

Artificial Intelligence in Smart cities and Healthcare

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Abstract

In the era of the Internet of things IoT and Artificial knowledge (AI) continues to define the century. Artificial intelligence refers to a wide term that incorporates machine learning, normal language handling, rule based expert systems, actual robots, and robotic automation. The rise of computerized system and clinical gadgets in securely and productively diagnosing, treating, and planning care is an obvious sign that AI is digging in for the long haul and fill in significance. While AI holds a great deal of potential, the ramifications for essential consideration suppliers should be tended to as it might restrict execution. Since the Epidemic cities in 2019, the healthcare industry has escalated its AI-based advances by 60%. As indicated by the investigation, AI calculations like ANN, RNN/LSTM, CNN/R-CNN, DNN, and SVM/LS-SVM has a higher impact on the different smart city domains. Smart city advances the unification of conventional urban infrastructure and information technology (IT) to improve the quality of living and sustainable urban services in the city. To achieve this, smart cities require coordinated effort among the general public as well as private sectors to introduce IT stages to gather and examine massive amounts of information. Simultaneously, it is vital to design effective artificial intelligence (AI) based tools to deal with medical services emergency circumstances in smart urban communities. This paper reviews about the current technologies like artificial intelligence in the healthcare for smart cities.

Keywords: Artificial Intelligence, IoT, Smart cities, Healthcare

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1. Introduction

Healthcare is a fundamental part of city life. A healthcare system includes particular gatherings (e.g., patients, essential consideration doctors, drug specialists, trained professionals, and different specialists) and various stages (counting medical issue checking, illness determination, clinical therapy, and restoration). Late years have seen the quick development of populace thickness in urban communities, the consistently maturing populace, and the ascent in constant disease, which presents fabulous difficulties on existing medical care frameworks, like the appeal on clinics, clinical staff, and clinical assets in

feasible urban communities. The headways in Internet of Things (IoT) and ubiquitous computing have presented to us a smart city, where we trust the controllable and organized city foundations (e.g., transportation devices, structures, public activity offices) can be utilized to help illness transmission identification, treatment checking, and recovery the board. Besides, man-made brainpower (AI) enabled medical services has demonstrated to be more productive, more reasonable, and more customized. Consequently, accumulating AI advances to medical services with regards to smart cities is profoundly essential.

These days, urban communities are becoming shrewd and can be proficiently overseen through various frameworks and offices. Its capability to help shrewd medical care frameworks can infiltrate various events (e.g.,

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savvy homes, local area wellbeing focuses, and brilliant emergency clinics) and situations (e.g., strange conduct observing, illness counteraction and analysis, clinical direction, solution proposal, recovery, and stamping observation). In this Research Topic, we exceptionally value the commitments exploring any of the diverse angles with respect to shrewd city helped medical services. All the more explicitly, we momentarily give a few opening issues as specific illustrations: as far as infection observing and counteraction, it is promising to use the foundations conveyed at each side of the city (e.g., building entryways, road garbage bin, and lifts) to identify sickness side effects (e.g., hack, fever, and asthma) among specific populaces. Considering significant wellbeing direction, strong profound learning calculations and structures, (for example, convolutional brain organizations and diagram brain organizations) can be conveyed in brilliant wellbeing places to examine huge scope wellbeing information, find recognizable transient/spatial/topological examples, and backing exact determination. Further, building a savvy medical care system among various gatherings is critical for effective clinical benefits. Recently, the population density in cities has increased at a higher pace [1].

To make lifestyles in cities more agreeable and functional, the city ought to be smart and compelling. It is basically accomplished through a clever unique cycle using computational intelligence based advancements. This paper investigates how artificial intelligence (AI) is being used in the smart city thought. Innovation has an imperative impact in smart cities, and imaginative mechanical procedures truly help metropolitan networks in turning out to be smarter. Smart cities use ICT to mechanize cycles and work on the idea of people's lives in metropolitan locales. Likewise, it uses facilitated information advances to chip away at metropolitan foundation and enable responsive organization to remember inhabitants for city association. Different present-day advances and approaches grant smart assist models with encouraging foster efficiency and exercises in medical administrations, transportation, energy, training, and various areas [1].

