

IMPACT OF AI IN INTERNET OF MEDICAL THINGS FOR HEALTH CARE DELIVERY

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ABSTRACT

The Internet of Things (IoT) is a network of wireless, interconnected, and networked digital devices that can gather, send, and store data without the need for human or computer interaction. The Internet of Things has a lot of promise for expediting and improving health care delivery by proactively predicting health issues and diagnosing, treating, and monitoring patients both in and out of the hospital. Understanding how established and emerging IoT technologies may help health systems deliver safe and effective treatment is becoming increasingly critical. The purpose of this viewpoint paper is to present an overview of existing IoT technology in health care, as well as to describe how IoT devices are improving health service delivery and how IoT technology can alter and disrupt global healthcare in the next decade. The promise of IoT-based health care is explored further to theorize how IoT can increase access to preventative public health services and help us migrate from our existing secondary and tertiary health care systems to a more proactive, continuous, and integrated approach. The intersection of the Internet of Medical Things (IoMT) for patient monitoring and chronic care management and the use of Artificial Intelligence (AI) is becoming more promising than ever as the adoption of telemedicine continues to grow dramatically. Connected devices generate huge volumes of data based on real-time measurements of patient vitals, which is delivered to cloud-based applications that are monitored by medical specialists in virtual contact centres. The policy is applied per-patient, and healthcare providers receive warnings and messages when a patient's heart rate, oxygen level, glucose level, blood pressure, or other measurement reaches a set threshold. Depending on the sort of telemedicine and telehealth platforms in use, this data is tracked and acted upon by specialists who monitor many patients for many different practices, and in other circumstances, this data is sent directly to the provider. AI in healthcare, as well as other crucial technologies are essential for resolving the issue and producing future prosperity

Keywords: Artificial intelligence, Internet of Things, Internet of Medical Things

1. INTRODUTION

Artificial intelligence (AI) has the potential to revolutionize the medical and healthcare industries. The impact of AI in medical diagnostics, in particular, has broadened the possibilities for providing high-quality patient care. One of the primary applications where AI providers are researching game-changing potential is early illness diagnosis, and they are fiercely investing in implementing AI in radiology to augment conventional techniques. In the AI in medical diagnostics business, picture recognition is likely the most attractive consumer offer. In millions of photos extracted from

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the target population, algorithms have been learning, unlearning, and relearning illness indicators. Outsourcing things to emerging economies has become popular as a cost-cutting strategy.

The use of devices is expanding, and the amount of data created as a result, as more devices are authorized and even approved by authorities such as the Federal Drug Administration (FDA) in the United States. The data is useful not only for treating chronic conditions or as part of an at-home post-operative care solution, but also for researchers, pharmaceutical product developers, other scientists, and health insurance companies, who can use it to better understand patterns and collaborate with institutions and professionals to improve care protocols so that the cost of care can be reduced and it shall be accessible to all.

The application of AI analytics becomes much more intriguing and beneficial when Internet of Mdical Things (IoMT) devices create huge data. For instance, Barry Solomon, co-founder of TeleMedCo, a technology business that pioneered the use of AI in emergency rooms (using IBM Watson's AI engine), and has now expanded into telemedicine solutions and services for seniors and veterans in the United States. It combines traditional "virtual visits" with remote patient monitoring via PrimoCare's gadgets and a 5G-connected hub.

Health monitoring will become less invasive and more automated as a result of smarter sensors, software, and services, lowering the need for human caretakers while restoring dignity to elders who have lost it through time. Wearables that target everything from swallowing problems to incontinence are now available from health startups. Ten years ago, monitoring a senior for hip-breaking falls might have been impractical without the help of a relative or personal nurse, but falls can now be detected and addressed immediately with smartwatches; similarly, wearables targeting everything from swallowing problems to incontinence were impractical without the help of a relative or personal nurse, but falls can now be detected and addressed immediately with smartwatches; similarly, wearables targeting everything from swallowing problems to incontinence were impractical without the help of a relative or personal nurse. Monitoring without wearables – wireless devices that reduce or remove human involvement in the monitoring process and medically focused IoMT sensors developed specifically to record human biometrics will be the next steps.

