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The Optimisation Of Healthcare Through Artificial Intelligence

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Abstract:
This research explores the application of artificial intelligence in three different aspects of healthcare and the potential positive effects that it might have on the healthcare industry. Artificial intelligence has found great success in our day-to-day lives making them more efficient. Through the analysis of different research papers, the positive effects on efficiency are explored and presented. This paper explores the application of artificial intelligence in three different aspects of the healthcare industry - prevention, diagnosis/detection and treatment. Each aspect of the industry is bolstered in different ways through the application of artificial intelligence. The research conducted in this paper highlights how artificial intelligence can revolutionize the efficiency of the healthcare industry.

Keywords: *Artificial intelligence, healthcare, efficiency, treatment, diagnosis, detection.*

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I. Introduction

The potential for artificial intelligence (henceforth, AI) in our day and age is increasing at an astronomical scale. It is often stated that what we live in now is the cusp of a new era. To date, the usage of artificial intelligence has been used in a multitude of sectors to save precious human hours completing monotonous and repetitive tasks. For instance, robots working in factories to screw down bolts. The ability of AI to complete the same task over and over again with a high degree of efficiency and precision has opened the door to its potential usage in more complicated sectors such as health care. Although many people think our ability to use AI is still primitive, it is quite advanced with the use of nanobots, early warning detection systems and heart disease detection systems - all examples of AI having the potential to increase the efficiency of the healthcare system. This paper will examine the potential positive effects that these aspects of AI could have on the healthcare industry's efficiency through better prevention, diagnosis/detection and treatment methods.

II. Materials & Methods

To conduct research English papers were examined using different digital research resources (Google, Google Scholar etc.) Keywords such as “nanobots”, “artificial intelligence”, “early warning systems”, “health care”, “heart disease detection systems”, “prevention”, “treatment” and “detection” were all used to establish a list of potential sources that were then filtered by hand for relevancy.

Many sources were used to conduct research to establish a link between the potential application of these forms of artificial intelligence and efficiency. The following paper uses said sources to establish the link.

III. Discussion

Optimization through Prevention

In Canada, a visit to the emergency room can cost a person 8 hours of their day, over and above that, the average time to see a doctor is 2.2 hours (DeClerq, 2022). Long wait times are certainly caused by inefficiency and unnecessary visits. One way to alleviate the number of visits to the emergency room and thus increase efficiency is prevention. Preventing unplanned visits can be done through early warning systems. Mapp et al. (2013) and Panday et al. (2017) both discuss the usage of early warning systems and their effects on emergency rooms.

Mapp et al. (2013) start off by stating that physiological changes in a person suffering from cardiac arrest can be observed eight hours before the episode takes place. In assessing the ability of an early warning system to alert healthcare officials prior to a complication Mapp et al. (2013) examined 9 studies that were conducted to draw a conclusion. It was concluded from the study that early warning systems supplemented with decision aids

and clinical support systems produced the most effective approach to decreasing the number of people admitted to the emergency room (Mapp et al., 2013).

Panday et al. (2017) conducted a review of numerous studies with regard to early warning systems and their ability to make prognosis on admission and mortality. In all, Panday et al. (2017) reviewed 42 papers with the majority looking at early warning systems' ability to diagnose mortality and the rest pertaining to the early warning systems' ability to detect the need for emergency room visits. Panday et al. (2017) concluded MEWS (Modified Early Warning Score) and NEWS (National Early Warning Score) performed the best in determining the likelihood of death or the need for hospitalization.

In all, both papers conducted studies using a multitude of papers to formulate a conclusion on which early warning systems had the most profound effect on hospitalization and death rates. Mapp et al. (2013) concluded that early warning systems supplemented with decision aids and clinical support systems produced the most effectiveness. Whereas Panday et al. (2017) concluded that early warning systems such as MEWS and NEWS were the most effective in this domain. Nevertheless, both papers corroborate the potential link between early warning systems and the efficiency of the health care system.

