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The Future Outlook of Artificial Intelligence in Cancer Prevention, Diagnosis and Treatment Toward 2030

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ABSTRACT: Using Artificial Intelligence technics to prevent, diagnose and treat cancer is a promising are(Liao, Ding, Jiang, Wang, Zhang & Zhang, 2018). As a matter of fact, the earlier a cancer is diagnosed, the better the chances of survival. Or, if diagnosed in the late stages of the disease, the faster the patient is treated with the right treatment, the better the chances of survival. Recently, the availability of a large and diverse amount of data has made it possible to use intelligent systems to get more precise results for patients. Depending on the type of cancer, facing metastasis is always a challenge for physicians, scientists and patients (La Porta & Zapperi,2018). This paper is to illustratehow artificial intelligence algorithms have been improving and boosting the research to save lives.

KEYWORDS: artificial intelligence, cancer, machine learning, artificial neural networks, prevention, diagnosis, treatment

I. INTRODUCTION

The healthcare system changed tremendously in the last century. In the early 1900s, a physician treatment was only possible at a patient's home (Moseley, 2008). The very few hospitals that existed provided minimum care. Also, medical science and technology were so primitive that physicians could not treat accurately and properly most of their patients, leaving them misdiagnosed or even leaving them to die (Moseley, 2008).

Fortunately, physicians became more effective thanks to the advances of medical tools and machines. Doctors could treat patients using stethoscopes, X-rays, ultrasound, CT and MRI scanners.It is in the 1950s that a medical revolution occurred: the use of computers in medicine. Employing computers in a medical setting was one of the most important technological change at that time. It became a starting point for those who sought a better health. Automated medical machines performed tests quicker and more accurately than healthcare professionals.
In the 1970s, some Artificial Intelligence Researchers developed systems that could automate a human physician diagnosis. Unfortunately, since the system was found to provide random diagnosis to patients without any explanation, it was not approved by the medical community at that time.

Thankfully, in the 2010s, scientists got back to using Artificial Intelligence (herein after AI) in their application in medicine. Since then, it has become a hot trend worldwide and this time is more accepted by the medical community.Thanks to major technology advances and the rise of internet(Marr, 2018), AI transforms the way we collect data as well as the way we use them on patients' health to improve their treatments or render the appropriate diagnosis. There exists a vast amount of data (such as numbers, texts and images among others) that only AI can analyze quicker than human beings(Borus& Lin, 2018).
This research will mainly try to answer the following question: What is the future outlook of Artificial Intelligence in cancer prevention, diagnosis and treatment looking toward 2030?

Background

From the 1950s to nowadays, Artificial Intelligence has been a roller coaster of positive and negative outcomes in many different areas (Moseley, 2008). Firstly, we would like to address self-driving vehicles: cars can drive without assistance. But they can also kill pedestrians. An example is the Uber self-driving SUV that ran over a pedestrian because of a software malfunction (Peng, 2018).
Secondly, there are also AI recruiting tools in the world: human resources professionals are replaced by machines that can screen resume faster than human beings. As a consequence,those automated tools can recommend the company what they think right profiles are. However, AI is as good as the data it uses. From 2014 to 2017, Amazon used one of this HR tools, but their AI recruiter favored men over women because it used data from the past years where more male candidates were hired (Peng, 2018).
Lastly, AI cancer treatment recommendation tool: IBM Watson developed an application that could recommend the appropriate treatment for patients with cancer. Unfortunately, some doctors complained that the app sometimes gave recommendations that could harm patients and even kill them (Peng, 2018).

Nonetheless, despite all the setbacks that have happened in some cases, research in AI is still ongoing and improving (Wilson & Daugherty, 2018).At the Imperial College of London, an AI system can give the best treatment strategy for a patient with sepsis after the system analyzed thousands of records of other patients (Wighton, 2018).Another good AI example is at the John Radcliffe Hospital, in Oxford, where they use AI to detect heart defectsas well as lung cancer (Omitogun, 2018).Also, scientists at Microsoft have been developing a machine-learning algorithm to fight Parkinson condition in patients.

