

# ASSESSING THE IMPACTS OF COMPUTER TECHNOLOGY IN HEALTHCARE INDUSTRY: PROGNOSIS, DIAGNOSIS, AND COVID-19 TREATMENT PERSPECTIVES

J. S. Igwe<sup>1\*</sup>; C. Ituma<sup>2</sup>; J. O. Ugah<sup>3</sup>; G. E. Ugwu<sup>4</sup>

**1\*:** Ebonyi State University Abakaliki, Nigeria;

**2:** Ebonyi State University, Nigeria;

**3:** Ebonyi State University, Nigeria;

**4:** Ebonyi State University, Nigeria;

**ORCID ID:** <https://orcid.org/0000-0002-0520-3646>

**Abstract-** One of the major characteristics of computer is versatility; the ability to do different kinds of jobs or being applied in solving problems in all facets of life. The adoption of computer technology in health sector is increasing on daily basis. This paper looks into the impact of computer technological tools in health care sector with majors on prognosis, diagnosis and treatment. Precisely, Artificial Intelligence (AI) is one technology that has become relevant in virtually every field of human endeavor. Obviously, contributions of AI tools in health sector with particular emphasis on applying it in curbing deadly diseases can never be over emphasized. An online survey was carried out with 200 participants. 67% of them agreed that AI technology will bring a faster solution to curtailing high mortality rate due to deadly diseases. They also agreed that limited testing capabilities and discourteous behaviours of the citizens are the major issue making flattening the curve of mortality rate across the globe. They suggested that diagnosis and prognosis should be the potential angle beckoning for AI assistance to complement human experts.

**Index Terms:** Computer Technology, Healthcare, Artificial Intelligence, Prognosis, Diagnosis, Treatment, mortality

## I. INTRODUCTION

The world is facing the greatest tragedy for the first time since the era of information rule. It is unbelievable that with current level of human

development anchored on Information Technology and fastest means ever of transportation of human, goods and services, a pandemic killed over six millions of people. Over six hundred million people across the globe have been infected by the novel virus (Worldometer, 2020) [1].

Artificial Intelligence has penetrated every facet of life. The term is already a household name both to those that understand what it means and to those who know little or nothing about it. The global rapid transformation is a function of Artificial Intelligence. Artificial Intelligence has reached breakthrough levels of performance that is exceeding the abilities of human experts (Anthens, 2019) [2]. One of the major areas of applications of Artificial Intelligence is health care. The dependency on artificial intelligence based health care devices is exponentially increasing. For example, ten percent (10%) of Americans wear Activity Trackers to monitor the measures of their fitness or well being (Knowles et al, 2018) [3]. One specific

domain is diagnosis. A computational paradigms utilizing artificial intelligence neuroscience knowledge will help to scale computing technology (Almone, 2019) [4]. A review carried out by Adhikari et al put it that it is only 13.8% of total published articles on COVID 19 were based on clinical manifestations and diagnosis (Adhikari et al, 2020) [5]. This study was carried out to support the fact that Artificial Intelligence System can improve the prediction, diagnosis, and treatment of several diseases.

## II. METHODOLOGY

There was a systematic review of literature on application of Artificial Intelligence in Healthcare with emphasis on three specific applications of prognosis, diagnosis and treatment. Random Search terms such as Artificial Intelligence, Diagnosis, and Prognosis were used. Search Topic method was also adopted to obtain studies on use of Artificial Intelligence in health industry.

An online questionnaire was designed and disseminated via different social media platforms such WhatsApp and Facebook by providing participants with the link. Participants were drawn from academia made up of lecturers from different fields, postgraduate researchers in computer fields (both master's and doctorate students), undergraduate

students of Computer Science, graduates of Computer Science and other disciplines. The targeted number of participants was 200, though 198 responded by filling and submitting. Each responder is only permitted by the system to submit only once.

## III. ARTIFICIAL INTELLIGENCE IN HEALTHCARE INDUSTRY

Though there are several application areas of Artificial Intelligence in Healthcare sector, this study focused on 3 major areas of prognosis, diagnosis and treatment.

### A. Prognosis

An accurate prediction of a disease will yield a measure that will ensure that particular disease is prevented or adequately prepared for appropriate treatment. Artificial Intelligence software was developed that can predict more accurately the presence of ovarian cancer. The system will automatically indicate the type of treatment that will be most effective for the particular patient. (Genetic Engineering & Biotechnology News, 2019) [6]. Artificial Intelligence has performed comparably to traditional methods when predicting patients at risk of cardiovascular disease (Edwards, 2019) [7]. The name of the Artificial Intelligence tool is TEXLAB. TEXLAB utilizes machine learning technique to evaluate the tumors in the ovary using shape, structure,

size and genetic composite. It generates the result as a Radiomic Prognostic Vector (RPV) score. The score determines how severe the likelihood cancer is going to be.

