IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 9, September 2021

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.282

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.282|

|| Volume 10, Issue 9, September 2021 ||

DOI:10.15662/IJAREEIE.2021.1009018 |

Machine Learning Algorithm based State-of-the-Art Health Care System

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ABSTRACT: Medical workers are using artificial intelligence to become more valuable, including physicians, nurses, radiologists, researchers, pharmacists, and many other healthcare professions. A smart healthcare system that uses artificial intelligence as a tool for improving healthcare industry operations and for optimising patient care plans is proposed in this study. Based on an AI-assisted system, which is said to support a hospitalised patient that used emergency medical services, this proposal can help process the patient's data, identify early-stage illnesses, and even facilitate triage decisions. it can automatically identify and evaluate human molecular data in the clinic and also automatically generate reports from radiologists. The proposed architecture is extremely versatile and able to meet the varied and complex healthcare needs of modern hospitals. This paper also illustrates the latest advances in AI application.

KEYWORDS: artificial intelligence, deep learning, machine learning, smart health care

I. INTRODUCTION

Artificial intelligence (AI) was valued at roughly $1441 million in the healthcare business in 2016, and it is expected to reach approximately $22,700 million by 2023. AI assists in the gathering of data, processing that data, and making a flawless prediction utilising algorithms that have been well proven to reduce the margin of error. Natural language processing, physical robotic systems, and machine learning, as well as deep learning and neural networks, are all key AI technologies in this context. The major goal of AI in healthcare is to investigate the important links between patient outcomes and preventative treatment techniques. For various applications, multiple AI algorithms have been developed. proposes target recognition and image interpretation, suggests a remote sensing image retrieval algorithm based on an improved Sobel operator, and suggests large-scale, high-dimensional data processing for images of the human brain in order to establish a hierarchical model of hidden relational logic, detecting future smart city criminals. utilising artificial intelligence is detailed in, a video stream based on object detection is proposed in, and deep learning is used to extract images of cultivated land. Deep learning is used to diagnose faults from photos. In order to recover animal photos from a large network of images, a hash network approach based on deep neural networks is developed. based on block information, provides a moving target tracking technique.

Artificial intelligence has also been used in a variety of smart health services, including robotic surgery, cardiology, cancer treatment, and neurology. Drug development, patient monitoring, and personalised medication have all been addressed, as well as assisting doctors in making the best decisions possible, locating related medical data or information from various textbooks and journals [18], storing patient data on the Cloud for easy access, and so on.
The goal of this work is to present an architecture for an AI-based smart healthcare system that will give patients with comprehensive support throughout their lifetimes. All departments will contribute to this AI-based support, including EMS, nurses, doctors, radiologists, clinical laboratories, pharmacy, and so on. Researchers will be able to combine data from patients and AI-based decision-making to improve the health-care system, R Alugubelli. (2016). et.al. This suggested system will also demonstrate how to use recent advances in AI to automate the entire healthcare system, which has never been done before in extant studies.

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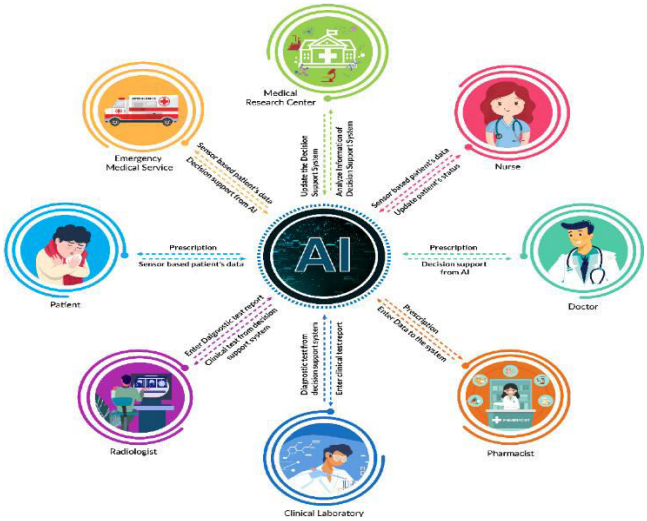

