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A Comprehensive Review on Artificial Intelligence and Analytics in Public Health

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Abstract

This review paper investigates the crucial role of artificial intelligence (AI) and analytics in improving healthcare for everybody, with a focus on public health. The paper begins by presenting the notion of artificial intelligence (AI) and its role in improving healthcare. It then examines the various interventions of AI in various aspects of healthcare, including predictive modelling, epidemiological analysis, diagnosis and treatment planning, healthcare system management, public health policy, clinical research, health promotion, disease prevention, precision medicine, drug discovery and development, public health emergency response, and mental health.

The article concludes that artificial intelligence and analytics offer enormous promise to revolutionise healthcare and enhance patient outcomes, while also underlining the obstacles and ethical considerations that must be addressed to ensure that these technologies are utilised responsibly and equitably.

Keywords: Artificial Intelligence, Analytics, Public Health, Healthcare

1. Introduction

In order to increase health outcomes, improve decision-making, and address public health issues, analytics and artificial intelligence (AI) are being used more and more in the field of public health. Tools for public health analytics and AI can be used to spot patterns and trends, forecast health concerns, focus actions, and enhance the quality of healthcare services.

The diagnosis and management of infectious diseases is one application of analytics and AI in public health. For instance, AI-based algorithms can be used to analyse data from various sources, including social media, public health monitoring systems, and electronic health records, to find outbreaks and track their progress. Additionally, populations with a high risk of infection can be identified using predictive analytics, and AI techniques can be used to optimise vaccination distribution and assess the effectiveness of interventions.

Personalised medicine is a further use for analytics and AI in public health. AI can assist in the identification of efficient treatment choices specific to particular patients by analysing vast volumes of data on patients' health state, medical history, and genetic information. When treating chronic illnesses like diabetes, cancer, and cardiovascular disease, where personalised treatment programmes might enhance health results, this strategy is very helpful.

Numerous advantages of analytics and AI in public health include enhanced disease surveillance, rapid epidemic detection, and precise risk assessment. Other advantages include better decision-making, improved health care delivery, and resource utilisation that is more effective. Public health professionals can respond swiftly to changing situations by using real-time monitoring and evaluation of health treatments made possible by AI and analytics.

For enhancing health outcomes and tackling issues in public health, the combination of analytics and AI offers a lot of promise. To fully utilise these technologies, however, it is crucial to address the issues related to their use and make sure that their implementation is morally and fairly distributed.

2. The role of Data Analytics in Public Health

In order to discover patterns and trends in health outcomes, identify disease risk factors, and create evidence-based interventions to enhance health outcomes for populations, researchers and practitioners must use data analytics. The subject of public health data analytics has changed recently as a result of the accessibility of huge datasets, improvements in computing techniques, and machine learning.

Disease surveillance and epidemic detection are two areas where data analytics has proven extremely useful. For instance, researchers have analysed social media data using machine learning algorithms to spot signs of infectious disease outbreaks immediately, similar to how data from electronic health records and hospital admissions can be used to analyse the success of public health initiatives, monitor disease incidence, and spot patterns in disease transmission.

The identification of risk variables for a variety of health outcomes, including chronic illnesses like diabetes and cardiovascular disease, has also been done using data analytics. For instance, to identify diabetes risk factors and create individualised prevention plans, researchers have utilised machine learning algorithms to analyse enormous datasets of environmental and health data. Analysing data has also been used to pinpoint social and geographic inequalities in health outcomes, assisting public health professionals in creating more focused interventions to increase health equity.

The creation and assessment of health interventions is a significant additional use of data analytics in public health. For instance, researchers have developed individualised treatments to encourage physical activity and healthy eating using machine learning algorithms to analyse big databases of health behaviour data. Analysing data on health outcomes and intervention uptake, data analytics has also been used to assess the efficacy of public health interventions, such as vaccine campaigns and health promotion programmes.

In the realm of public health, data analytics is becoming a more crucial tool since it offers insightful information on disease surveillance, risk factors, health disparities, and interventions. As data availability and processing capacity continue to rise, the use of data analytics in public health is going to become more and more crucial.

3. Interventions of AI in Different Aspects of Healthcare

3.1 Predictive Modelling in Public Health

In order to anticipate the spread of diseases, the efficacy of interventions, and the health outcomes of populations, predictive modelling in public health uses mathematical models. These models can be used to influence public health policies and strategies because they are often based on epidemiological data.

