Artificial Intelligence: Application in Health Care System

Divyakant. A. Patel*[1], Kunjal L. Vegad[1], Ghanshyam. V. Patel[1], Yogesh K. Patel, Ronak Patel[1], Dhwani A. Shah[1], Ekta D. Patel[1], Kishor Dholwani[2]

1. Sharda School of Pharmacy, Pethapur-Mahudi Road, Pethapur, Gandhinagar-382610
2. Sardar Patel college of Pharmacy, Bakrol, Anand - 388120

Corresponding Author:
Dr. Divyakant. A. Patel
I/C Principal and Professor,
Department of Pharmacognosy,
Sharda School of Pharmacy,
Email: dk81181@gmail.com

Abstract:

Artificial intelligence (AI) is defined as a field of science and engineering concerned about the computational comprehension of what is commonly called intelligent behavior, and with the creation of artifacts that exhibit such behavior. It is the sub field of computer science. AI has recently surpassed human performance in several domains, and there is great hope that in healthcare. The purpose of Artificial Intelligence is to make computers more useful in solving problematic healthcare challenges and by using computers we can interpret data which is obtained by diagnosis of various chronic diseases like Alzheimer, Diabetes, Cardiovascular diseases and various types of cancers like breast cancer, colon cancer etc. A few ongoing researches of AI applications in healthcare that provide a view of a future where healthcare delivery is more unified, human experiences. This Review will explore how artificial intelligence and machine learning can save lives by helping individual patients beat the odds. Some examples of artificial intelligence assisted diagnosis of various diseases are given below.

Keywords: Artificial Intelligence, Healthcare System, Robots, Computer data, Diseases.

DOI Number: 10.14704/nq.2022.20.12.NQ77112 **NeuroQuantology 2022; 20(12): 1342-1352**

Introduction:

The term intelligence refers to the ability to acquire and apply different skills and knowledge to solve a given problem. In addition, intelligence is also concerned with the use of general mental capability to solve, reason, and learning various situations. Intelligence is integrated with various cognitive functions such as; language, attention, planning, memory, perception. The evolution of intelligence can basically is studied about in the last ten years. Intelligence involves both Human and Artificial Intelligence [1].

In Artificial Intelligence, "Artificial" means objects that are made or produced by human beings rather than taking place naturally, and "Intelligence" is the capability to form tactics to achieve goals by interacting with an information-rich surroundings therefore Artificial Intelligence simply represent the intelligence of machines and the separation of computer science that targets to generate it [2].

Artificial Intelligence (AI) could organize patient routes or treatment tactics better, and also provide physicians with literally all the information they need to make a excellent decision in health care and medicine [3]. AI already established some areas in healthcare and it is only the beginning to alter dramatically starting from the design of treatment tactics

through the bolster in repetitive jobs towards medication management or drug development[4].

In the 21st century artificial intelligence (AI) has become an important area of research in virtually all fields: engineering, science, education, medicine, business, accounting, finance, marketing, economics, stock market and law, among others. The field of AI has grown enormously to the extent that tracking proliferation of studies becomes a difficult task [5].

According to father of artificial intelligence John McCarthy, who coined the term "Artificial intelligence" in 1956, said that "It is the combination of science and engineering to make intelligent devices for human welfare." "Artificial intelligence is an intellect that is much smarter than the best human brain in practically every field, including computer science and linguistic logic. "It is a modern method of machines which will do muscle work and illustrate complex questions in a "intellectual" manner. It is concerned with the basic and most important aspects in our life i.e. philosophy, computer science, mathematics, linguistics, biology, neuron science, sociology etc. AI plays a very important role to exhibit intelligent behaviour, to learn, demonstrate and give advice to the user[6].