2. Artificial Intelligence

Technology has a vital impact in smart cities, and imaginative mechanical methods truly help metropolitan networks in turning out to be smarter. Smart cities use ICT to computerize cycles and work on the idea of people's lives in metropolitan areas. Moreover, it uses facilitated knowledge advances to chip away at metropolitan foundation and enable responsive organization to remember inhabitants for city association. Different present day advances and approaches grant smart assist models with encouraging foster efficiency and exercises in medical administrations, transportation, energy, training, and various districts. Artificial brain organization and significant learning computerized thinking progressions are quickly growing, basically in light of the fact that AI

processes a great deal of data a ton faster and makes assumptions more unequivocally than humanly possible.

While the huge volume of data being made reliably would cover a human trained professional, AI applications that utilizations AI can take that data and quickly change it into critical information. As of this synthesis, the fundamental block of using AI is that it is exorbitant to deal with a ton of data that AI programming requires.

The ideal trait of artificial intelligence is ability to help and take actions have the clearest opportunity concerning achieving a specific goal. A subset of artificial intelligence is AI (ML), which implies that PC ventures can normally gain from and conform to new data without being helped by individuals. Profound learning strategies engage this customized learning through the maintenance of tremendous proportions of unstructured data like text, pictures, or video [2].

Intelligence is portrayed by learning and thinking. Learning is a basic part in AI and is acknowledged through AI. Thinking is another piece of AI, which consolidates data control to make exercises. The AI is expected to oversee two distinct ways - emblematic based and information based (AI). Human's interaction data through the eyes and that might measure up to the computer vision. In AI it incorporates techniques for getting, handling, examining, and figuring out images [2].

3. AI in Smart Healthcare

Artificial intelligence in health care is an umbrella term to portray the application of machine learning (ML) algorithms and other cognitive technologies in clinical settings is shown in [Figure 1](#). In the least difficult sense, AI is when PCs and different machines mirror human perception, and are equipped for picking up, thinking, and simply deciding or making moves. Computer based intelligence in medical care, then, is the utilization of machines to dissect and follow up on clinical information, typically determined to foresee a specific result [2].

A huge AI use case in medical care is the utilization of ML and other cognitive disciplines for clinical conclusion purposes. Utilizing patient information and other data, AI can assist specialists and clinical suppliers with conveying more precise determinations and treatment plans. Additionally, AI can assist with making medical services more prescient and proactive by breaking down huge information to foster better preventive consideration proposals for patients.

Medical services are quite possibly of the most basic area in the more extensive scene of large information due to its crucial job in a useful, flourishing society. The use of AI In healthcare service information can be a matter of life and death. Computer based intelligence can help specialists, medical caretakers, and other medical services laborers in their everyday work. Simulated intelligence in medical services can upgrade preventive consideration and personal satisfaction, produce more exact conclusions and therapy plans, and lead to better understanding results in

general. Simulated intelligence can likewise foresee and follow the spread of irresistible infections by investigating information from an administration, medical services, and different sources. Therefore, AI can play a crucial part in worldwide general wellbeing as a device for combatting epidemics and pandemics [3].

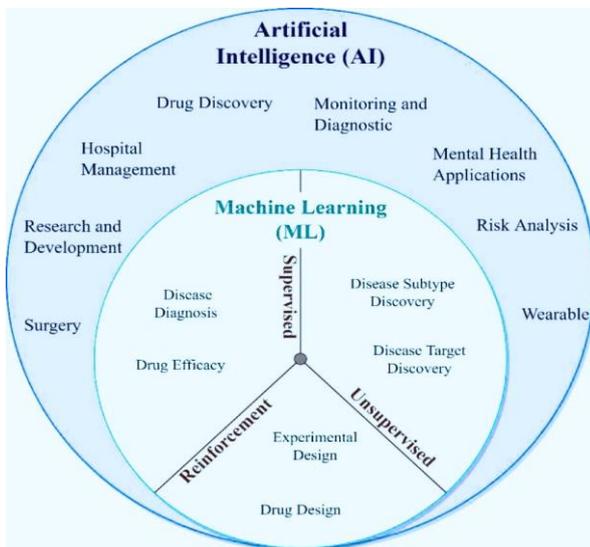


Figure 1. Artificial Intelligence in Smart Healthcare

Numerous cities are attempting to mimic the concept of smart city medical administrations via completing regular advancements and contraptions by merging clinical resources with AI-composed game plans. Since smart wellbeing is related with the ICT underpinning of the smart city, it very well may be named a subset of e-wellbeing. Artificial intelligence composed IoT has assisted wellbeing with caring frameworks essentially. Dependability, quality, network dormancy, and information move limit are several the issues holding state of the art medical consideration back from transforming into a reality [3].