Problem Definition

Getting the truth from an AI system is the main concern among healthcare professionals. An AI system is an artificial neural network that consists of several layers of mathematical operations (Abbass, 2002, p. 267). Each mathematical layer receives a data input which results in another data output (p. 269). The data output becomes a data input for the following layer. Each layer passes along the information needed for the following layer, leaving out unwanted information (p. 274). Finally, the process of mathematical operation followed by passing the information from one layer to the other layer is repeated until we reach the last layer. (p. 274).

During the process, the AI system skims through data and finds patterns. This is how it learns from the data it is fed with and can then apply to similar problems. For example, in the case of cancer diagnosis (Portnoi, Yala, Schuster&Barzilay, 2019, p. 8), an AI system will use the data of patients with similar information (symptoms, radiology images or genes) that were diagnosed with the same type of cancer.

The problem with an AI structure is that it learned to diagnose from the mass, meaning that, from 100,000 cancer cases it can say if a patient has cancer or no(Peng, 2018). However, if during its learning, there was one patient with similar information who turned out not to have cancer, someone can be given the wrong diagnostic. Or worse, what if someone has a cancer but the AI system do not see it because it learned that patients with similar symptoms ended up not having cancer.

Problem Statement

Artificial Intelligence uses mathematical models to predict or render a result based on past experiences (Gupta, 2017). The more we feed our mathematical models, hence, our AI systems, the more accurate the result is (Khan, Wei, Ringnér, Saal, Ladanyi, Westermann, . . . Meltzer, 2001).However, in the healthcare industry, when a patient has cancer, the use of information from thousands over the individual information might be harmful to the patient.

Purpose of the Study

The purpose of this study is toshow that we can rely on Artificial Intelligence to prevent, diagnose and treat pathologies in patients in developed countries. However, we must be aware of certain limitations of those intelligent systems. That is why, they must be used as complementary tools to human medical doctors.

In the healthcare industry, intelligent systems are used much more often than it used to be, especially in cancer diagnosis and treatment(Borus & Lin, 2018).AI can help save more lives due to early detection and accuracy of diagnosis.Nowadays, medical doctors detect tumors through imaging technics, such as radiology or scanners(Kubota, 2017).As a matter of fact, radiologists receive a lot of data every day and have to render diagnostics as fast as possible. Sometimes, patients wait for days to hear back from their radiologists. In that case AI systems can help radiologists treat images faster and help patients save days being anxious or not knowing what to do.

For example, according to the study from the University of Central Florida (Kotala, 2018, p. 8), engineers developed an AI algorithm that could accurately detect lung cancers. In general, lung cancer can beseenthrough CT Scanner (Computerized Tomography Scanner). Hence, they fed their AI system with about 1,000 CT scans to check if they could find defects in patients' lung tissues. The study revealed thatthe algorithm was 30 percent more accurate than a human doctor would have been.

In developed countries, death from cancer is very high. Unfortunately, people die from cancer because they were diagnosed in the late stages of the disease.

Research Questions

The study will attempt to answer the following research questions.

1) Will AI replace a physical doctor's office?
2) How can AI prevent, diagnose or treat cancer?
3) Is AI a temporary trend in medicine or is it the beginning of a new era?

Hypotheses

1) If Doctors use intelligent systems to prevent cancer, render cancer diagnosis or treat cancers, then, they might be replaced by them over time.

2) If all the technologies involved in AI keep on improving, then AI systems will become more efficient over time
3) If AI is incorporated in all the decision making of all healthcare providers no matter the specialty, then,we will all see intelligent systems as a normality.

