

Role of Artificial Intelligence in Combating the Pandemic Covid 19 – A Perlustration

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Abstract

Artificial intelligence (AI) is a branch of computer science that deals with the problem-solving by the aid of symbolic programming. The use of artificial intelligence in pharmaceutical technology has increased over the years. It has greatly evolved into a science of problem-solving with huge applications in business, health care and engineering. The major advantage of AI is that it reduces the time and, in turn, reduces the costs that are associated with health care, enhances the returns on investment and may even cause a decrease in cost for the end-user. A large number of researches are being carried out to improve the current available AI technology. As the coronavirus outbreak continues to spread across the globe, researchers are looking to use artificial intelligence as a way of addressing the challenges of the virus. The present chapter briefly describes the importance of AI in combating COVID 19 and then looks at the various AI tools that are available.

Keywords: Artificial intelligence, Artificial Neural Network, BlueDoT, DeepMind, Health care, Covid 19

INTRODUCTION

Viral infections play an important role in human diseases and recent outbreaks in the advent of globalization and ease of travel have underscored their prevention as a critical issue in safeguarding public health. Despite the progress made in immunization and drug development, many viruses lack preventive vaccines and efficient antiviral therapies, which are often beset by the generation of viral escape mutants.

CoV is an enveloped, positive-sense single-stranded RNA (ss-RNA) virus belonging to the *Coronaviridae* family. Coronaviruses (CoV) are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). It is a new strain that was discovered in 2019 and has not been previously identified in humans. Coronaviruses are assumed to be zoonotic, meaning they are transmitted between animals and people. Common signs of infection include respiratory symptoms, fever, cough, shortness of breath and breathing difficulties. In more severe cases, infection can cause pneumonia, severe acute respiratory syndrome, kidney failure and even death.¹

GLOBAL STATUS OF COVID 19

Globally more than 39,00,000 confirmed cases of COVID-19 have been reported. In late December 2019 a cluster of patients was admitted to hospitals with an initial diagnosis of pneumonia of an unknown etiology in Wuhan, China. Studies indicated that the spread of COVID-19 was relatively quick and reported that it had spread to several other countries after its outbreak in China. On 31 January 2020, there were 213 deaths reported globally. The current status (as of 8th May) of corona virus around the world is about 39,76,655 confirmed cases, 2,73,932 confirmed deaths, 13,72,049 recovered cases and 213 Countries, areas or territories with cases as per WHO².

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is the study of complex information that processes problems that have their tools in some aspects of biological information processing. AI needs machine-learning, facilitates heightened diagnostic sensitivity, specificity and treatment³. The main aim of the subject is to identify useful information processing problems and give an abstract account of how to solve them. Machine Learning (ML) is one of the most exciting areas for the development of computational approaches to automatically make sense of data. Artificial Intelligence is defined as a branch of computer science that deals with problem-solving by the aid of symbolic programming. It deals with the design and application of algorithms for analysis of, learning from and interpreting data⁴.

ARTIFICIAL INTELLIGENCE IN MEDICINE

Artificial intelligence (AI) is now an emerging trend in the medical field. As the coronavirus outbreak continues to spread across the globe, researchers are looking to use artificial intelligence as a way of addressing the challenges of the virus. AI is slowly becoming a very integral part of the pharmaceutical industry as well as the health-care team⁵. With innumerable researches being carried out throughout the world to improve the efficiency of manufacturing and other health-care related activities, researchers are looking into the prospect of employing AI for every activity carried out. These tools are capable of functioning at a much faster rate and the chances of error that may occur with the use of these tools are negligible⁶. The bigger the health-care sector gets the more sophisticated and more technologically advanced infrastructure it will need. This means that the sector is going to rely heavily on AI for most of its future works. This is a good news from the point of view of productivity and efficiency. AI not only increases efficiency but also minimizes errors that are much more frequent when a human is handling the task. This, in turn, means a reduced wastage, better quality of the product and a larger profit margin for companies. This is one of the prime reasons

why the industry is getting more and more technologically advanced.⁷

ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL TECHNOLOGY

The use of artificial intelligence in pharmaceutical technology has increased over the years, and the use of technology can save time and money while providing a better understanding of the relationships between different formulation and process parameters. Neural networks, genetic algorithms, and fuzzy logic are rapidly growing technologies that could be applied to the formulation and processing of pharmaceutical products⁸. Over the last decade, increasing interest has been attracted towards the application of artificial intelligence (AI) technology for analysing and interpreting the biological or genetic information, accelerated drug discovery, and identification of the selective small molecule modulators or rare molecules and prediction of their behaviour⁹. Application of the automated workflows and databases for rapid analysis of the huge amount of data and artificial neural networks (ANNS) for development of novel hypotheses and treatment strategies, prediction of disease progression, and evaluation of the pharmacological profiles of drug candidates may significantly improve treatment outcomes. Target fishing (TF) by rapid prediction or identification of the biological targets might be of great help for linking targets to the novel compounds. AI and TF methods in association with human expertise may indeed revolutionize the current theranostic strategies, meanwhile, validation approaches are necessary to overcome the potential challenges and ensure higher accuracy¹⁰.