Daley (2020)[8] discussed 32 examples on where Artificial Intelligence can be applied in Healthcare. Some of his examples that were identified to fall under prognosis are: (1) Freenome; An Artificial Intelligence tool for predicting earliest stages of cancer in the blood. (2) Beth Isreal Deaconess Medical Center developed AI-Enhanced Microscope for identification and prediction of the presence of harmful bacteria in the blood. This has up to 95% accuracy. (3) Xtalpi's ID4 predicts the chemical and pharmaceutical properties of small molecule candidates for drug design and development in days. (4) KensSci is an AI tool that uses a combination of AI algorithms and big data to predict clinical information on who might get sick. (5) H2O.ai utilizes data from healthcare system to predict patients that needs intensive care unit (ICU) transfers. Table 1 summarizes some of the AI tools and where they are applied in prognosis of diseases.

**Table 1: Examples of Artificial Intelligence Tools Applied in Prognosis**

SN	AI Tool	Disease Predict	Organ Affected	Target
1	TexLab	Cancer (Tumor)	Ovary	Predict tumor in ovary & its severity
2	Freenome	Cancer	Blood	Detect cancer in the blood early
3	Beth Isreal Microscope	Bacteria	Blood	Detection of harmful bacteria
4	Xtalpi's ID4	Chemical	Molecule from Drug	Predict chemical properties
5	KenSci	Clinical Information	Body System	Predict who will get sick
6	H2O.ai	Data from Healthcare System	Body System	Predict patients that needs ICU

## B. Diagnosis

Good diagnosis of any disease is a half way of solving it. Artificial Intelligence nowadays performs a more reliable diagnosis when compare to human experts (Lo, 2019) [10]. Poor diagnosis of diseases in USA in 2015 accounted for the deaths of 10% of the total deaths in 2015 [8]. There is a need to pay more attention to computer based diagnostics approaches especially with the increasing growth of machine and deep learning application in the health industry. Some of the notable applications of Artificial Intelligence tools in diagnosis are summarized here: (1) PathAi; this is AI tool that uses machine learning algorithm to aid pathologists detect more accurately cancerous disease. (2) Bouy Health; this is AI algorithm that utilized symptoms and cure checker to diagnose and treat diseases. It makes use of Chabot that listens to a patient's symptoms and health challenges. It subsequently informs the patient correct care based on its outcome. (3) Proscia; this is a tool for detecting patterns in cancerous cells. (4) Echocardiograms; uses sound wave to paint the heart picture for identifying whether patient has any heart disease(Medical Futuristic, 2019) [11]. (5) Stanford University developed a smart algorithm for detecting skin cancer (Medical Futuristic, 2019) [11]. Table 2 organized some of these AI tools being used in Medical Diagnosis.

**Table 2: Examples of Artificial Intelligence Tools Applied in Diagnosis**

SN	AI Tool	Disease Diagnosed	Organ Affected	Target
1	PathAi	Cancer	Body	Detect cancer in the body
2	Bouy Health	Vast Diseases	Body	Use symptoms & Cure checker to diagnose diseases
3	Proscia	Cancer pattern	Cells	Detects pattern in cancerous cells
4	Stanford Smart Tool	Skin Cancer	Skin	Detection of skin cancer
5	Echocardiograms	Heart Diseases	Heart	Detection of any heart diseases
6	California Tool	Breast Cancer	Breast	Identify cancer in the breast
7	Enlitic	Scan Related Cases	Several organs	Streamline Radiography results

## C. Treatment:

The essence of diagnosing a disease is to enable proper treatment. Healthy society is needed for increase workforce. The role of digital computer especially AI based tool in management of patients is enormous. For instance, AI based tool can be used to monitor and manage patient outside the four walls of care delivery (Panch, 2019) [12]. The highlights of those AI tools engage in treatment of patients are: (1) CloudMedX; this utilizes machine learning algorithm to produce information for improving patient recovery process under healthcare [8]. (2) Tempus; this is an AI tool for parsing through large world collection of clinical trial for the purpose of personalizing the healthcare treatment [8]. (3) Robot – Assisted Surgery; with appropriate algorithms, robots are used to perform complex surgery with better precision and flexibility [8]. (4) CyberKnife System; this is an AI tool with robotic arms for precision in treatment of cancerous tumors all over the body. (5) MYCIN; this is first AI program developed. It is used for treatment of blood infections (IBM Watson Health, n.d.) [13]. (6) Dxpain; AI system that provides hierarchical list for identification of medical indices. (Datta et al, 2019) [14] Table 3 is used to organize this AI tools deployed majorly for treatment and management of patients.

