

Original Article

# Lawful and Righteous Considerations for the Use of Artificial Intelligence in Public Health

Patel Keyur

Independent Researchers, NJ, USA.

Corresponding Author : [keyur.bme@gmail.com](mailto:keyur.bme@gmail.com)

Received: 26 November 2023

Revised: 31 December 2023

Accepted: 18 January 2024

Published: 30 January 2024

**Abstract** - The research paper considers the transformational effects of AI and ML entailed by algorithms used on public health, with the conduction of statistical data from freely available databases. One part of the practice involves information mining from EHRs and leveraging the media for diverse health data. Nevertheless, ethical considerations that include user consent, security issues, violation of privacy, biases, and legal uncertainties, such as regulatory frameworks and accountability issues, must be critically considered. Recommendations highlight such things as the need for explainability, AI safety, and public engagement and provide ways of channeling future research to bolster both the efficacy with which AI is applied and how it remains ethical when deployed in matters concerning public health.

**Keywords** - Artificial intelligence, Machine learning, Public health, Ethical, Legal.

## 1. Introduction

AI in medicine has undergone significant transformations over the last 10 years, particularly with AI and ML being brought into play. It no longer focuses on producing a strictly algorithmic approach but creates paths for personalized healthcare. In the case of public health, AI and ML technologies are promising in terms of improved diagnostics, predicting therapeutic efficacy, and possible steps towards preventive medicine. However, the biggest question regards the data collected for these advancements, especially when it comes indirectly from publicly available databases without directly interacting with patients or healthcare providers.

This research paper will focus on data collection methods, AI and ML algorithms, ethical concerns from using them in medical services, legal aspects, and recommendations enabling stakeholders to take advantage of these technologies.

## 2. Methodology

### 2.1. Data Collection Methods

AI chatbots generally rely on EHRs to retrieve medical data automatically. Research conducted by Samaras et al. (2023), called Cardio Mining, intended to accelerate the overhaul of the country's cardiovascular system by implementing AI and ML technology. The research team used manual and automated methods to extract information from medical records (Fig 1). It was then divided into three sets: training containing 70%, validation containing 15%, and the remaining 15% used for testing the model. Data was extracted

by Samaras et al. (2022) using two main strategies. The initial approach focused on deeply analyzing some documents to investigate the advanced structures of neural transformers alongside specific models like linear ones and SVMs (Fig 2). The representation of bag-of-words was used to develop models in which these words were treated as a label for the classification task. The second technique can be explained expertly and uses transformer architecture to label the sequences of each entity. This is about how to choose specific words from the provided document.

Moreover, social media is highly beneficial for feeding data to AI and machine learning models in public health. These platforms allow people to share relevant information about their health. (Leung, 2023). So, AI algorithms commonly pull data out of user-produced content to understand what is going on in public health. Moreover, social media platforms use tracking technologies like cookies and pixels to track users' behavioral and preferential patterns. This data is beneficial and can be used for advertising and content. It helps health organizations identify popular health topics, find out which sources of information people rely on, and determine how to make those resources more accessible. Finally, health organizations may partner with social media platforms, exchanging patient data for user data (Leung, 2023). Individuals often log in using their social media profiles on health organization platforms, allowing the organizations to link the data with social media identities. This partnership-based data collection method enhances the richness and diversity of the data available for analysis.



