engineering proceedings

MDPI

Proceeding Paper

Intelligent Machine Learning Based Internet of Things (IoT) Resource Allocation †

Koushik Chakraborty [1], Dhiraj Kapila [2], Sumit Kumar [3], Bhupati [4], Nazeer Shaik [5] and Akanksha Singh [6,*]

1 Office of the Registrar, Adamas University, Kolkata 700126, India; koushik215@gmail.com
2 Department of Computer Science & Engineering, Lovely Professional University, Phagwara 144411, India; dhiraj.23509@lpu.co.in
3 Department of Artificial Intelligence & Machine Learning, COER University, Roorkee 247667, India; mail2dr.sumit@gmail.com
4 Department of IoT, K L Deemed to be University, Vaddeswaram, Guntur 522302, India; bhupati@kluniversity.in
5 Department of Computer Science and Engineering, Srinivasa Ramanujan Institute of Technology, Anantapur 515701, India; nazeershaik2002@gmail.com
6 Department of Computer Science and Engineering, BBD University, Lucknow 226010, India
* Correspondence: ankakaanj@bbdu.ac.in
† Presented at the International Conference on Recent Advances in Science and Engineering, Dubai, United Arab Emirates, 4–5 October 2023.

Abstract: The Internet of Things (IoT) and machine learning provide insights that would otherwise be hidden in data for quicker, automated responses and improved decision-making. By ingesting images, videos, and audio, machine learning for the Internet of Things can be used to predict future trends, identify anomalies, and enhance intelligence. The IoT organic framework comprises millions of sharp objects, and to form these sharp objects to communicate and work suitably, asset tasks are necessary. Protection of the quality of service (QoS) is one of the diverse reasons that resource tasks ought to be performed. These techniques aid accomplices in choosing tasks resulting in preeminent regard and impact. Prebuilt software-as-a-service (SaaS) applications, called IoT Cleverly applications, can use dashboards to analyze and display data from IoT sensors. If one of the devices is hacked, the security of every other device in this chain is compromised. This can possibly result in second thoughts about a security plans. A user can see key execution indicators and measure the time between data entries by using IoT dashboards and alarms. Calculations based on machine learning can find peculiarities in equipment, notify customers, and even start robotized repairs or proactive countermeasures. AI and Profound Learning resemble managing a real workplace issue such as marking by combining a few innovations that enable constant naming.

Keywords: IoT application; machine learning; IoT Parameters; resource allocation; optimization

Citation: Chakraborty, K.; Kapila, D.; Kumar, S.; Bhupati; Shaik, N.; Singh, A. Intelligent Machine Learning Based Internet of Things (IoT) Resource Allocation. *Eng. Proc.* **2023**, *59*, 73. https://doi.org/10.3390/engproc2023059073

Academic Editors: Nithesh Naik, Rajiv Selvam, Pavan Hiremath, Suhas Kowshik CS and Ritesh Ramakrishna Bhat

Published: 19 December 2023

1. Introduction

The organization of physical things that are embedded with sensors, programs, and different advancements for the explanation, communication, and exchange of data with different devices and systems over the internet is known as the Internet of Things. These embedded instruments can be family heirlooms or cutting-edge mechanical innovations. Experts anticipate that the number of connected IoT devices will rise to USD 10 billion by 2020 and USD 22 billion by 2025 from the current USD 7 billion. These forecasts rely on associates in the electronics industry [1]. In recent years, the Internet of Things (IoT) has emerged as one of the most significant innovations of the 21st century. Through embedded devices, we can relate ordinary articles such as indoor controllers, kid screens, kitchen machines, vehicles, and the internet [2]. Consistent communication between people, things, and forms is made possible by this. Actual articles can impart and gather data for unimportant human interventions that are valuable for use in the cloud, gigantic data, investigation, adaptable advances, minimal expense processing, and other advances [3]. The application of Internet of Things (IoT) technology in industrial settings, particularly for the instrumentation and control of cloud-based sensors and devices, is referred to as industrial IoT (IIoT). Machine-to-machine communication has recently been used in industries for wireless automation and control. Nevertheless, organizations can achieve an unused motorization layer and, subsequently, make novel pay and exchange models that are valuable to the ascent of distributed computing and related developments such as investigation and AI [4–6]. Some people refer to the Internet of Things as Industry 4.0 or the Fourth Industrial Revolution. The enabling of IoT computing devices is depicted in Figure 1. With cloud based IoT applications, trade clients can quickly upgrade existing forms for financial services, client benefits, human assets, and supply chains. Additionally, complete business forms need not be duplicated [5].