ARTIFICIAL INTELLIGENCE IN DRUG DISCOVERY

Cherkasov investigated the preparation of small peptides having broad-spectrum antibiotic activity by using the information on chemical biology that has been accumulated. By the application of peptide array technology and utilizing the composition of the amino acid of the peptides which are more active, they randomly prepared two large libraries of 9-amino-acid peptides. The collected data were used in combination with Artificial Neural Networks, which are electronic models of the brain's neural structure, thus creating *insilico* models that represented antibiotic activity¹¹. When carrying out random sampling analysis, these models were found to be very successful in the prediction of 1,00,000 virtual peptides activity. Some of the peptides that were predicted as pinnacle candidates were also shown to be highly effective against a large number of "Superbugs" that are multidrug-resistant and had activities equal to or even better than four of the most frequently used antibiotics¹². The structure-activity relationship (SAR) of organic molecules was studied by Klopman. He suggested a new paradigm meant for structure evaluation is computer-automated, and it recognizes structures of molecules from the KLN code, which is a linear coding routine of the molecule, automatically and then further identifies, tabulates and analyzes biophores, which are substructures

that are actually responsible for the biological activity of the molecules, statistically. It was applied for studying the carcinogenicity of polycyclic aromatic hydrocarbons, ketoxime carbamates' pesticides activity and carcinogenicity of N-nitrosamine in rats¹³.

Another milestone in predicting pharmacological activities of several drugs was the utilization of Deep Neural Networks (DNNs) was studied by Aliper¹⁴. The group of scientists trained DNNs such that it could be utilized for the prediction of the therapeutic use of several drugs using data of gene expression. These data were obtained from experiments on human cell lines. DNN was found to be highly accurate in classifying drugs into different therapeutic categories and also it finds application in recognition of pharmacological properties of several drugs¹⁵.

ARTIFICIAL INTELLIGENCE IN COMBATING CORONA

There are many areas where AI can contribute to the fight against COVID-19. Few are listed here

- i) early warnings and alerts
- ii) tracking and prediction
- iii) data dashboards
- iv) diagnosis and prognosis
- v) treatments, and cures
- vi) social control

For the first time in a pandemic, Artificial Intelligence (AI) is playing a role like never before in areas ranging from diagnosing risk to doubt-clearing, from delivery of services to drug discovery in tackling the Covid-19 outbreak.

SOME AIS ON TRACK

Artificial-intelligence systems were thought to be among the first to detect that the coronavirus outbreak, back when it was still localised to the Chinese city of Wuhan, could become a full-on global pandemic. Some Artificial-intelligence systems in use are

DeepMind, the AI arm of Google's parent company Alphabet, is using data on genomes to predict organisms' protein structure, potentially shedding light on which drugs could work against COVID-19¹⁶.

Canadian startup Darwin AI has developed a neural network that can screen X-rays for signs of COVID-19 infection.

While using swabs from patients is the default for testing for coronavirus, analysing chest X-rays could offer an alternative to hospitals that don't have enough staff or testing kits to process all their patients quickly.

From a lung CT scan, the AI is designed to quickly detect lesions of possible coronavirus pneumonia, to measure its volume, shape and density, and to compare changes of multiple lung lesions from the image, which all provide a quantitative report to assist doctors making fast judgement.

While a manual read of a CT scan can take up to 15 minutes, AI can finish reading the image in 10 seconds. Application of this technology in COVID-19 has not yet been published

When there are too many cases to test and PCR-based diagnosis takes too long (sometimes over a week), CT imaging with AI could serve as a surrogate for doctors when fast judgement is needed. Doctors no longer need to engage in the lengthy process of manually reading images one by one to identify high risk cases, while coronavirus-probable patients wait around the hospital posing a severe risk of infecting other patients and hospital staff.

BlueDoT, a Canadian health monitoring firm that crunches flight data and news reports using AI, is being credited by international reports to be the first to warn its clients of an impending outbreak on December 31, beating countries and international developmental agencies, the Indian tech space too is buzzing with coronavirus cracking activities.

