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# ARTIFICIAL INTELLIGENCE IN HEALTHCARE: ANALYSING ITS ABILITY TO DO HUMAN DOCTORS JOB

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Master's Thesis

Supervisor

Prof. Dr. Galip CANSEVER

İstanbul, 2024

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I hereby declare that this thesis meets all format and submission requirements for a Master's thesis.

I hereby declare that all information/data presented in this graduation project has been obtained in full accordance with academic rules and ethical conduct. I also declare all unoriginal materials and conclusions have been cited in the text and all references mentioned in the Reference List have been cited in the text, and vice versa as required by the abovementioned rules and conduct.

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Signature

# DEDICATION

First and foremost, I would like to thank ALLAH, the almighty to help me to complete thisthesis and i am very grateful to him. After that, i would like to dedicate this thesis to myself after two years of hardwork, dedication and belief to complete my thesis and my studies at Alitnbas University as it was a very long journey. Furthermore, I would also liketo dedicate this thesis to my mother and father who were with me since the beginning and always believed in me. Next, I also want to remember my siblings and my others relatives and family members. Next, I would also like to highlight all my teachers at University of Djibouti, such as Doctor Wahib, Doctor Fatima, Doctor Nasser, Doctor said, Prof Idriss, Prof Ayoub, Prof Mohamed. Finally, I would like to dedicate this thesis to all my altinbas university professors and doctors especially Prof.Dr.Galip Cansever.

# PREFACE

I guarantee that this thesis has not been written as part of a personal project for anyuniversity neither for any organization but only as a goal to graduate from university.

# ABSTRACT

## ARTIFICIAL INTELLIGENCE IN HEALTHCARE: ANALYSING ITS ABILITY TO DO HUMAN DOCTORS JOB

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In today world, the importance of technology cannot be overstated. Many technologies in current time have been developed to make life easier for the society. Every technical breakthrough, form the development of the wheels to internet, has built on the one before it, accelerating the pace of growth in the field. This rapidness of technological advancement may cause big changes in the decades to come influencing various domains. Artificial intelligence is one of these technologies. Artificial intelligence impacted many facets of our life and it is now a fundamental component of modern technology. It is extensively utilized in numerous fields including business, government, science, and medical industry. In this research, we will concentrate on artificial intelligence in healthcare by first exploring the evolution of artificial intelligence and its current applications in healthcare. Then we will discover the artificial intelligence capabilities in healthcare. Next, we will discuss the role of human doctors in healthcare. Furthermore, we will study the ethical considerations of integrating artificial intelligence in medical practice. Finally, a comparative analysis will be conducted between artificial intelligence and humans in certain medical area suggesting that a collaborative approach combining artificial intelligence strengths and human's expertise may represent the future of healthcare.

**Keywords:** Technology, Artificial Intelligence, Human Doctors, Healthcare, Research, Exploring.

# ÖZET

## SAĞLIK HİZMETLERİNDE YAPAY ZEKA: İNSAN DOKTORLUK İŞİNİ YAPMA YETENEĞİNİN ANALİZİ

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Günümüz dünyasında, teknolojinin önemini aşırı derecede ifade edemeyiz. Toplumun hayatını kolaylaştırmak için günümüzde birçok teknoloji geliştirilmiştir. Her teknik yenilik, internetin tekerleklerinin gelişimini şekillendirerek, önündeki tekene dayanarak, alandaki büyüme hızını hızlandırmıştır. Teknoloji ilerlemesinin bu hızı, önümüzdeki on yıllarda çeşitli alanları etkileyen büyük değişikliklere yol açabilir. Yapay zeka bu teknolojilerden biridir. Yapay zeka hayatımızın birçok yönünü etkiledi ve modern teknolojinin temel bir bileşeni haline geldi. İş, hükümet, bilim ve tıbbi endüstri de dahil olmak üzere çok sayıda alanda yaygın olarak kullanılmaktadır. Bu araştırmada, öncelikle yapay zekanın evrimini ve sağlık sektöründe mevcut uygulamalarını araştırarak sağlık sektöründeki sanal zekaya odaklanacağız. O zaman sağlık hizmetlerinde yapay zeka kapasitelerini keşfedeceğiz. Daha sonra, insan doktorlarının sağlık hizmetlerinde oynadığı rolü tartışacağız. Ayrıca, yapay zekanın tıbbi uygulamaya entegre edilmesi konusundaki etik düşünceleri de inceleyeceğiz. Son olarak, bazı tıbbi alanlarda yapay zeka ile insan arasındaki karşılaştırmalı bir analiz gerçekleştirilecek ve bu da yapay akıl güçlerini ve insan uzmanlığını birleştiren bir işbirliği yaklaşımının sağlık sektörünün geleceğini gösterebileceğini öne sürüyor.

**Anahtar Kelimeler:** Teknoloji, Yapay Zeka, İnsan Doktorları, Sağlık, Araştırma, Keşif.

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# ABBREVIATIONS

| | | |
|---|---|---|
| AI | : | Artificial Intelligence |
| CNN | : | Convolutional Neural Network |
| EHR | : | Electronic Health Record |
| IoT | : | Internet of Things |
| MRI | : | Magnetic Resonance Imaging |
| RNN | : | Recurrent Neural Network |

# LIST OF SYMBOLS

| | | |
|---|---|---|
| A | : | Coefficient |
| X | : | Independent Variable |
| Y | : | Dependent Variable |

# 1. INTRODUCTION

Artificial intelligence plays an important role in many sectors such as politics, industries orhealthcare systems. The concept of artificial intelligence has existed since centuries but it was until the mid of the 20th century that is has been developed to interfere various domains. This fast development of artificial intelligence has created many imaginations in people mind, wondering to what extent this technology will impact various sectors like industries, politics, banks or healthcare. The objective of its invention was to facilitate tasks for humans, to address societal challenges or to potentially discover new technologies. Artificial intelligence in healthcare refers human invented machines capable of executing medical tasks. It is used to analyse complex medical information's, suggestingtreatment plans or to enhance overall patient care. These machines are also capable predicting future illness of a patient and they use machine learning or natural language processing to participate in a diagnostic precision of a patient for instance. However despite its capacity, it remains to see whether artificial intelligence can match human doctor abilities to analyse different stages of patient care.

Firstly, we first explore the evolution of artificial intelligence and its current applications inhealthcare. Secondly, we will discover the artificial intelligence capabilities, roles of human doctors and the ethical considerations of integrating artificial intelligence in healthcare. Finally, we will conduct a comparative analysis between artificial intelligence and humans in certain medical area.

## 1.1 THE EVOLUTION OF ARTIFICIAL INTELLIGENCE AND ITS CURRENT APPLICATIONS IN HEALTHCARE

Even though the concept of artificial intelligence was known for almost five centuries, the formal field of artificial intelligence was emerged in mid-20th century. It was mostly found by an American computer scientist named john McCarthy at university of Dartmouth in 1956. Later on, so that these machines complete task only humans are capable to perform, learning in which to remove an important amount of features from data multiple layers of processing in form of neural network are needed.