Figure 1: Artificial intelligence-based architecture for a smart health system

II. APPLICATIONS OF SMART HEALTH SYSTEM

Figure 1 depicts the suggested architecture for AI-assisted smart healthcare systems, in which AI aids doctors, patients, nurses, EMS, pharmacists, radiologists, clinical laboratories, and researchers. The sections that follow describe how those actors are supported:

2.1 Patients:
Hospitals that employ this architecture for smart healthcare systems will supply each of their listed patients with a sensor-based wireless device to track them. Whether it's at home or in the hospital, the device will automatically update the patient's daily data in a centralised database system. AI will make decisions depending on the data provided by the patient, and EMS will be dispatched if necessary.
The most essential role AI will play for patients is in providing all relevant patient data in a timely manner and effectively screening the affected area of the patient. AI counsels the patient and assists the physician in providing appropriate care. These AI-based support systems are sometimes smarter than doctors, able to make accurate diagnoses and treat patients with critical illnesses more effectively than doctors. This AI-based decision support system is undergoing continual development based on a variety of parameters like fresh patient data, cure rate, and so on. The system, which will be outlined later, will be maintained by the medical research centre at all times.

2.2 Emergency Medical Service (EMS): EMS stands for "emergency medical service."
EMS can benefit from sensor-based gadgets that are always in the hands of the patients. AI aids EMS in making decisions and providing immediate treatment for critical patients, such as stroke victims. AI-based algorithmic computers ask for a variety of inputs, such as temperature and blood pressure, in order to monitor the patients' condition and provide quick assistance for a limited time. The AI assists in extracting blood from the patient and also gives nurses instructions. Nurses use AI to keep track of their patients' progress. It also directs people to the appropriate hospital for a specific ailment.

2.3 Registered Nurses
Nurses can quickly manage large amounts of patient data with the help of clever AI-based gadgets, eliminating the need to manually enter the information. The AI-based system, which gathers data from patients' smart gadgets, keeps nurses up to current at all times. AI also aids nurses in assessing disease severity and anticipating future interventions.

2.4 Doctors:
By monitoring and screening the patient and offering support for making quick judgments, AI makes everything easier and faster. AI can rapidly convert unstructured data into structured data, resulting in precise results and a faultless diagnosis. AI-generated radiologist reports, clinical laboratory findings, and a variety of other decision-support technologies assist doctors.

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Doctors can use AI to examine important nurse-patient conversations as well as patient notes. It also aids doctors in identifying the portions of the body that are affected, lowering patients' quality of life, and identifying effect areas before they become chronic illnesses.

2.5 Radiologists

Radiologists benefit from AI in terms of disease detection and surveillance. With picture recognition tasks, AI algorithms have made remarkable progress.

AI mostly assesses radiological graphs and recognises complex patterns in the form of images automatically. Recent AI apps have been developed to detect RSNA, a type of paediatric bone ageing, and to display the affected portion in better detail than can be seen with the human eye. Lung cancer is the most frequent and dangerous type of tumour, and it requires prompt detection and treatment. To detect pulmonary nodules, lung cancer screening is required.

Artificial intelligence can detect nodules and classify them as cancerous or benign.

Because of the lengthy process, mammography screening is a major difficulty for most radiologists. However, AI can help understand the results and quickly identify calcium deposits in the affected person's breast. The application of AI algorithms in this regard not only slows the progression of chronic diseases, but also aids radiologists in identifying patients with dangerous problems and treating them first. AI also indicates which cases should be referred to a radiologist. For example, if a person's leg is broken and they are ignorant of it, they should go to Radiology right away R Alugubelli, (2018).

2.6 Clinical research facilities

Artificial intelligence (AI) has become increasingly prevalent in clinical laboratories' day-to-day operations and procedures.

Digital pathology allows pathologists to capture pathology data such as whole slide images (WSI) and uses machine learning to detect subtle trends and deliver detailed information to pathologists. AI in clinical microbiology laboratories is the gold standard in full-laboratory automation, supplementing human innovation. The algorithms used allow for the automatic reading and interpretation of growth on plates, as well as the recognition of colony shape and other critical functions. The proposed system's AI-based clinical laboratories will test a small volume of serum or blood from several samples in a single day and deliver accurate answers to all clinical issues that are difficult for humans to answer.