Significance of the Study
Artificial Intelligence has been playing a role in the healthcare industry for the past decades and lately has been more and more in demand. It will definitely have a major impact in a not so far future(Gupta, 2017).
First of all, from a patient point of view, AI systems will definitely add some benefit. According to the international agency for research on cancer, in 2018, more than 18 million new cancer cases were foundworldwide (Global CancerFacts & Figures, 2018). Among them, more than 9 million died that same year (Global CancerFacts & Figures, 2018).From a patient point of view, AI systems can save lives. They can help patients being diagnosed in the early stages of the disease, hence increasing their chances of being treated efficiently.
Second of all, from a physician point of view, the advantages of using AI systems bring the same benefits as the patients' point of view if not more. Patients will be more willing to trust intelligent systems if their doctors do. Moreover, doctors are known to be overwhelmed by work and their patients, leaving them to misdiagnose some patients. This is one of the reasons why AI systems can help doctors. They will help healthcare professionals have a second opinion on their patients(Esteva, Kuprel, Novoa, Ko, Swetter, Blau & Thrun, 2017).
The overall significance of using Artificial Intelligence in healthcare is to give the best outcomes to patients.

II. Literature Review

This literature review was organized to show the influence of Artificial Intelligence (herein after AI) in the healthcare industry, especially in the prevention, diagnosis and treatment of cancer.
For a very long time, AI was considered as a fiction and a non-tangible concept that everyone was fascinated about. It generated hope and enthusiasm because of the many applications we could conceive from it (Marr, 2018). Also, we already use intelligent systems in areas such as communication and transportation.
Since cancer is one of the deadliest diseases in the world, there has been an increasing interest in AI applications to help people survive cancer. Those applications are to improve diagnosing, preventing and treating cancer. In fact, hospitals, clinics and other healthcare facilities around the world increased their efforts to use AI technics in medical research and patient care settings (Jha& Topol, 2016). And, the availability of large datasets of information on cancer patients makes it easier for intelligent systems.
In fact, an AI system, also called an Artificial Neural Network, is a very complex mix of back-to-back mathematical operations (Abbass, 2002, p. 267). Each of these mathematical operations (a layer) generates a result that is sent to the following set of mathematical operations. The process of passing the information from one layer to another leaves out the unwanted information and provides a more accurate result. This is how the AI system learns from the information it is fed with, by skimming through data and finding patterns.
This literature review will discuss the prevention, the diagnosis and the treatment of cancer diseases with AI systems.This study will also include different research on how to improve AI technics to provide a more accurate cancer prevention, diagnosis and treatment.

Artificial Intelligence in cancer prevention

In the US only, each year, more than 250,000 women are diagnosed with breast cancer; around 63,000 of those women can have an aggressive form of the disease leading to more than 40,000 deaths (Nbcf, Breast Cancer Facts, n.d.). Unfortunately, 12% of women will have breast cancer during their life. Furthermore, 25% of all cancers in women are breast cancers. It is the second major cause of women's death after lung cancer(Nbcf, Breast Cancer Facts, n.d.).

Previous research showed that AI algorithms can help predict the outcome of breast cancer: SVM, NB, C4.5 and k-NN (Asri, Mousannif, Moatassime, & Noel, 2016, p. 1065). Those algorithms are known to be the most influential data mining algorithms in the research community. Several theories have been proposed to apply these four algorithms to predict breast cancer, some focusing on evaluating their efficiency and effectiveness, others on improving their accuracy and precision (Khan, Wei, Ringnér, Saal, Ladanyi, Westermann, . . . Meltzer, 2001). The method introduced by Hiba Asri and her co-researchers has the advantage that it is based on previous work that already showed good accuracy (Asri, Mousannif, Moatassime, & Noel, 2016, p. 1065). It uses classifier algorithms to predict the survival time for patient with breast cancer. In fact, other researchers from another team, Chaurasia and Pal (p. 1065), compared different data mining and machine learning algorithms between each other: Naïve Bayes, SVM-RBF kernel, RBF neural networks, Decision trees (J48) and simple CART (Chaurasia &Pal, 2014). They used each one of the algorithms on breast cancer datasets to also determine the survival time of patients. They found out that SVM-RBF kernel scored an accuracy of 96.84% (p. 1065).

In the study, Asriemployed an experimental methodology which prescribes the use of libraries from a Weka machine learning environment (Asri, Mousannif, Moatassime, & Noel, 2016, p. 1066): it contained a collection of algorithms that will help conduct the team's experiments. Then, the study also used a dataset that consisted of 458 benign cases and 241 of malignant cases (p. 1066). From initial information, each algorithm must find out which cases are the benign and malign cases. The higher the number of good answers, the higher accuracy rate for the algorithm (p. 1068).