4. E-health Service Architecture

The IoT Smart City logical classification unites a lot of correspondences shows, data associations, standards, and prerequisites for the creation of uses in a city. However, special care ought to be taken to complete e-Health Care Services, not simply considering the way that it is an order focused on prosperity and prescription, yet rather because it oversees issues that can be obstructing to a singular's life [4]. Moreover, focuses associated with security and assurance should be surveyed preceding advancing Health applications. An inconceivable representation of this sort of organization is m-Health applications that have flooded the market due to the Smart-telephones and wearables that work with the looking at and assessments of the clients due to the colossal number of sensors that these contraptions

integrate. M-Health applications rely upon a lot of Internet and figuring developments, correspondence and information systems, and sensors and wearables contraptions related in a body region organization (BAN), individual region organization (PAN), thus on, which are used to get constant data which is transported off the PC people group to be taken apart by trained professionals and expect control over their patients [4]. Whether or not we talk about the destiny of IoT in this field, these integrate becoming new enabling stages for a developing people, for instance, recognizing the activities of everyday living, checking social co-tasks and industrious disorder management. In this regard, e-prosperity presents another medical consideration network perspective that interconnects IP based correspondence progresses, for instance, close field communications (NFC), 6LOWPAN, Low power Bluetooth and emerging 5G networks for future Internet-based medical consideration organizations. Thus, the make of m-IoT applications is normal due to the interest for care in homes; where the two patients and their gatekeeper will be benefited, from the individual and monetary viewpoint [5]. Accordingly, consistent trades for routine tests clinical can be avoided; convey ability cost in medical administrations can lessen, flow, and redesigns in clinical outcomes can be gotten to the next level. Likewise, a sweeping improvement in the underpinning of data associations and clinical contraptions using far off correspondence to grasp data and send through different structures until they show up at the master doctor. E-prosperity applications should be arranged so they do not hinder patients' normal schedules passing on them to communicate their thoughts in a protected environment, serenity of mind, food and drink contacts with friends and family, including giving encouragement physical, social and mental inclination [5].

4.1. Sensor data collecting layer

Data securing is performed through different sensors answerable for estimating physiological signals, for example, body temperature, heart rate, respiratory rate, pulse, muscle action, and others. The sensors are associated with a passage, which is liable for handling the data prior to being conveyed to the doctor; generally, it is a versatile (cell) base situated nearby the patient. Sensors incorporated into the BAN ought to be light weight, little and shouldn't ruin the singular's development, regardless of whether they utilize battery-powered or replaceable battery they ought to guarantee that the data isn't lost during substitution periods [6]. Also, the ongoing sensor plans are flexible on the grounds that they can be put anyplace on the body creating more vigorous medical applications, and closeness and the contact with the skin the sensors permit estimating specific physiological boundaries. In this context, an identification design in view of IoT works with the execution of these plans, since they adaptively further develop energy efficiency, permitting the utilization of sensors in light of the patient necessities. Because of the energy impediment

of these devices, these may require low power correspondence conventions, for example, ZigBee or Bluetooth that are utilized in low-speed WPANs [6].