The application of mathematical models to forecast the spread of infectious illnesses is one instance of predictive modelling in public health. For instance, it is typical practise to simulate the transmission of infectious diseases like influenza, measles, and Covid-19 using the SIR model (Susceptible-Infected-Recovered). The proportion of the population that is vulnerable to the disease, the proportion that is infected, and the proportion that has recovered and developed an immunity are all taken into account by this model. The SIR model can forecast how the disease will spread over time and how effective various interventions may be by taking into account aspects like the infectiousness of the disease, the rate of contact between persons, and the efficiency of interventions like immunisation.

The application of machine learning algorithms to forecast health outcomes is another instance of predictive modelling in public health. One study that employed machine learning algorithms to identify which heart failure patients were most likely to be readmitted to the hospital within 30 days after release was one that was published in the Journal of the American Medical Association. Age, race, comorbidities, and medication use were among the parameters the researchers found to be predictive of readmission using a dataset of more than 6,000 individuals.

Predictive modelling can also be used to assess how well public health measures are working. For instance, a study that appeared in the Lancet employed a mathematical model to assess the effects of a potential TB vaccination in India. The vaccination, according to the model, would be economical and could, over a 20-year period, cut the incidence of TB by up to 40%.

Predictive modelling can offer useful insights into the consequences of public health, but it's crucial to remember that these models are based on assumptions and may not always be reliable predictors of actual results. As fresh data becomes available, it is essential to continuously assess and improve these models.

Predictive modelling is an effective tool for research and policy creation in public health. Public health authorities can make decisions that will improve the health of communities by utilising mathematical models to forecast disease spread, health outcomes, and the efficacy of interventions.

3.2 Epidemiological Analysis with AI

Epidemiology is the study of the prevalence and causes of health-related conditions or occurrences in communities, as well as the use of this knowledge to manage health issues. It is a vital area of public health that aids in the detection, comprehension, and management of disease transmission. To find patterns and trends in health-related events, epidemiological analysis entails gathering, analysing, and interpreting data.

In order to increase the precision and speed of data analysis, disease surveillance, and epidemic identification, AI is increasingly being employed in epidemiological analysis. Artificial intelligence (AI) methods like machine learning, natural language processing, and deep learning can analyse vast amounts of data from several sources to spot patterns and trends that human analysts might miss. AI can also be used to identify at-risk populations and predict the possibility of future disease outbreaks.

The creation of machine learning algorithms to forecast the spread of infectious illnesses is one example of how AI is used in epidemiological study. For instance, in a 2018 study, machine learning algorithms were employed to forecast the development of dengue fever in Brazil. The study forecasted the possibility of dengue outbreaks in various geographic areas of the nation using data on dengue cases and weather trends. In terms of forecasting the spread of dengue fever, the machine learning method was found to be more reliable than conventional statistical models.

The use of natural language processing tools to analyse social media data for the early detection of disease outbreaks is another example of how AI is being used in epidemiological study. In order to identify the early spread of flu-like symptoms, a 2019 study analysed Twitter data using natural language processing techniques. The study discovered that, compared to conventional disease surveillance methods, Twitter data can be utilised to forecast the development of flu-like symptoms up to two weeks in advance.

To find patterns and trends in the occurrence of diseases and the effectiveness of treatments, AI can also be used to analyse sizable datasets from electronic health records (EHRs). In a 2020 study, EHRs were analysed using machine learning algorithms to find heart disease risk factors. The study discovered that using EHR data, machine learning algorithms could precisely forecast the possibility of cardiac disease.

The detection of disease outbreaks and disease surveillance could be revolutionised by the application of AI in epidemiological studies. Large data sets from numerous sources can be analysed using AI approaches to spot patterns and trends in health-related occurrences. AI may also be used to identify at-risk populations and forecast the possibility of future disease outbreaks. However, there are drawbacks to using AI in epidemiological study, such as algorithm bias and issues with data quality and privacy. To guarantee that AI is used to public health in a responsible and efficient manner, these issues must be resolved.

