AI in Medicine: Ethics

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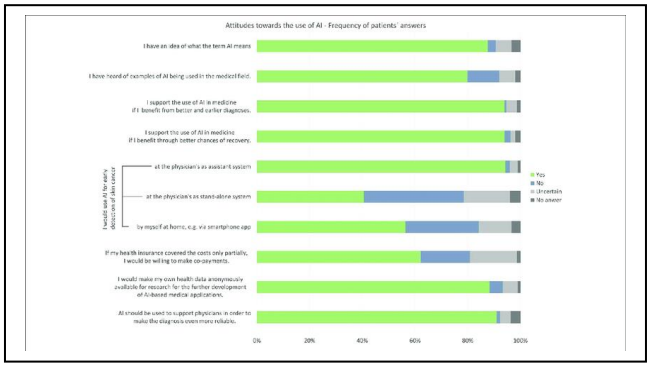
***Abstract*-** It's a fact that artificial intelligence is the breakthrough of this century. Day by day AI invades new fields of life, medicine is not an exception. In this article we are not diving into the applications of AI in medicine, we are concerned more about the Ethics of AI implementation in medicine. When we try to implement AI in medicine many questions are asked, such as: Does a patient become just a bunch of numbers and statistics? How would a machine emphasize patients, especially elderly people? How could we permit a machine to make vital decisions about people's lives? And finally, do we have equal opportunities of benefiting from this technology?
With the help of four of the most cited papers that discussed this problem, we'll try to give a clear answer to these questions.
Keywords—Artificial intelligence, medical care, medicine, ethics, fears.

I. Introduction

Truth is truth, people fear new things, especially if these things are related to their health and lives. This is not the case with AI, maybe people wait for any hope to help them in their treatment the following survey [1] confirms what we say.



With the widespread of AI, more and more people ask questions because of the ambiguousness of the ethics of the AI technology used in medicine. However, there is no doubt that AI technologies made and are still making a huge difference in the history of medicine, and a source of hope for many patients as well. The following time chart highlights some of these achievements.

The talk of ethics in AI has attracted the attention of many scholars and conferences.
The University of Toronto for example organized a conference on this topic last July. Last February NordForsk organization held a conference about this topic. Saint Louis University is organizing a series of conferences on the main issues of our topic. So, we need to get some answers on these areas of AI applications which are not clear to many people. The motivation of this paper is to answer these. We have depended on the information found on the first four references mentioned in the references section. We hope to make a summary of what these references wrote on our topic. We'll give some main points on the effect of AI on people's mental health and its psychological impact on them. We'll make use of the following papers in the survey: Logical, Philosophical and Ethical Aspects of AI in Medicine [2], Applications of Artificial Intelligence in Medicine and Pharmacy – Ethics Aspects [3], The disruptive power of Artificial Intelligence. Ethical aspects of gerontechnology in elderly care [4], Artificial Intelligence in Healthcare and Medicine: Promises Ethical Challenges, and Governance [5].

II. Our Methodology

A. Search problem & data collected

As mentioned, we want to decrease the vagueness of the ethical part of the implementation of AI in medicine. By expanding the small slices of information on our topic which are mentioned in the four studied papers. The data collected is the data from these papers, we'll give a quick brief on the data collected by every paper of the four.

B. Processing this data

We processed the data by breaking it into small main points. This approach was helpful as it gave us the capability of giving a full idea of the studied papers to the reader. This method had a limitation which was mentioning the references used in the studied papers. We had to mention more than a reference in the same sentence sometimes, which may be confusing. However, we believe that this is the best possible approach.