In addition, another study conducted by Enshaei, Robson and Edmonson concluded very promising results when comparing their machine-learning tool to conventional statistical approaches in the prediction of ovarian cancers (Enshaei, Robson & Edmonson, 2015, p. 3970). The method introduced consisted in creating a database of 668 cases of epithelial ovarian cancer over ten years (p. 3970) and collecting information about the survival rate of each patient. Then, their AI tool was trained to learn from the cases. After that, it could predict the survival rate of current ovarian cancer patient with an accuracy of 93% (p. 3970).

Another method employed by Valdes, Solberg, Heskel, Ungar and Simone is to develop an AI system to predict radiation pneumonitis in patients who have stage 1 of lung cancer (Valdes, Solberg, Heskel, Ungar & Simone, 2016, p. 1). In this study, the authorsconclude that their AI tool needed to improve by gathering more data on patients who had the condition in the past (p. 19). However, their intelligent system proved to be on the right track.

Although studies have been conducted by many authors, predicting cancer is still insufficiently explored.Moreover, although research has illuminated that some algorithm has an excellent accuracy score in determining if a patient has cancer or not no study to date has examined the change in genes in the phase preceding cancer. A further question is whether there are some visible and non-visible physical change in precancerous patients that AI can detect and point out as a potential cancer. A new approach is therefore needed to recognize cancer by noticing precancerous signs in patients.

Artificial Intelligence in cancer diagnosis

Several studies suggest thatdiagnosing cancer in general can save lives if detected at an early stage (Abdel-Zaher& Eldeib, 2016, p. 139; Asri, Mousannif, Moatassime, & Noel, 2016, p. 1064; Conner-Simons, 2017; Esteva et al., 2017). Since, breast cancer represent 25% of cancer patient in women, numerous studies were conducted. (Abdel-Zaher & Eldeib, 2016; Asri, Mousannif, Moatassime, & Noel, 2016; Conner-Simons, 2017; Esteva et al., 2017; Abbass, 2002).

A series of recent studies from Wu have indicated thatan Artificial Neural Network (herein after ANN) was used to learn 43 mammographic features with a back-propagation algorithm (Abbass, 2002, p. 266). The aforementioned ANN, when fed with mammograms images, could render diagnostics: 1 for malignancy or 0 for benign. The ANN was classified an expert in rendering the right diagnostic (Wu et al., 1993).

Another study by Floyd showed that a back-propagation algorithm was used in a different way (Floyd et al., 1994). It was given eight input parameters: mass size, morphology and density among others. Unfortunately, based on a dataset of only 260 cases, the accuracy of the algorithms was just 50%, which is very low (Abbass, 2002, p. 266).

The method introduced byAbbass has the advantage that it uses a much more performant algorithm than the ones employed by his predecessors Wu and Floyd: MPANN (Abbass, 2002, p. 272). The algorithm was trained to render a diagnostic of either benign or malignant based on features it had to recognize in the datasets: clump thickness, uniformity of cell size, uniformity of cell shape among others. Fortunately, the results showed a slightly better performance than the results from other researchers.

Some authors have also suggested that it is important to get rid of false positives cases that lead patients to undergo unnecessary surgeries (Conner-Simons, 2017). Indeed, there is a high number of patients who are diagnosed with malignancy of breast cancer despite being cancer free. A false positive is when a patient seems to have all the symptoms of breast cancer (lesion on mammograms, abnormal cells after biopsy) but the lesion they were diagnosed with ends up is a benign tumor. Consequently, researchers at MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) developed an AI system to determine if a lesion will become a cancer (Conner-Simons, 2017). The accuracy of their AI model is 97%.

In the study conducted by Abdel-Zaher, a specific automatic system was developed to detect breast cancer (Abdel-Zaher & Eldeib, 2016, p. 144). It consisted in combining different mathematical operations in an algorithm so that from the beginning of the experiments, the accuracy of the outcome result could get very high. It was so performant that it reached an accuracy of 99.64% (p. 144). However, the author emphasized the need to improve their approach by adapting the commercial hardware to be used by healthcare professionals to their very efficient and fast AI model (p. 144).