The CAD system, which is one of the most significant applications of AI, has been gradually deployed for the diagnosis of colon, lung, and breast cancer. As a result, CAD has become a widely used AI application in clinical practise. The application of artificial intelligence to the analysis of entire human molecular data, as well as genetics, has ushered in a new era. AI has the capacity to understand and address a variety of clinical trial difficulties.

2.7 Pharmacy

In the pharmaceutical industry, artificial intelligence (AI) refers to the use of automated algorithms to accomplish jobs or activities that need or rely on human intelligence. Artificial intelligence has a significant impact on the operational efficiency of pharmacies and medication stores. The suggested system will automatically send out notifications concerning drug shortages, oversold or high/low demand, and so on. AI has enabled pharmacists to move beyond simply dispensing prescriptions to disease management and patient interaction. AI mainly identifies the association between different health problems sand the types of medicines or therapies best suited to treat them.

Hospitals that use the proposed system will provide AI-powered smartphone apps that track patients' medicine usage in real time. These apps use a webcam to check that patients are taking their medications or prescriptions as prescribed. These pharmaceutical data are also used by researchers and scientists who are developing new medications or drugs, as mentioned in the next section.

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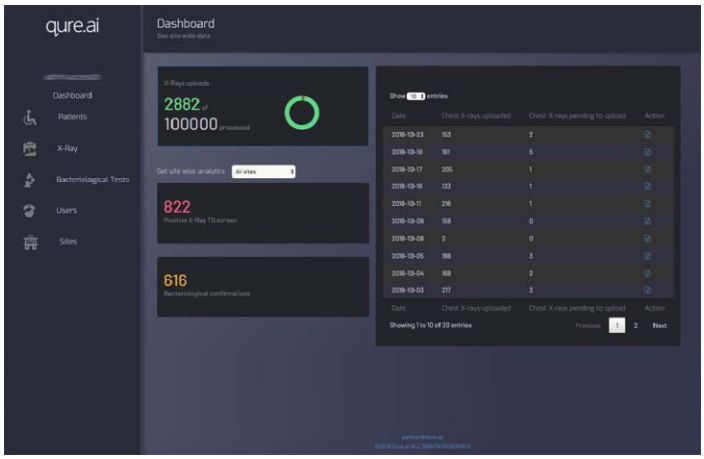

Figure 2: Fig. 2. Interface of qXR tool

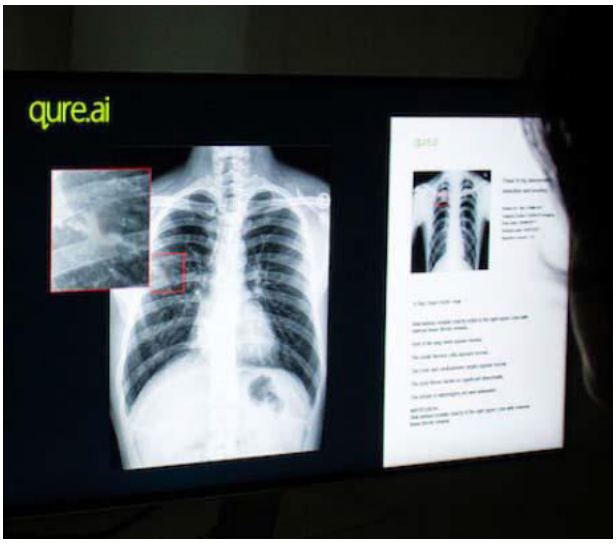

Fig. 3. Chest X-ray screening by Qxr

Fig. 4. Interface of qER

Researchers can use the suggested technology to acquire data more quickly and do predictive studies of new drugs or diseases. Researchers can use prepared data for study purposes, and AI can automatically write the narrative provided by doctors and nurses, resulting in a perfect and accurate report. This report assists researchers in determining the root cause of sickness, gathering the greatest evidence of its interactions with other biomedical entities, and optimising the production process. Researchers can also use AI to validate the mix of biomarkers and recruit the patient, allowing for diagnosis. AI allows researchers to repurpose different pharmaceuticals as well as extract biological knowledge for discovering new ones with the new indications. AI is also useful for testing different substances against cells and

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finding molecules that require additional investigation and time. When compared to human analysis, AI speeds up the screening process and produces faster findings.