III. SUMMARIZING THE FOUR PAPERS

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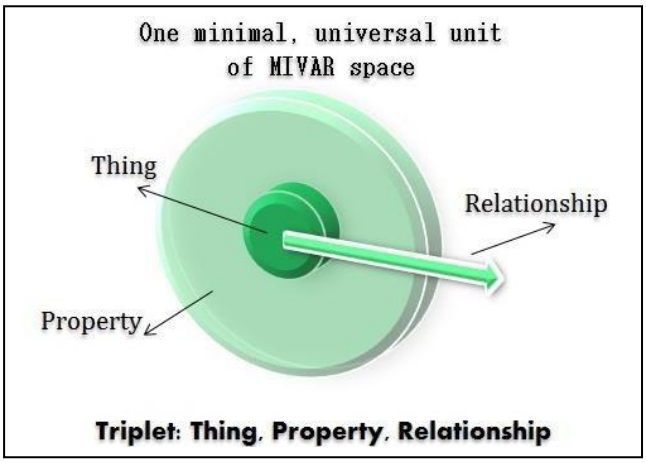
A. First research: Logical, Philosophical and Ethical Aspects of AI in Medicine

One of the few papers that discussed the philosophical aspect of our study. The paper began by giving a small comparison between narrow, logical, and general AI [6]. Narrow AI is AI is the applied AI that includes neural networks, genetic algorithms, and other pre-intellectual forms of complex computing, allowing one to understand and explore the physical world. General AI, which is not achievable up till now- means that super-intellectual AI will understand speech and emotions like a human and could participate in social processes independently. Finally, the logical type relates to inferences, models of reduction, abduction (propose a hypothesis), induction (reasoning from particular to general), truth maintenance systems, and decision support systems. The heart of this research is the MIVAR (Multidimensional Informational Variable Adaptive Reality) technology which can create all three types of AI. The MIVAR unit can be expressed as the relation of a thing, property, and relation.



The pearl of this research was applying the MIVAR technology for the creation of medical ontology for the first time in MIVAR technology history which is the novelty of the study. However, all these parts are out of our scope. A doctor without compassions: a doctor is a "prescription machine, a spy of symptoms". This is how This research opens our eyes to the importance of the emotional side of the treatment process and asks one of the Vital questions " Can a machine emphasize and Show mercy?". The Paper shows that this is Possible, it informs us that this Can be done using two ways: the MIVAR way and the Mirror neurons way. The difference between the two approaches is Simple. The artificial network of Mirror neurons can give AI a Simple empathic, emotional experience, without which medical care and medicine, in general, would be very inhuman. The MIVAR technology with the help of rules and constraints can imitate emotions and empathy. Another good part of this research is discussing the social and psychological aspects of implementing AI in medicine, which gives us some answers to our questions. We ask the question: do we care about the emotional side of treatment? at least in the last years. Erich Fromm alleged that human chooses the direction of robotism, [7] which means that people are losing much of their humanism Values: How Could we know that people are changing in manners? Paper Suggests we should get the help of historians. According to Jacques Le Goff [8], history is the science of time, and memory is one of the objects of historical investigation. The problem now is that we are witnessing new Sort of massive memories, computers memory. We ended up with no real solution. This Is one of the cons of the paper not Paying enough attention to ethics is another drawback of the paper as it farms only lots of like paper. On the other hand, the paper confirms that machines can emphasize, which is the answer to the second question. The contribution of the paper is also unique, new, and important.

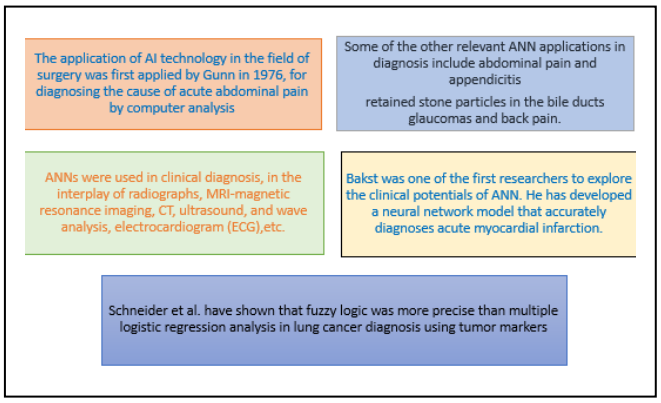
B. Second research: Artificial Intelligence in Healthcare and Medicine: Promises, Ethical Challenges, and Governance