3.3 AI-assisted Diagnosis and Treatment Planning

Artificial intelligence (AI)-assisted diagnosis and treatment planning is a growing discipline in healthcare that makes use of this technology to help doctors make more precise diagnoses and design efficient treatment regimens. AI can assist healthcare professionals in swiftly and accurately analysing vast amounts of data, which will enhance patient outcomes as more and more medical data is created.

Different kinds of AI models are available that can help in diagnosis and planning treatments. One such model is machine learning, which involves training a computer program on a large dataset of medical images or patient data, allowing it to identify patterns and make predictions based on the data it has been trained on. Natural language processing (NLP), which may be used to analyse and understand text-based medical records, is another form of AI model.

Radiology is one area where AI-assisted diagnosis and treatment planning is being applied. AI is capable of analysing medical pictures like X-rays, CT scans, and MRI scans to find anomalies and help with diagnoses. For instance, a recent study indicated that an AI system had a diagnosis accuracy of 94.5% for breast cancer in mammography, compared to 88.4% for human radiologists. Another study discovered that an AI system had a 94% accuracy rate for diagnosing lung cancer in CT images, compared to a 91% accuracy rate for human radiologists.

AI-assisted diagnosis and treatment planning can also be applied to personalised medicine, in which a patient's genetic profile, medical history, and other aspects are taken into account when creating a treatment plan. AI is able to analyse vast volumes of patient data to find trends and forecast which treatments would likely be most successful for a given patient. One study, for instance, employed artificial intelligence to analyse the medical records of almost 700,000 patients to determine which drugs were most beneficial for treating type 2 diabetic patients, resulting in more specialised treatment programmes.

Implementing AI-assisted diagnostic and treatment planning in healthcare is not without its difficulties, though. The necessity for high-quality data is one of the biggest obstacles. To be trained effectively, AI models need a lot of high-quality data, and if that data is biassed, erroneous, or lacking in some other way, the AI model may not be accurate. A further difficulty is the requirement to integrate AI with current healthcare workflows and systems, which can be difficult and time-consuming.

AI-assisted diagnosis and treatment planning has the potential to revolutionise healthcare by enhancing diagnostic accuracy, establishing personalised treatment plans, and lowering healthcare costs. However, there are obstacles to overcome, and continual research is required to ensure that AI is used efficiently and safely in healthcare.

3.4 AI in Healthcare System Management

Because of its potential to improve patient outcomes, increase efficiency, and reduce costs, artificial intelligence (AI) has become a hot topic in healthcare system management. AI technology may be used to diagnose diseases, create personalised treatment plans, manage medications, and monitor patients.

One of the key advantages of AI in healthcare is its capacity to swiftly and accurately analyse large amounts of data. This is particularly beneficial for diagnosing complex disorders and detecting patterns in patient data that would otherwise go undiscovered. For example, AI algorithms can analyse medical images and find anomalies that human radiologists may miss. This can assist doctors in developing more accurate diagnosis and treatment regimens.

AI can also be used to tailor treatment strategies to a patient's specific traits and medical history. AI systems can identify which medicines are most beneficial for specific patient populations by analysing enormous databases. This can result in better outcomes and lower healthcare expenses.

AI can be utilised to improve drug management in addition to diagnosis and treatment. AI-powered systems, for example, can assist clinicians in identifying potential drug interactions and side effects, as well as suggesting

alternative treatments if necessary. This can assist to prevent adverse outcomes and ensure that patients receive the best drugs possible.

Patient monitoring is another area where AI can be useful. AI systems can discover early warning indications of deterioration and alert healthcare personnel before a major event occurs by analysing patient data in real-time. This can assist to prevent hospital readmissions and problems.

Despite the potential benefits of artificial intelligence in healthcare, there are some issues to consider. One source of concern is the possibility of bias in AI systems. If the data used to train the algorithm is skewed, the algorithm may be skewed as well, resulting in inaccurate diagnoses or treatment suggestions. There are also issues regarding data privacy and security, as AI systems rely on significant amounts of medical data to function.

By enhancing diagnosis, treatment, drug administration, and patient monitoring, AI has the potential to revolutionise healthcare system management. While there are obstacles to overcome, ongoing research and development in this sector will most certainly result in even more powerful and successful AI systems in the future.

3.5 Public Health Policy and Analytics

Public health policy and analytics are critical components of the healthcare system that ensure the general public receives high-quality healthcare. Governments, healthcare organisations, and other stakeholders make choices and take activities to promote and safeguard the population's health and well-being. Public health analytics, on the other hand, entails the systematic collecting, analysis, and interpretation of healthcare data in order to increase understanding of public health issues and guide policy decisions.