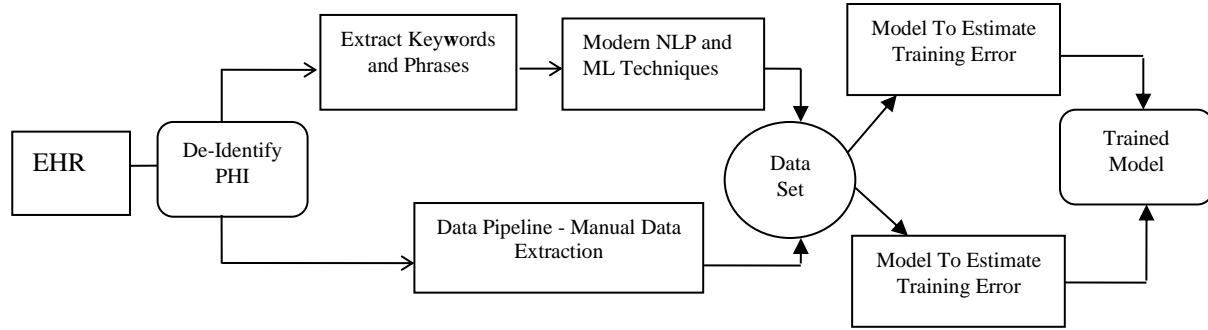


Fig. 1 Data extraction technique

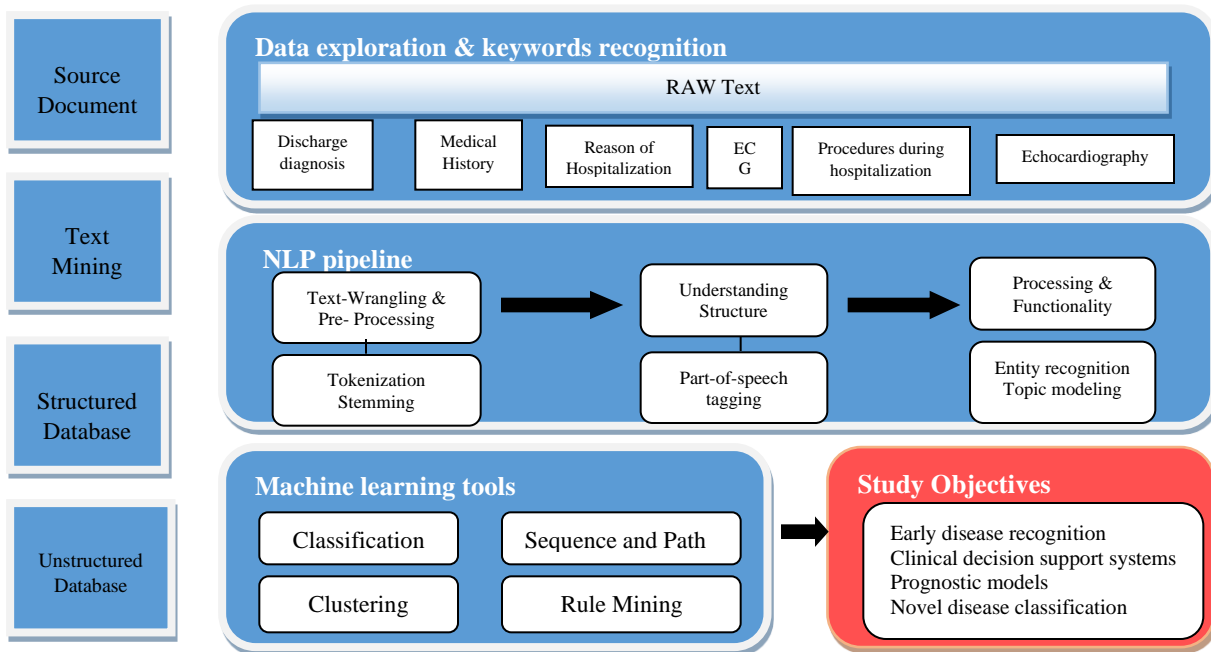


Fig. 2 Extraction of knowledge from unstructured clinical notes

### 3. AI and ML Algorithms and Techniques

Machine learning algorithms and AI figure out patterns in data and use them to make decisions automatically. They can predict outcomes or provide valuable insights. In simple terms, machine learning algorithms get smarter through practice. Machine learning algorithms adapt to information through repetitive associations with training data inputs over time to optimize performance.

Another essential thing in medical diagnosis is understanding how various clinical aspects are related to a particular disease population. It is crucial to get accurate results from machine learning (Naik et al., 2020). Artificial neural networks imitate biological networks, mimicking how information is processed and interconnected with the cells. This machine learning technique can predict an ailment by taking inputs such as symptoms and analysis techniques doctors use to classify the illness.

### 4. Results and Implications

#### 4.1. Impact on Disease Management and Prevention

The effectiveness of AI in the healthcare sector is determined by its capability to detect patterns, analyze large datasets, and provide recommendations based on management policies to prevent diseases (Chikhaoui et al., 2022). Analyzing large populations' health data can help identify health risks and reveal trends, which can consequently support proactive healthcare interventions. This technology enables officials to handle specific health issues after identifying them using supervised computational methods. These tools help clinicians anticipate future problems to manage them proactively (Chong, 2021). They help the community by giving early signs of incoming diseases so they can take appropriate steps and mitigate possible illness because otherwise, they would be caught off guard. By predicting any outbreak, the government can have enough time to plan strategies to minimize the spread of disease and provide adequate measures for it.