Therefore, an important issue in the literature is that it can neglect the people who have cancer but show no symptoms at all. Combined with the risk of error, some people might die from being misdiagnosed. Furthermore, there are key questions and notions that are still not discussed in the literature on the use of AI systems to diagnose cancer in patients. All algorithms are to diagnose cancers with a certain degree of accuracy

and efficiency, meaning there will still be people misdiagnosed if we were to use those systems today. Study addresses the research question of improving AI systems so they can become as complete as a human doctor(Portnoi, Yala, Schuster & Barzilay, 2019, p. 8). As one of the authors, Abdel-Zaher, notes earlier, more work is necessary to have a working efficient AI model work on adaptable computer hardware.

Artificial Intelligence in cancer treatment

Several studies suggest that we can rely on AI to provide the right treatment to patients diagnosed with cancer (La Porta& Zapperi, 2018;Walczak & Velanovich, 2017; Gupta, 2017; Kickingereder et al., 2019; Wighton, 2018; Brown, 2018). For example, research has provided evidence for making cancer treatment less toxic (Matheson, 2018). Researchers from MIT developed machine-learning techniques to determine the dosage needed for patients undergoing chemotherapy or radiotherapy for a certain for of brain cancer: glioblastoma (Matheson, 2018). This form of cancer is so aggressive that patients with the disease have a life expectancy of a maximum of five years. Also, to fight against it, doctors administer the maximum dose of different type of drugs combined with chemotherapy and radiotherapy, leaving patients with side effects. In order to avoid the side effects, powerful algorithms can determine the right and effective dose to provide patients. Indeed, the machine learning algorithm is fed with datasets from treatment given to previous patients and learns from them to adjust the doses and frequency of doses (Matheson, 2018). It aims to give the minimum amount of drugs a patient with glioblastoma needs but provides an effective amount (amount that will reduce the size of the tumor).

Some authors, Walczak and Velanovich, have also suggested that AI systems can help both patients and physicians choose the right treatment. For example, researchers created an ANN system to reduce regret in the decision-making process for surgical resection to treat pancreatic cancer (Walczak& Velanovich, 2018, p. 111). In fact, regret is reduced when the ANN system a 7-month survival rate of pancreatic cancer. This is when doctors and patients can think of choosing the treatment that has the most benefits (p. 111). In the case of pancreatic cancer, the treatment options are most of the time: observe/do nothing, adjuvant therapy, surgery to remove the pancreas and combination of surgery and adjuvant therapy. This ANN was designed because in the past a lot of patients and doctors regretted their treatment decision, leading them to die earlier than if they have picked another treatment choice.

Despite interesting results for the use of AI to treat cancer, a number of questions still remain to be addressed. As a matter of fact, research on the subject is very recent and started only in the end of 2017.A critical open question is whether researchers can develop another ANN to determine the outcome of choosing a specific treatment based on the current health situation of the patient with pancreatic cancer. It will help all patients and not only those who have a survival rate of seven months. Additional studies to understand more completely the key tenets of providing the right treatment to patients without endangering their lives (more than they already are)are required.

Conclusions

The existing research around AI systems preventing and diagnosing cancer as well as rendering the right treatment for cancer patients is still at the very beginning(Liao, Ding, Jiang, Wang, Zhang & Zhang, 2018). A lot of research AI systems exist but are still in the testing process before being commercialized and considered as trustworthy (Susskind, 2016). The study addresses several further questions on improving the accuracy of AI systems in preventing breast and ovarian cancers. A more systematic and theoretical analysis is required to develop robust algorithms that will perform better than the ones tested in this scientific literature.

Specifically examining the ANNs, machine-learning techniques and AI systems, we are still a long way to go to have robust and performant automated tools (Thrall et al., 2018). However, the current findings on cancer prevention, diagnosis and treatment are very promising for the next decades. The question then becomes how best to define the perfect AI model that will save the most lives. One of the tough challenges for all researchers in this domain is to design the one tool that will prevent, diagnose and treat all existing cancers.

