Letter to the Editor
Machine Learning in Public Health

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Dear Editor

As an artificial intelligence (AI) branch, machine learning has pioneering applications in public health, ranging from disease diagnosis to epidemic prediction. Machine learning (ML) is a strategic lever to improve care services' access, quality, and efficiency and create health systems based on learning and value. In the following, we mention only a part of ML assistance in public health.

ML programs have dominated medicine in many ways. It has extensively been used in image classification and natural language processing. Medical image processing is a way to diagnose many diseases. ML can help specialists with deep and accurate image analysis to diagnose diseases better and earlier [1].

Using ML to generate automated early warnings in epidemic surveillance by leveraging vast open-source data with minimal human intervention has the potential to be both revolutionary and highly sustainable. ML can overcome the challenges facing weak health systems by detecting signals of epidemics much earlier than traditional surveillance [2].

ML for big data in public health has emerged as a powerful tool for analyzing and extracting valuable insights from large and complex datasets.

This technology can revolutionize public health by enabling researchers and policymakers to make data-driven decisions and develop targeted interventions. Machine learning holds great promise for large data analysis in public health. Its ability to process large datasets quickly and identify complex patterns makes it an invaluable tool for detecting diseases, predicting outbreaks, personalizing treatments, and informing public health policies [3].

Another example of the application is precision medicine, where clinical trials are based on patient selection based on DNA profiles that provide biomarkers for targeted therapy rather than a standardized approach applied to the entire population. ML aims to identify patterns in the large and complex datasets generated using precision medicine. It can be used to make predictions or classifications on new unseen data or for advanced exploratory data analysis. ML analysis of precision medicine's multi-modal data allows for broad analysis of large datasets and, ultimately, a comprehensive understanding of human health and disease [4].

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Machine learning can be applied to health monitoring and surveillance by analyzing data from wearable devices, electronic health records, and social media to monitor population health trends and identify potential public health threats [5].

The development and introduction of new drugs is another example. ML can analyze large datasets of chemical compounds and their biological effects, helping researchers identify potential new medicines and accelerate drug development [6].

Due to the complex and non-linear behavior of diseases, which reduces predictability and the comorbidities in some patients, it is difficult and sometimes impossible to analyze medical information with classical methods [7]. Therefore, the need for machine learning is felt more than ever today. AI and ML methods allow for extracting information from deep data and the integration of the opinions of different experts. In addition, one of the essential advantages of ML is that it improves its performance and the possibility of updating according to experts' latest findings and experiences. Considering the importance of the health of the global community, the occurrence of various diseases and their different mutations, the staggering costs of treatment, and the lack of specialists in some fields of therapy in underdeveloped countries, a system is required to provide the health services with the lowest cost along with the right quality and accuracy. Machine learning has all of these capabilities. AI and ML can create significant changes and effects at different levels: Technological, clinical, human and cognitive (patient and doctor), professional and organizational, economic, and even legal and ethical.

We strongly believe that the application of AI and ML in medicine has helped health and improved the quality of public health. Machine learning will revolutionize the medical industry in the future.

Besides the importance of using ML in public health, it is necessary to pay attention to the challenges and limitations in this field. Data quality and availability, privacy and ethical concerns, resource constraints, regulatory hurdles, and integration with existing systems are some critical issues that should be considered [8].

This article suggests that AI-based systems should be seen as a solution for transforming the health system. The analysis of extensive data, widely used in public health and medicine, is impossible with classical models. However, ML is a solution for analyzing large amounts of data.

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