#### **4.2. Targeted Strategies and Interventions based on Individual Risk Aspects**

AI can provide customized treatments and focus on exact health threats to propose better healthcare. Through AI, a doctor can personalize how he wants to deal with a particular patient depending on his pre-existing conditions and exposure to risk factors. A system that assesses the patient's medical record should be used efficiently to predict vulnerable cases. To prevent the occurrence of such disorders, doctors need to create customized interventions (World Health Organization 2021). One way to reach healthier outcomes is by targeting specific goals while reducing costs and improving the community's health.

#### **4.3. Treatment Optimization through Clinical Decision Support Systems**

Through AI, better treatment strategies can be made for public health through clinical decision support systems. Study materials enable clinical specialists to analyze the disease and give the proper guidelines on which actions to take for the patients. By aiming to renew methodology, medical professionals can get a higher level of satisfaction among patients, benefiting better outcomes as there will be fewer errors.

They can use artificial Intelligence to identify a patient's drawbacks in their previous medications. It enables both the patient and the healthcare provider to evade any harm that would have been posed by taking the wrong medicine or under/overdosing.

### **5. Ethical Considerations**

#### **5.1. Informed Consent**

When AI technology is used in public health to control and detect diseases, there is an essential ethical concern of consent. These digital innovations are alternatives to traditional methods, which require interaction between patients and healthcare providers because these will interact through the data available (Racine et al., 2019). It indicates a change from how people were updated about their health, how they would prefer to have conversations, and when an agreement can be made about their healthcare.

#### **5.2. Security and Privacy**

Public health must ensure privacy and security measures when accessing extensive datasets of patient records (McKay et al., 2023). The AI not only has the potential to handle healthcare-related tasks smartly but can also store, manipulate, and assess vast amounts of health data. These activities might lead to viewing, sharing, and using old health text prints against the patient's will (Brown, 2020). As AI tools require extensive training data, the willingness of individuals to share health data becomes pivotal for successful AI development. Thus, striking a balance between the need for data to enhance public health outcomes and ensuring individual privacy becomes imperative.

#### **5.3. Bias and Discrimination**

Another significant issue around using AI in public health is that it could lead to biased results and decisions. AI algorithms will produce unfair outputs when the information they were trained on is discriminatory, even though they can work perfectly if the data is correct. Biased datasets can play a crucial role in identification since they would not be able to identify groups effectively, leading to lower levels of precision (Safdar et al., 2020). Health indicators will not show promising numbers as some of the population will not receive the preferred healthcare, impacting health on a large scale.

### **6. Legal Considerations**

#### **6.1. Regulatory Frameworks**

There is no specific framework through which healthcare professionals can control the use of AI in public healthcare. The current legal frameworks focus on technology and data privacy, but they do not consider the complexities introduced by AI in healthcare. Chikhaoui et al. (2022) stated that AI technology is rapidly growing, but the law forces struggle to keep up with its pace. There needs to be more adaptable laws in place.

#### **6.2. Liability and Accountability**

In traditional medical practices, the obligations and responsibilities of doctors were well spelled out by the law; however, AI experts who provide health care through modern technology have no clear directives. Using AI systems in clinical settings can be harmful to patients because there are no legal boundaries belonging to them. The research by Naik et al. (2022) elaborates that it is challenging to know the responsible person if there are any unexpected outputs or failures in AI. Clinicians need to be able to describe and interpret the AI output to back up their actions during stressful occurrences. Not incorporating proper checking measures can impose significant threats that may hinder the potential advantages of Artificial Intelligence in healthcare.

### **7. Recommendations**

#### **7.1. Explainability**

Explainability emphasizes the clarity and visibility of AI systems, particularly in the healthcare context (Amann et al., 2020). From a legal perspective, there are three core fields where explainability plays a significant role: Informed approval, certification, approval as medical devices, and liability. Doctors must know how AI systems work, their outcomes, and how they are processed in a particular environment. The methods by which the AI system learns, including unsupervised, supervised, and reinforcement learning, should be explained to patients. Secondly, for medical devices to be certified and given the go-ahead by regulatory authorities like the FDA and MDR, there must be clear outputs and transparency in AI algorithms. Although unclear, transparency should be ensured to utilize these devices efficiently and safely. Thirdly, the AI system's

decision-making processes and operations must be clarified to minimize liability. It is essential to acknowledge the underlying models and algorithms to identify the role of AI in making big clinical decisions that could have a bad outcome.

