

COVID-19 Pandemic: How to Use Artificial Intelligence to Choose Non-Vulnerable Workers for Positions with the Highest Possible Levels of Exposure to the Novel Coronavirus

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ABSTRACT

The COVID-19 pandemic has affected people globally; nowadays several countries are facing a major change in daily life due to universal quarantining, closed schools, social isolation, and shelter-in-place orders. In addition, this pandemic caused an economic crisis. International Labour Organization (ILO) reported that not only COVID-19 is a serious threat to public health but also the economic and social disruption of this crisis threatens the long-term livelihoods and wellbeing of millions of people. In this short paper, we introduce our hypothesis on using artificial intelligence (AI) technology to predict which employees are most vulnerable to the infections caused by the novel coronavirus (SARS-CoV-2). Such a system can be used in a wide variety of work places such as libraries, banks, drugstores, and hotel receptions to reduce the risk of severe infections in employees as well as to ensure the safety of labor force and the sustainability of businesses and jobs.

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Keywords

COVID-19; Coronavirus; Machine Learning; Prediction Model; Classification

Introduction

The Coronavirus disease 2019 (COVID-19) was first detected in early December 2019 in Wuhan, China [1]. This pandemic has affected people globally, regardless of their nations, races, and socioeconomic groups. Many countries now are facing a major change in daily life due to universal quarantining, closed schools, social isolation, and shelter-in-place orders [2]. The novel coronavirus (SARS-CoV-2) can be transmitted by respiratory droplets and physical contact. The incubation period for SARS-CoV-2 is around 3 to 7 days, but in some cases, this period can be as long as 24 days [3]. COVID-19 had quickly spread to

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different countries and as of April 6, 2020, it caused more than 60 000 deaths [4]. As of April 11, 2020, more than 1.6 million COVID-19 cases are reported globally. Scientists believe that currently it is not clear how or when COVID-19 tragedy will end. Data collected from 21 hospitals in Wuhan, China shows that among 168 patients who died, 75% were male. While the median age was 70 years, about 96% were older than 50 years. Moreover, about 74 had 1 or more comorbidities. The most common comorbidities were hypertension (50%), diabetes (25%), and ischemic heart disease (18.5%)[4]. Moreover, in Italy, among 1591 laboratory-confirmed COVID-19 patients admitted to ICUs of the Lombardy Region, the median age was 63 years and 82% were male. Furthermore, among 1043 patients with available data, 68% had at least one comorbidity (hypertension 49%) [5].

Economic Crisis

International Labour Organization (ILO) has announced recently that about 25 million jobs could be lost globally as a result of COVID-19 [6]. Given this consideration, COVID-19 not only created a health care crisis but an economic crisis. About 10 million people filed for unemployment insurance during the 2 weeks ending on March 28, 2020. Moreover, it has been suggested that the US economy will contract by 10- 25% during the second quarter. Now, there is a growing global concern over the economic costs of throwing a very large proportion of people out of work. A long-term lockdown can trigger a sharp rise in unemployment and hence, more domestic violence. ILO

believes that not only COVID-19 is a serious threat to public health, but the economic and social disruption of this crisis threatens the long-term livelihoods and wellbeing of millions of people.

AI Against COVID-19

Recent reports indicate that Artificial Intelligence (AI) can be introduced as a potentially powerful tool in the global fight against the COVID- 19 pandemic [7–10]. AI has also been introduced as an effective tool to accurately predict which newly infected patients will develop the severe respiratory disease (ARDS). Considering the growing capabilities of AI, we believe that AI techniques might help employers choose non-vulnerable workers for positions with the highest possible levels of exposure to the virus. In this short paper, we discuss how a local COVID-19 hospitalization/mortality database in each country can be used to estimate hospitalization and mortality risk for each worker. Therefore, in a library, a bank or a store, non-vulnerable employees can be selected for responsibilities with the highest probability of exposure to the virus.

Developing an AI model, in general, includes three steps: data collection, feature extraction/selection, and model development. Hospitalization/mortality database in each country or worldwide with laboratory-confirmed COVID-19 can be used as the database. In terms of features, we hypothesize that features from demographic, socio-economic and lifestyle factors, patient's health status, physiological data could be used as inputs of the AI-based model. Particularly, we propose using features such as gender, age, general medical

information such as comorbidities (diabetes, cardiovascular disease, respiratory disease, iron deficiency anemia), number of services, number of COVID-19 cases are reported in the vacancy of the office.

For feature selection and dimensionality reduction, well-known feature selection methods including filter method (univariate and multivariate) and wrapper method (forward selection, backward elimination or floating search methods) could be used [11]. The objective of this step is to remove irrelevant variables and select a subset of variables (predictors) for use in the predictive model construction. Feature selection step should be used to simplify the model, fasten the training process, avoid the curse of dimensionality, improve generalization (model's ability to predict the output for new data), and to make the model easier to interpret and understand by the users.

In terms of the model, several machine learning algorithms such as decision trees, support vector machines, Neural Networks, Random Forest, or Deep learning could be used as these models were successful tools in predicting medical conditions and adverse events even in the Patients with COVID-19 [6, 7, 9].

In short, in this letter we discussed how AI capabilities can assist employers/managers to decide which employees are most vulnerable to the virus and finally manage them. We believe that this AI-based model might be used in a wide variety of work places ranging from libraries, to banks, drug stores, and hotel receptions to reduce the risk of severe infections in employees as well as to ensure the safety of labor force and the sustainability of busi-

nesses and jobs.

Conflict of Interest

None declared by the authors

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