4.2. Medical resource management layer

Putting away the cloud offer versatility and openness benefits of interest from the two patients and clinical organizations. Also, hosting and handling can lessen costs by giving better demonstrative data. Despite the fact that there are issues that should be viewed as in clinical data put away in the cloud like Hybrid Cloud/Cloudlet Architecture: Cloudlets have been acquainted as an answer with convey low dormancy to observing undertakings through PANs. Plus, the correspondence between the concentrator (mobile) and the Cloudlet is finished through a Wi-Fi interface, lessening inertness and data move albeit the utilization of LTE isn't enthusiastically suggested in light of the fact that it is uncovered the transmission of data to the slack delivered by the mobile network [7]. Protection Patient's Data: The patient data can undoubtedly be compromised, on the grounds that a PAN or BAN is associated with a centre point, and anybody with a straightforward sniffer could catch the network bundles, uncovering the patient's status and weaknesses. It is prescribed to utilize encryption strategies to guarantee data security. Secure data stockpiling in the cloud: Per the terms defined by the Health Insurance Portability and Accountability Act (HIPAA), clinical records should be divulgence safeguarded, making fitting moves for forestalling unapproved getting to this data. Clinical data handling in the cloud is as yet a test in IoT applications [7].

4.3. Smart medical service layer

The sensors can in-corporate different physiological examples to the customary office and research office assessments, allowing to work on the patient's medicines. This dataset brings the chance of performing data assessment, and define an AI model for sickness prediction or recognize upgrades during the time spent clinical diagnostics. Not enduring, prior to being utilized for a huge extension, a couple of hardships ought to be overcome, these consolidate the support of the regulatory prerequisites for the medical gear, the readiness of clinical staff, etc., which makes that these improvements won't be taken on quickly [8]. Usually, breaking down the tremendous proportion of data that the sensors give is an outstandingly perplexing endeavour. Nevertheless, with the ascent of Big Data for the control of huge volumes of data, various estimations and methodologies have been made for the treatment of clinical data. One of the most generally perceived issues presented in this field is that the data have not a semantic connection. Thus, the growing experience may not work; one expected reply for this issue is to take advantage of the clinical records that various substances have taken care of in their electronic systems. Similarly, view of data in the clinical field is fundamental, in light of

the fact that reference charts, pie frames and other can be utilized to address the improvement of a disorder, and subsequently specialists find it more straightforward to show the conditions of a patient. Due to the high volume of data accumulated by the IoT sensors means a lot to consolidate present day portrayal gadgets for addressing this data. Besides, a vital piece of compact finders, concerning the data obtained in a lab, is that data are assembled over a much longitudinal way, inside radiant short lived looking at and simultaneously through different modes [9].

5. Smart Applications and Role in E-health

The technology address serious areas of strength for a, we can approach sensors, coordinated circuits, and more instruments which can be used by subject matter experts, scientists, schools and even high school projects, to propel the creation of IoT applications. These parts incorporated into an exchanges net-work, allowing have applications or things related with the Internet. The going with depicts specific Smart City applications that contribute to a great extent to e-wellbeing organizations [10].

5.1. Smart Building

The aim is to make residencies, homes and business structures more sustainable, put together on energy efficiency to work with respect to the individual fulfilment, e.g., smart structures can screen their essential prosperity, direct lighting and warming considering presence detection, and use wise devices to robotize everyday tasks [11].

5.2. Smart Environment

The aim is to chip away at the quality of life and security of residents, e.g., Avoiding noise in metropolitan networks, early rebuke of episodes or unforeseen events, obstruct guides of people and safe districts in case of disastrous occasions, e.g., shakes, floods, volcanic launches, twisters, and forest fires [12].

5.3. Open Data

It implies data that is openly available and may be used and inspected by outcasts (legal openness). Metropolitan people group can use opensource stages like Jkan to convey data and to use the data to make one more application to help people.

5.4. Smart Citizens

This thought is associated with the creation of networks, e.g., smart training uses life-long learning programs, which could focus in on employability, digital thought, or specific people social affairs, e.g., children with mental irregularity, more established or those with physical disabilities.

5.5. Smart Transport

One of the most important aspects to consider within a Smart City is mobility. It can work on the security, efficiency, quality of life and time of users within the urban communities, e.g., Using complex sensors, an independent vehicle can incorporate a personal assistant, self-driving and self-leaving capacities, control the force of the lights and even work on in the decrease of CO2 emissions. Indeed, whether the driver experienced any crisis, the vehicle could go without help from anyone else to the closest clinic. At long last, paths committed to bikes can give an option to the utilization of vehicles, decreasing the outflow of gases and working on the health of the users [13].