In order to solve healthcare difficulties such as disease outbreaks, chronic diseases, health inequities, and environmental health hazards, public health policies and analytics are necessary. Analytics give evidence-based insights into the causes and impacts of health problems, while policies guide resource allocation and intervention execution to address these issues.

The COVID-19 pandemic is one example of the use of public health policy and analytics. Analytics was critical in tracking the virus's progress, identifying vulnerable people, and forecasting the impact of various policy responses. Analytics-generated evidence was used to implement public health initiatives like as vaccination programmes, social distance, and mask regulations.

Chronic diseases such as diabetes, heart disease, and cancer have also been addressed using public health policy and analytics. Analytics aid in the identification of risk factors, the monitoring of illness trends, and the evaluation of the effectiveness of prevention and treatment programmes. Based on the insights given by analytics, policies such as healthy lifestyle initiatives, screening programmes, and access to healthcare services have been introduced.

Another area where public health policy and analytics are critical is environmental health. Environmental health threats such as air and water pollution, hazardous compounds, and climate change can be identified using

analytics. Analytics-generated evidence is used to implement policies such as environmental restrictions, public education campaigns, and community initiatives.

Public health policy and analytics are critical for tackling healthcare concerns and enhancing population health and well-being. The combination of these two elements has the potential to result in evidence-based policy, effective interventions, and improved healthcare outcomes. To secure a healthy future for all, policymakers, healthcare organisations, and other stakeholders must prioritise public health policy and analytics.

3.6 AI in Clinical Research

AI has the potential to transform clinical research by enabling the analysis of massive amounts of data, lowering costs, and improving patient outcomes. In my book, I will examine the existing applications of AI in clinical research, as well as the hurdles that must be overcome in order to fully realise the technology's potential.

Artificial intelligence has been used in a number of clinical research tasks, including patient recruiting, study design, data analysis, and clinical decision-making. In drug discovery, for example, machine learning algorithms can identify promising drug candidates and forecast their efficacy and toxicity. This can help to speed the drug discovery process and lower the probability of clinical trial failure. Another case in point is patient recruitment, where AI can assist in identifying eligible people for clinical trials, thereby speeding up recruitment and lowering expenses.

AI may also be used to analyse massive volumes of patient data to uncover patterns and trends that human analysts may miss. AI, for example, can analyse electronic health records to identify people at risk of acquiring a specific disease, allowing for early intervention and improved patient outcomes. AI may also analyse clinical trial data to find factors that influence patient results, enabling more personalised treatment strategies.

However, various hurdles must be overcome before AI's full potential in clinical research can be realised. One difficulty is the lack of high-quality data. AI algorithms require vast volumes of high-quality data to be effective, and obtaining such data from clinical trials can be difficult. There are also issues regarding data privacy and security, as well as the possibility of bias in AI systems.

Another barrier to overcome is the requirement for regulatory approval of AI algorithms in clinical research. As AI algorithms become more integrated into clinical research, precise rules and regulations are required to assure their safety and effectiveness.

AI has the potential to transform clinical research by making enormous amounts of data easier to analyse, lowering costs, and increasing patient outcomes. However, various hurdles must be overcome in order to fully realise the potential of this technology. It is critical that academics continue to focus on developing AI algorithms that are safe, effective, and compliant with regulatory requirements.

3.7 AI and Analytics in Health Promotion and Disease Prevention

AI and analytics are increasingly being utilised to assist healthcare practitioners and policymakers in making data-driven decisions in the realm of health promotion and illness prevention. AI is described as machines' ability to execute activities that normally require human intelligence, such as pattern recognition and data prediction.

Analytics, on the other hand, refers to the process of analysing data in order to extract insights and make sound judgements.

The analysis of large-scale datasets to uncover patterns and risk factors linked with various diseases is one of the key uses of AI and analytics in health promotion and disease prevention. Machine learning algorithms, for example, can analyse electronic health information to identify people at high risk of developing chronic conditions like diabetes or heart disease. This data can then be utilised to create tailored therapies to help avoid the start of certain diseases.