Machine learning has revolutionized our way of life, from language recognition, image retrieval, handwriting recognition, weather forecasting and GPS routes to online search engines. It is now time to concentrate on successes in machine learning for biological discovery to benefit human health. Artificial Intelligence is a branch of computer science which has the potential to analyzing complex data. Their potential is to extract out meaningful relationship with a data set and it can be used in the diagnosis, treatment and predicting outcome in many clinical scenarios. The purpose of Artificial Intelligence is to make computers more useful and to understand the principles. Non-communicable diseases (NCDs), also known as chronic diseases, are not passed from person to person. They are of long duration and generally slow progression. The four main

types of non-communicable diseases are cardiovascular diseases (like heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructed pulmonary disease and asthma) and diabetes.

Early diagnosis of any chronic disease is very helpful in minimizing compilations of disease. It helps in deciding treatment protocols. There are various diagnosis and treatment protocols which prove that artificial intelligence is a boon in health care. The purpose of artificial intelligence is to make computers more useful in solving problematic healthcare challenges and by using computers we can interpret data which is obtained by diagnosis of various chronic diseases. Some of the areas covered will reveal how artificial intelligence is helpful in diagnosis and treatments of various chronic diseases[7].

Application of Artificial Intelligence in Healthcare

Artificial intelligence in breast cancer

Breast Cancer is a major cause of concern worldwide. It is the most frequently diagnosed cancer in women and can also occur in men. Breast cancer arises when cells grow and multiply uncontrollably, which produces a tumor or a neoplasm. In women with breast cancer who are younger than 50 years of age, chemotherapy increases their 15-yr survival rate by 10%; in

older women the increase is 3%.

Early detection of breast cancer is of utmost importance. There are a growing number of breast cancer patients throughout world and

eISSN 1303-515

there is need for new techniques in diagnosis related with such type of patients and prediction of cancer in its different forms. This can lead to decrease in the rate of mortality [8].

At an early stage cancer can be detected with the help of screening tests. The most effective tool for detecting breast cancer in its earliest and most treatable stage is Mammography. Furthermore, this exam allows the detection of other pathology and may suggest the nature such as normal, benign or malignant. The American Cancer Society recommends the cancer screening

guidelines for most adults. The introduction of digital mammography is considered the most important improvement in breast imaging [9].

A growing area of research relates to the use of techniques from Artificial Intelligence applied to the processing of information necessary for the medical diagnosis. Artificial intelligence (AI) is the subfield of computer science which is exhibited by machines or software and becoming a

popular as it has enhanced the human life in many areas. AI developed systems that reliably interpret mammogram data, intuitively translate patient's charts into diagnostic information which accurately predicts breast cancer risk.

Techniques that depend on the principle of intelligent systems such as neural networks, nearest neighbor methods, computer aided design (CAD) algorithms, fuzzy logic approach, decision trees and linear programming methods. Currently Curemetrix algorithm, iT Bra, NLP (Natural language processing) software, Genes to systems breast cancer database (G2SBC) and

Triple negative breast cancer database intelligent systems are used for breast cancer detection.

Computer-aided diagnosis (CAD) systems use computer technologies to detect irregularity in mammograms and these results are used by radiologists for diagnosis which plays an important role. The CAD performance can change from one condition because some lesions are more difficult to detect than others, this is because they have similar characteristics to normal

mammary tissue [10].

Higher breast density usually indicates a higher possibility for the presence of malignant tissue. A human observer can distinguish different structures very well without the information of their overall brightness. In automatic breast density classification, it is important to decide which parameters give the best division between categories [11].

A smart wearable device iTBra has been developed by Cycardia Health for monthly breast scanning. This can be an important artificial intelligent technique to early breast cancer detection. Cyrcadia Health is a US based medical biosensor company which utilizes predictive analytics to accomplish early breast cancer detection through personalized wearable devices. The Cyrcadia breast patches are fitted with sensors which track temperature changes in variance over time believed to be a circadian cellular change caused by a reduced PER1 (period estrogen receptor) and PER2 protein expression in the presence of breast cancer. When tissue is healthy, the Cyrcadia predictive algorithmic output displays an irregular variant metabolic pattern. In the case of cancer, the varied pattern of metabolic activity becomes compressed, or demonstrates more of a flat line profile in tissue infused cancers.