An American computer scientist named john McCarthy at university of Dartmouth in 1956. Later on, so that these machines complete task only humans are capable to perform, many subfields of artificial intelligence have been structured. Today, many artificial intelligences systems reckon on machine learning and deep learning. Machine learning is afield of study in artificial intelligence where algorithms are applied on computer system sothey can perform human level tasks and without other explicit instructions. It requires inserting more data in a computer system so it is able to perform without additional instruction [1]. To increase their efficiency to meet the tasks, more data inserting is mandatory. Sometimes it is noticed that machines learning systems would not complete the tasks because it is widely known that the neuron of a machine learning systems don't match the humans neuron brain which contains almost hundred millions neurons, so still machine learning systems need a bit of advancement in term of algorithm used and data collection. Deep learning is a type of machine learning in which to remove an important amount of features from data multiple layers of processing in form of neural network are needed. Compared to machine learning, deep learning required almost none human intervention and able to predict more accuracy than machine learning. While deep learningmachines are still not able to match the human brain, its neural network often comes close of simulating human brain. During 1960s, the creation of artificial intelligence systems forbiology were created because of a project called Dendral in which artificial intelligence algorithms were used to assess chemical compounds. In 1970s, it was the years when expert systems become important applications in artificial intelligence domain. These systems convert human level intelligence into general-purpose system to help in conducting with medical diagnosis and decision making. Moving fast in 1990s, it was the decade when machines learning were introduced due to advancement of computational used for drug discovery examines chemical structures to next locate potential drug candidates readjusting the already present medications for new indications. Drug discoveryrelated AI improve efficiency, reduces prices, and accelerates potential therapies for many diseases It has changed almost every part of the healthcare and assisted tremendously the healthcare workers. As every technology inventions images and see whether the cancer is malignant or benign. In case the cancer is malignant, the specialists send the patient to another specialist for treatment Artificial intelligence technologies and the presence of

electronics health records (EHR) [2]. Algorithms such as neural network were applied to task like medical image analysis or drug discovery. The 2010s saw a huge shift in AI in healthcare because it was the years deep learning was invented which inspired by structure of human brain. Deep learning algorithms like CNN and RNN changed the process of analysing the medical images and genomics. Fast forward on our current times, AI have participated in medical precision and personalized healthcare. Artificial intelligence machine interpret a huge amount of genomic data to predict potential disease a patient may suffer and provide the plan of prevention of the disease. These machines are also capable of predicting the survival rate of a cancer patient for instance. For future outlook, it is expected that AI systems will develop and continue toevolve and to enable to interconnect researchers and healthcare providers to arrive at the maximum research. Virtual care, AI-driven drug discovery are among areas expected to drive innovation.

Over the last seven decades, AI in healthcare has witness a tremendous changes in many medical parts of analysis and assessment. Despite of the need to certain improvement on how artificial intelligence may be useful in healthcare, AI applications assist the doctors and healthcare providers and workers in an efficient way. For Instance in medical imaginganalysis, the images provided by MRI, CT and X-rays are assessed by AI computer systems and help radiologists to suspect abnormalities causing to a more accurate diagnoses. Compared to human doctors, AI applications for medical image analysis examine the image very fast and efficiently so that the process analysis finishes rapidly. For clinical decision support, machines learning and natural processing methods are used to examine electronic health record (EHR) and genomic data. These systems help the healthcare providers to arrive a correct medical recommendation. AI systems are also usedin “Remote Patient Monitoring” using home sensors to gather health data from patients in addition of used healthcare settings to monitor the patient and enable the patient to get care. AI systems in healthcare take data from a clinical text like (EHR) by the assistance of . Everything - from privacy violations, bias, the potential costs from medical mistakes, clinical challenges of decision responsibility, treatment goals, transfer of decision-making, and the need for substantially new care models, the potential for employment shift is touched by AI tools. Addressing these concerns is critical to evaluate potential risks and rewards.

Natural language processing. Natural language processing application improves the decision making of the doctors and assists the healthcare responsible in administration. Clinical coding, automated coding are done by natural language processing. AI is also useful in medical precision and genomics as it eases precision medicine by analysing genomics. For instance in early stage of a cancer, AI applications for genomic identify the tumor and precise where the genetic mutations occurred. AI application systems are used for drug discovery as it speeds up the process by upgrading clinical trial design. The AI used for drug discovery examines chemical structures to next locate potential drug candidates readjusting the already present medications for new indications. Drug discovery related AI improve efficiency, reduces prices, and accelerates potential therapies for many diseases [3]. AI is used for healthcare management. The healthcare management is very mandatory for patient as if it is well managed, patient will feel welcomed. AI driven healthcare management are used to take care of resource allocations, workflow management to improve efficiency, reduces prices and to enhance patient stays in the healthcare. For small other activities such as potential beds for patients, time-table enhancement for stuff and financial process management, the healthcare responsible also use the AI [1]. AI overall assists the healthcare responsible to guarantee a high-level careto patients. Above are the activities the AI does for the well-functioning of the healthcare centers. In the future, it expected that artificial intelligence expend their services in healthcare centers.

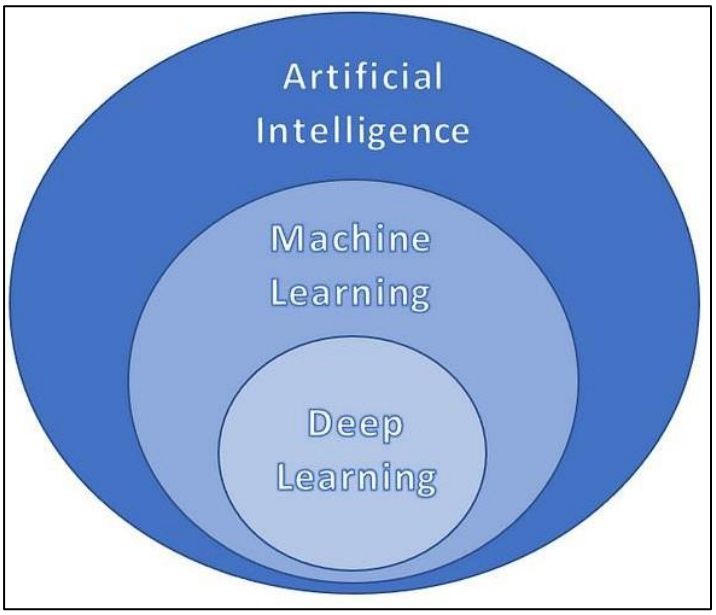



**Figure 1.1:** Figure Showing The process of Artificial Intelligence Subsets.

This figure represent that artificial intelligence is composed in first, machine learning which is a subset in which algorithm are used to level up the human response. Whearas deep learning is used for fast operations than machine learning.