**Table 3: Examples of Artificial Intelligence Tools Applied in Treatment of Patients**

SN	AI Tool	Disease Diagnosed	Organ Affected	Target
1	CloudMedX	Generic	Generic	produce information for improving patient recovery
2	Tempus	Generic	Generic	Use clinical trial for personalizing the healthcare treatment
3	Robotic Surgery	Surgery	Surgery part	For complex surgery with better precision and flexibility
4	CyperKnife	Cancer	Cancer location	treatment of cancerous tumors
5	Mycin	Blood infection	Blood	treatment of blood infections
6	Dxpain	Generic	Generic	identification of medical indices

## D. AI on COVID 19

So many AI researchers and Software developers have done appreciable level of work in a bid to provide solution to the pandemic. A look on research publications is implying that AI can outperform its

human counterpart in healthcare key areas such as prediction, diagnosis, and treatment (Daveport and Kalakota, 2019) [15]. Artificial Intelligence remains one domain that has huge role to play. AI can provide solution from different angles. Some of the aspects AI can be deployed in fighting COVID 19 are getting substances that is capable of curing COVID 19, to specifically scan for COVID related signs pneumonia in the lung, and also in tracking the spread of the disease (VOX, 2020) [16]. Predicting the spread of COVID 19 depends on other factors such as time, space, population density and probability of interaction (Yang, 2020) [17]. AI Scientist highlighted nine ways machine learning can help to fight COVID 19 pandemic. They are:

(1) Identify those that will be most at risk (2) Diagnosing infected patients (3) Faster production of drugs (4) Predict the spread of the disease (5) Understand viruses better (6) Map where viruses come from (7) Predict the next pandemic (8) Identifying the primary host of the virus (9) Predicting potential pandemic (Schmitt, 2020) [18]. Extensive gathering of diagnostic data about COVID 19 using AI algorithms on those infected will be the most effective means of saving lives, which will also minimize economic effects of COVID (Naude, 2020) [19]. A new study has found those who were infected with COVID will go on to develop acute respiratory syndrome (Science

Daily, 2020) [20]. Different Diagnostic Models Based System on COVID 19 is already in existence. They ranged from APP to diagnose asymptomatic patients to symptomatic patients. Also available is the APP for early detection of COVID 19 infection in adult (Wynants, 2020) [21]. Speedy and accurate precision in diagnosis of COVID-19 will save lives, mitigate the spreading of the disease. It will also generate data on which to train AI models [19].

It is an obvious fact that Artificial Intelligence played a huge role in solving the major problems of COVID 19 pandemic from the research works above. The review indicates that the role AI tools are playing comprises of prediction, diagnosis, treatment and health record tracking.

#### IV. RESULTS AND DISCUSSION

An online Survey was conducted to get the opinion of the public, their roles and what they think AI can offer in the fight against diseases. 198 out of 200 participants responded by filling and submitting their forms. Each participant is allowed to submit only once. The outcome is thus:

**Question One:** Do you agree that Artificial Intelligence is playing a great role in the world today?

198 responses were gathered from this question as shown in Table 4, where 54 strongly agreed, 81

agreed, 53 strongly disagree, 6 were indifference, 4 disagreed, and 2 participants did not respond.

**Table 4: Artificial Intelligence is Playing a Great Role in the World Today**

SN	Response	Frequency	Percentage (%)
1	Strong Agree	54	27
2	Agree	81	40.5
3	Neutral	6	3
4	Disagree	4	7.5
5	Strongly Disagree	53	26.5

**Question Two:** Which areas of life is Artificial Intelligence mostly applied?

197 participants responded to question. 85 (43.1%) participants were of the view that AI is mostly applied in health sector. This is followed by home automation with 42 (21.3%) participants. War fare and Education respectively got 26 (13.2%) and 19 (9.6%) respectively. Figure 2 illustrates the distribution using pie chart.

Count of Which areas of life is Artificial Intelligence mostly applied?