Optimization through Diagnosis/Detection

All three forms of artificial intelligence mentioned in the introduction (nanobots, early warning detection systems and heart disease detection systems) have a positive effect on the efficiency of the healthcare industry. Nanobots for their part can have embedded microchips under human molecules that send signals when a disease is detected (Kumar, 2018). Having the ability to detect a disease anywhere in the body reduces the amount of time needed for a human to search manually. This can increase time spent on diagnosis and on the treatment of other patients, thus increasing the efficiency of a healthcare establishment. The use of nanobots with this application can also detect unknown diseases reducing the need for tests and procedures to determine what exactly the patient is suffering from.

The best use of early warning systems (henceforth, EWS) for detection is for infectious diseases. Early warning systems also known as EWSs can be used to act as surveillance for infectious disease outbreaks providing healthcare officials with crucial time to prepare and limit the spread (Meckawy et al., 2022). By providing healthcare officials with a heads-up, decisions can be made to better handle the spread of the pandemic-wide infection. With better planning thanks to the sooner notice there won't be that initial shock phase where everything is disorganized and uncontrolled. Thus, by having early notice the healthcare industry has a head start and can better prepare itself rendering it more efficient and effective when dealing with the outbreak.

As stated in the name heart disease detection systems serve to detect heart disease before they are apparent to the patient or health care officials. This system is capable of sensing parameters such as body temperature, blood pressure and the heartbeat of a patient providing doctors with a clear profile of the patient (Nashif et al., 2018). This system can alert healthcare officials before an episode of the disease has taken effect due to the decision-making capabilities of the detection system that assigns a risk level depending on the factors mentioned above (Nashif et al., 2018). By having the ability to assess the risk level actions can be taken to reduce the level before it reaches a level where hospitalization is needed. As a result, fewer people would end up clogging the medical system with problems that could have been mitigated.

Optimization through Treatment

When it comes to treatment, nanobots are the most effective form of AI among the three in optimizing the healthcare industry. The other two forms of AI have more applications in preventing and detecting diseases. Nevertheless, nanobots pull their weight when it comes to their ability to optimize treatment. One way in which nanobots render the healthcare industry more efficient is through their super small size, because they are so small they possess the ability to move through the capillaries without obstructing their flow allowing the movement of the nanorobots anywhere in the body (Kumar, 2018). This allows for better and eased delivery of medication to hard-to-reach areas in the body that would otherwise require more extensive treatment methods. Additionally, nanobots have great use in the treatment of diabetes. Thanks to an onboard chemical sensor, the nanorobot can determine if the patient needs to inject insulin or any other medication (Kumar, 2018). By alleviating the need to constantly draw blood for these types of tests human error decreases and limits the amount of people who suffer complications from not having known when to take their medication. This, once again helps to alleviate the strain on the healthcare system permitting it to function in a more optimal way.

IV. Rebuttal

The integration of AI in our daily lives has always been a contested subject and this is no different in the healthcare industry. Many worry that the implication of artificial intelligence in the healthcare industry would increase the risk of data leaks, leaving vital health information very vulnerable (Khan et al., 2023). With information potentially being held hostage the efficiency of a medical establishment would take a hit. However,

through the development of more advanced forms of artificial intelligence, better methods of countering breaches have also been developed. Though no method is 100% certain to prevent hacking, added levels such as VPNs, two-factor authentication and firewalls can greatly limit the ability of a hacker to gain access to vital health information (Vigderman & Turner, 2023). Thus, through the application of countering methods the risk of a potential breach is reduced.

V. Conclusion

In conclusion, the integration of artificial intelligence in healthcare demonstrates significant potential for optimizing various aspects of the industry, including prevention, detection, and treatment. Early warning systems, nanobots, and disease detection systems all contribute to enhanced efficiency and patient care. While concerns regarding data security persist, advancements in AI security measures offer potential solutions. Future research could focus on refining AI technologies for even more accurate disease detection and treatment customization, as well as addressing ethical and privacy implications in the expanding use of AI in healthcare.

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