Contract Research Organizations (CRO) for research will be supported under the suggested framework. A contract research organisation (CRO) assists medical sectors, pharmacies, and biotechnology enterprises. They were created primarily to reduce the expenses of firms producing new pharmaceuticals or medicines for the healthcare industry. CROs have extensive expertise collaborating with scientists, researchers, and physicians to define specific questions that benefit everyone.

III. PROPOSED SYSTEM

With its newest advancements, AI has astounded the world, and everyone in the medical field is attempting to adopt it. qXR for tuberculosis screening, qER tool for head CT scans, qScout-EMR, InMotion ARM, and Google AI for breast cancer diagnosis are only a few of the recent advances that will be employed in the proposed system:

3.1 qXR TB screening:qXR is an X-ray chest scan tools that detect indications of tuberculosis pulmonary, hilar, and pleural. qXR employs an AI system which can detect both primary and atypical primary pulmonary tuberculosis. It can also test for problems including lung cancers in high-risk populations, COPD, and other heart diseases simultaneously, besides its usefulness for tuberculosis.

3.2 Head CT scanning qER tool

It is an instrument that identifies and locates a number of different brain disorders such as intracerebral bleeding, midline shift, mass effect, infarcts and cranial fractures, as demonstrated in Figure 4. Table 1 shows the exactness.

Table 1. The accuracy of each algorithm

Abnormal finding	AUC (Confidence interval)	Specificity	Sensitivity
Intraparenchymal haemorrhage	0.95	0.86	0.9
Extradural hemorrhage	0.97	0.87	0.95
Intracranial haemorrhage	0.95	0.89	0.9
Subarachnoid Hemorrhage	0.95	0.89	0.9
Subdural Hemorrhage	0.96	0.89	0.9
Mass Effect	0.98	0.91	0.95
Intraventricular haemorrhage	0.96	0.9	0.9
Cranial Fracture	0.94	0.87	0.87
Infarct	0.97	0.93	0.93
Midline Shift	0.93	0.88	0.88

3.3 qScout-EMR to register and trace contacts

You may access this tool on any mobile or laptop device. It is mostly for registration and contacting of COVID-19. We shall nonetheless work with the company to amend this software to monitor daily symptoms for all patients. The UI of this tool is displayed in Figure 5.

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Figure 5:Interface of qScout

3.4 ARM movement

Robots from InMotion are employed as instruments in the US and over 20 other countries for neurorehabilitation. A number of motor impairments, including spinal cord injuries, cerebral palsy, hemiplegic shoulder discomfort, multiple sclerosis, Parkinson's disease, musculoskeletal spasticity, have been thoroughly investigated.

IV. CONCLUSION

The presented architecture indicates that any health institution can apply this AI method as a way of cost-cutting and efficient and accurate management for all stakeholders. The proposed AI-assisted system supports a patient with emergency medical services from the moment of his hospital admission, processes long patient data, detects severe disease, automatically recognises complicated patterns and in the clinical environment, can analyse the entire human molecular data and patient genetics. It reduces the risk of human mistakes on the part of doctors by generating radiologist reports created by AI, clinical laboratory reports and numerous other tools to support decisions and facilitates decisions on early disease identification and diagnosis. It processes raw data not only for patients but also extremely rapidly reports, helping scientists, doctors, nurses and other stakeholders to gain the support they need effectively. In the present study, we also identify contemporary developments related to the function of AI in health, such as early detection of tumours, genetic code connection, the development of new medicinal products etc., which might be applied in this project design. In other words, the suggested system will increase health professionals' ability to grasp the basic needs of their patients, enable them to advise their patients and provide them with efficient support by optimising their staff time and cost reduction. The AI-based healthcare business offers a wealth of benefits and healthcare professionals and hospitals all over the world need to switch to AI systems.