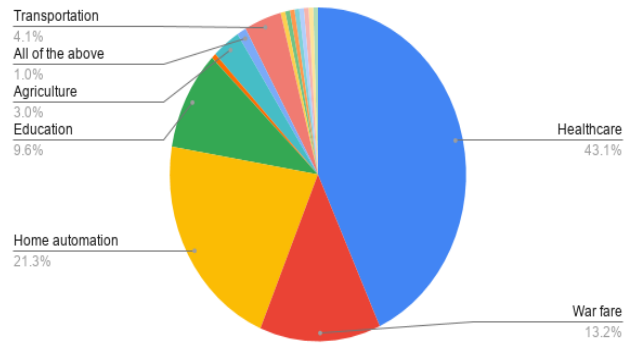


Figure 2: Area of Life AI is Mostly Applied

**Question Three:** Which area do you think Artificial Intelligence should be more useful in healthcare delivery?

198 participants responded to this question. Majority of the participants 113 (57.1%) picked diagnosis as the aspect of healthcare AI should be more useful. Treatment and prognosis followed with 33 (16.7%) and 24 (12.1%) respectively. Health record and Administration got 19 (9.6%) and 9 (4.5%) respectively. The illustration of the distribution is discuss in Figure 3.

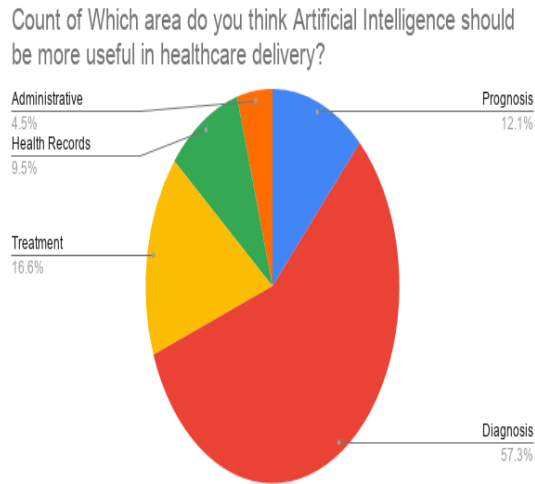


Figure 3: AI Most Useful Area in Health Sector

**Question Four:** What do you think is the major problem that made flattening the active cases curve of pandemic such as COVID 19 difficult?

This question got the attention of 195 participants. 76 participants (39%) attributed the problem of flattening the curve of active cases of COVID 19 to discourteous behavior of the citizens of different countries, while 75 participants (38.5%) think it is the limited test capabilities of many countries that is causing the problem. However, 25 participants (12.8%) blamed limited human experts and 19 participants (9.7%) said it is human immunodeficiency related concerns that is responsible for the problem. See Figure 4 for Bar Chart view

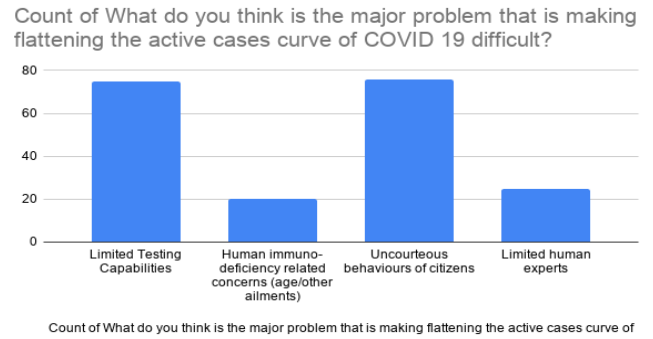


Figure 4: Major Problems in Flattening Active Cases of Pandemic (COVID 19) Curve

**Question Five:** Tick areas where you think Artificial Intelligence is most needed in handling COVID 19 pandemic that is ravaging human race

The focus of this question is to know which areas in fighting COVID 19 demand the deployment of AI. Diagnosis got 41.9%; Prognosis has 33.4%; treatment is having 18.4% and health records with other received 6.3%

## V. CONCLUSION

86 participants making up 43.4% majority supported the fact that Artificial Intelligence is mostly applied in healthcare. Hence, this is in line with this research objective. Also, 114 responders (57.3%) opined that artificial intelligence is most useful in diagnosis of disease. 67 % of the participants agreed that Artificial Intelligence will bring closer solutions to health problems. Most people actually suggested that Diagnosis and Prognosis should be the major focus of



researchers in trying to bring in AI solutions to the health challenges.

This survey is in agreement with calls for the world to think and continue to act towards Artificial Intelligence as a technology that will bring a rapid solutions to disturbing health concerns such as of COVID 19. It has identified diagnosis and prognosis as potential areas that require AI tools urgently. Also, the research stressed and call on policy makers in different countries to intensify more efforts in addressing the unruly behaviours of the citizens.