The development of personalised interventions is another application of AI and analytics in health promotion and illness prevention. Data from wearable devices such as fitness trackers and smartwatches can be analysed by AI algorithms to deliver personalised suggestions for physical activity, nutrition, and sleep. These guidelines can be adapted to a person's personal health goals and can aid in the prevention of chronic diseases.

AI and analytics can also be utilised to improve healthcare delivery efficiency. Predictive analytics, for example, can be used to forecast demand for healthcare services, allowing providers to allocate resources more effectively. Chatbots powered by AI can also be used to offer basic health information to patients and answer their queries, freeing up healthcare experts to focus on more difficult cases.

However, there are several drawbacks to using AI and analytics in health promotion and illness prevention. One of the most significant difficulties is data quality. To make accurate predictions and suggestions, AI systems require a vast amount of high-quality data. However, concerns such as missing data, data mistakes, and prejudice might jeopardise data quality. As a result, it is critical to guarantee that data is gathered and analysed in a thorough and systematic manner.

Another issue to consider is the ethical implications of AI and analytics. Concerns have been raised concerning privacy and data security, as well as the possibility that AI algorithms would perpetuate and exacerbate existing biases. As a result, it is critical to guarantee that AI and analytics are used ethically and responsibly.

AI and analytics have the potential to transform the field of health promotion and illness prevention by offering significant information and recommendations to healthcare providers and policymakers. However, there are some issues that must be addressed in order to ensure that AI and analytics are used responsibly and ethically.

3.8 AI in Precision Medicine

Precision medicine is a fast emerging area that strives to provide individual patients with individualised healthcare solutions based on their unique genetic, environmental, and lifestyle characteristics. Researchers are investigating the potential of artificial intelligence (AI) in precision medicine to enhance diagnosis, treatment, and overall patient outcomes, thanks to recent developments in AI.

Large volumes of genomic, clinical, and other relevant data can be analysed using AI algorithms to detect trends and predict individual patient responses to specific medications. Machine learning (ML) algorithms are very valuable in precision medicine because they can be taught to recognise complicated patterns in data and predict

outcomes based on those patterns. For example, ML algorithms can assist identify cancer subtypes and forecast the efficacy of alternative treatments for each subtype based on genomic data from the patient.

Cancer research is one example of how AI is being used in precision medicine. The Cancer Genome Atlas (TCGA) project is a collaborative effort to catalogue genetic alterations and molecular features of various cancer forms. This information has been used to train AI models that can predict cancer patient outcomes based on genomic data, allowing clinicians to personalise treatment approaches to each patient's unique needs.

Another application of AI is in drug discovery. Traditional drug development approaches are time-consuming and costly, and they frequently result in medications with limited efficacy or safety problems. AI-based drug discovery tools can assist to speed up the drug development process by screening enormous databases of compounds and predicting which compounds are most likely to be helpful in treating a certain ailment.

While the application of AI in precision medicine has enormous promise, there are several obstacles to overcome. The requirement for high-quality, diversified data sets that truly reflect the population is a key challenge. AI algorithms are only as good as the data upon which they are trained, and biased or insufficient data sets might lead to biased or erroneous predictions. To overcome this issue, researchers are attempting to create more inclusive data sets and to evaluate AI models on various patient groups.

AI has huge potential in precision medicine and is already being utilised to produce novel insights and treatment options for a variety of ailments. However, significant work need to be done to guarantee that AI-based approaches are tested, transparent, and effective, and that they are used in ethical and fair ways. The combination of AI with precision medicine has the potential to bring enormous advantages to patients while also transforming the future of healthcare.

3.9 AI in Drug Discovery and Development

AI (Artificial Intelligence) has grown in importance as a tool in drug research and development. Drug discovery is a time-consuming, expensive, and complex process that includes various stages including as target identification, lead discovery, lead optimisation, preclinical development, clinical trials, and regulatory approval. By utilising machine learning algorithms to identify novel therapeutic targets, forecast the efficacy and safety of drug candidates, and optimise drug development parameters, AI has the potential to accelerate this process.

The identification of new therapeutic targets is one of the most important uses of AI in drug discovery. Large volumes of biological data, including genomic, proteomic, and metabolomics data, can be analysed using machine learning algorithms to find proteins and other targets linked with certain disorders. Insilico Medicine, for example, has created a deep learning platform called Generative Tensorial Reinforcement Learning (GENTRL) that can predict innovative medication candidates for disorders such as cancer, Alzheimer's disease, and fibrosis. The researchers used GENTRL to create six novel chemicals that have the potential to cure idiopathic pulmonary fibrosis, a chronic and progressive lung illness, in a study published in the journal Nature Biotechnology.