## 1.2 ARTIFICIAL INTELLIGENCE CAPABILITIES AND THE ROLE OF HUMAN DOCTORS IN HEALTHCARE

Having worth more than ten billions dollars and expect to worth one hundred the amountin 2030, it is easy to notice the transformation that the artificial intelligence has brought to healthcare industry. It has changed almost every part of the healthcare and assisted tremendously the healthcare workers. As every technology inventions, artificial intelligence is used to maximum. It is used to enhance the efficiency for the work and permit to get better result. First, artificial intelligence is useful for the administrative things. Artificial intelligence participate to alleviate the workers from doing paperwork, giving the healthcare providers to be more available to others things like taking care of thepatient and meeting the needs. Artificial intelligence also assists the clinicians for note- taking. Artificial intelligence is also known to be served as virtual nursing assistants sometimes because of patient's preference. In fact AI assisting virtual nurse are programmed to answer the medication answers and to assist the patient doctor to find a physician if necessary. AI systems can also be key in case of conducting a surgery like reducing blood loss and pain after surgery and ensuring safety in most affectable organs. AI can also play role in fraud prevention in healthcare industries [5]. AI can also play role in fraud prevention in healthcare industries. Furthermore, AI provides a higher efficiency while medical imaging analysis by providing the doctors corrects data. Artificial intelligence also contributes massively in others area of healthcare which is data analysis.It assesses risks by examining a large amount of patient's data to predict their potential outcomes. For instance, it can tell the patients who may risk getting disease such as diabetes or heart failure. After recognizing the potential disease that the patient may get, AI driven systems recommend the measurement to be taken for prevention. Then, artificial perfect the treatment that patient must be undergoing and reanalyse previous patient data such as its genetics to suppose the most perfect treatment possible. In radiology, many healthcare biggies like Aidoc use the artificial intelligence alimented by algorithms in their X-rays analysis process to detect anomalies and

diseases. Diseases such as cancer can be easily recognized by the AI by a higher accuracy. In cardiology, artificial intelligence can forecast the gotten outcome conducted by electrocardiograms (ECGs) in a high level AI application regulation and capacity can pattern changessuch accountability and their functional trade-off.

Precision and accuracy allowing next to doctor to do the next step toward treatment. Big healthcare companies such as AliveCor's KardiaMobile utilize this kind of artificial intelligence. In ophthalmology, artificial intelligence retinal imaging is used to disclose diseases such as diabetes, glaucoma. Dermatology is a field of medicine which concern thetreatment of the skin, hair, or face for both adults and children and their specialists are called dermatologist. In dermatology, if the suspected disease is skin cancer, the specialistsuse AI to examine the images and see whether the cancer is malignant or benign. In case the cancer is malignant, the specialists send the patient to another specialist for treatment. The AI is also used to detect the problems related to lungs. The Ai can easily examine the images of the chest conducted by an X-rays or CT. Certain healthcare centers also put to use artificial intelligence for stomach, pancreas, and colon related diseases. The treatment of these diseases is done in gastroenterology. The specialists use endoscopy for analysis and artificial intelligence assist the specialists to locate polyps and others abnormalities in colon for instance. In oncology which is a study of cancer detection, the programmed artificial intelligence machines scan multiple data such as genomics data to classify the type of cancer. Some healthcare also use natural language processing artificial intelligenceas they facilitate the patient-doctor conversation to get ensures accurate medical records. AI-driven natural processing participate the decision making of the healthcare providers by facilitate them the extraction of huge amount of data from the patient recorded data. It is mandatory for the healthcare industries to be aware of affected population by diseases so the artificial intelligence assists for the updates and inform them the future possible diseasethat could propagate among the population. AI assists with resource allocation by spotting trends and patterns in population health data.

Despite many healthcare centers or industries use artificial intelligence for many part of healthcare be the administrative workflow or the imaging analysis, the human roles in healthcare remains extremely mandatory. Human doctors are privileged to make

decision. While AI systems provide only recommendations for diagnosis, doctors are able to take decision about treatment of a patient due to their experience and qualification [7]. The artificial intelligence will examine or analyse the images provided by different machines such as X-rays and then from there the doctor will make decision accordingly. Before making decisions, doctors usually practice two types of thinking, integrative thinking and experience thinking. For integrative thinking, doctor combine patient past complaints.

Imaging results and multiple other data before taking decisions. For experience decisions, doctors use their experiences without look for instance patient past diseases to make decisions which may be risky but still more often decisions are corrects. In medicine field, the communication is extremely important. Doctors are able to communicate with patients in order to know what the patient suffers and also get information about the past complaints of the patient. The doctors conduct an effective communication to the patients and their families to explains them the necessary treatments, their processes and in the same time listen the patients carefully and permit their families to express their concerns. This one thing the doctors are superior to artificial intelligence since the artificial intelligence are not yet developed for communication although it could be in near future. Another thing doctors are master is the empathy toward the patients. Doctors are human and it is human nature to show w their emotional side to patient and try as much as they can to try to in some way to mentally influence positively the patient and gain patient trust.One of the biggest roles of doctors toward their patient is to assess them physically in order to know their suffer. Unlike the AI, doctors can examine the patient physically to see where the default is and then evaluate it and prescribe treatment accordingly. Doctors also have a professional responsibility. Doctors obeys the rules and conduct themselves in a professional way while being in healthcare centers and give the patient care, respect, welfare. Every time, the doctors play the role of leader among others including nurses, therapists and pharmacists to ensure the work conducted is done. Together, they assess thepatient problem and if the situation requires a specialist they inform the patient. Their work is not yet finish, the doctor will collaborate with the specialist even if the specialist is from another healthcare center. All of this is shows the professionalism of the doctors and the considerations they give to the patients. As the saying “nothing is perfect”, neither the

doctors are. Doctors as a human beings commit errors while examining the patients or analysing the imaging processes, so they can learn it some experience by avoiding repeating the same mistakes and research and educations are their tools to do that. Technologies are also a key for doctors to not repeat the mistake but before using them an extreme critical thinking is required. Probably doctors biggest off healthcare role is to playlike an informers to public about the diseases, their behaviour, their causes and their symptoms. They also conduct campaigns to promote the importance of self-caring in orderto improve public health outcomes. While artificial intelligence participate in image analysis to assist the doctors about patient health.

Analysis and diagnoses, it fall short to human in term ethical capability, responsibility, physical assessment and empathy toward patient. A future where artificial intelligence complements human doctor's ability will be more probable and in that way the efficiency of patient treatment will enhance.

## 1.3 THE ETHICAL CONSIDERATIONS OF INTEGRATING ARTIFICIAL INTELLIGENCE IN HEALTHCARE

In today world, artificial intelligence plays a tremendous role in healthcare systems assisting in ways. Despite all, this advancement must meet some strict ethical challenges. Healthcare is at the frontier of AI application and innovation. The dawn of AI promises alluring prospects. Routine medical tasks and patient care will be optimized. The accuracy and efficiency of medical diagnosis and treatments will improve. AI has enormous potential to lead human civilization from a civilization driven by asset-driven management to a civilized civilization driven by infrastructure-driven management. At the same time, the application of AI will also entail opportunities and ethical challenges. Everything - from privacy violations, bias, the potential costs from medical mistakes, clinical challenges of decision responsibility, treatment goals, transfer of decision-making, and the need for substantially new care models, the potential for employment shift is touched by AI tools. Addressing these concerns is critical to evaluate potential risks and rewards and maximize the responsibility of AI tools in healthcare. Studies reveal opportunities and ethical risks in the application of AI can be quantified and evaluated appropriately. Post analyses indicate the potential benefits and risks resulting from the widespread application of AI to healthcare [9]. For instance, it is increasingly clear that ethical challenges such as fairness and injustice, privacy