Automated Breast Density Software (iReveal) accurately estimates percent breast density (PBD), area of dense tissue, total breast area and irrespective of the (FDA-approved) imaging sensor.

iReveal identifies the risk of potentially masking

a cancer, then maps the percentage of the fibro glandular tissue to a density category corresponding to the BI-RADS (Breast Imaging Reporting and Data System) standards. Curemetrix algorithm that detects what direction and projection of breast is in cause was developed to create a unique "breast health score" for each image may lead to improved medical image analysis and anomaly quantification. It also creates a unique "breast health score" for each image may lead to improved medical image analysis and anomaly quantification. G2SBC a resource which integrates data about genes transcripts and protein altered in breast cancer cells. This database represents a systemic biology oriented data integration approach devoted to breast cancer.

Artificial neural network (ANN) is one of the best artificial intelligence techniques for common data mining tasks nonlinear statistical data modeling tools. ANN is used for classification between cancerous and noncancerous image. Their ability to learn from historical examples,

analyze non-linear data, handle imprecise information and generalize enabling application of the model to independent data has made them a very attractive analytical tool in the healthcare. Fuzzy logic is used to predict survival in patients with breast cancer. An intelligent method to assist in the diagnosis and second opinion of breast cancer, used for processing and sorting data obtained from smears of breast mass obtained by fine needle aspirate [12].

Natural language processing (NLP) software algorithms for mammographic imaging characteristics and mammogram reports provide an automated means to aid in data extraction and analysis for clinical decision support system [13]. It is very important to continue the development of these methods which gives the right direction for research in nearly diagnosis of breast cancer and provide the medical experts with a second opinion thus remove the need for biopsy, excision and reduce the unnecessary expenditure.

AI in Management of Alzheimer's disease

Alzheimer's disease (AD) is the most common neurodegenerative disorder to date, with no cure or preventive therapy. Histopathological hallmarks of AD include deposition of β-amyloid plaques and formation of neurofibrillary tangles in brain. AD is the leading cause of dementia, characterized by substantial memory loss, impairment of multiple cognitive function and behavioral changes which affects a large population worldwide [14].Diagnosis and management of AD remains an expensive and laborious process that is completely unsustainable in aging population.

Application of artificial intelligence (AI) to this incurable disease may help in early detection. Use of various automated systems and tools like Brain-computer interfaces (BCIs), Arterial spin labeling-magnetic resonance imaging (ASL-MRI), Electroencephalogram (EEG), Positron emission tomography (PET), Single photon emission computed tomography (SPECT)scans and various algorithms helps to minimize errors, early detection and control disease progression[15].

Use of different AI algorithm in brain MRI scans sets a path to distinguish between early stages of Alzheimer's disease. Brain-computer interfaces (BCIs) help AD patients to convey basic thoughts by sending commands from the brain to an external device. Arterial spin labeling (ASL) imaging is promising functional biomarker that creates perfusion maps which recognizes blood perfusion pattern in various regions of brain assisting detection of different stages of AD. MRI coupled with ASL can intercept or slow disease advancement from subjective cognitive decline to mild cognitive

impairment to AD [16]. Uses of automated machine learning method have potential use in management of AD.

Electroencephalograms (EEG) have been demonstrated as a reliable tool in AD research and diagnosis. It is simple, noninvasive and potentially mobile brain imaging technology. EEG has high temporal resolution and may therefore contain crucial information about abnormal brain dynamics in AD patients. Three major effects of AD on EEG have been observed: slowing of the EEG, reduced complexity of the EEG signals and perturbations in EEG synchrony. AD seems to affect different frequency bands in EEG by specific ways like decrease of power in higher frequencies (alpha and beta, 8 Hz–30 Hz) and increase of power in low frequencies (delta and band, 0.5 Hz–8 Hz) is associated with in Mild cognitive impairment (MCI) patients as compared to healthy age control groups[17].

