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Short Communication

Artificial Intelligence and Pandemics

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Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. It is also known as Machine Intelligence which is any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals. An intelligent agent should be skilled in perception, practical reasoning and have an ability to take action to achieve its goals. It incorporates the skills required to pass the Turing Test, which assesses whether a machine can think like a human? AI makes it possible for machines to learn from experience, adjust to new inputs and perform human-like tasks. The goals of artificial intelligence include learning, reasoning, and perception. AI has the potential to help in all the stages of healthcare, from syndromic surveillance through to rapid diagnosis tests and faster drug development. The ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a specific goal. It's of two types. The weak AI systems are designed to carry out one particular job whereas strong AI systems can carry on the tasks considered to be human-like; without having a person's intervention. These tend to be more complex and complicated systems and involve deep learning which is done through a neural network. AI is being used for all the three classical medical tasks: diagnosis, prognosis and therapy. AI can predict and diagnose disease at a faster rate than most medical professionals. AI-driven software can be programmed to accurately spot signs of a certain disease in medical images such as MRIs, x-rays, and CT scans. In 2018, researchers at Seoul National University Hospital and College of Medicine developed an AI algorithm called DLAD (Deep Learning based Automatic Detection) to analyze chest radiographs and detect abnormal cell growth, such as potential cancers. Enlitic develops deep learning medical tools to streamline radiology diagnoses; Freenome uses AI in screenings, diagnostic tests and blood work to test for cancer. When it comes to infectious diseases, prevention, surveillance and rapid-response efforts can go a long way towards slowing or stalling outbreaks. AI is being incorporated into the first lines of defense in the pandemic by projecting the spread of the virus, and thus can take steps to combat this crisis only if we know. Artificial intelligence can help predict the conditions and locations where spillovers of known and unknown pathogens might occur. AI can predict hotspots around the world where the virus could make the jump from animals to humans. Once a known outbreak has been identified, health officials can use AI to predict how the virus is going to spread based on environmental conditions, access to healthcare, and the way it is transmitted. This allows governments and agencies to plan ahead and ban or educate against high-risk activities. When it comes to outbreak detections, AI-based models can be developed and trained to analyze massive amounts of data from heterogeneous sources, taking on a task that typically requires human experts to work tirelessly around the clock and with incredible speed. This is the real strength of AI-based methods, making analysis more efficient and scalable, complementing and learning from human intelligence to support timely decision making. BlueDot Inc., a Canadian software company, during the 2009 H1N1 Influenza pandemic, correctly made predictions using worldwide air travel data to anticipate the global pathway of the outbreak. The company was also instrumental during the 2014

Ebola outbreak where, using risk assessment models, it was near perfect in predicting the spread of Ebola in West Africa. In 2016, six months prior, BlueDot was able to correctly predict that the Zika virus outbreak would be experienced in Florida. It has its applications in Prediction of viral mutation even before a new strain has even emerged, Identification of potential viral proteins from the sequence, Drug development for the potential candidate search. A program developed by Salama's group could predict nucleotide substitutions in primary RNA sequences of the Newcastle disease virus (Avian pneumoencephalitis) using a rough set gene evolution technique. DeepMind, a UK technology company, developed a new protein structure prediction system called Alpha Fold using AI methodology. The program trains a neural network to predict the distances between protein residues within a sequence. Then, after applying an optimization algorithm, the system folds the protein into a calculated structure. Such structure predictions could lead to a much wider availability of structural information compared with older techniques, and may be especially useful where no experimentally determined homologous protein structures are available. Drug discovery is expensive and time consuming, but AI can shorten the process and increase efficiency using neural networks. Neural networks are trained to generate chemically feasible compounds and predict their chemical properties. In-silico screening utilizes a solved viral protein structure and specific computer programs to screen for drugs that can bind the viral proteins (typically an active domain) and potentially inhibit the virus replication. Biosurveillance is the science of early detection and prevention of a disease outbreak in the community. Analytics, machine learning, and natural language processing (NLP) are being increasingly used in biosurveillance. Scanning social media, news reports and other online data can be used to detect localized disease outbreaks before they even reach the level of pandemics.