the degree changes, the best-fit line is affected considerably. For the degree 2 or quadratic regression, the best-fit line has the half-U shape. For this graph, the red color represents the prediction, and blue represents the best-fit line.

4.4.3 Prediction using Multiple Linear Regression degree 3

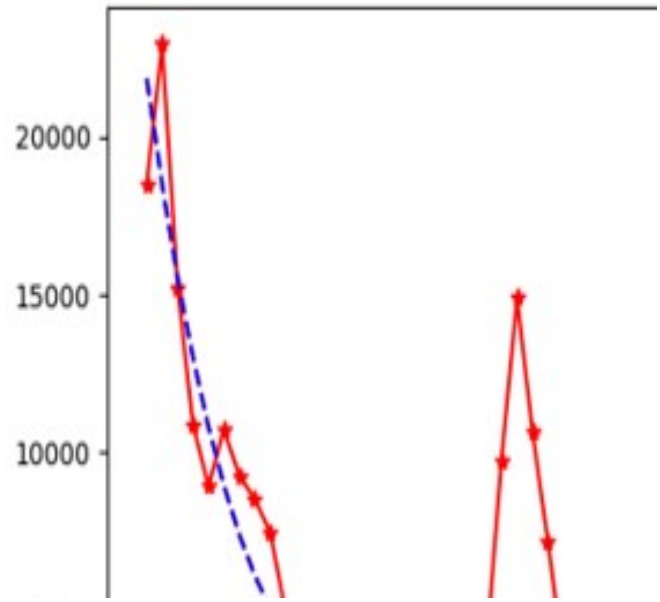

Figure: Graph for prediction using ML degree 3

As seen before, the multiple linear regression can be tested on various degrees. As the degree changes, the best-fit line is affected considerably. For the degree 3 or cubic regression, the best-fit line has deviated from the half-U shape when compared to the degree 2. As shown with the blue color which represents the best-fit, there has been a little deviation of the best-fit line which explains that it changes drastically when the degree increases to fit the prediction. The last line of the prediction shows that the covid-19 pandemic victims decreased, which has also affected the best-fit line on the graph.

4.4.4 Prediction 1 (after 1 week)

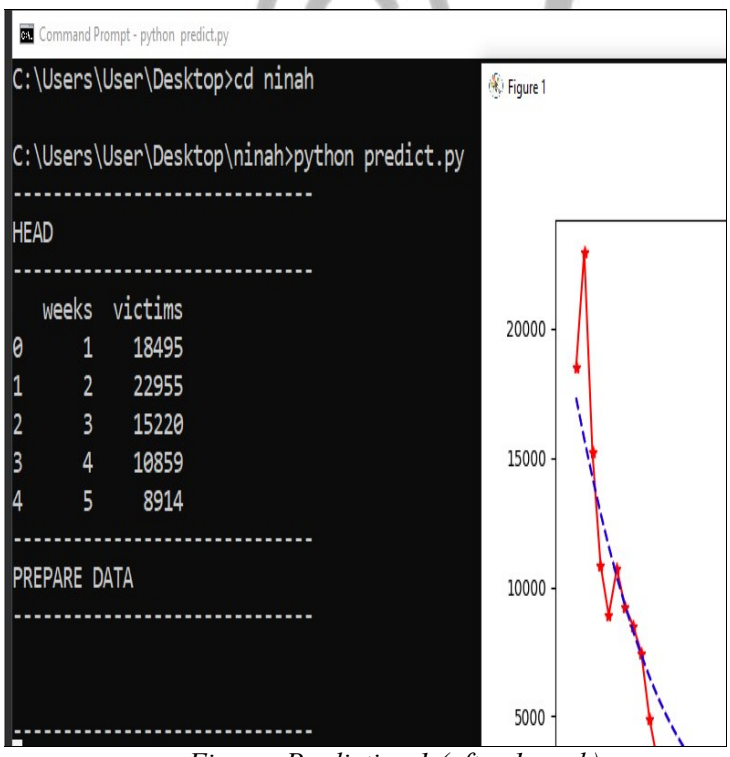

Figure: Prediction 1 (after 1 week)

As explained in previous lines, the red line represents the prediction of covid-19 pandemic victims while the blue line represents the best-fit. With the red line for prediction, it started with a big number of covid-19 victims but fortunately the victims were reduced as show on the graph. Sometimes could increase but not on the high rate. The system predicted that the number of covid-19 victims will decrease in coming weeks. To do so, the system must be trained to the currently processed data to learn current changes and be able to predict upcoming changes in accordance with recent data. For this, the results show that the covid-19 pandemic victims will decrease in one week to come. Remember that the dataset was recorded for an entire year in its 52 weeks.