Finally, most of the research reviewed in this literature prove that the AI revolution has already started in the healthcare industry. We are on the verge of discovering even greater results and more robust algorithms.

III. RESEARCH DESIGN AND METHODOLOGY

The purpose of this study is to show that we can rely on AI to be as efficient as a regular medical doctor in the future for cancer patients. Meaning that intelligent systems will be able to prevent, diagnose and treat cancers looking towards 2030. In the previous chapter, the literature review, we surveyed books, peer-reviewed scholarly articles and other relevant sources to the prevention, the diagnosis and treatment of cancer patients with AI. In the literature preview, provided both a description and an evaluation of the research questions we are investigating. Also, we could identify gaps that exist in the literature as well as point out the need to explore additional research. In this chapter, we will discuss the appropriate method to answer our different research questions. “Research approaches are plans and the procedures for research that span the steps from broadassumptions to detailed methods of data collection, analysis, and interpretation” (Creswell, 2014, p. 31).A

research approach must be carefully chosen so that the outcomes can help answer the research questions. The selection of the right approach depends on different factors: nature of subject analyzed, author's personal experiences and the participants involved in the study(Creswell, 2014, p. 31). Therefore, we will explain the reasons why we choose a specific method.

Methods

Mixed methods research consists in collecting qualitative and quantitative data that will be treated distinctively from one another (Creswell, 2014, p. 32).

In order to answer each of our research questions from the current study, we will conduct a mixed method research approach. More precisely, we will employ exploratory sequential mixed methods. Firstly, we will apply the qualitative method approach to explore what each participant has to say (Creswell, 2014, p. 44). Secondly, we will discover broad patterns to exploit and use them in the following phase. After analyzing the data, we will use the quantitative methods, which consists of the second phase of our approach (Creswell, 2014, p. 44).

Data Collection

As mentioned in the previous paragraph, this study will use a mixed methods approach to gathering the data for the research and more precisely, this study will use exploratory sequential mixed methods.

Qualitative data collection. The first portion of the study will consist in collecting the data for the qualitative phase. Firstly, we will gather information through observations, interviews, documents and audio-visual materials. Our observations will be done without participating. We will conduct our interviews either as face-to-face, one-on-one or by telephone or in groups of several participants. There will not be any limitation in regards to the length of the interview and the frequency of the person we will interview. Our interviews will be based on the number of questions we will ask our participants as well as the quality of the answers given. Also, to collect the information needed for the study, we will employ different types of documents: newspaper, journals and peer-reviewed articles(Creswell, 2014, p. 241).Audio and visual materials such as films, video and audio tapes will also be used (Creswell, 2014, p. 241). Secondly, each participant in our study will be asked open-ended questions so that we can record fieldnotes (Creswell, 2014, p. 100). Thirdly, from the data previously analyzed, we will be able to define categories (Creswell, 2014, p. 100). Fourthly, we will try to determine patterns from the aforementionedcategories (Creswell, 2014, p. 100). Finally, we will present patterns from past research experiences (Creswell, 2014, p. 100).A non-exhaustive list of those generalizations can be: AI in cancer prevention, AI in cancer diagnosis, AI in cancer treatment, AI as a medical doctor.

The population and sample we will address our approach to will be current cancer patients, survivors of cancers, families and friends of people who died from cancers, Oncologists, Doctors of Philosophy (Ph.D.) whose research are related to AI. Furthermore, we will survey a small sample of neutral people. We think that it is important to interview and take into account the opinions of those not involved with AI and cancer through friends or family. Although, at this time we do not have a specific number of people to survey, we will limit our study to a minimum of a 200 participants for each of the six categories of individuals mentioned above (current cancer patients, survivors of cancers, families and friends of people who died from cancers, Oncologists, Doctors of Philosophy (Ph.D.) whose research are related to AI).

Quantitative data collection. The second portion of study will follow the patterns generated from the qualitative study phase so that they can be interpreted.