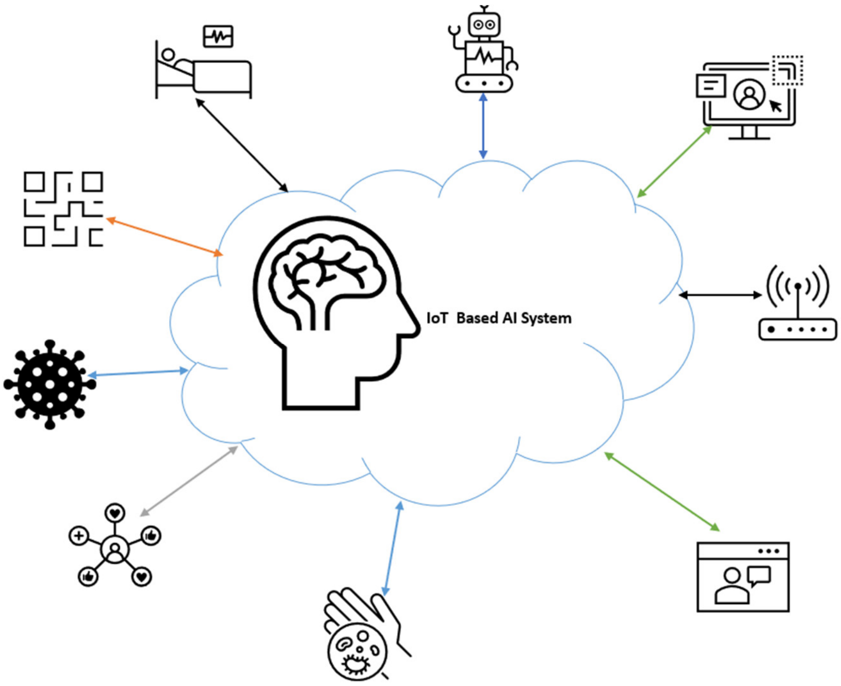

Figure 1. IoT applications working with ML.

The Internet of Things is best suited for businesses that would benefit from incorporating sensor devices into their operations. Manufacturers can gain an upper hand by utilizing creation line testing to empower proactive staff support when sensors distinguish an impending issue [7]. When the generation yield remains constant, sensors can accurately measure it. With the assistance of sensor alerts, manufacturers can quickly check the adaptation for accuracy or remove it from production until it is settled. As a result, businesses stand to gain from improved resource execution management, increased uptime, and lower operating costs. The automotive industry could also greatly profit from the utilization of Internet of Things applications. Notwithstanding the advantages of consolidating the Internet of Things (IoT) into creation lines, sensors currently introduced in vehicles can furnish drivers with suggestions and caution them of forthcoming issues. Automakers and service providers can learn more about how to keep vehicle owners informed and their vehicles running smoothly from the data gathered by IoT-based applications [8–10].

Several applications for the Internet of Things provide frameworks for transportation and assistance coordination. Using information from IoT sensors, inventory-carrying armadas can reroute themselves in response to the weather, vehicle accessibility, or driver accessibility. Temperature control and track-and-trace monitoring sensors can also be integrated into the stock itself. IoT observation applications that send alarms when temperatures rise or fall to a level that undermines the item would greatly benefit the food and beverage, pharmaceutical, and flower industries, all of which frequently carry temperature-sensitive stock. The management of various IoT system devices is depicted in Figure 2. With the assistance of Internet of Things applications, retail businesses can manage stock, improve customer experience, expand their stock organization, and cut operational costs [11–13].