Management of diabetic complications using artificial intelligence

Diabetes is a chronic progressive metabolic disorder characterized by high blood glucose level. Increase in blood glucose is observed due to either destruction of pancreatic β-(Type I) or cells resistance to insulin (Type II). The disease progression leads to serious micro vascular or macro vascular complications namely neuropathy, nephropathy, retinopathy and cardiomyopathy. The management of diabetes and its complication is very tough job as there are several factors that keep blood sugar level in control. However increasing sample volume of diagnostic results makes it even more robust[18, 19].

The application of Artificial intelligence (AI) in diagnosis or monitoring of diabetes and its complication may improve the patient's quality of life. The computer assisted diagnosis, decision support systems, expert systems and implementation of software may assist physicians to minimize the intra and inter-observer variability. The application of AI facilitates interpretation of results with high accuracy and maximum speed. Foot amputation is one of the advanced stages of diabetic neuropathy. To monitor and for early detection the group of scientists from Hebrew University of Jerusalem and Hadassah Medical Center have developed a washable intelligent sock (SenseGOTM) that is able to track pressure changes on patient's foot. The senseGO contains number of pressure sensors that collect the information regarding pressure, incorrect posture, overexertion and ill-fitting shoes-the variables responsible for foot ulcers. Further senseGO relays this information on smartphone application [20].

Microalbuminuria (MA) is an independent predictor of Diabetic nephropathy and cardiovascular diseases. Detection of microalbuminuria is very important screening tool to identify diabetic nephropathy. Marateb and co-workers developed fuzzy MA classifier system to predict MA without measuring urine albumin. They used clinical parameters usually monitored in type II diabetic patients. The rule induction was done by particle swarm optimization. Statistic featuring was done with multiple logistic regressions. Age, Gender, BMI, DD, systolic BP, FBS, HbA1c, Bs2hpp, CHOL, LDL, HDL and TG were used as input parameters. The performance of MA classifier was evaluated using 10-fold cross-validation. The minimum sensitivity, specificity, precision and accuracy of the proposed fuzzy classifier system with feature extraction were 95%,
85%, 84% and 92%, respectively [20].

Decline in kidney function is variable in diabetic patients; hence it is difficult to predict determinants of diabetic nephropathy. Cho and co-workers applied various machine learning techniques such as feature selection methods and support vector machine (SVM) classification

and developed a new visualization system which uses a nomogram approach. The proposed method can predict onset of diabetic nephropathy about 2-3 months before the actual diagnosis. Additionally, the visualization system provides physicians with intuitive information for risk factor analysis [21].

Peripheral diabetic neuropathy is foremost cause of disability in diabetic patients. The early diagnosis can be done by Morphometric parameters of corneal nerves. Ferreira and co-workers developed a fully automatic algorithm for morphometric parameters extraction and corneal nerve segmentation. They enhanced the corneal images through phase shift analysis, the structure classification was done by Hessian matrix computation and then nerves were constructed using

morphological methods. The developed algorithm produced good results for nerve searching and nerve length measurement[22].

Sanchez and co-workers evaluated the performance of a comprehensive computer-aided diagnosis (CAD) system for diabetic retinopathy (DR) screening, using a publicly available database of retinal images and to compare its performance with that of human experts. They applied previously developed CAD system to 1200 digital color fundus photographs. The system

achieved an area under the ROC curve of 0.876 for successfully distinguishing normal images from those with DR with a sensitivity of 92.2% at a specificity of 50%. These compare favorably with the two experts, who achieved sensitivities of 94.5% and 91.2% at a specificity of 50% [23].

The computer assisted diagnosis, decision support systems, specialist systems and execution of software may help physicians to reduce the intra and inter-observer variability. The application of AI enhances interpretation of outcomes with high precision and maximum speed c. For an instance, The Diabeter Clinic‟s latest observational test applied a system built on top of a self-optimizing AI platform. The system, named as Rhythm, forecasts and manages blood glucose levels of people with diabetes, relied only on non-invasive biometric sensors and AI [24].

