AMALGAMATION OF INTERNET OF THINGS WITH ARTIFICIAL INTELLIGENCE

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Abstract

Every walk of human life has been revolutionized with the advent of Internet of Things and it made a significant impact in making the world more smarter than ever. The Internet of Things (IoT) is demarcated as an exemplar in which objects furnished with sensors, actuators, and processors that communicate among each other for a significant purpose. With its growing inclusiveness in all walks of life, it is identified that the typical application scenarios of IoT are based on the intelligent transmission and processing of huge amounts of data accumulated from various sources that can be devices or objects in the network connected together. The intelligent services that help users to make decisions smarter are the need of the hour. However, Artificial Intelligence (AI) empowered system in the IoT is strongly the hour of need to meet the demand for the existence of intelligent services that require an extremely strong data processing capability.

I. Introduction

Nowadays internet has become pervasive and is affecting the life of humans in many ways that are unimaginable. The human life is entering into

an epoch where a number of appliances are connected to the internet. This is the modern era of "Internet of Things", simply termed as IoT. Many technologies which work together are agglomerated and emerged as a single technology that is IoT. IoT devices are furnished with embedded sensors, transceivers, actuators and processors. Every field of life is transfigured by sway of "Internet of things". As the growing inclusion of IoT in various walks of life, there comes the need for analyzing huge amounts of data sensed and accumulated by the various devices connected to the network. The analysis of such veracious amount of data finds the necessity of Artificial Intelligence and IoT to be going in hand in hand with each other. In the following section, this paper consists of brief introduction to AI and its applications. Then an overview of IoT and its applications is presented and it also focuses on how AI can be blended with IoT.

II. Artificial Intelligence

The term Artificial intelligence is the intelligence exhibited by machines, in contrast to the natural intelligence unveiled by human beings. It is a discipline of computer science that aims to create intelligent machines and has become a vital part of the Information Technology. It aims at transforming machines to have the ability of possessing natural intelligence of analysing things and act accordingly like humans. AI can be applied in many areas like education, finance, transportation, marketing, banking, politics, economics, healthcare, and game playing to lessen errors in decision making. It analyses the data which is used for optimization of tasks. The applications of Artificial Intelligence are shown in Figure 1.
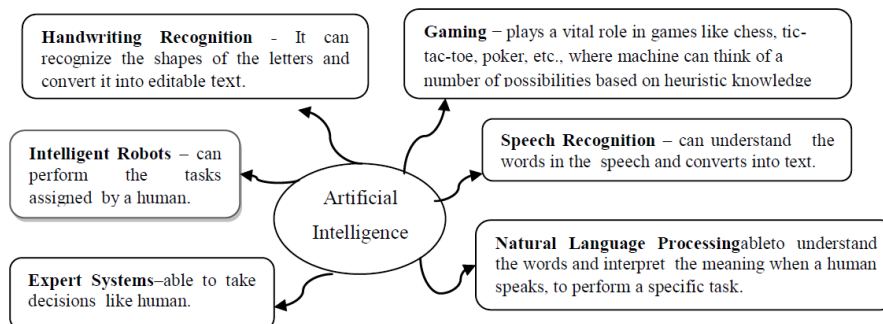

Figure 1. Applications of Artificial Intelligence.

III. Internet of Things (IOT)

Internet of Things (IoT) has brought about a revolution in modern technological era and intensifying speedily due to contemporary developments in communication technology as well as sensor manufacturing technology. Internet of things comprises of interconnection of physical entities like vehicles, consumer appliances and other things which are equipped with software, sensors, and actuators The main objective of IoT is to connect the physical world with the digital world. Therefore, the physical world is generally the collection of sensors and the sensed data is translated into processable data, and this data has to be translated into commands that are to be executed by actuators. Due to the mounting importance in IoT, the number of areas intended to support IoT has augmented extensively. The architecture of IoT is shown in Figure 2.
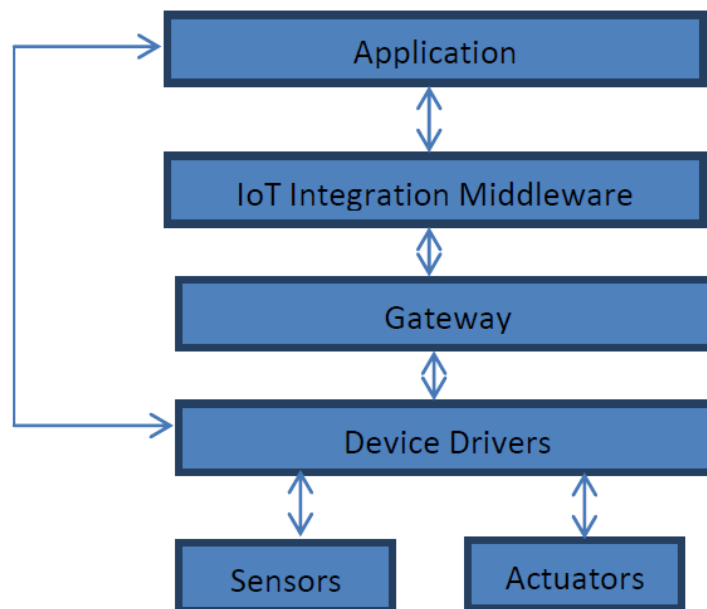
Figure 2. IoT Architecture.