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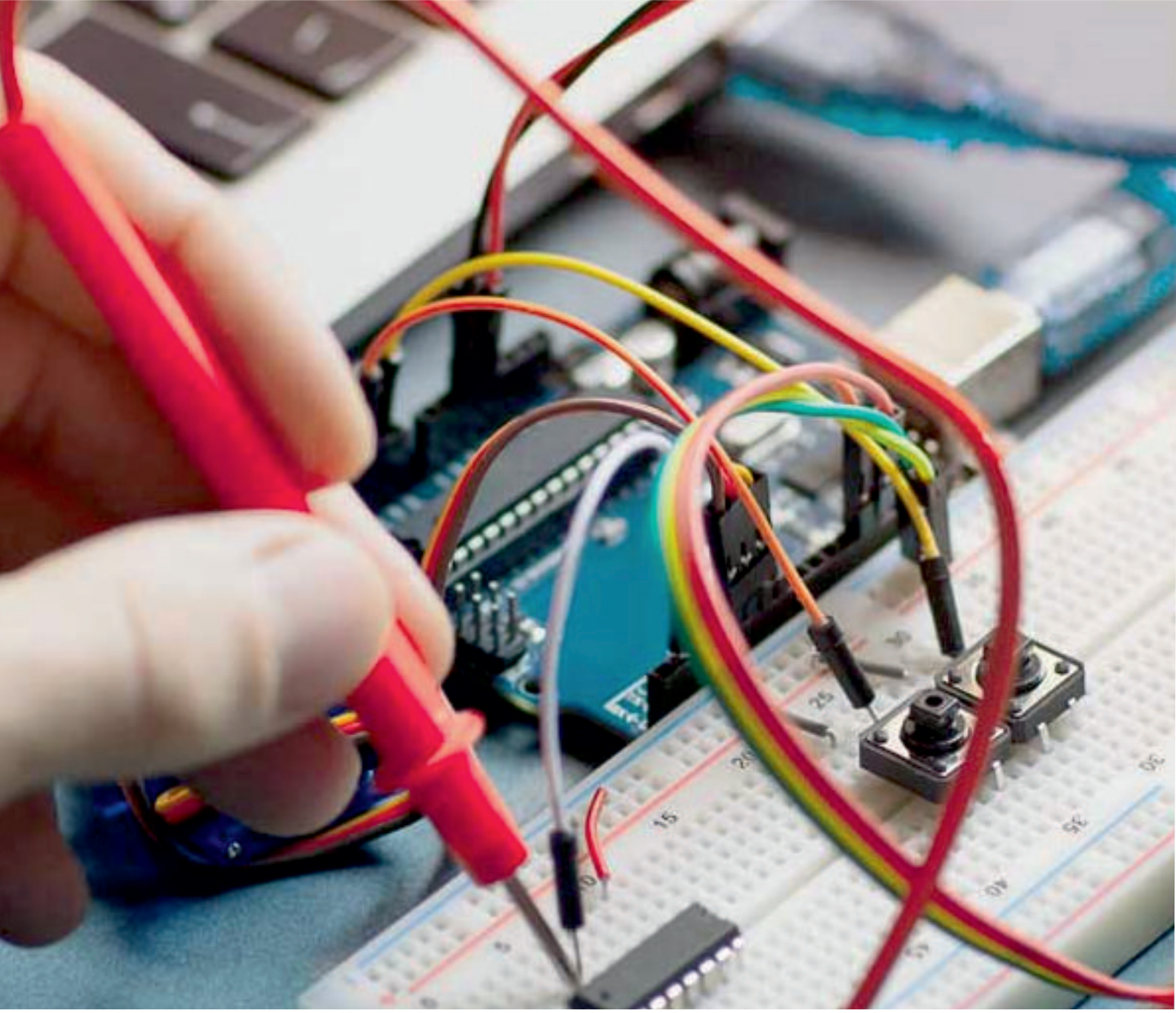

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