The paper begins with a quick introduction to the science of AI defining it as the force that reinforces industries, and it has a big role in society including medicine. it was invented in 1955 by john McCarthy and is defined as "the science and engineering of making intelligent machines ". The authors confirm that AI has been applied in different aspects of life in the last fifty years. Then the paper gives us some information on the chip "TruthNorth" which was a breakthrough in the art of AI because it can give machines and computers some of the Human brain-like abilities. After that, the authors confirm that governments have already paid attention to making plans and strategies forAI applications, with NG-PI as an example. NG-AI is the best national AI strategy, with not only goals for research and development and industrialization, but also standard-setting and ethical norms, and security. Then the paper gives us a quick idea about the applications of AI, and it categorizes them into three main branches virtual, physical, and combination between virtual reality and robots [8][9][10]. Then the paper starts handling our interested field. The paper highlights challenges that may help us to answer our questions. It confirms that it is important to find the balance among three relationships: 1) science - Medical indication. 2) human society - Safety and priority of life. 3) Individual - Patient desire. These three terms cover all sides of the good usage of these apps on the patients. Ethics about AI in medicine have been elaborated in Bioethics of Clinical Applications. There are some ethical issues facing the clinical application of AI which must be handled: safety, efficiency, privacy, informed consent, and the right to decide to get the satisfaction of the patient. Big data are indispensable to AI research in healthcare. Moreover, research and development involving AI in medicine are currently inseparable from animal experiments as research on certain biological interventions, such as gene editing and stem cell therapy, is currently permitted in somatic cells, it is prohibited in human embryos or germ cells. The paper gives us an answer to our second question which was "Does a patient become just a bunch of numbers and statistics?". It sets some ethical rules that we must follow when applying new AI inventions and discoveries in medicine. We're taking the most rules related to our questions. The first rule is that clinical staff must be careful with patient's life as technical errors associated with such technologies may cause problems and don't take risks

as successes in areas beyond control could result in even more serious issues. “Neurobian Hybridization” is an example of this type of experiment. It refers to interfacing brain-inspired devices with the real human brain. As BCI technology -for example- when using a reader on a patient’s scalp to help people with spinal-cord injuries, which could lead to brain infection and subsequent damage to the brain. However, BCI is a “direct connection between living neural tissue and artificial devices” [11][12][13][14]. The second rule is giving priority to the individual’s interests; no one can sacrifice the individual’s rights and interests even for the sake of human society. Another important ethical consideration is ensuring fairness among individuals once AI applications are allowed into clinical practice. In such cases, the professional will be required to act in the best interests of his patient, according to the four requirements under Johnsen’s framework of general ethical issues Moreover, everyone should have an equal opportunity to enjoy the benefits provided by AI in medicine. The Paper’s pros could be summarized as it is the most of the four research papers that give the ethical part enough space. It showed the advantage of AI well. Cons are its language was not good enough as it was translated before, and Its order was so bad as I was made to arrange it from scratch to summarize it well.

C. Third research: Applications of Artificial Intelligence in Medicine and Pharmacy – Ethics Aspects

When we talk about the medical field, we talk about living being, especially human being, which has feelings, emotions, goals, dreams, family, friends, and responsibility. So, they can’t just be numbers and statistics. AI is one of the world's most influential inventions of the century. It’s occupied a lot of ground, it replaced humans in many jobs, It is believed that automation and AI will take over, and over the next 5 years, 7.1 million jobs will be extinguished, but can it replace humans in a field like medicine, where feelings, empathy, and warmth are very important factors? Before answering that question, we need to about its role in this area. Let’s show you some of its uses. First, it was used for the first time in the field of surgery in 1976, for diagnosing the cause of acute abdominal pain by computer analysis. The most important application of AI in the medical field is Artificial neural networks (ANNs), whichare computer programs designed to simulate some of the functions of the human brain such as learning, the ability to generalization, and conclusions based on prior experiences. Then Esteve et al. published a paper in 2017 on the classification of skin cancer using deep neural networks. Skin cancer is diagnosed visually. Using AI, processing a series of images in its databases (specifically 129,450 images), amore precise classification of skin lesions can be made that represents skin cancer in different stages. Finally, IBM has developed an AI system called Watson. The supercomputer can quickly review a patient's genetic data to diagnose the disease, which would normally take several weeks. The IBM System Watson has diagnosed a woman who was unsuccessfully treated for acute myeloid leukemia, a rare type of leukemia by comparing the patient's genetic testing and oncological data from over 20 million cases to which it had access. The following figure summarizes the main points of the history of AI implementation in medicine due to their effect on the history of medicine.