and security, AI application regulation, AI capacity of accountability, loss of decision autonomy, care pattern changes, workforce shifts - and their functional trade-offs. For example, it is necessary to utilize the potential of AI in the relative balance between efficiency and effectiveness. Healthcare, balances insurability and reduced quality of work, and provides services to patients. Researchers in pre-analysis indicate whether the use of AI tools in factory automation will ultimately create or drive social imbalances and inequities. Similarly, AI applications will increase health disparities and a reduction in overall health. This paper organizes these opportunities and challenges into a two-dimensional classification. The first dimension is efficiency: existing practices or methods without AI, and the second dimension is effectiveness: non-existent classes. With the rapidly developed new technologies in the modern era, from Internet of Things (IoT) to mobile health (mHealth), and especially with advanced technologies like Artificial Intelligence (AI), there are new opportunities for healthcare applications. Nevertheless, these opportunities come with the caveat that they will affect patients and professionals in profound ways. Identifying the benefits and challenges of advanced enabling technology can be helpful for the adoption process by understanding the possible impacts of AI on healthcare. With the rapid technological growth in the developed countries, AI technology is widely being used in the medical field, offering patients new experiences along with powerful tools to help healthcare service organizations in health management and service delivery, in healthcare management, workforce management, personalized healthcare, health diagnostics, surgeons' tools and patient engagement. With regard to these technological enhancements in AI, privacy and ethical concerns are also on the rise. This is further emphasized as the IoT era brings new opportunities that encompass not only people but also devices and sensors. Increased service providers entities collect and store a wide range of personal health data that include personal life details, habits and location information as well related to their health status and conditions. Patients are no longer just passive beneficiaries of healthcare but also become a part of health management which facilitates their participation in decisionmaking processes related to their health. Thus, increased concerns about data processing encompass data privacy. Therefore, ensuring privacy and security of personal health data are critical. At the same time, patients are concerned about the ways their personal data is managed in healthcare organizations. The decision-making process is governed by ethical standards that enhance and promote patient respect, care and trust in. Therefore, utilizing patient data

through AI with personal and formal data along with medical resources, and concern for both human and animals' rights is essential. Utilizing emerging AI technologies without consideration ethical and privacy factors remains a significant social issue. People are aware that AI technology improvements are strongly informed, demonstrating art tasks like language translation, visual perceptions and emotional intelligence. This potentially allows to regulating ethical clarity and transparency [6]. On the other, AI application is being used to develop autonomous weapons which pose lifethreatening risks, so inspecting ethical clarity will be useful. Bias is also present in the data used for machine learning. For example, data containing a higher proportion of coronary artery disease in men and mental health diagnoses in women could lead intelligent systems to make recommendations based on prevalence rather than appropriateness. Algorithms have been found to disadvantage black patients in health care. For example, they lead to fewer referrals to special programs that help patients who have complex medical needs such as those with serious mental illnesses. Therefore, identifying and addressing AI bias is of paramount importance. The AI community must address these issues before racial and gender biases can become a consistent and systematic cause for further discrimination. Ethical guidelines such as discriminating when providing solutions to issues in the real world are widely accepted. Datasets used in training the algorithms are sometimes biased in favor of specific racial or privileged groups of individuals, such favoritism is mirrored in the algorithms' behavior. Creating a diverse database of patient information and using it as a training set for AI can detect and eliminate potential biases in the datasets used. For example, an AI developed by IBM was discovered to be directing the treatment of cancer patients towards a specific subset of the population. The algorithm failed to recommend the same treatment even when the data of African-American patients was included in the training set. When the data of these individuals was included, recommendations were then equally made. The development of AI that rely on diverse and unbiased dataset could help in eliminating biases, therefore, be tailored to every patient, undermining race or any form of discrimination. There is currently no clearly established framework for regulating AI products. While some government agencies have already taken on policy advice, other sectors of the government are often not prepared or adequately equipped to handle the nuances of AI-related innovation within their current regulatory framework. The use of AI in healthcare is currently limited by the scope of "in-vitro diagnostic devices". As AI penetrates every aspect of healthcare, the world needs

to adopt broader, more comprehensible frameworks to assess and regulate its use. Comprehensive data protection laws, such as the European Union General Data Protection Regulation (GDPR), are a good starting point for policymakers. The attitudes of many countries towards data protection have largely contributed to disparities in applying AI to healthcare and are the challenges facing policymakers in harmonizing international rules while protecting human rights. Too much freedom in AI creates many opportunities, including serious opportunities in AI. Currently, the use of AI in healthcare is limited by the range of "in-vitro diagnostic devices". As AI penetrates every aspect of healthcare, the world needs to adopt broader, more comprehensible frameworks to assess and regulate its use. Comprehensive data protection laws, such as the European Union General Data Protection Regulation (GDPR), are a good start for policymakers. The attitudes of many countries towards data protection have largely contributed to disparities in applying AI to healthcare and are the challenges facing policymakers in harmonizing international rules while protecting human rights. Too much freedom in AI goes hand in hand with many opportunities, including serious potentials of adversities in AI. The use of AI is regulated in healthcare to a lesser extent than with the introduction of medical devices. The introduction of artificial intelligence is expected to fill unmet needs and create value in the healthcare industry. Addressing challenges brought by environmental change, decrease of work force and aging demographics is essential. Big data analysis by AI is expected to innovate and enhance not only precision medicine but also hospital work, biomarker discovery, diagnostics, drug discovery as well as drug development, and patient counseling with natural language processing. AI is also expected to innovate and enhance pharmaceutical development, the pharmaceutical business model, and establish flexibility and manufacturing strategies using continuous processing technology. Although AI in healthcare attracts considerable attention, integration into clinical practice is challenging. We need regulatory considerations, system organization, and technology confidence. The expectations for AI by stakeholders can become extraordinarily high. As AI is not a panacea, it is difficult to clearly define the expected value; it is also clear that AI requires appropriate application to achieve the value. There are also potential risks in new employment and unemployment. Trust in AI requires operational transparency and technological security. With these factors as a mutual basis, it is necessary to create an environment in which AI can be generally accepted. At medical institutions, it is challenging to integrate AI into

healthcare if it is a mere system tool that falls within the expertise of radiologists, pathologists or path physiologists. Encrypted AI becomes opaque and difficult to understand by healthcare providers. Retrospective application of AI that emerges after completing clinical studies that do not correspond to new treatment. Healthcare is restricted by high rates of manual routine work. Long working hours lead to healthcare provider burnout. Conversely, providing care with AI technology has been proposed to significantly improve both efficiency of healthcare services and the diversity of the fields in which they are offered [4]. There is research that used AI-enhanced medical software in a healthcare setting and demonstrated a time-saving advantage in daily medical procedures through faster and more accurate procedure administration, recommended experiences, and other tasks resolution through deep learning-enhanced medical software. Moreover, a landmark study compared time efficiency by using only one study assistant to retrieve medical information from patients. The study was equipped with just two approached AI-based technologies, and another app with an open internet search engine. Two subjects performed 90 completed questions from multiple medical areas that would lead to randomized completed numerous resources during the process of caring for patients. It lasted between 17 seconds and 26 seconds, with specific data collected from that, which reflected differences in accuracy and requested a vast examination of healthcare information systems building the usable efficiency of modern-day AI-based retrieval systems in healthcare. Additionally, these AI-based technologies demonstrated successful use in helping diagnose entities, be directed towards differentiation based on your condition from more distinguishable-looking diseases. The results suggest that AIbased care info-retrospective situation items can assist in about STD reduction and improve procedures. A significant consideration in the healthcare sphere is the cost of implementing AI technologies. discussed a clinical decision-making set of examples that considers the potential cost implications of providing care to patients. They noted the cost implications due to the inclusion of patients that receive unnecessary medical treatment that in turn increase the cost to society. American health care spending reached $3.3 trillion (around $10,348 per person) or 17.9% of the gross domestic product (GDP) in 2016, with government entities covering about 64% of these costs. Looming Medicare expenditures hold the potential to more than double the costs of care that is projected to reach $5.7 trillion by 2026. While AI utilization in healthcare can be a significant source of savings, this adoption is projected to be slow as numerous obstacles remain. Clinical