Artificial neural network in diagnosis of cardiovascular diseases

Significant information regarding cardiovascular diseases ranging from detail of symptoms to different types of biochemical data and results of imaging devices are available to the facilitate diagnosis by clinicians. Artificial Neural Network (ANN) is a mathematical or computational model which inspired by the structural and functional characteristics of biological neural

networks [25]. ANNs involve extensive use of science and technology. It is also used to predict probability of the disease pathology. It has proven its application in the classification of leukemia, diagnosis of diabetes and tuberculosis, radiograph and living tissue image analysis [26]. The most important application of this technique is in the diagnosis of cardiovascular

diseases. This technique can predict heart diseases based on information available on various risk factors such as family history, diabetes, age, hypertension, alcohol intake, high cholesterol, tobacco smoking and physical inactivity.

Structurally the ANN is formed by a series of “neurons” which are arranged in three layers i.e. input layer, hidden layer and output layer. A weight connection connects each neuron in layer with each neuron in the next layer and, the value of the weight shows the strength of the connection. The number of layer and number of neuron in the layer depends on the complexity of the system. The neurons in the input layer receive the data and transfer them to neurons in the first hidden layer through the weighted links where the processing of data

takes place and the results are transferred in the output layer[27].

Baxt et al. used ANN for the diagnosis of myocardial infarction in 331 adult patients suffering from anterior chest pain and compared the diagnostic sensitivity and specificity with that of the clinician attending the patients. In the study ANN was utilized using clinical data available of 351 patients hospitalized for MI and later the ANN system having the data was tested on 331 patients with anterior chest pain. The outcome of the study showed that ANN may be a valuable aid in diagnosis of myocardial infarction. [28]

Detecting malignant diseases and assessing the effectiveness of chemotherapy in cancer

Some kind of skin markings, similar to lesions, can be symptomatic of medical conditions. Recognizing them can assist medical practitioners distinguish malignant conditions like skin cancer earlier. Certain treatment systems are now applying AI algorithms for this. Derma Compare is a main example that applies AI algorithms to compare and contrast images of melanoma moles with images of 50 million known moles uploaded by patients and doctors in the entire world [29].

The revolution in digital computer technology that has made feasible new and complicated imaging techniques may subsequently have an impact on the interpretation of radiologic images. In mammography, computer image and AI techniques have been used effectively to distinguish or to portray abnormalities in digital images [30]

Robot assisted surgery

Robotic surgery, computer-assisted surgery, and also robotically-assisted surgery are terms for technological improvements that utilizes the robotic systems to aid in surgical procedures[30]. Robotically-assisted surgery was created to conquer the limitations of preexisting minimally-invasive surgical procedures and to improve the capacity of surgeons performing open surgery [31].

Managing medical records and data

The most apparent use of artificial intelligence in healthcare is data management. Gathering it, storing it, normalizing it, and tracing its ancestry. It is the primary step in revolutionizing the obtainable healthcare systems [12]. quite recently, the AI research branch of the search giant, Google, propelled its Google Deep mind Health project, used to mine the information of medical statistics a good way to offer extremely good and expeditious health services [13]. Since the essential step in health care is compiling and investigating data, data management is the most broadly utilized application of artificial intelligence and digital automation. Robots collect, store, re-layout, and trace data to offer faster, more consistent access [32]. The past decade has seen an emission in the measure of health information that is currently obtainable [33].

In healthcare industry, data (patient information, diagnosis information, new research findings, and more) is generated in massive volumes every day [34]. The combination of huge data analytical tools have helped organizations achieve the insights essential to collaborate much more efficiently with patients and take excellent decisions, and this dependence on large data and storing it to reducing wastage; from cutting coast to streamlining hospital staff timings; from empowering remote patient monitoring to anticipating epidemics, the utilization of bog data has been growing notably [30].