2. INTRODUCTION TO INTERNET OF MEDICAL THINGS (IOMT)

The value of medical IoT (IoMT) is being magnified by the synergistic expansion of machine learning (ML) and artificial intelligence. In processing vast amounts of continually streaming data from linked medical devices, doctors are able to derive actionable findings more rapidly and reliably.

The medical field is no exception to the growth of IoT applications across industries. Metrics and patient feedback have become critical for care providers as many healthcare system shifts to evidence-based outcomes with incentives that are beginning to match. Payers are becoming increasingly interested in lowering costs by using more effective therapies.

Data-driven care will continue to expand and will have a positive impact on both treatment costs and quality. Healthcare has improved its ability to steer the ship in that direction over the last decade. The main benefit of sensors in healthcare is that they shorten the time between measurement, detection, and treatment. Insulin pumps use blood glucose monitors with sensors under the skin that communicate blood glucose levels to external receivers to measure and distribute doses at the proper moment, albeit with patient input. Furthermore, the data analytics tools currently available add context and meaning to measurements at a considerably faster rate than previously conceivable.

3. ARTIFICIAL INTELLIGENCE (AI) IN MEDICAL DIAGNOSTICS KEY TRENDS

Deep learning algorithms have sparked a flurry of activity in order to improve access to high-quality diagnostics at a reasonable cost. This could save a person's life if they have a chronic illness that is not diagnosed in a timely manner. Patients who are on the receiving end are individuals who are at high risk for cardiovascular disease. Another factor driving AI research in the medical diagnostics market is the need to improve diagnosis accuracy, whether through a single image or a series of images.

As seen by the growth of AI-based apps, the internet of medical things is making significant progress. On the one hand, AI businesses want to close the huge gap between demand and availability of radiologists, while also lowering the cost of radiological scans. The use of AI apps in the detection of diseases and increase patient-centered care is, in general, the key clinical proposition of AI in healthcare.

Origin Wireless has created a "wireless AI" system that maps closed environments using Wi-Fi signals. The wireless radio waves in a room generate an unseen "wave pool," which Origin's Remote Patient Monitoring system monitors for ripples that indicate disruptions. Origin RPM detects when a person quickly transitions from standing to laying on the floor without the need of a camera or motion sensors, and can send a warning to nearby caretakers or off-site family members. Subtle variations in data streams can reveal granular changes in a person's activity, breathing, and sleeping patterns. SakuraTech, a Japanese firm, is employing millimetre wave signals to wirelessly monitor up to four heart and respiration rates at the same time, promising to operate over common obstacles like clothing and blankets while transferring data to the AWS cloud for continuous remote monitoring.

It would be impossible to understand room-scale, volumetric quantities of wireless data in this way without machine learning, similar to a sonar system constantly seeing moving objects in the water without determining their intent. However, trained AI can comprehend a room's layout as depicted by radio waves, then identify dangerously unusual patterns in the humans who dwell there, all without invading personal privacy. Wi-Fi and millimetre wave scanning, unlike AI image segmentation, act like radar, and their data may be utilized to discern patterns without the requirement for photos or videos.

Essence Group just released 5G PERS, a senior independent living solution that includes activity monitoring, fall detection, and voice communication. 5G PERS monitors a collection of typical IoT motion sensors, but it employs 5G cellular connectivity for infrastructure rather than Wi-Fi or 4G. PERS 5G can operate in homes without Wi-Fi routers because it connects IoT sensors to the cloud over a cellular connection — the solution is freestanding, so it can be installed and remotely monitored without requiring the senior to maintain separate hardware or services.

General-purpose IoT sensors have been utilized to enable everything from smart refrigerators to industrial quality assurance systems using cameras and movement detectors, but medically oriented IoMT sensors connect wirelessly to health clouds for individual biometric monitoring and data storage. IoMT sensors can be significantly more "personal" than ever before because they're created exclusively for sensing individual human life signals: Their tiny electronics can enable external motion tracking in always-on wearables, as well as internal monitoring via ingestible wireless pills like HQ, Inc.'s CorTemp, a core temperature gauge that stays within your body for 24-36 hours.