guidelines must first be developed and implemented to ensure that AI is appropriately utilized. Ethical guidelines to address and remedy the psychologically damaging loss of control and trust due to the employment of AI-based algorithms in healthcare are essential. Poor execution of AI also poses inherent risks. and noted the usability issues [e.g., excessive burden on healthcare providers due to an increase in alerts and instructions without the inclusion of relevant clinical information] that impaired the usage of HIT. Furthermore, if software implementation is ineffective, technology may not be fully utilized and then unable to reach its full potential. Successful AI implementation should be consistent and be able to bridge the gap which currently exists between the clinician and the patient/their carers and should form part of a larger system which reflects moral and ethical responsibilities of doctors and responsibility, accountability of AI supplier vendors to undertake their research and development. To remind those involved in AI implementation in healthcare to ensure that AI software is designed. Inaccurate data collection, lack of standard regulation, privacy, and safety issues. However, as the realworld data generate complex relationships among the entity, the algorithm is highly influenced by the data used in training. The lack of established principles involved in data processing, such as data privacy, confidentiality, and security, raises concerns about cooperation in data sharing. The integration of AI technology in healthcare leads to medical robots and AI in various capacities, taking over minor to major roles. Given the trust patients have on healthcare professionals, particularly healthcare leadership, and management positions are taken over by these automated robots supported by AI technology raises ethical dilemmas. In healthcare, manual labor during imaging is performed by technologists, radiographers, or other healthcare practitioners. The ingress of the fully automated business model redefines the role performed by radiologists and technologists in patient care. Due to collaboration with AI technology, the radiologist tends to remote patient diagnosis, unable to provide their sub-specialized skill to optimally manage the patient. This issue raises concern regarding job responsibilities, job market, and replacement affairs. The introduction of appropriate algorithms for diagnosis by AI technology can lead to overreliance on the system by the healthcare providers. Defective performance during misleading of an algorithm might result in serious healthcare management errors. Even if the accurate algorithm identifies the ailment, the derived result does not improve patient satisfaction as AI impersonates the traditional care provider. If anything has to mislead, the patient–healthcare professional bonding would jeopardize,

leading to dissatisfaction about care choice made by AI technology. We started to lay the interpretability foundation to enable these future AI systems. The trust that societies have in AI is essential. AI should be created and used to benefit people and the planet, respecting privacy, encouraging inclusiveness, and functioning transparently. The purpose of this chapter is to shed light to AI in the health and care context discussing its ethical implications and providing next steps to fully harness AI potential. AI has notable implications to the health system, including accessibility, accuracy, speed and cost of care. Such implications are critical for the sustainability of national health systems and for critically reducing health inequalities in our societies. Concluding, AI is a disruptor that advances efficiency and cost effectiveness in health systems. Such advancements are necessary to ensure sustainability of health systems. However, the efficiency and cost effectiveness of AI should not compromise the trust that citizens place on the health and care system. To do so, values such as privacy, reliability, inclusiveness, fairness, and transparency should be respected.

# 2. EXPERIMENT

The following experiment is to conduct a small comparison between an AI virtual assistantand human doctors in predicting accuracy and precision of patient disease. Since the healthcare centers are overloading with patients of different needs especially in a very populated area, it is extremely difficult for doctors to assess all needed patients. So AI virtual assistant will play a assistant role by allowing patients to self-examination themselves and get precaution against the potential future diseases. Some may doubt this AI as they did not get used to it but it is extremely important to get patients trusts so can this AI develops.

## 2.1 METHODOLOGY

The objective of this experiment is to test AI virtual assistant by comparing it to human doctor's performances. AI virtual assistant assist the patient triage advices and precautionsto take. The operation happened due to consultation of patient to both AI virtual assistant and human doctors. The parameters taken into account are the accuracy, the safety, the recall and the appropriateness. The both roles between AI virtual assistant and patient & between patient and doctors are played by physicians. One hundred vignettes were created,each vignette represent the simulation of a medical condition. Vignettes contain certain data about patient important for the process. Data such as their initial problem, data about their symptom and their previously health problems. Patient called vignette was having separate meeting with four doctors and AI and the recommendations provided by each of them was recorded. The recording was done three times. The equation used during experiment is:

$$Y = A.X \tag{2.1}$$

## 2.2 RESULTS AND DISCUSSION

### 2.2.1 Results and Discussion

The results gotten after the first recording is shown in Table 2.1 below:

**Table 2.1:** Results of Both Doctors and AI After First Recording.

| | RECALL | PRECISION | SAFETY | APPROPRIATENESS |
|---|---|---|---|---|
| Doctors | 84.4% | 44.2% | 90.8% | 91.3% |
| AI | 85.4% | 45.2% | 96.3% | 88.7% |

The results gotten after the second recording is shown in Table 2.2 below:

**Table 2.2:** Results of Both Doctors and AI After Second Recording.

| | RECALL | PRECISION | SAFETY | APPROPRIATENESS |
|---|---|---|---|---|
| Doctors | 82.8% | 41.5% | 95.3% | 94.6% |
| AI | 82.6% | 41.7% | 99.4% | 93.2% |

The results gotten after the third recording is shown in Table 2.3 below:

**Table 2.3:** Results of Both Doctors and AI After Third Recording.

| | RECALL | PRECISION | SAFETY | APPROPRIATENESS |
|---|---|---|---|---|
| Doctors | 84.5% | 45.1% | 93.2% | 85.6% |
| AI | 71.8% | 45.1% | 95.3% | 88.1% |

**Table 2.4:** Results of Average Both Doctors and AI After All Recordings.

| | RECALL | PRECISION | SAFETY | APPROPRIATENESS |
|---|---|---|---|---|
| Doctors | 83.9% | 43.6% | 93.1% | 90.5% |
| AI | 80% | 44% | 97% | 90% |