AI is a branch of computer science and technology adapting with the simulation of smart behavior in computer system. Coordinating the experience, information, and human contact of clinicians with the power of AI will enhance the high quality of patient care and also lower its cost. Data from whole patient

populations can be analyzed using AI to discover new evidence and determine high-quality healthcare practices [35].

Treatment design

AI is resulting in advancements in healthcare treatments, such as upgrading the organization of treatment tactics, analyzing data to provide superior treatment strategy, and monitoring treatments [36]. AI has the ability to rapidly and more accurately recognize signs and symptoms of disease in medical images, such as MRI, CT scans, ultrasound and x-rays, and therefore permits faster diagnostics reducing the time of patients wait for a diagnosis from weeks to mere hours and expeditiously the introduction of treatment choices [37].

Doctors can now search information, such as Modernizing Medicine, a medical assistant used to gather patient information, record diagnoses, mandate tests and prescriptions and arrange billing information [38]. Furthermore, the aptitude to explore public databases with information from thousands of doctors and patient cases can assist physicians manage better personalized treatments or discover similar cases [39]. AI will encourage clinicians adopt a more extensive strategy for malady administration, better facilitate care designs and help patients to all the more likely oversee and satisfy with their long haul treatment programs [40].

Drug creation

Machine learning algorithms are now being used with numerous achievements to decrease drug discovery times. Developing pharmaceuticals by means of clinical tests is exceptionally tedious, as often as possible taking considerably more than 10 years, and cost billions of U.S dollars. Using AI to restore parts of the drug discovery process can be much quicker, cheaper, and safer. At the same time AI cannot completely remove all the stages concerned in drug creation, it can assist with stages like, discovering new compounds that could be possible drugs. It can also assist to find new applications for previously tested compounds [41].

Between the West Africa Ebola in 2014 virus outbreak, a program powered by AI was used to scan accessible medicines that might be redesigned to fight against the disease. Two drugs were discovered to reduce infection in one day, when analysis of this kind generally takes months to years, a difference that might signify saving thousands of lives [42]. Not long from now, AI platforms united with in-memory computing technology will have the capacity to offer accelerated drug discovery and development and delivery and also help scientists find new uses for drugs [43].

Future of Artificial Intelligence

AI is in advance traction in many fields. AI has the likelihood to have an enormous and positive impact for doctors and patients in healthcare. Because of the capability to collect and analyze a huge amount of various data, AI could yield considerably quicker and much more accurate diagnoses for a broader section of the population. Individuals without access to extremely specialized healthcare might achieve the advantage of that experience through AI [44].

Healthcare expenses could potentially fall due to previous and more accurate diagnoses. AI also causes risks for the medical profession and patients. Until the data warehouse gets big enough and extremely well qualified, doctors will have to persist to use their training and experience to guarantee that artificial intelligence is yielding the proper diagnoses and course of medical treatment [45]. As AI technologies expand, they will change the way doctors look at their patients, broaden the possibilities to predict and treat diseases, save healthcare expenses and progress medical care in regions where access to healthcare is limited.

Finally, picturing a future of medicine based on data and analytics gives explanation for hope but needs constant research to understand its full potential [46].

References:

[1] Jahanzaib Shabbir and Tarique Anwer, Artificial Intelligence and its Role in Near Future, Journal of Latex class files, Volume 14, No.8, August 2015.

[2] S. A. Oke, A Literature Review on Artificial Intelligence, International Journal of Information and Management Sciences, Volume 19, Number 4, pp. 535-570, 2008.

[3] Boden MA. Creativity and artificial intelligence, Artificial Intelligence 1998;103:347-56.

[4] Fogel AL, Kvedar JC. Artificial intelligence powers digital medicine. NPJ Digit Med, 1:5, 2018.

[5] Ranganath R, Gerrish S, Blei DM. Black Box Variational Inference. Aistats 33:814-22, 2014.

[6]Mahind Rupali1, Patil Amit2A Review Paper on General Concepts of
"Artificial Intelligence and Machine Learning", International Advanced Research Journal in Science, Engineering and Technology, Vol. 4, Special Issue 4, 79-82, January 2017.