To collect the data according to the aforementioned patterns, we will conduct short interviews (telephone, face-to-face), web-based questionnaires, surveys and clinical trials. The purpose is to test the patterns derived from the qualitative study so that we make an estimation in numbers. These estimations will be represented in diagrams, tables, graphs and will be stored in databases.

Our pool of participants will be the same used in the qualitative study part: current cancer patients, survivors of cancers, families and friends of people who died from cancers, Oncologists, Doctors of Philosophy (Ph.D.) whose research are related to AI.

Furthermore, the surveys we will conduct will be closed-ended questions over the phone or face-to-face with a duration no longer than 20 minutes. The participants we will not be able to reach over the phone will be sent a questionnaire to their email addresses. Each questionnaire will not take more than 20 minutes to complete. Depending on the results, we might ask participants to complete more than one survey.

In addition, we will work closely with selected hospitals in specific cities across the United States. The selected hospitals will be either new-technology friendly or on the verge of implementing AI in their systems or currently using it. Example of such hospitals are: NYU Langone Health, Massachusetts General Hospital, Mayo Clinic, Cleveland Clinic, Johns Hopkins Hospital and UCLA Medical Center among others. Another environment we will do our quantitative data collection will be at doctors' private practices.

Lastly, we will handle our clinical trials in hospitals or private practices to check the outcome of using AI on cancer patients over the duration of their disease. Therefore there is no specific time limit. Also, we will check the outcome of using AI from a doctor's point of view.

Data Analysis

The data collected from the qualitative study phasewill be analyzed first to determine patterns from the participants involved. Then, we will start from those patternsour quantitative study that will store results into quantitative measures (Creswell, 2014, p. 276).

Qualitative data analysis.

Once we gathered all the non-numeric information from all of our participants through observations, interviews, documents and audio-visual materials, we will conduct a grounded theory towards our subject of interest: AI. Indeed, we will start our analysis with general questions that serve as guidance to later find patterns. Our non-exhaustive list of area to get into are: AI in cancer prevention, AI in cancer diagnosis, AI in cancer treatment, AI as a medical doctor. Then when we get deeper in the qualitative analysis over time, we will be able to identify patterns that will serve in the second phase of the mixed methods.

Quantitative data analysis.

Following the qualitative method, we will have identified key patterns to follow. After the collecting our data thanks to the methods explained in the quantitative data collection part, we will be able to measure with numbers. Finally, those numbers will be placed in categorized tables, graphs, diagrams and different statistics to be later interpreted.

Limitations

Although this study will provide significant insight into the use of AI in a medical setting, there are limitations. First, this study will be limited in time and cannot last several years. Sometimes, cancer patients evolve slowly with the disease. We might not get to see the outcome for some patients because it might take years.

Also, still speaking of constraints, budget might be one of them. It might be difficult to conduct a lot of interviews since they are expensive and time consuming.

Finally, using web-based questionnaires might exclude the persons who do not have access to internet or a computer and cannot be reach for other types of questionnaires or interviews.

Summary of Proposal

In today's growing demand in curing cancer and hence saving lives, more and more researchersturn to Artificial Intelligence (herein after AI). Indeed, intelligent systems can assist healthcare professionalsin their daily tasks.However, getting the truth from an AI system is the main concern among healthcare professionals. AI uses mathematical models to predict or render a result based on past experiences (Gupta, 2017).The purpose of this study is to show that we can rely on Artificial Intelligence to prevent, diagnose and treat pathologies in patients in developed countries.

In this research, we will discuss previous research that was done in the past, the different AI technics employed as well as their outcomes.Also, in order to answer each of our research questions from this study, we will use the exploratory sequential mixed methods approach. We will collect qualitative datathrough observations, interviews, documents and audio-visual materials. Then, we will follow the patterns generated from the qualitative study to collect quantitative data using short interviews (telephone, face-to-face), web-based questionnaires, surveys and clinical trials. Finally, we will be able to interpret the results and conclude. This is only after this portion that we will know if AI will replace a physical doctor's office in the future and if AI a temporary trend in medicine or if it is the beginning of a new era. Lastly, we will be able to understand how AI can prevent, diagnose or treat cancer.

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