**Chart 2.1:** Chart of Average Representing the Performance of Human Doctors.

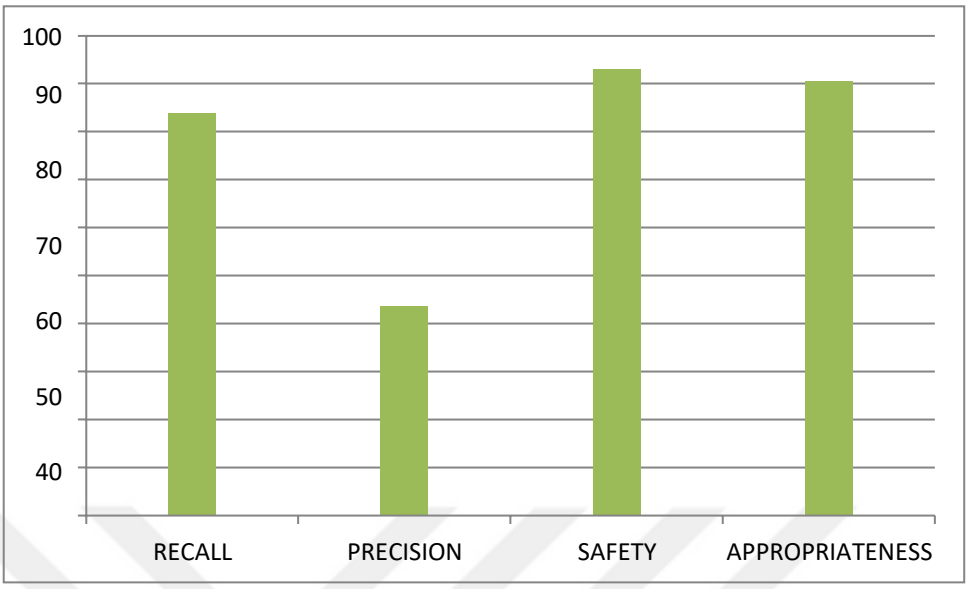
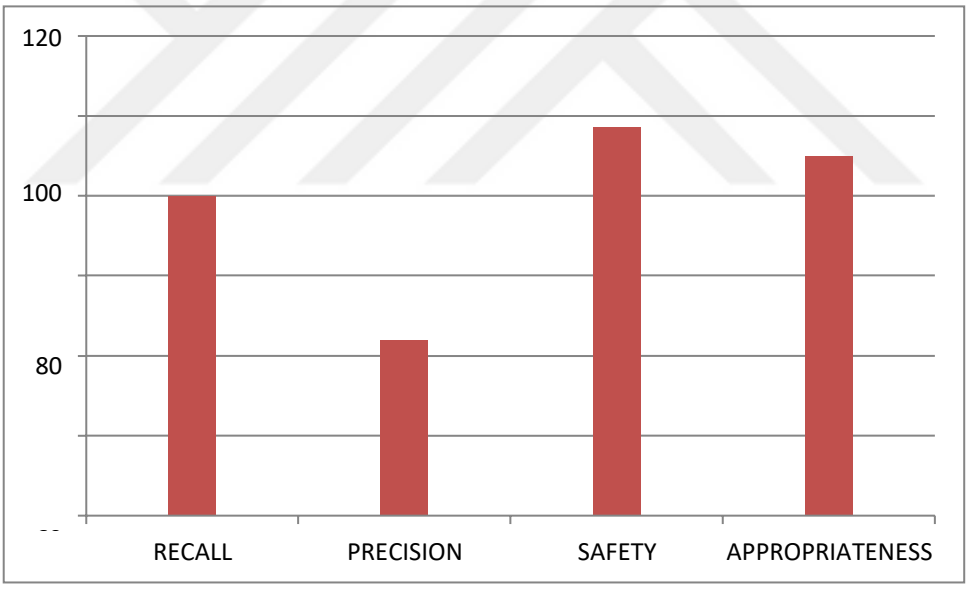



**Chart 2.2:** Chart of Average Representing the Performance of AI.




We determined the accuracy and recall of the AI and doctors against the condition designed for one scenario. Recall is the fraction of appropriate diseases that are contained in the characteristic. When seeing only the alone ailment designed for one scenario, this agrees to the bulk of characteristic that held the designed disease, over all scenarios. ultimate appropriate prioritize approval, stillit is not inevitably the case that one these different belief are unfit or dangerous. By providing the minimum and maximum appropriate emphasement.

Precision is the magnitude of the ailments in the characteristic that are appropriate, and penalizes long characteristic. In this study, the AI was capable to conclude the designed ailment, accompanying accuracy and recall corresponding to human doctors and in some cases surpassing human-level depiction. To determine emphasize veracity, a liberated expert judge was requested to designate a range of dependable and appropriate emphasize effects each scenario. Providing a range of acceptable emphasize approvals was instigated apiece reality that doctors frequently differ on ultimate appropriate prioritize approval, stillit is not inevitably the case that one these different belief are unfit or dangerous. By providing the minimum and maximum appropriate emphasize, the judge displays the rangeof approvals that are neither dangerous nor excessively careful. We distinguished the prioritize pieces of advice of doctors and the AI against the judge's "golden standard" range. We define a "reliable" sort as some approval that was of equal or better importance than the judge's minimum emphasize, and an "appropriate" prioritize as some approval that flatten within the judge's range of satisfactory approvals. In this study, we establish that the AI determined a more reliable prioritize approval than doctors approximately (97.0% against 93.1%); at the payment of a little lower suitability.

# 3. CONCLUSIONS

To conclude, the formal field of artificial intelligence was emerged in mid-20th century. It was mostly found by an American computer scientist named john McCarthy at university of Dartmouth in 1956. Later on, so that these machines complete task only humans are capable to perform, many subfields of artificial intelligence have been structured. Today, many artificial intelligences systems reckon on machine learning and deep learning. Machine learning is a field of study in artificial intelligence where algorithms are applied on computer system so they can perform human level tasks and without other explicit instructions. It requires inserting more data in a computer system so it is able to perform without additional instruction. To increase their efficiency to meet the tasks, more data inserting is mandatory. Sometimes it is noticed that machines learning systems would not complete the tasks because it is widely known that the neuron of a machine learning systems don't match the humans neuron brain which contains almost hundred millions neurons, so still machine learning systems need a bit of advancement in term of algorithm used and data collection. Deep learning is a type of machine learning in which to remove an important amount of features from data multiple layers of processing in form of neural network are needed. Compared to machine learning, deep learning required almost none human intervention and able to predict more accuracy than machine learning. While deep learning machines are still not able to match the human brain, its neural network often comes close of simulating human brain. Artificial intelligence machine interpret a huge amount of genomic data to predict potential disease a patient may suffer and provide the plan of prevention of the disease. These machines are also capable of predicting the survival rate of a cancer patient for instance. For future outlook, it is expected that AI systems will develop and continue to evolve and to enable to interconnect researchers and Creating a diverse database of patient information and using it as a training set for AI can detect and eliminate potential biases in the datasets used. For example, an AI developed by IBM was discovered to be directing the treatment of cancer patients towards a specific subset of the population. The algorithm failed to recommend the same treatment even when the data of African-American patients was included in the training set. When the data of these individuals was included, recommendations were then equally made. The attitudes of many countries

towards data protection have largely contributed to disparities in applying AI to healthcare and are the challenges facing policymakers in harmonizing international rules while protecting human rights.

