Chapter 3
Deep Learning–Based Intelligent Sensing in IoT

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ABSTRACT

The heart of Industry 4.0 is established by a new technology called the internet of things (IoT). Through the internet, the IoT makes it possible for machines and gadgets to share signals. Using artificial intelligence (AI) approaches to manage and regulate the communications between various equipment based on intelligent decisions is made possible by the internet of things (IoT) technology. Data collection devices can be fundamentally altered to "lock in" to the best sensing data with regard to a user-defined cost function or design constraint by utilizing inverse design and machine learning techniques. By allowing low-cost and small sensor implementations developed through iterative analysis of data-driven sensing outcomes, a new generation of intelligence sensing systems reduces the data load while significantly enhancing sensing capabilities. Machine learning-enabled computational sensors can encourage the development of widely distributed applications that leverage the internet of things to build robust sensing networks that have an influence across a variety of industries.

INTRODUCTION

Internet of things (IoT) became inevitable as it enhances the lifestyle of humans in terms of intelligent living, healthcare, sustainable energy, and Industrial 4.0. IoT helps the globe to be connected together via smart devices and technologies. The domain covers various fields of automation and was predicted that billions and billions of devices would be connected and monitored 24/7. The term IoT helps to

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connect devices that are readable, locatable and controllable (Intelligence, S. C. B. 2008). Researchers have predicted that the IoT market would be worth $2:7 to 6:2 trillion by 2025(Manyika et al., 2013).

Large volumes of data should be evaluated as the internet of things (IoT) expands, and the most recent algorithms should be adjusted to work with big data (Chen et al., 2015). IoT include sensors, software, and technologies of connecter network to exchange information. The main aspects of IoT are the active sensing and efficient sharing of information (Awin et al., 2019).

IoT is assisted by intelligent sensor devices which aids intelligent communication between connected devices. Billions of sensors and connected devices generate voluminous data. These sensors improve the intelligence of the IoT. Deep learning techniques have great potential to analyze the complex behavioral pattern of IoT ed devices. Convolutional Neural network is one such platform where a very large amount of data can be assessed effectively to enhance the performance of Intelligent IoT.

Many authors have contributed to intelligent sensing systems in IoT. Kavitha et al have proposed an intelligent system that can sense gas leakage in industries and vehicles over the globe. The authors integrated the data collected to google cloud through web servers that ease the monitoring of air pollution. Dinesh Kumar etal have proposed an intelligent sensing system that can collect data from scattered nodes to form a backbone node. This backbone node could balance and reschedule the incoming traffic (Sah et al., 2022).

The architecture of IoT for offline data analysis was done using traditional procedures such as classification, clustering and pattern recognition. Hung Li-Ling, 2022 Al proposed an action model that can advance the flexibility of sensors to enhance the intelligence of IoT. This model could sense and transmit parameters that could achieve reliable quality of service. Also, it adjusts the current status level of the sensors if it fails to satisfy the condition to achieve the required quality of service (QoS).

Architecture of IoT

There are many uses for Internet of Things (IoT) technology, and its use is accelerating quickly. The Internet of Things functions as it was intended or developed to in accordance with the various application areas for which it has been used. Architecture of IoT does not follow any standards internationally. Working principle and the domain where IoT is going to be implemented determine the architecture. The functioning and application of IoT in various domains determine its architecture. However, there is a fundamental process flow upon which IoT is founded. The four stages of IoT architecture are shown in figure 1.