The trend is clear: IoMT sensors will continue to improve in terms of power, ease of use, and widespread adoption. Even smaller 3-nanometer chips will be commercially available next year, making microchipped pills literally easier to swallow. New 5-nanometer chip fabrication has already yielded atomic-scale transistors that can be powered by barely any energy, and even smaller 5-nanometer chips will be commercially available next year. Simultaneously, mobile AI processors are roughly doubling in performance every year, implying that tomorrow's client devices may have AI capabilities that are superior to yesterday's cloud and edge servers. Two years from now, remote monitoring tasks that seemed impossible two years ago would appear to be completely within the capabilities of even the most basic handsets.

4. CATEGORIZING MEDICAL IOT APPLICATIONS

- **1) Diagnostics:** Devices that track bodily metrics that may signal medical diseases such as diabetes and atrial fibrillation are becoming more common. Continuous monitoring of vital physiological factors such as blood chemistry, blood pressure, brain activity, and pain levels is possible. This can aid in the detection of early indicators of illness start or activity, resulting in better responses. Once a disease propensity or risk factor has been established, causal indications can be closely tracked with the correct focused sensors. Because of features like heart rhythm monitoring and fall detection, even the most recent version of Apple Watch 4 has been classified as a class 2 medical equipment. It should be noted that the majority of consumer-oriented devices have not gone through the FDA regulatory procedure to become medical devices.
- **2) Recuperation:** Patients' postoperative recovery time accounts for a large portion of the operation cost, and reducing it is a critical component of cost reduction. For a total knee replacement, for example, hospitalization in the United States takes roughly two days compared to four to five days in the United Kingdom's National Health Service (NHS). There is a need to cut down on time spent in a skilled nursing facility and physiotherapy outside of the hospital. This can be performed by using wearable sensors to help with exercise, compliance, and remote monitoring for issues that could lead to changes if not addressed in a timely manner.

Sensors can monitor a variety of vital indicators and alert caregivers to intervene in a timely manner. Sensors in conjunction with telemedicine make it even easier to assist in the rehabilitation process. Knowing what patients are up to in between visits can assist shorten the time it takes for them to recuperate from surgical operations. Indeed, a three-year collaboration between Geisinger System and Force Therapeutics led in much better outcomes. According to Greg Slabodkin of Health Data Management, this includes a 30 percent reduction in hospital length of stay, a 56 percent drop in skilled nursing facility utilisation, and an 18 percent reduction in readmissions.

- **3)** Chronic Care: With blood pressure, glucose levels, sweat, and even tear analysis, sensors that detect body parameters are becoming increasingly sophisticated. When compared to standardized examinations, the benefit is not just in terms of logistics, but also in terms of data collection frequency. In chronic degenerative conditions like rheumatoid arthritis, mobility sensors can aid improve stride and form. The monitoring and response of patients to treatment compliance is another category of IoMT device application. Poor outcomes and prolonged recovery can be avoided in chronic care by using IoT devices for measurement and monitoring.
- **4) Prophylactics:** Devices that actively engage patients with guided exercise can help reduce injury and the related expenditures of medical treatment. Examples of how devices can aid in prevention include joint range of motion in the orthopaedic area and posture alignment to prevent cervical spondylosis. Upright is an example of a device.

Wearables, for example, may help the elderly avoid catastrophic falls by monitoring their activities and detecting anything unexpected that could lead to a loss of balance and a fall. The inbuilt IMU (Inertial Measurement Unit) in Apple's watch detects a fall or the likelihood of one. It can even be used to measure tremors caused by neurological illnesses such as Parkinson's disease.

5. CONCLUSION

The synergistic expansion of machine learning (ML) and artificial intelligence is increasing the usefulness of medical IoT. Data analytics and machine learning (ML) help speed up the treatment process by processing enormous amounts of continually streaming data from sensor-assisted medical devices. Preventive treatment, using streaming data, can drastically minimize hospitalization and the expense of acute care. This would boost productivity while also improving patient happiness and results. However, some data security concerns in transit and at rest must be carefully assessed. Furthermore, the possibility of false positive readings might put patients and the healthcare system under undue stress. The three key features of IoMT that must constantly be prioritized are accuracy, repeatability, and reliability.

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