## 7.0 References

- [1] Worldometer. (2020). *COVID-19 CORONAVIRUS PANDEMIC*. Retrieved April 24, 2020, from Worldometer Website: <https://www.worldometers.info/coronavirus/>
- [2] Anthes, G. (2019, June). LifeLong Learning in Artificial Neural Network. *Communications of ACM* , pp. 13-15.
- [3] Knowles, B., & Renner, A. S. (2018, December). Uncertainty in Current and Future Health Wearables. *Communications of ACM* , pp. 62 - 67.
- [5] Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., et al. (2017, June 22). Artificial intelligence in healthcare: past, present and future. *Stroke Vasc Neurol* , doi:10.1136/svn-2017-000101.
- [6] Genetic Engineering News and Biotechnology . (2019, February 15). *Artificial Intelligence Improves Ovarian Cancer Prognosis*. Retrieved April 16, 2020, from Genetic Engineering & Biotechnology News: <https://genengnews.com>
- [7] Edward, C. (2020, March 02). *AI provides accurate and reliable heart disease prognosis, finds study*. Retrieved April 20, 2020, from Verdict Media Limited: [www.medicaldevice-network.com](http://www.medicaldevice-network.com)
- [ 8] Daley, S. (2019, July 4). *SURGICAL ROBOTS, NEW MEDICINES AND BETTER CARE: 32 EXAMPLES OF AI IN HEALTHCARE*. Retrieved April 16, 2020, from Built in 2019: <http://builtin.com>
- [9] Family Medicine and Community Health. (2020, April 7). *Prediction models for diagnosis and prognosis of covid-19 infection: systematic review and critical appraisal*. Retrieved April 16, 2020, from BMJ: <http://www.bmj.com>
- [10] Lo, C. (2019, December 18). *Is AI paving the way to doctorless diagnosis?* Retrieved April 16, 2020, from Verdict Medical Devices: <https://www.medicaldevice-network.com>
- [11] Medical Futuristic. (2019). *Top A.I Algorithms in Healthcare*. Retrieved April 29, 2020, from <https://medicalfuturistic.com>
- [12] Panch, T. (2019, November 14). *How AI Can Impact Chronic Disease Management*. Retrieved April 16, 2020, from PSQH: <https://psqh.com>
- [13] IBM Watson. (n.d.). *Artificial Intelligence in medicine*. Retrieved April 16, 2020, from IBM Watson Health: [www.ibm.com](http://www.ibm.com)
- [14] Datta, S., Barau, R., & Jonali, D. (2019, December 12). *Application of Artificial Intelligence in Modern Healthcare System*. Retrieved April 16, 2020, from Intechopen: [mts.intechopen.com](https://www.intechopen.com)
- [15] Davenport, T., & Kalakota, R. (2019). The Potential of Artificial Intelligence in Healthcare. *Future Healthcare Journal* , 94-98.
- [16] VOX. (2020). *recode*. Retrieved April 29, 2020, from VOXMEDIA: <https://voxmedia.com>
- [17] Yang, C. W. (2020, March 15). *Can You Predict How Corona Virus Spread? Data, AI and Predictive Model in Pandemic*. Retrieved April 29, 2020, from <https://medium.com>

[18] Schmitt, M. (2020, April 7). *How to fight COVID 19 with machine learning*. Retrieved April 30, 2020, from <https://medium.com>

[19] Naude, W. (2020, April 1). *Artificial Intelligence Against COVID 19- Early Review*. Retrieved April 29, 2020, from Medium: <https://medium.com>

[20] Science Daily. (2020, March 30). *Experimental AI tool predicts which COVID-19 patients develop respiratory disease*. Retrieved April 16, 2020, from Science News: <http://sciencedaily.com>

## **AUTHORS**

First Author – Igwe, Joseph Sunday, Ph.D., Ebonyi State University, Abakaliki Nigeria;  
+2347089713878

Second Author – Ituma, Chinagolum, Ph.D., Ebonyi State University, Abakaliki Nigeria

Third Author – Ugah, John Otozi, Ph.D., Ebonyi State University, Abakaliki Nigeria

Fourth Author – Ugwu, Gabriel Evo, Ph.D., Ebonyi State University, Abakaliki Nigeria

**Correspondence Author is Dr Igwe, Joseph Sunday. ORCID ID: <https://orcid.org/0000-0002-0520-3646>**