ARTIFICIAL INTELLIGENCE IN INDIA

CoRover, a start-up in the AI space that has earlier developed chatbots for railways ticketing platform, has now created a video-bot by collaborating with a doctor from Fortis Healthcare. In this platform, a real doctor from Fortis Healthcare not a cartoon or an invisible knowledge bank will take questions from people about Covid-19¹⁷.

Apollo Hospitals has come up with a risk assessment scanner for Covid-19, which is available in six languages and guides people about the potential risk of having the virus.

The Jaipur-based Sawai Man Singh Hospital is trying out a robot, made by robot maker Club First, to serve food and medicines to patients to lower the exposure of health workers to coronavirus patients.

This is the first time in healthcare that Artificial Intelligence, Machine Learning, and Natural Language Processing are being used to create a Virtual Conversational AI platform, which assists anyone to be able to interact with doctors and have their queries answered unlike other search engines, which do not guarantee the authenticity of information.

ARTIFICIAL INTELLIGENCE IN DISCOVERING DRUG FOR COVID 19

Another start-up, Innoplexus AG, headquartered in Germany but founded by Indians, is claiming that its AI-enabled drug discovery platform is helping to arrive at combinations of existing drugs that may prove more efficacious in treating Covid-19 cases.

Its AI platform, after scanning the 'entire universe of Covid-related data' has thrown up results to show that Hydroxychloroquine or Chloroquine, an anti-malaria drug that is being prescribed as a prophylactic for coronavirus under many protocols works more effectively with some other existing drugs than when it is used alone¹⁸.

Analysis shows that Chloroquine works more effectively in combination with Pegasys (a drug used to treat Hepatitis C) or Tocilizumab (a rheumatoid arthritis drug) or Remdesivir (yet to be approved antiviral drug for Ebola) or Clarithromycin (an antibiotic).

ADVANTAGES OF AI IN COVID 19

AI would have low error rate compared to humans, if coded properly. They would have incredible precision, accuracy and speed. They won't be affected by hostile environments, thus able to complete dangerous tasks, explore in space and endure problems that would injure or kill us. Use of artificial intelligence in fighting the pandemic corona virus will definitely help to abate the spread of the virus because of involvement of robots instead of human. AI can accelerate both the processes of discovering new drugs as well as for repurposing existing drugs.¹⁹

LIMITATIONS OF ARTIFICIAL INTELLIGENCE

Although use of artificial intelligence has several advantages it has got certain limitations like implementing AI is the availability of data. Lack of data, too much outlier data and noisy social media, big data hubris, and algorithmic dynamics, AI forecasts of the spread of COVID-19 are not yet very accurate or reliable. Data is often siloed or inconsistent and of poor quality, all of which presents challenges for businesses. If we look at this from the point of view of human employment, then we will be forced to think that substituting humans for machines will mean large-scale unemployment and soon all the activities that were once a human job will be a part of AI's job. As Stephen Hawking said, "this may mean the end of the human race". Hence, AI should be brought into health care but AI should be made such that it works in coordination with humans²⁰.

CONCLUSION AND FUTURE PERSPECTIVES

Artificial Intelligence is broadly defined here as a field that deals with the design and application of algorithms for analysis of, learning from and interpretation of data. AI integrates many branches of statistical and machine learning, pattern recognition, logic and probability theory as well as biologically motivated approaches, such as neural networks, evolutionary computing or fuzzy modeling, collectively described as "computational intelligence." ANNs are a great tool in data analysis and modeling. It is said that a human being is the most sophisticated machine that can ever be created. Everyone would have agreed to this line a few decades ago. However, the scenario, today, has changed drastically. Humans are no longer considered the most sophisticated machines. The human brain, which is believed to be the most complex network of knowledge, is working hard to create something that is much more efficient than a human being in doing any given task and it has succeeded to a great extent in doing so. AI is slowly becoming a very integral part of the pharmaceutical industry as well as the health-care team. With innumerable researches being carried out throughout the world to improve the efficiency of manufacturing and other health-care related activities, researchers are looking into the prospect of employing AI for every activity carried out. The AI tools like Watson for oncology, tug robot and robotic pharmacy has changed the face of the profession considerably. These tools are capable of functioning at a much faster rate and the

chances of error that may occur with the use of these tools are negligible. Thus, to conclude AI is playing a significant role in the fight against COVID-19 and it can be increased by providing proper training to many people to avoid the spread of the pandemic.

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