Healthcare providers to arrive at the maximum research. Virtual care, AI-driven drug discovery are among areas expected to drive innovation. Over the last seven decades, AI inhealthcare has witness a tremendous changes in many medical parts of analysis and assessment. Despite of the need to certain improvement on how artificial intelligence may be useful in healthcare, AI applications assist the doctors and healthcare providers and workers in an efficient way. For Instance in medical imaging analysis, the images provided by MRI, CT and X-rays are assessed by AI computer systems and help radiologists to suspect abnormalities causing to a more accurate diagnoses. Compared to human doctors, AI applications for medical image analysis examine the image very fast and efficiently so that the process analysis finishes rapidly. For clinical decision support, machines learning and natural processing methods are used to examine electronic health record (EHR) and genomic data. These systems help the healthcare providers to arrive a correct medical recommendation. AI systems are also used in "Remote Patient Monitoring" using home sensors to gather health data from patients in addition of used healthcare settings to monitor the patient and enable the patient to get care. AI systems in healthcare take data from a clinical text like (EHR) by the assistance of natural language processing. Natural language processing application improves the decision making of the doctors and assists the healthcare responsible in administration. Clinical coding, automated coding are done by natural language processing. AI is also useful in medical precision and genomics as it eases precision medicine by analysing genomics. For instance in early stage of a cancer, AI applications for genomic identify the tumor and precise where the genetic mutations occurred. AI application systems are used for drug discovery as it speeds up the process byupgrading clinical trial design. The AI used for drug discovery examines chemical structures to next locate potential drug candidates readjusting the already present Healthcare is restricted by high rates of manual routine work. Long working hours lead to healthcare provider burnout. Conversely, providing care with AI technology has been proposed to significantly improve both efficiency of healthcare services and the diversity of the fields in which they are offered. There is research that used AI-enhanced medical software in a healthcare setting and

demonstrated a time-saving advantage in daily medical procedures through faster and more accurate procedure administration, recommended experiences, and other tasks resolution through deep learning-enhanced medical software. Moreover, a landmark study compared time efficiency by using only one study assistant to retrieve medical information from patients medications for new indications. Drug discovery related AI improve efficiency, reduces prices, and accelerates potential therapies for many diseases. As every technology inventions, artificial intelligence is used to maximum. It is used to enhance the efficiency for the work and permit to get better result. First, artificial intelligence is useful for the administrative things. Artificial intelligence participate to alleviate the workers from doingpaperwork, giving the healthcare providers to be more available to others things like takingcare of the patient and meeting the needs. Artificial intelligence also assists the clinicians for note-taking. Artificial intelligence is also known to be served as virtual nursing assistants sometimes because of patient's preference. In fact AI assisting virtual nurse are programmed to answer the medication answers and to assist the patient doctor to find a physician if necessary. AI systems can also be key in case of conducting a surgery like reducing blood loss and pain after surgery and ensuring safety in most affectable organs. AI can also play role in fraud prevention in healthcare industries. AI can also play role in fraud prevention in healthcare industries. Furthermore, AI provides a higher efficiency while medical imaging analysis by providing the doctors corrects data. Artificial intelligence also contributes massively in others area of healthcare which is data analysis. It assesses risks by examining a large amount of patient's data to predict their potential outcomes. For instance, it can tell the patients who may risk getting disease such as diabetes or heart failure. After recognizing the potential disease that the patient may get, AI driven systems recommend the measurement to be taken for prevention. Then, artificial perfect the treatment that patient must be undergoing and reanalyse previous patient data such as its genetics to suppose the most perfect treatment possible. In radiology, many healthcare biggies like Aidoc use the artificial intelligence alimented by algorithms in theirX-rays analysis process to detect anomalies and diseases. Diseases such as cancer can be as the realworld data generate complex relationships among the entity, the algorithm is highly influenced by the data used in training. The lack of established principles involved in data processing, such as data privacy, confidentiality, and security, raises concerns about cooperation in data sharing.

The integration of AI technology in healthcare leads to medical robots and AI in various capacities, taking over minor to major roles. Given the trust patients have on healthcare professionals, particularly healthcare leadership, and management positions are taken over by these automated robots supported by AI technology raises ethical dilemmas. In healthcare, manual labor during imaging is performed by technologists, radiographers, or other healthcare practitioners. The ingress of the fully automated business model redefines the role performed by radiologists and technologists.

Easily recognized by the AI by a higher accuracy. For experience decisions, doctors use their experiences without look for instance patient past diseases to make decisions which may be risky but still more often decisions are corrects. In medicine field, the communication is extremely important. Doctors are able to communicate with patients in order to know what the patient suffers and also get information about the past complaints of the patient. The doctors conduct an effective communication to the patients and their families to explains them the necessary treatments, their processes and in the same time listen the patients carefully and permit their families to express their concerns. This one thing the doctors are superior to artificial intelligence since the artificial intelligence are not yet developed for communication although it could be in near future. Another thing doctors are master is the empathy toward the patients. Doctors are human and it is human nature to show w their emotional side to patient and try as much as they can to try to in some way to mentally influence positively the patient and gain patient trust. One of the biggest roles of doctors toward their patient is to assess them physically in order to know their suffer. Unlike the AI, doctors can examine the patient physically to see where the default is and then evaluate it and prescribe treatment accordingly. Doctors also have a professional responsibility. Doctors obeys the rules and conduct themselves in a professional way while being in healthcare centers and give the patient care, respect, welfare. In today world, artificial intelligence plays a tremendous role in healthcare systems assisting in many ways. Despite all, this advancement must meet some strict ethical challenges. Healthcare is at the frontier of AI application and innovation. The dawnof AI promises alluring prospects. Routine medical tasks and patient care will be optimized. The accuracy and efficiency of medical diagnosis and treatments will improve. AI has enormous potential to lead human civilization from a civilization driven by asset- accurate algorithm identifies the ailment,

the derived result does not improve patient satisfaction as AI impersonates the traditional care provider. If anything has to mislead, the patient–healthcare professional bonding would jeopardize, leading to dissatisfaction about care choice made by AI technology. We started to lay the interpretability foundation to enable these future AI systems. The trust that societies have in AI is essential. AI should be created and used to benefit people and the planet, respecting privacy, encouraging inclusiveness, and functioning transparently. The purpose of this chapter is to shed light to AI in the health and care context discussing its ethical implications and providing next steps to fully harness AI potential. AI has notable implications to the health system, including accessibility, accuracy, speed and cost of care. Such implications are critical driven management to a civilized civilization driven by infrastructure-driven management.At the same time, the application of AI will also entail opportunities and ethical challenges.Everything - from privacy violations, bias, the potential costs from medical mistakes, clinical challenges of decision responsibility, treatment goals, transfer of decision-making,and the need for substantially new care models, the potential for employment shift is touched by AI tools. Addressing these concerns is critical to evaluate potential risks and rewards and maximize the responsibility of AI tools in healthcare. Studies reveal opportunities and ethical risks in the application of AI can be quantified and evaluated appropriately. Post analyses indicate the potential benefits and risks resulting from the widespread application of AI to healthcare. For instance, it is increasingly clear that ethicalchallenges such as fairness and injustice, privacy and security, AI application regulation, AI capacity of accountability, loss of decision autonomy, care pattern changes, workforce shifts - and their functional trade-offs. For example, it is necessary to utilize the potential of AI in the relative balance between efficiency and effectiveness. Healthcare, balances insurability and reduced quality of work, and provides services to patients. Researchers in pre-analysis indicate whether the use of AI tools in factory automation will ultimately create or drive social imbalances and inequities. Similarly, AI applications will increase health disparities and a reduction in overall health. This paper organizes these opportunities and challenges into a two-dimensional classification. The first dimension is efficiency: existing practices or methods without AI, and the second dimension is effectiveness: non-existent classes. With the rapidly developed new technologies in the modern era, from Internet of Things (IoT) to mobile health (mHealth), and especially

with advanced technologies like Artificial Intelligence (AI), there are new opportunities for healthcare applications. Nevertheless, these opportunities come with the caveat that The doctors conduct an effective communication to the patients and their families to explains them the necessary treatments, their processes and in the same time listen the patients carefully and permit their families to express their concerns. This one thing the doctors are superior to artificial intelligence since the artificial intelligence are not yet developed for communication although it could be in near future. Another thing doctors are master is the empathy toward the patients. Doctors are human and it is human nature to show w their emotional side to patient and try as much as they can to try to in some way to mentally influence positively the patient and gain patient trust.One of the biggest roles of doctors toward their patient is to assess them physically in order to know their suffer.

