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CSC 578 “Class project”, Part (B) Survey Paper.

The role of Deep learning models in the prediction and analysis of COVID-19.

COVD-19 is an acronym derived from coronavirus disease 2019. It was in Wuhan City, Hubei Province where COVID-19 was first discovered (Hu et al., 2020). In 2020, there was less sufficient information on how this virus was transmitted , and the result was shuttering the worlds’ economies, closing schools, and changing people lifestyles all over the globe when most countries forced total lockdowns on its citizens. On 4,563,458 confirmed cases were reported (John Hopkins University, 2020). Different public health policies were being enforced by all countries to control the transmission of the virus at the expense of their economies. In underdeveloped countries like India, which are heavily populated, the virus was spreading at a high space (Arora et al., 2020). The Indian government implemented several lockdowns to try to contain the virus, which saw a reduction of in the number of cases (Mohfw, 2020).With fundings from the advanced world economies for example United States of America, Canada and Germany, medical organization were devoting all their resources in searching for a vaccine for this “novel coronavirus” (Arora et al., 2020).

Arora, Kumar, and Panigraphi (2020) claims that to enforce the adequate supply of Personal Protective Equipment, masks and other medical equipments like ventilators, public health officials did what they could to try and stop the virus, however, there was insufficient literature on the prediction of COVID-19. In China, numbers of COVID-19 deaths had been estimated with the use of Patient Information Based AI Algorithm (Wang et al., 2020). They also claim how the mortality rates would differentiate in respect to climate. For instance, based on the United States Spread analysis, they correlated temperatures and COVID-19 cases, where the justified results found a causal relationship “between weather parameters and COVID-19” mortality rates (Gupta et al., 2020). In the lieu of preventing the spread the disease, Auto Regressive Integrated Moving Average models were used in Spain to make short daily estimates (Ahmar & Val, 2020). Fanelli and Piazza (2020), used the Auto Regressive Integrated Moving Average models to predict the number of COVID-19 positive cases based on the different population segments, for example, susceptible, recovered, infected and dead: doing this helped public health officials in the better allocation of medical resources and equipment across the country. According to Reddy and Zhang (2020), “they have used deep learning models (LSTM) for predicting the end date of this epidemic in Canada. ” Arora, Kumar, and Panigraphi (2020) claim to have used Recurrent Neural networks and long short-term memory to predict the number of COVID-19 cases and the data sets they used did not come from all states of India so they are proposing to explore ways of coming up with a deep learning model for predicting the number of COVID-19 cases of all Indian states and they hope that their contribution could be adopted by other stake holders.

Arora et al. (2020) explored Recurrent Neural Networks and long short-term memory and its different forms, for example, stacked LSTM, Convolutional LSTM and Bidirectional LSTM. The author claims that not only are Recurrent Neural Networks known to have a short-term memory due to the fact they apply hidden layer activations before the prior time step, but they also have a problem with the gradient disappearance (Hochreiter & Schmidhuber, 1997). Arora et al.(2020) proposes Long short-term memory to be a stable methodology, which produces forecasts from data gathered over a certain period. Furthermore, the authors narrate how a combination of long short memory cells and Recurrent Neural Networks are used for long term memory storage since Recurrent Neural Networks have a limited storage capacity of information (Hochreiter & Schmidhuber, 1997). The data utilized comprised of thirty-two independent time-series-analysis data of identified COVID-19 cases from amongst twenty-eight states in India and four country territories with a period of 14 March 2020 to 14 May 2020 and this databank was sourced out of the Indian Government ministry website (Arora et al., 2020). Arora et al. (2020) explored a variety of Recurrent Neural Networks model designs, for example, staked LSTMs, Bi-directional LSTMs and Convolutional LSTMs, where they used to generate future predictions of yet to be identified cases of any region in India. To optimize the mean squared error loss, they used the Adam optimizer, and the test data set was utilized to evaluate the models’ error. Not only did they base their model on errors, but also, they used the largest accuracy to select the best time series model. Also, they used the Rectified Linear Unit activation function to solve the problem of gradient disappearance. Amongst the three variants of LSTM, Bi-directional LSTM had the lowest mean absolute error and they used it “for evaluating predictions of COVID-19 positive cases” (Arora et al., 2020).

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