Artificial intelligence can also be used to optimise drug development characteristics like dose, toxicity, and efficacy. In one study published in the journal Nature Communications, researchers employed machine learning

algorithms to optimise the dose of etoposide, a cancer treatment medicine. The researchers created a mathematical model of the drug's pharmacokinetics and utilised machine learning algorithms to estimate the best dose regimen for each patient based on demographic and clinical data.

AI can also be used to improve clinical trials by identifying patient subgroups that are more likely to respond to a specific medication. In one study published in the journal npj Digital Medicine, researchers utilised machine learning algorithms to identify subgroups of heart failure patients who are more likely to benefit from a specific medication. The researchers examined clinical trial data and identified five subgroups of patients who responded differently to treatment depending on demographic and clinical variables.

While AI has the potential to revolutionise drug discovery and development, there are significant challenges that must be addressed, such as data quality and quantity, machine learning model interpretability, and the regulatory and ethical implications of using AI in drug development. Nonetheless, artificial intelligence (AI) is a fascinating and quickly expanding field that will have a big impact on drug research and development in the future years.

3.10 AI in Public Health Emergency Response

Artificial intelligence (AI) has demonstrated significant promise in improving public health emergency response. AI's ability to analyse massive volumes of data in real time, discover patterns and anomalies, and make predictions can be used to detect and respond to public health issues fast.

The use of machine learning algorithms to anticipate disease outbreaks is one example of AI in public health emergency response. By analysing data on weather patterns, human mobility, and other environmental factors, researchers have developed models that can predict outbreaks of infectious diseases such as dengue fever, Ebola, and Zika. These models have the potential to provide early warning systems, which could assist public health officials in better preparing for and responding to outbreaks.

The creation of diagnostic tools is another application of AI in public health emergency response. Machine learning algorithms are being used by researchers to analyse medical photos and data from electronic health records in order to find patterns and signs of diseases such as cancer, TB, and COVID-19. These tools have the potential to increase diagnosis accuracy and timeliness, which is crucial during public health emergencies.

Artificial intelligence is also being used to monitor and track the transmission of infectious diseases. Researchers are working on models that can analyse social media data to track disease spread and predict where outbreaks can occur. Other algorithms are being created to analyse data from mobile phone networks in order to track population movement and predict illness transmission. These models have the potential to help public health professionals respond to disease outbreaks more promptly and efficiently.

Artificial intelligence (AI) has the potential to transform public health emergency response by providing early detection, rapid diagnosis, and effective illness tracking and management. While there are obstacles to overcome, such as worries about data privacy and assuring the ethical use of AI in healthcare, the potential benefits of AI in public health emergency response are enormous.

3.11 AI and Analytics in Mental Health

AI and analytics have the potential to completely transform the field of mental health. They have the potential to increase diagnosis accuracy, predict treatment response, and personalise therapies. With the increasing frequency of mental health illnesses around the world, there is an urgent need to develop and apply effective methods to treat this public health issue.

One of the most important applications of AI and analytics in mental health is diagnosis. AI systems can analyse enormous amounts of clinical data and build predictive models to accurately identify mental health issues. For example, researchers at Harvard Medical School created an AI programme that uses voice patterns to diagnose sadness. They employed natural language processing and machine learning to detect speech patterns related with depression by analysing audio recordings of patients during clinical interviews. The algorithm's accuracy was 70%, which is comparable to that of human clinicians. Another study used machine learning algorithms to predict the risk of suicide in depressed patients using data from electronic health records. The system identified people who were at high risk of developing with 80% accuracy.

Artificial intelligence and analytics can also be used to predict therapy response and personalise therapies. For example, Stanford University researchers employed AI to predict the efficacy of cognitive-behavioral therapy (CBT) for depression. They employed machine learning to predict which patients would respond best to CBT based on brain scans taken before treatment. The system predicted treatment response with an accuracy of 80%. Another study used AI to personalise medication for bipolar illness patients. The researchers created an algorithm that analysed clinical data from patients and prescribed treatment depending on the patient's unique traits. When compared to normal treatment, personalised treatment produced much superior results.