Will affect patients and professionals in profound ways. Identifying the benefits and challenges of advanced enabling technology can be helpful for the adoption process by understanding the possible impacts of AI on healthcare. The primary focus for integrating AI education into medical school, residency programs, and graduate medical education will have to be on defining general competencies. This will ensure that medical students and healthcare professionals obtain basic knowledge in AI. However, a particular competency clause will be important for health professions' educators who are responsible for ensuring basic understanding in an organized and systematic approach to educating future practitioners. Furthermore, additional "AI competencies" should be incorporated into curricula and moved from specialized academic programs to be included in medical education. For academic institutions, providing opportunities for AI training needs to be supported to address the human resources needed to integrate AI into the education of students. Future AI systems will likely be far more powerful than current systems. The current methods are fragile and because of this, they do not scale well. Making the models generalized to unseen data will be important so that we can trust the conclusions of medical models working in the wild with a variety of patients and doctors. We envision a future where AI is not the single decision-making entity but is programmed to work in concert with other humans such that both parties have a say in the final decision. Our research program will take a step towards this future in the domain of mental health by giving therapists AI-powered tools that assist them to

better understand complex human behaviour. Better Model Interpretability: Models with higher interpretability will allow us to perform exploratory analysis and help us build meaningful models of human cognitive behaviour and reality. A more generalized AI that can provide this kind of meaningful interpretation will enable us to ask less philosophical questions about AI, such as how AI the suspected disease is skin cancer, the specialistsuse AI to examine the images and see whether the cancer is malignant or benign. In case the cancer is malignant, the specialists send the patient to another specialist for treatment. The AI is also used to detect the problems related to lungs. The Ai can easily examine the images of the chest conducted by an X-rays or CT. Certain healthcare centers also put to use artificial intelligence for stomach, pancreas, and colon related diseases. The treatment of these diseases is done in gastroenterology. The specialists use endoscopy for analysis and artificial intelligence assist the specialists to locate polyps and others abnormalities in colon for instance. In oncology which is a study of cancer detection, the programmed artificial intelligence machines scan multiple data such.

Can help us become more interested in our patients and the world again. In order for these AI models to be adopted, they must be interpretable by humans both on a technical level and in a superordinate sense. We started to lay the interpretability foundation to enable these future AI systems. The trust that societies have in AI is essential. AI should be created and used to benefit people and the planet, respecting privacy, encouraging inclusiveness, and functioning transparently. The purpose of this chapter is to shed light toAI in the health and care context discussing its ethical implications and providing next steps to fully harness AI potential. AI has notable implications to the health system, including accessibility, accuracy, speed and cost of care. Such implications are critical for the sustainability of national health systems and for critically reducing health inequalities in our societies. For these reasons, in 2020, the Greek Government announced the allocation of 1.5 billion, the largest investment, in AI, taking a first step to spur economic development. Agencies recently turned to a deeper understanding of the ethical implications of using AI considering the increased number of AI applications in health. Concluding, AI is a disruptor that advances efficiency and cost effectiveness in health systems. Such advancements are necessary to ensure sustainability of health systems. However, the efficiency and cost effectiveness of AI should not compromise

the trust that citizens place on the health and care system. To do so, values such as privacy, reliability, inclusiveness, fairness, and transparency should be respected. Defective performance during misleading of an algorithm might result in serious healthcare management errors. Even if the accurate algorithm identifies the ailment, the derived result does not improve patient satisfaction as AI impersonates the traditional care provider. If anything has to mislead, the patient–healthcare professional bonding would jeopardize, leading to dissatisfaction about care choice made by AI technology. We started to lay the interpretability foundation to enable these future AI systems. The trust that societies have in AI is essential. AI should be created and used to benefit people and the planet, respecting privacy, encouraging inclusiveness, and functioning transparently. The purpose of this chapter is to shed light to AI in the health and care context discussing its ethical implications and providing next steps to fully harness AI potential. AI has notable implications to the health system, including accessibility, accuracy, speed and cost of care. Such implications are critical for the sustainability of national health systems and for critically reducing health inequalities in our societies.

# REFERENCES


[1] Abdelhameed, A. & M. Bayoumi, "A Deep Learning Approach for Automatic Seizure Detection in Children With Epilepsy," *Frontiers in Computational Neuroscience*, 2021, pp.15.

[2] Ahmed, F. E, "Artificial neural networks for diagnosis and survival prediction in coloncancer," *Molecular Cancer*, 2005, pp. 4-29.

[3] Bou Assi, E., D. K. Nguyen, S. Rihana & M. Sawan, "owards accurate prediction of epileptic seizures: A review," *Biomedical Signal Processing and Control*, 2017, pp. 144- 157.

[4] Ossins, D, "Discriminating algorithms: 5 times AI showed prejudice" NewScientist, 2018.

[5] Densen, P, "Challenges and opportunities facing medical education," *Transactions ofthe American Clinical and Climatological Association*, 2011, pp. 48-58.

[6] Sajda, P, "Machine Learning for Detection and Diagnosis of Disease," *Annual Review ofBiomedical Engineering*, 2006, pp. 537-565.

[7] Benjamin Musri*e*. (2021, August). The Evolution Of Artificial Intelligence In Healthcare. GenieUs Genomics. Sydney, Australia. Available: https://medium.com/codex/the-evolution-of-artificial-intelligence-in-healthcare- bc7da8bcfc1e.

[8] Ahmed Al Kuwaiti. (2023, June). A review Of The Role Of Artificial Intelligence Inhealthcare. Journal of Personalized Medicine. Basel, Switzerland. Available: https://www.researchgate.net/publication/371291355_A_Review_of_the_Role_of_Artifici al_Intelligence_in_Healthcare.

[9] Adam Baker. (2020, November). A Comparison Of Artificial Intelligence And HumanDoctors For Purpose Of Triage And Diagnosis. Frontiers In Artificial Intelligence 3. Germany.Available:https://www.researchgate.net/publication/347242432_A_Comparison_of_Artificial_Intelligence_and_Human_Doctors_for_the_Purpose_of_Triage_and_Diagnos is.

# APPENDIX A

## MATERIAL SUBMITTED WITH THE THESIS PAPER

Within the thesis document, I also submitted a conference paper that I have submitted in “international of innovative science and research technology” consisting of three pages describing the topic and its details. The paper describe exactly all the details about my thesis subject and correlate with it.