. Infinite, supernatural, superhuman, indispensable applications. It saves time, lives, money, and effort, and gives highly accurate results. So, there’s no escaping AI in medicine. But like everything else in life, they have an advantage, they have disadvantages. They need very accurate information from the patients who sometimes don’t say everything right away. What if a robot received two simultaneous calls? Can we let it make the decision? Of course, no, we can’t do something like that, they can’t decide who’s receiving the service first, in some situations they can, but we can’t rely on them. And what about privacy and security with AI? Who owns information? AI can be hacked, it’s not like humans save data in their brain cells, it just has a hard disk that contains all information, it can be stolen or hacked by anyone, who is in charge when something like this happens? As we mentioned before, in the medicine field empathy, feelings and warmth are very important, do robots have any of them? According to this paper, they don’t have emotions, they don’t feel the pain, they can’t understand human life, relationships, and feelings, they just understand numbers and data, for them, the patient is just a bunch of numbers and stats and that’s not everything in medicine. According to us, AI can’t replace humans in the medical field, despite all its powerful capabilities and amazing solutions. so, the best way to use is to keep humans in humanitarian aspects and lend the numbers and data analysis to AI to handle it.

D. Fourth: ‘The disruptive power of Artificial Intelligence. Ethical aspects of gerontechnology in elderly care

Gerontechnology based on Artificial Intelligence (AI) is expected to fulfill the promise of the so-called 4pmedicine and enable predictive, personalized, preventive, and participatory elderly care. Although empirical evidence shows positive health outcomes, commentators are concerned that AI-based gerontechnology could bring along the disruption to elderly care. A systematic conceptualization of these concerns is lacking. In this paper, such a conceptualization is suggested by analyzing the risks of AI in elderly care as “4d-risks”: the depersonalization of care through algorithm-based standardization, the discrimination

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of minority groups through generalization, the dehumanization of the care relationship through automatization, and the disciplinarian of users through monitoring and surveillance. Based on the 4d-model, strategies for a patient-centered AI in elderly care are outlined. Whether AI-based gerontechnology will actualize the 4p-perspective or bring about the 4dscenario depends on whether joint efforts of users, caregivers, care providers, engineers, and policymakers will be made. Does a patient become just a bunch of numbers and statistics? Unfortunately, yes, the increasing usage of technology in nursing with its focus on the patient as the body may undermine the holistic approach to nursing practice and limit the ability of nurses to integrate the patient's individual experience of illness into the clinical process. How could we permit a machine to make vital decisions about people's lives? By machines such as bed sensors, wearable sensors for vital functions, floor sensors, and sensors for measuring the use of electricity patient data is collected and analyzed and vital decisions are made based on this data. Advantages of this paper: This paper highlighted an important problem, which is the disruptive power of Artificial Intelligence in the elderly care field, and most of the risks (4ds) are also discussed at length. Disadvantages of this paper: We think it did not give effective ways to solve the problem.