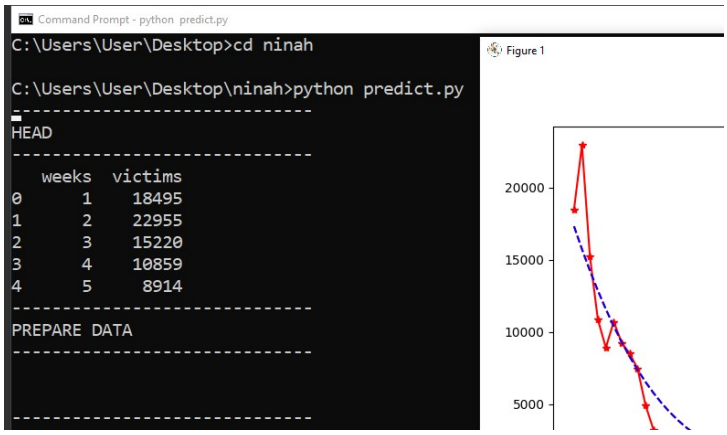

Figure: Prediction 2 (after 2 weeks)

The system predicted that the number of covid-19 victims will decrease in coming weeks. For this graph, the prediction of covid-19 pandemic victims will decrease by -30 in coming 2 weeks. The left pane shows the execution of the predictor in coming 2 weeks, while the right pane shows the graph of that prediction along with the best-fit line. Remember that we have used the second degree in multiple linear regression, which is a good idea instead of 1 degree or simply the linear regression.

4.4.5 Prediction 3 (after 3 weeks)

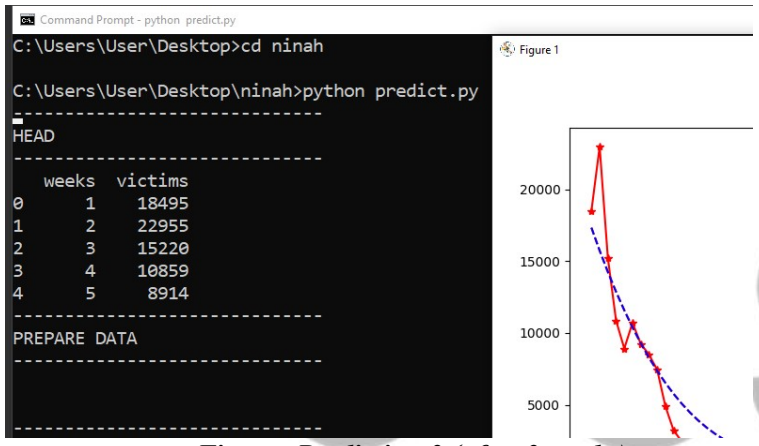

Figure: Prediction 3 (after 3 weeks)

As explained in previous lines, the red line represents the prediction of covid-19 pandemic victims while the blue line represents the best-fit. With the red line for prediction, it started with a big number of covid-19 victims but fortunately the victims were reduced as show on the graph. The system predicted that the number of covid-19 victims will decrease in coming weeks. For this graph, the red color represents the prediction of covid-19 pandemic victims, and the blue represents the best-fit line (as explained in previous lines). The system predicted that the number of covid-19 victims will decrease by -38 in coming 3 weeks.

4.4.6 Prediction 4 (after 5 weeks)

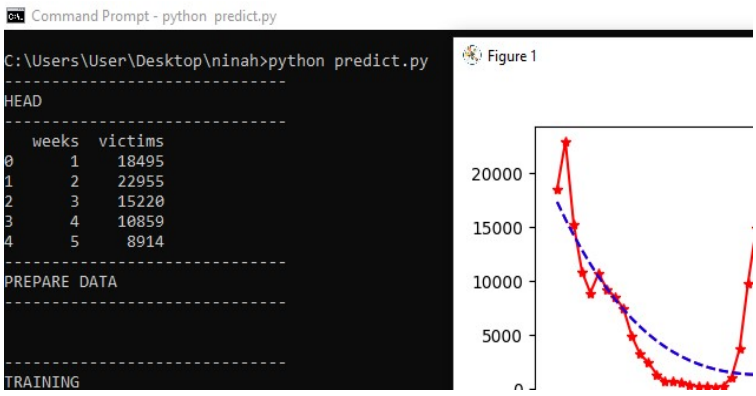

Figure: Prediction 4 (after 5 weeks)

For this graph, the red color represents the prediction of covid-19 pandemic victims, and the blue represents the best-fit line (as explained in previous lines). With the red line for prediction, the number of covid-19 victims fortunately the victims were reduced as show on the graph. Sometimes could increase but not on the high rate. The system predicted that the number of covid-19 victims will decrease by -56 in coming 5 weeks.

Conclusion

The drive of this research was to develop an extended model for predicting Covid-19 pandemic victims using artificial intelligence. This study presented an assortment of findings start with demographic findings. A great number (52%) of the respondents employed in this study were female and most of them (64%) were in middle age between 29-39 years old. The percentage of 66% (equal to 33 out of 50 respondents) had a bachelor degree. Furthermore, the dataset that was used to train the model to predict COVID-19 was gathered from an open source data shared by RBC/Airport Command Post, which contained information about patients with COVID-19 positive and these data have been used to train the model.
Different models have been used in predicting COVID-19. They mainly extract 3D features from the segmented 3D lung region using CT images. The obtained volumes were fed into the proposed DeCoVNet (3D deep Graphical processing unit to Detect COVID-19). The researcher has designed the model for predicting Covid-19 pandemic victims using artificial intelligence. The researcher used different methods to design the model. Many applications have been developed using Machine Learning in various fields such as healthcare, banking, military equipment, space etc. The model simulation indicated how the procedure of predicting Covid-19 pandemic victims using artificial intelligence was done. The dataset that was used to train the model to predict COVID-19 was gathered from an open source data shared by RBC/Airport Command Post. The data set contained information about patients with COVID-19 and these data have been used to train the model.

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