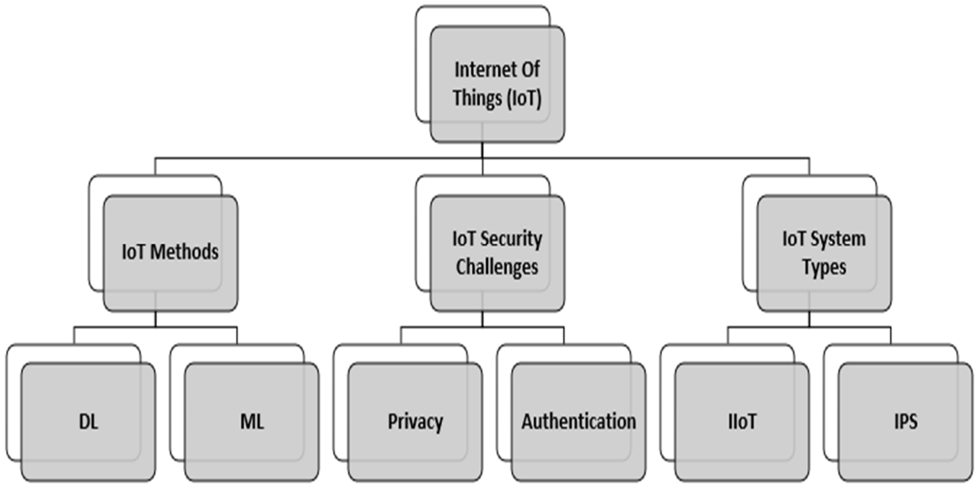

Figure 2. Classification of IoT computing systems.

RFID-based data can, for example, be collected by weight sensors on clever racks and sent to an Internet of Things platform for programmed stock checking and alerts when supplies run out. Customers can receive relegated offers and movements from reference centers that add to and interact with their user experience. The advantages of the Web of Things (IoT) in open zones and other assistance-related conditions are goliath. In light of that, IoT-based applications could also be used by government-owned utilities to notify customers of both major and minor disruptions to water, control, or sewer services. IoT applications can gather information about the severity of a power outage and send assets to utilities to help them return to operation more quickly after a power outage. The medical industry also gains several advantages from IoT resource monitoring. When it comes to patient-assistance resources such as wheelchairs, orderlies, medical attendants, and specialists frequently require precise headings. By tracking the IoT-equipped wheelchairs in a clinic, the IoT asset-monitoring application makes it possible for anyone looking for a wheelchair to quickly locate the one that is closest to them. This strategy can be used to adhere to the budgetary constraints for each department's physical resources as well as numerous other medical center resources [14–16].

2. State of the Art

Nowadays, everyone prefers lively cities. With cutting-edge developments that will employ data from IoT contraptions to communicate between substances, "smart" urban communities will continue to expand thanks to the IoT. The Internet of Things can expand the possibilities for greatly improved urban areas through, for example, "smart" lighting, automated stops, climate assessments, "smart" water frameworks, the elimination of wasted time, walkable areas, and "smart" homes that clear a path for the better use of structures, ensure occupants' security, and assist in resource organization [17]. The Internet of Things (IoT) can possibly broaden productivity by enabling motorization and constant data investigation. By optimizing workflows and spotting errors that the human eye would have missed, the IoT also has the potential to ensure smooth operations and high yields. It can also aid in building control rooms, keep track of resources in manufacturing plants, and save time during production [9–11]. Through the Internet of Things (IoT), healthcare providers can access real-time data to screen patients remotely and reduce disease risk. Along these lines, a helpful consideration of work drive can focus more on assessment, learning, and calm satisfaction [18]. Using manufacturing insights with the help of AI capabilities, businesses can obtain more value from their vast data set. AI will analyze the data gathered by IoT devices using a variety of methods, including information arrangement, unrestricted information visualization, real-time area monitoring, vision examination, and others [3].

Edge computing stores the data on a local device near the Internet of Things device rather than sending it to the cloud for sorting and calculation. Soon, more affiliations will adopt “smart” edge contraptions, as there will be less trade speed usage by IoT contraptions using edge computing. Retail inclusion is becoming smarter and greatly improving with the use of RFID and the use of IoT contraptions. Store managers can follow guests’ experiences, examine their behavior, and suitably manage stock by making use of IoT gadgets [4]. Real-time information from wellness trackers and other wellness devices can improve quality of life by monitoring health metrics such as blood sugar levels, pulse rates, and blood measurements, among others. Smart medical devices can send alerts to the individual or control board in an emergency [19]. The introduction of 5G will lead to an increase in the number of connected devices and Internet of Things (IoT) applications over the next few years, bringing our lives to a hyper-connected state [5]. Since IoT innovation is simple and flexible for almost every development provides data through pertinent information concerning activities, process execution, and normal circumstances requiring screening and examination, the utilization of IoT advancements differs from one field to the next, as previously mentioned [20]. IoT development is being used by certain organizations to examine, unravel, overhaul, and robotize various structures. Notwithstanding the way that IoT applications offer various advantages that will certainly modify our lives, they also accompany various obstacles that must be overcome for them to function well [14].