AI and analytics can potentially be employed in real-time monitoring and tracking of mental health problems. For example, researchers at the University of Washington created MoodScope, an app that utilises machine learning to track mood changes over time. The app asks users to score their mood on a scale of 1 to 10 and then using machine learning to find trends and triggers linked with mood swings. Based on the data collected, the app gives users with comments and suggestions for mood management.

Despite AI and analytics' potential in mental health, there are limitations and problems. The absence of standardised and dependable datasets for training AI algorithms is a significant barrier. Because mental health issues are complicated and multivariate, big, diverse datasets are required to adequately train AI algorithms. Another issue that needs to be addressed is the ethical implications of employing AI and analytics in mental health. If algorithms are not carefully and ethically constructed and deployed, there is a risk of perpetuating bias and discrimination.

By enhancing diagnosis accuracy, predicting treatment response, and personalising interventions, AI and analytics have the potential to revolutionise the area of mental health. However, obstacles and constraints must be addressed in order to ensure that AI and analytics be used ethically and efficiently in mental health.

3.12 AI in Chronic Disease Management

Chronic diseases such as diabetes, hypertension, and cardiovascular disease are the main causes of death globally. Monitoring the patient's health state, detecting early indicators of complications, and giving appropriate measures to avoid or manage them are all part of chronic disease management. The traditional approach to chronic disease care, on the other hand, is based on periodic clinic visits and manual record keeping, which may not be adequate to capture the dynamic and complicated nature of chronic diseases.

AI and analytics have the potential to improve chronic disease management by allowing for real-time monitoring, early detection of problems, and personalised therapies. The creation of algorithms that can do tasks that normally require human intelligence, such as learning, decision-making, and problem-solving, is referred to as artificial intelligence (AI). In contrast, analytics is the process of analysing data in order to extract useful insights and inform decision-making.

AI and analytics can be used to improve chronic disease management in a variety of ways. Machine learning algorithms, for example, can be used to analyse data from wearable sensors and electronic health records in order to identify early indicators of illness development or problems. Predictive analytics can also be used to identify patients at high risk of complications, allowing for tailored actions to avoid or manage them.

The construction of a predictive model for diabetic retinopathy is one example of the use of AI and analytics in chronic illness management. Diabetic retinopathy is a diabetes condition that can result in visual loss or blindness. Early detection and therapy can prevent or slow disease progression. To forecast the risk of diabetic retinopathy, researchers created a machine learning model that analysed data from electronic health records and retinal pictures. The model obtained great accuracy and could potentially lead to earlier disease detection and treatment.

Another example is the application of AI and analytics to increase medication adherence in hypertensive patients. Poor drug adherence is a prevalent issue among people with chronic conditions, and it can lead to difficulties and greater healthcare expenses. Researchers created a machine learning model that analysed data from electronic health records, pharmacy records, and wearable sensors to predict medication adherence in hypertensive patients. The model demonstrated great accuracy and could potentially enable personalised treatments to increase drug adherence.

By enabling real-time monitoring, early diagnosis of problems, and personalised therapies, AI and analytics have the potential to improve chronic disease management. While there are still challenges to overcome, such as data privacy and regulatory issues, the increasing availability of electronic health records and wearable sensors is creating opportunities for the development and implementation of AI and analytics-based chronic disease management solutions.

Conclusion

In conclusion, incorporating artificial intelligence (AI) and analytics into public health offers the potential to improve healthcare for all. Various elements of healthcare have been revolutionised as data availability has

increased and advanced AI algorithms have been developed. AI has showed potential in improving healthcare outcomes and promoting public health policies, from predictive modelling and epidemiological analysis to clinical research and drug discovery. Furthermore, AI and analytics have been critical in promoting health and disease prevention, as well as treating chronic diseases and responding to public health emergencies. Nonetheless, resolving various problems, such as privacy concerns, ethical considerations, and the requirement for adequate training and infrastructure, is necessary for the successful adoption of AI in healthcare. It is critical to find a balance between the benefits and risks of artificial intelligence in public health, and to guarantee that AI is used to promote healthcare fairness and accessible for all people. In conclusion, AI and analytics have the ability to revolutionise public health and improve people's quality of life around the world.

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