The Role of Artificial Intelligence in the Development of COVID-19 Vaccine

Dear Editor,

The coronavirus disease-2019 (COVID-19) pandemic is a phenomenon that has infected and killed many people in many countries. Vaccination has been suggested as a good way to fight COVID-19, and it is certainly important to design a safe and effective vaccine. In the healthcare system, artificial intelligence (AI) is emerging as an effective tool. The use of AI in diagnosing various health conditions and interpreting complex medical issues is very significant. AI capabilities can be used as an effective tool to study SARS-CoV-2 and its capabilities, virulence, and genome. For example, machine learning techniques such as neural networks and support vector machines can be used to identify antigens from protein sequences. Epidemic progression can also be tracked and patients monitored. Thus, AI accelerates research into the treatment of COVID-19.[1]

In a study conducted in Canada, a drive-through method which is a hybrid model consisting of a discrete event and an agent-based simulation was proposed as one of the effective temporary mass vaccinations among other methods. In this study, a machine learning model was presented which is based on a large data set derived from 125,000 runs of a drive-through mass vaccination simulation tool. The results show that this model can well predict the main outputs of the simulation tool. Thus, this model has become an online application that can help mass vaccination planners to more quickly evaluate the results of a variety of mass vaccination facilities.[2] Researchers in China have developed a deep learning-based drug screening method for novel coronavirus using Dense Convolutional Network (DenseNet) to predict interactions between proteins and ligands. This method helps predict which drug compounds will respond preferably well to the virus.[3] In a study conducted in the USA, potential COVID-19 vaccine candidates were predicted using the Vaxign-ML reverse vaccination machine learning platform, which relied on supervised classification models. The results showed that the predicted vaccine targets have the potential to produce an effective and safe COVID-19 vaccine.[4] A study was also conducted in the United Kingdom with the aim of training deep learning Recurrent Neural Networks (RNNs) to produce simulated spike protein sequences. In this study, RNNs were trained to present computer-simulated coronavirus spike protein sequences in the style of previously known sequences and to investigate their characteristics. This approach may provide a possible alternative to identifying vaccine design targets by creating spike sequences.[5]

Thus, for AI technology to be used in vaccine development, more attention needs to be paid to data collection in this area. In fact, by recording various data that represent the performance of the vaccine or information about proteins and interactions between them, space can be provided for the use of AI and machine learning techniques. Various solutions can be suggested. The first solution is to use simulation software, because this software can produce and evaluate large amounts of data at a very low cost. The second solution is to discuss proteins and the interactions between them. In this case, too, machine learning techniques can be used to predict these interactions.

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Conflicts of interest

There are no conflicts of interest.

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