The objective is to further develop medical services frameworks, making them more powerful and efficient under the watchful eye of patients being this physically or from a distance, e.g., The wearable devices could send data from patients with a sickness (cardiac pathologies, insufficiencies, arrhythmias, etc.) to continuous checking frameworks, permitting specialists to act in the shortest conceivable time when something unanticipated is happening. Ambulances could send continuous estimations of a patient to the trauma centre so that while showing up the hospital, the specialist has every one of the outcomes and manage the most effective prescription for his/her fast recuperation, or even saving the patient's life. To be sure, rescue vehicle robots could be incorporated for sending them to remote or painful regions in optimal times, keeping away from jams and land courses [13].

6. IoT and Healthcare

Related to WSNs the IoT brings an exceptional measure of information that the network foundation necessities to deal with. The answer for these issues is to tweak the customary organization plans to the most recent guidelines of organization insight, which guarantees ideal security. Medical clinics, centres and care offices need cost effective network, the security of which consents to information insurance guidelines but at the same time is simple to utilize and to work [14].

6.1. Digital Drugs

One of the more current improvements in the medical administrations industry is known as "smart pills". Smart pills are taken like normal medication yet are furnished

with an observing development extension to the genuine solution or some likeness thereof. They use it to propel data to a sensor worn on the body. These sensors screen drug levels in the body considering a patient's obvious or dissected condition. The data from the minimal sensors are then conveyed to a cell phone application, and that suggests that patients can get to data on their vital capacities themselves. Experts can do this expecting the patient agrees. This is the manner in which the treating specialists choose if a drug is filling in as expected or possibly causing optional impacts.

In November 2017, Abilify My Cite shipped off the main FDA-cleared smart pill that time ventured when the medicine was truly taken. At the point when the pill comes into contact with the patient's gastric destructive, it sets off a sensor that means the hour of contact and first advances this data to the wearable sensor ultimately to the cell phone application. The right estimation and the supported confirmation are huge basics for a viable treatment. Such data is altogether vital for clinical specialists, and they at absolutely no point in the future need to rely upon the patient's assertion alone when treatment plans ought to be totally adhered to. If patients fail to do this, the expert can search for a discussion and explain the explanation straight forwardly.

One of the areas that causes fairly more trouble are assumed "mechanical" pills. Once ingested, they can do certain jobs straightforwardly in the patient's body. Right when the prescription is conveyed, the development separates and is handled, a decision that is great for enormous, long, chained drug particles like proteins, peptides and antibodies [14].

6.2. Patient monitoring

Pattern setting advancements in medical administrations license both continuous and transient consideration to eagerly be seen even more. Distant patient checking (RPM) engages medical administrations specialists to screen fundamental signs and assess genuine reactions to past medications without being in a comparative spot as the patient. The gadget used depends upon the prosperity of the different patient. For instance, it very well may be an embedded-on heart device, an airflow Monitor, or an arranged blood glucose meter. The gadget being alluded to accumulates the best data. In case the characteristics are not as they should be, the data are simultaneously shipped off a data set for recording and to the treating trained professional. The expert can analyse the data dynamically and answer as required. Such gadgets are as often as possible used following a movement. They help with decreasing the number of medical facilities stays and avoid re-confirmations since issues are perceived even more quickly. This licenses experts to answer earlier and keep away from likely ensnarement's. With the help of the data accumulated consistently, it is besides possible to change and change treatment decisions even more quickly, dependent upon the patient's actual reaction and condition.

This grants experts to answer earlier and avoid likely troubles [15].

7. Conclusion

The future of health care is exceptionally encouraging, taking into account the rapid development in sensor technology, AI and machine learning. For patients, hospitals and physicians as well medical device manufacturers, there are new open doors as well as even the commitment to utilize the Internet of Things. Clearly challenges and significant changes must be dominated. All through the investigated writing there is a consistency for use of smart advancements in smart cities and particularly in healthcare, and AI and blockchain innovations are key driving factors for enhancement and improvement of overall user experience of smart cities. Despite the fact that there are expected drawbacks of artificial intelligence and machine learning advancements with regards to smart cities, they still likewise have a potential to have an impact on the manner in which we know smart healthcare and smart urban communities at this point.

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