IV. Proposed Architecture

The billions of sensors that will continue to be connected to the internet in future will generate exponentially more data. In traditional data analytics,

the data models that are used are generally static. These are of inadequate use, to address data that is unstructured which varies rigorously. In case of IoT, it is crucial to detect the relationships among huge volumes of input data produced by sensors. The devices connected to the Internet and are directed to central location, generate huge volumes of data and sensors can be embedded into all types of such devices. These big streams of data sensed by the sensors can be analysed through some Data Analytics and can be acted upon in specific manner that will be beneficial to the user. The proposed framework follows these five steps:

- Sense
- Transmit
- Store
- Analyse
- Act

Sense: Sensors accumulate data from the surroundings and transform it into valuable data. Data is considered as a heart of the IoT architecture.

Transmit: The accumulated data through the sensors will be in analog format. This data need to be collected and converted into digital data for processing. Data Acquisition Systems (DAS) execute the functions of data aggregation and conversion. The aggregated and digitized data is then received by the Internet gateway and it routes the data over the Internet or Wi-Fi, or wired LANs, to the next stage.

Store: Data for which in-depth processing is needed and where there is no need of instant feedback, is furthered to cloud-based systems or to physical data centre, where powerful computers will analyse and manage the data to store it in a secured manner.
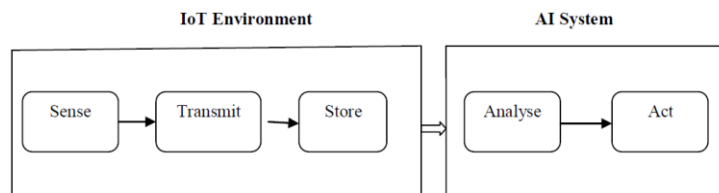

Figure 3. Architecture of Proposed Framework.

Analyse. In this step, the data accumulated is directed to the servers. This data is compared not only with the data acquired from the similar machines but also with the data acquired previously from the same machine. The proposed system can identify the minute changes and notify the user about the malfunctions that can be focused. These results of analysis will be communicated to destined smart phone within no time. This Analysis of data is performed using Deep Learning algorithms to detect patterns in the data generated by IoT devices. Deep Learning encompasses automatic feature detection from the existing data. This data can be Transactional data, multimedia data, sequence data, text data etc. This is the phase which determines the true value of any IoT service.

Act. Act can be considered as a means of performing necessary action that can be an insightful action performed physically like automatically switching off a device when it's sensor's data reaches a specified threshold or simply send a text message to the specified source like a smart refrigerator sending a text message to a user when it is out of milk. Whatever may be the result of "Act", it is entirely based on the analysis of the input data received.AI when combined with IoT, evolves the emerging trend in technological field i.e. "Intelligence of Things"

AI + IoT = The Intelligence of Things.

In forthcoming days, there will be a technological evolution in all walks of life, where the sensor-laden world would be merged with an artificially intelligent one. So the future of Artificial intelligence will be extended into the real world of everyday objects. This interface that will become enlivened with intelligence.

V. Applications

AI technology integrated with IoT has number of applications in numerous fields and further scientists, engineers, and technologists have begun to implement it in various circumstances. For example, wearable devices that track a patient's health are already in use but now these can be used to provide real-time updates to the patients about their health .As an another example, a wall in a house becomes damaged by water incursion. By the time of notice, odds of the wall may need to be replaced. If the wall had

sensors for moisture detection, it sends an alert so that necessary action can be taken immediately before the wall gets damaged. If artificial intelligence is entrenched into the home in the above case and the moisture sensors access were given to it, so that it could instantaneously contact a repair service to fix the leak, assign a deal based on existing market conditions and does the payment.

VI. Conclusion

In the near future both IoT and Artificial Intelligence (AI) will play a vital role in various ways. There are bigeminal causes which impulse the growing need for both these technologies and many industries, scientists, governments, technologists and engineers have started to enforce it in manifold circumstances. The benefits and potential opportunities of both the technologies i.e., AI and IoT can be proficient only when they are conjunctive, both at the devices end as well as at the server end and which can be called as "The Intelligence of Things".

This paper presented an overview of how IoT and AI can be merged together to make the analysis of IoT sensed data simpler and, in-turn help in taking smarter decisions. However, a lot of innovation need to take place in the areas of IoT applications combined with AI. These fields will definitely affect human life in unbelievable ways in the near future.

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