3. IoT Applications

The IoT, is an electronic tool furnished with sensors that sends information and receives directions because of its internet associations. In non-technical terms, there are billions of physical devices worldwide that are connected to the internet and contain sensors. The Internet of Things (IoT) can be used in a wide range of contexts to empower and enhance human existence. Take a cell phone, for example: users listen to music with headphones associated with their cell phone while occupied with different things (driving); this is a development area for the IoT fueled by artificial intelligence. IoT sensors in headphones could use AI to predict users’ emotions based on their heart rate data. Their smartphones could select the best song stored anywhere in the world based on that feeling. By 2027, there will be more than 41 billion Internet of Things devices, up from about 8 billion in 2019 [20]. A total of 400 responses from senior executives from around the world were used to create this survey. Those organizations include Alibaba, Letter Set, Amazon, Apple, VMWare, Verizon, and so forth. In addition, the survey states that the Internet of Things (IoT) market will grow to over USD 2.4 trillion annually by 2027, when all devices will have internet access. The Internet of Things (IoT) and the most recent advancements in artificial intelligence (AI) might enable the IoT system itself to become more intelligent and easily mimic human behavior [20]. A significant advancement in human life could result from the potent combination of AI and the IoT. Because DL and ML are subsets of AI, machine learning (ML) and deep learning (DL) play a more significant role in the discussion of artificial intelligence (AI) than ever before.

With regards to assembly lines in enterprises, the assistance of robots is highly desirable. Collaborative robots, also known as chatbots, are machines that collaborate with humans. They operate without being aware of any human-caused obstacles in their environment, which is their main drawback. If an accident was to occur, it could result in fatal injuries or death. To relieve the actual harm to people or to make robots sufficiently mindful of their workplace, certain existing security frameworks are insufficient. The development of an intelligent safety system for collaborative robots based on computer vision will make use of ML/DL algorithms and the Internet of Things.

4. Parameters Effecting the IoT

The proposed Algorithm 1 aims to find the nearest closure information in the approximation theory and is impacted by the disaster data systems of the messages in social media systems. In this study, we assessed many datasets collected from IoT application systems.

Algorithm 1: The proposed algorithm provides efficient ML for IoT applications

Input: The parameters of datasets are counted as the input in the algorithm.
Output: The optimized predictions of the messages are found for the end users.
1: Procedure (Methods:)
2: If (IoT Applications = Ø) then
3: {
4: Perform no value of detection.
5: Else Check (IoT Applications is in which Class)
6: {
7: If (IoT Applications = Upper Approximation) then
8: {
9: Apply the Fuzzy optimization system in IoT Applications.
Step1: Divide all the classes into functional and nonfunctional properties of classes.
10: else if (IoT Applications = Lower Approximation)
Apply the Fuzzy optimization system in IoT Applications.
11: end if
12: Step2: Formulate the different clusters of the lower IoT Applications as rejected.
13: }
14: end if
15: end if
16: end procedure

5. Evaluation System of IoT Applications

The data points contained within this convex hull will be removed from our point collection, as they are shown at the admin end as well. To accurately depict disaster-affected regions, this data can also be plotted on the graph. Figures 3 and 4 depict the efficiency of message sending and receiving predictions using machine learning in social media systems.