[7] Mishra SG, Takke AK, Auti ST, et al. Role of Artificial Intelligence in Health Care. Biochem Ind J. 2017; 11(5):120 © 2017 Trade Science Inc.

[8] Ontario HQ. Cancer screening with digital mammography for women at average risk for breast cancer, magnetic resonance imaging (MRI) for women at high risk: An evidence-based analysis. Ont Health Technol Assess Ser,10(3):1 -55, 2010

[9] Gotzsche PC, Jorgensen KJ. Screening for breast cancer with mammography. Cochrane Database Syst Rev. 6:CD001877, 2013.

[10] Fujita H, Uchiyama Y, Nakagawa T, et al. Computer-aided diagnosis: The emerging of three CAD systems induced by Japanese health care needs. Computer Methods Programs Biomed. 92(3):238-48, 2008.

[11] Dandolu V, Hernandez E. Mammographic breast density. N Engl J Med. 356(18):1885-87, 2007.

[12] Sizilio GR, Leite CR, Guerreiro AM, et al. Fuzzy method for pre-diagnosis of breast cancer from the fine needle aspirate analysis. Biomed Eng Online. 11(1):83, 2012.

[13] Gao H, Bowles EJA, Carrell D, et al. Using natural language processing to extract mammographic findings. J Biomed Inform. 54:77-84, 2015.

[14] K.L. Vegad, N.S. Kanaki, M.N. Zaveri, E.D. Patel. Bio Activity Guided Separation of Acetyl cholinesterase Inhibitor from Nardostachys jatamansi. Int J Curr Med Pharm Res., 3(4): 1076–1079, 2015.

[15] Cummings JL, Isaacson RS, Schmitt FA, et al. 2015: A practical algorithm for managing Alzheimer's disease: What, when and why. Ann Clin Transl Neurol, 2(3):307-323, 2015.

[16] TT Liu, GG Brown. Measurement of cerebral perfusion with arterial spin labeling: Part 1. Methods. J Int Neuropsychol Soc. 13(03):517-525, 2007.

[17]Deursen JAV, Vuurman EFPM, Verhey FRJ, et al. Increased EEG gamma band activity in Alzheimer's disease and mild cognitive impairment. J Neural Transm. 115(9):1301 -11, 2008.

[18]PatelE. D. , PatelN. J. VegadK. L.,JadavD. N.Pharmacognostic and Phytochemical Evaluation of Leaves of Manilkara hexandra (Roxb.) Dubard. IntJCurr Trends Pharm Res. 3(4): 984–988, 2015.

[19].PatelE. D., VegadK. L., Shah D. A., Patel Y.K., Kanzariya N. R., A Novel Therapeutic Target - Glycogen Synthase Kinase-3. Inventi Rapid:Molecular Pharmacology.(3):1-7, 2017.

[20]Hebrew University of Jerusalem. To help diabetics, intelligent socks are paired with smartphones.

[21]Marateb HR, Mansourian M, Faghihimani E, et al. A hybrid intelligent system for diagnosing microalbuminuria in type 2 diabetes patients without having to measure urinary albumin. Computers in Biology and Medicine. 45: 34-42, 2014.

[22] Cho BH, Yu H, Kim K, et al. Application of irregular and unbalanced data to predict diabetic nephropathy using visualization and feature selection methods. Artif Intell Med. 42(1):37-53, 2008.

[23]Ferreira A, Morgado AM, Silva JS. Automatic corneal nerves recognition for earlier diagnosis and follow-up of diabetic neuropathy. In: International Conference Image Analysis and Recognition Springer Berlin Heidelberg. 60-69, 2010.

[24]Sánchez CI, Niemeijer M, Dumitrescu AV, et al. Evaluation of a computer-aided diagnosis system for diabetic retinopathy screening on public data. Invest Ophthalmol Vis Sci. 52(7):4866-71, 2011.