From an ethical standpoint, the principle of autonomy is closely linked to clarifying ideas, actions, and practices one chooses. The only gateway to patient independence within AI-based decision-making is that there must be a yes from the patient side, which stems from the fact that he has correctly made a comprehensive understanding of all underlying algorithms and processes. There is an excellent impact on the patient's trust and autonomy when the AI system functions opaquely without disclosure. Explainability also intersects with the principles of beneficence and non-maleficence (Amann et al., 2020). Doctors should know the artificial intelligence systems very well to allow for maximum benefits for the patient. It helps assess the accuracy, changes and adjusts outcomes of potential risks to maximize gains, and provides philosophies for avoiding errors.

### **7.2. AI Safety and Security**

It is essential to ensure the safety of AI systems within Public health because potential harm will be caused to individuals otherwise. In a recent order, President Biden requested that developers disclose the outcomes of their safety tests (The White House, 2023). This is a significant step towards ensuring nationwide data security as the patients' security rights and that efficient cybersecurity measures will be implemented to maintain sensitive health data. Moreover, comprehensive testing protocols must be implemented to check the reliability and efficiency of AI algorithms before they are used in any public health system. It can be adapted through algorithmic bias, data validity checks, and adverse attack possibilities (Karimian et al., 2022).

### **7.3. Public Engagement**

There must be trust between the public and the organization to ensure that Artificial Intelligence will be ethically used in healthcare. Including the community pertinent to using health data and decisions around it to make AI applications is crucial. The UK's Academy of Medical Sciences has given prime importance to improving the continuous response time from AI technologies by actively involving patients and medical professionals (World Health Organization 2021). Providing formal and informal channels to the community, such as workshops and webinars, will serve as a platform to bridge any prevailing gaps. To facilitate a graceful transition in healthcare, redesigning training programs for the health workforce and improving general education on AI are essential for fostering trust and broad acceptance.

### **7.4. Limitations**

The findings from this study have some limits because the presented situations may differ when implemented in natural

settings. The usage of artificial intelligence and machine learning algorithms to improve public health is contingent upon updating its knowledge base according to evolving medical practices and procedures, besides the quality and quantity of data it is fed. Secondly, the ethical and legal discussions in the document are prone to changes due to ongoing technological advancements. The use of AI has grown significantly, and with it comes a new wave of opportunities and challenges in healthcare. Ethical and legal frameworks must be reviewed continuously to tackle contemporary issues. In addition, limitations related to AI forecasting must be accepted, even though the paper shows how AI can be helpful in disease prediction and personalized treatment options. The better the quality and quantity of the dataset, the more the AI model can be improved. Furthermore, the fourth journal highlights the pertinent role that public engagement plays in leveraging AI in healthcare provision and management. However, some complications exist, such as privacy problems, building reliance, and optimal communication.

### **7.5. Future Research Directions**

There should be more research in the future about how AI can be made safe for public health and hence reduce their potential risks somehow. Managing a strategic plan for the AI system will be essential as it will set specific standards to prevent and control diseases within a domain. The first focus of any dynamic and effective research system should be to improve the quality and establish transparent evaluation criteria for any work area. Additionally, exploring the impact of evolving legal frameworks on the responsible use of AI in healthcare and examining the effectiveness of public engagement strategies will contribute to the continuous improvement and ethical deployment of AI technologies in public health.

## **8. Conclusion**

In conclusion, the data that AI and ML algorithms extract from public databases play a pivotal role in transforming public health practices. The methodology involving AI chatbots and social media data has showcased the potential of AI in disease management, prevention, and personalized interventions. However, one crucial consideration to be made by the parties is that patients must be informed when and how their data was used, steps must be taken to ensure that the data cannot be breached or misused, and for complete confidence, much assurance should also be given regarding personal health information protection. Legislation should also be made to adapt to the fast advancements in AI technology, offering dynamic structures and illuminating liability issues. For instance, there ought to be laws that can make AI experts responsible for their actions, especially in cases where they affect public order. As we navigate the complexities of AI in healthcare, a balance must be struck between technological advancements and safeguarding individual rights and well-being.

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