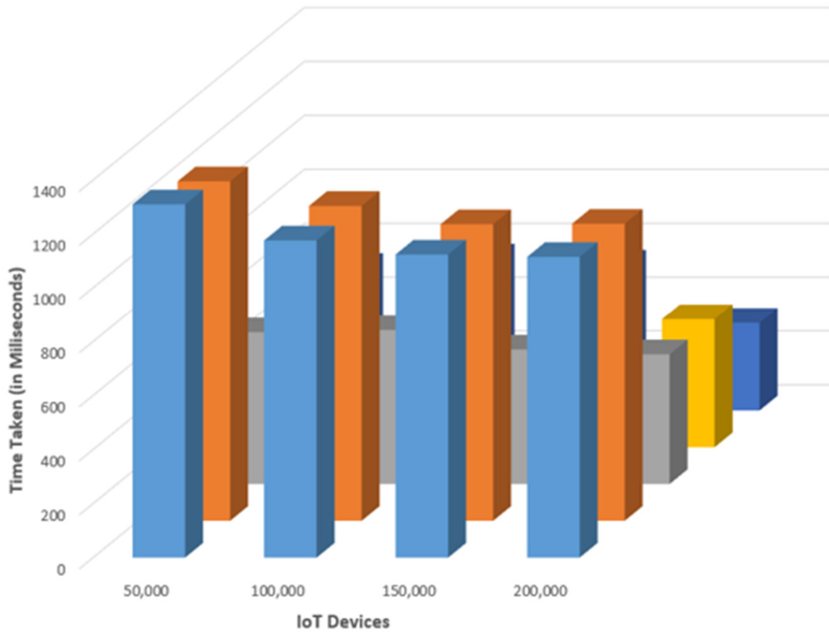

Figure 3. Efficient time evaluation of IoT applications in machine learning.

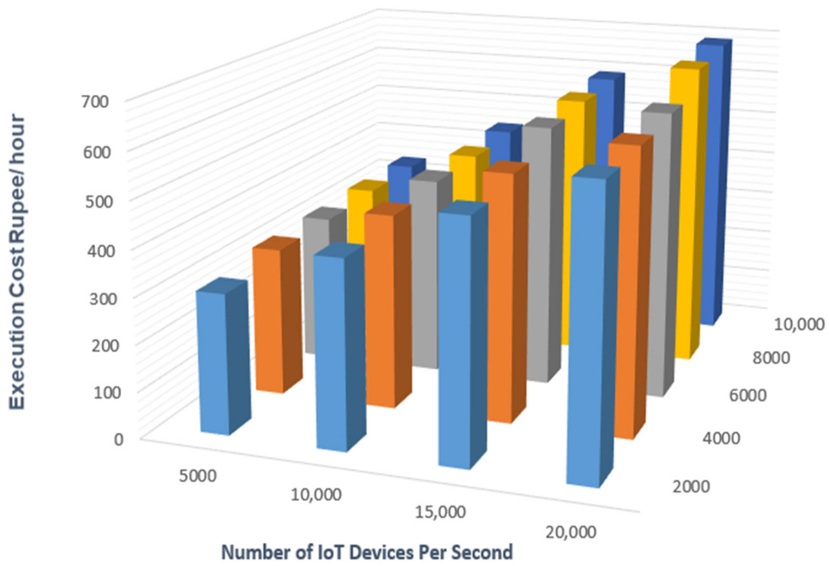

Figure 4. Cost of IoT devices using machine learning.

6. Conclusions and Future Work

In conclusion, the integration of Intelligent Machine Learning (ML) techniques with Internet of Things (IoT) resource allocation has shown great promise in optimizing the efficiency, reliability, and overall performance of IoT systems. The use of ML algorithms enables dynamic and adaptive resource allocation, allowing IoT devices and networks to respond to changing conditions and demands in real-time. This approach addresses the challenges posed by the diverse and dynamic nature of IoT environments, leading to improved resource utilization and enhanced user experiences. By addressing the future directions, the field of Intelligent Machine Learning-based Internet of Things resource allocation can further advance, providing more robust, efficient, and user-friendly solutions for the evolving landscape of IoT applications. Machine learning is being utilized as a potent technology to distinguish between attacks, unusual arrangements, and "smart" device behavior to accomplish this objective. There has been a significant mechanical advancement in machine learning as a direct result of this, which has provided several potential inquiries about openings for addressing the issues that the Internet of Things currently faces and will face in the future.

Author Contributions: Conceptualization, K.C., D.K., S.K., B., N.S. and A.S.; formal analysis, N.S. and A.S.; investigation, N.S. and A.S.; writing—original draft preparation, K.C., D.K., S.K., B., N.S. and A.S.; writing—review and editing K.C., D.K., S.K., B., N.S. and A.S.; supervision, N.S. and A.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The authors declare no conflict of interest.

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