[25] Nakajima K, Matsuo S, Wakabayashi H, et al. Diagnostic performance of artificial neural network for detecting Ischemia in myocardial perfusion imaging. Circulation Journal, 79 (7): 1549 -56, 2015.

[26]Malanda UL, Bot SD, Nijpels G. Selfmonitoring of blood glucose in noninsulinusing type 2 diabetic patients: It is time to face the evidence. Diabetes Care 36:176-8, 2013.

[27]Morton AH. An introduction to neural computing. Int Thomson Comput Press. 1995.

[28]Fernandez CJ, Gonzalez-Perez S, Ramos-Diaz JC. Artificial neural networks for closed loop control of *in silico* and ad hoc type 1 diabetes. Comput Meth Progr Biomed, 106 (1): 55-66, 2012.

[29]M Saghiri, K Asgar, K Boukani, et al. A new approach for locating the minor apicalforamen using an artificial neural network. Int Endod J. 45:257-265, 2012.

[30]Er O, Abakay A. Use of artificial intelligence techniques for diagnosis of malignant pleural mesothelioma. Dicle Medical Journal 42:5-11, 2015.

[31]Jaleel JA, Salim S, Aswin RB. Diagnosis and Detection of Skin Cancer Using Artificial Intelligence. International Journal of Engineering and Innovative Technology 3:311 - 15, 2013.

[32]. Juza RM, Haluck RS, Pauli EM, Rogers AM, Lyn-sue JR. Robotic cholecystectomy : A cost comparison with historically novel laparoscopic cholecystectomy. OA Robot Surg 2:1-4, 2014.

[33] Prabu AJ, Narmadha J, Jeyaprakash K. Artificial Intelligence Robotically Assisted Brain Surgery. IOSR Journal of Engineering 4:9-14, 2014.

[34] Lieberman H, Mason C. Intelligent agent software for medicine. Stud Health Technol Inform 08:99-109, 2002.

[35] Maglogiannis I. Introducing Intelligence in Electronic Healthcare Systems: State of the Art and Future Trends. Artificial Intelligence 71 -90, 1970:

[36] Mesko B. The role of artificial intelligence in precision medicine. Expert Rev Precis Med Drug Dev 2:239-41, 2017.

[37] Chou S, Chang W, Cheng CY, Jehng JC, Chang C. An information retrieval system for medical records & documents. Int Conf IEEE Eng Med Biol Soc 1474-7, 2008.

[38] Salman M, Ahmed AW, Khan A, Raza B, Latif K. Artificial Intelligence in BioMedical Domain An Overview of AI Based Innovations in Medical. Int J Adv Comput Sci Appl 8:319-27, 2017.

[39] Pacis DMM, Subido EDC, Bugtai NT. Trends in telemedicine utilizing artificial intelligence. AIP Conf Proc 1 -10, 1933.

[40] C. I. F. N. I. F. B. Digital healthcare s.l. gpbullhound. 2013:91643080.

[41] Imison C, Castle-clarke S, Watson R, Edwards N. Delivering the benefits of digital health care. The Nuffield Trust 1-108, 2016.

[42] Svetlana I, Zorica D, Jelena P, Jelena P. Artificial intelligence in pharmaceutical product formulation : neural computing. Chemical Industry and Chemical Engineering Quarterly 15:227-36, 2009.

[43] Agrawal P. Artificial Intelligence in Drug Discovery and Development. Journal of Pharmacovigilance 6:1 -2, 2018.

[44] Gawad J, Bonde C. Artificial Intelligence : Future of Medicine and healthcare. Bio chemistry: An Indian Journal, 11:113, 2017.

[45] Jiang F, Jiang Y, Zhi H, Dong Y, Li H, Ma S, Wang Y, Dong Q, Shen H, Wang Y. Artificial intelligence in healthcare: past, present and future. Stroke Vasc Neurol 2:230-243, 2017.

[46] Lu S, Burton SL. Man vs Robots ? Future Challenges and Opportunities within Artificial Intelligence (AI) Health Care Education Model. Proceedings of the RAIS Conference 2017.