IV. FULL COMPARISON BETWEEN THE FOUR PAPERS

Research / *Comparing points*	*A.* *Logical, Philosophical and Ethical Aspects of AI in Medicine*	*B.* *Artificial Intelligence in Healthcare and Medicine: Promises, Ethical Challenges, and Governance*	*C.* *Applications of Artificial Intelligence in Medicine and Pharmacy – Ethics Aspects*	*D.* *The disruptive power of Artificial Intelligence. Ethical aspects of gerontechnology in elderly care*
Novelty	**Applying the MIVAR technology for the creation of medical ontology for the first time in MIVAR technology history is the novelty of the study.**	**No novelty.**	**No novelty.**	**No novelty.**
Main Topic of paper	**MIVAR technology.**	**Gives a quick summary of rules regarding implementing AI in medicine**	**Summary of the history of AI and its applications.**	**Gerontechnology that is based on Artificial Intelligence (AI) and its relation to elderly people.**
Paper's main answer to the four questions of the research	**The paper answered the third question. It confirms that permitting a machine to make vital decisions. The IBM machine's "the best of our day" success rate was very low. And it also answers the second question. Paper confirms that machines can show mercy and love to patients using both MIVAR and Mirror neurons mentioned in it.**	**The paper helps us with the first question by giving us suggestions so that we could prevent the patients from the dehumanization that comes with the increasing usage of AI in medicine.**	**The paper asks questions more than gives answers or solutions. But it opened our eyes to the fourth question which was the ability to make AI reachable for all patients in the world. Which is for sure impossible in the present.**	**The paper answers the first question that patients are now becoming some numbers in an excel sheet. The answer is yes.**
Psychological side	**The only paper that discussed this part. And it suggested involving historians in this process because studying the past helps us to predict the coming effects of the revolutionary age of AI.**	**Didn't handle it.**	**Didn't handle it.**	**Didn't handle it.**
Pros	**The contribution is worthy. The link between people's behavior and history.**	**This paper is so good at ethical challenges. It showed the advantage of AI well.**	**The paper is a guide for those who don't know anything about AI applications in medicine.**	**This paper highlighted an important problem, which is the disruptive power of Artificial Intelligence in the elderly care field, and most of the risks (4ds) are also discussed at length.**
Cons	**Didn't give us a clear description of the current state of the ethics of usage of AI in medicine.**	**Its language was not good enough as it was translated before. Its order was so bad as we were made to arrange it from scratch to summarize it well.**	**As mentioned, it doesn't give answers or solutions to our problems.**	**It did not give effective ways to solve the problem of risks (4ds)**

Summary table of the research.

V. Discussion

After looking precisely at these papers and trying to answer our four main questions, whether a patient becomes just a bunch of numbers and statistics, how a machine would emphasize patients, especially elderly people, how we could permit a machine to make vital decisions about people's lives, and finally, whether we have equal opportunities of benefiting from this technology. We reached out that a machine can not leave a machine take the responsibility of making vital decisions in people's lives, so far. We concluded according to the recent research that we should implement the laws and rules mentioned in the second paper relating to this ethical problem, we concluded that it's not possible to help people with AI technology due to poverty, but it could happen one day. And the most important result was reaching the fact that machines can show mercy to patients. The following final point should be taken into consideration.

A. Future expectations

Companies are the real decision-makers when it comes to defining the ethics of AI implementation in every field, except for some powerful governments in the whole world. It's hard to predict what people will accept and what they won't accept in the implementation of AI in medicine, because people's manners are changing rapidly. The current revolution of communication and machine learning is the reason for this change. Due to these reasons, it's very hard to expect the future of these ethics.

B. Obstacles during research

As students, the biggest obstacle was understanding the advanced expressions, we had to search for these phrases to understand them.

Conclusion

In this article, some issues related to the ethics of implementing AI in medicine are considered. Using four pieces of research that handled this topic, we tried to find answers to four of the most important questions that show up when we speak about implementing AI in medicine. People usually ask whether patients become a bunch of numbers without paying attention to their feelings, which we found true. Hopefully, it won't be like that forever because of the continuous improvement of AI machines using many technologies such as MIVAR technology and Mirror neurons technology. The famous question of enabling a machine to make vital questions about people's life. The answer is we can't do this, because the algorithms of our AI machines in the world are not that accurate, at least for now. The fourth question of our ability to benefit from AI, and the answer was no, but again at least for now. Who knows what the future holds?

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