Volume: 5, Issue: 3
Page: 92-100
2021

International Journal of
Science and Business
Journal homepage: ijsab.com/ijsb

IJSAB International

Machine Learning Powered IoT for Smart Applications

Zhala Jameel Hamad & Shavan Askar

Abstract:
With the coming of fast advancements, with the assistance of IoT, a great percentage of heterogeneous devices can be connected with each other. The technology with the relationship of different devices through the internet is named the internet of things (IoT), makes a wide number of different characteristics and qualities of data. IoT and Machine learning (ML) guarantees the widespread advancement to grow the insights of the IoT devices and applications. Over the final few years, artificial intelligence and machine learning have advanced very significantly. It allows a machine or system to learn more effectively than people learn on their own. When we learn some kind of system about the concept of our trial or the knowledge obtained after evaluating it. Combining IoT with rapidly advancing ML technologies can make 'smart machines' that mimic smart action to do well-informed resolve with little or no human involvement. There are at least two fundamental reasons, why machine learning is a suitable solution for the IoT world? The primary has got to do with the volume of data and the automation openings. The second is related to the prescient investigation. Therefore , this paper focuses on ML in different techniques and different domains that motivate and support IoT applications. Many previous works related to this subject and examples have been addressed, explained in detail. The results showed that ML plays a vital role in monitoring, processing, systematic investigation, and smart use of the expansive measure of data in several fields. It was also beneficial for helping users' process massive data.

IJSB
Literature review
Accepted 1 February 2021
Published 3 February 2021
DOI: 10.5281/zenodo.4497664

Keywords: *Machine Learning, Internet of things, SDN, Smart Applications*

About Author (s)

Zhala Jameel Hamad, Information System Engineering, Erbil Polytechnic University, Erbil, Iraq. Email: zhalla.mei20@epu.edu.iq.
Shavan Askar (Corresponding Author), Assistant Professor, Erbil Polytechnic University, Erbil, Iraq. Email: shavan.askar@epu.edu.iq.

1. Introduction

Rising technologies in later a long time and main improvements to communication between various devices has become easier than ever before with Internet protocols and computer frameworks (Mahdavinejad et al., 2018). IoT is getting to be a new unavoidable everywhere offering dispersed and transparent services, many smart devices, including cell phones, sensors, or other intelligent devices, are connected through it. Data shared by contact between devices (Cui et al., 2018). The most objective of communication systems is to transmit reliable data that's robust with regard to the given environment and for the recipient to dependably recover the data. According to various projections, about 25-50 billion devices are expected to be connected to the Internet by 2020 (Jindal, Gupta, & Bhushan, 2019; Mahdavinejad et al., 2018). The IoT worldview is both progressive as well as an enabler of automated and convenient lifestyles for present-day people (Adi, Anwar, Baig, Zeadally, & Applications, 2020). A massive amount of data creates by The Internet of Things is a big challenge to be handled, other obstacle includes the limitation of the current network structure that are incapable to handle real-time sensitive applications using IoT, therefore Software Defined Networking is expected to be a suitable network infrastructure for such applications (Askar, 2017; Fizi & Askar, 2016; Askar, 2016; Keti & Askar, 2015).. Knowledge motivates machine learning and creates intelligence from it. It is necessary to know that, Dependence on human input can fail, so it needs machine learning support to become a fully compatible and human error resistant system (Laha, Chowdhury, & Karmakar, 2020). Human errors are easily corrected through algorithms in an integrated world. By feedback technique that optimizes the entire process. The prescient component of the system can recognize the right input to make the expected output. Machine learning uses the previous action to builds and recognizes patterns that display support future events and behavior. Machine learning provides IoT data hidden experiences for quick, computerized responses, and effective decision. Machine learning for IoT can be utilized to extend future patterns, identify anomalies, and by taking in pictures, audio, and video to expand intelligence (Dharinya & Ephzibah, 2020; Askar et al., 2011; Al Majeed et al., 2014). Further, this review argues on machine learning techniques with (example)s, that are utilized or organized in IoT applications in order to clarify the benefits of applying such a system in various fields. We are able to discover that the application of IoT can advantageous and supported by ML.

2. Background theory

2.1 Overview of machine learning

Machine learning is a technology for Artificial Intelligence (AI) or a subset of (AI). The ML region is expected to imitate the way inputs are interpreted by the human brain to generate rational responses. (Galbusera, Casaroli, & Bassani, 2019). ML algorithm attempts to discover a relationship between any output values and features called labels. At that point, the information gotten during the preparing stage is used to identify patterns or make decisions regards of new input. (Zantalis et al., 2019). It's also able to determine and use hidden structures inside the data to make intelligent choices. Also can dispense with human mistakes and enable huge data to produce real-time insights and permit Internet of Things devices to reach their full potential (Al-Turjman & Baali, 2019). With the advancement of AI and computational algorithms, several difficult issues were addressed (Laha et al., 2020). Real-world issues have high complexity which makes them great candidates for the implementation of ML, also it can be connected to different regions of computing to plan and program explicit algorithms with tall execution output (Alzubi, Nayyar, & Kumar, 2018). ML approaches can be divided into three major groups in general. This division is primarily based on the type of information and the purpose of the assignment. Those are categories of machine learning. Guided (Supervised), Unguided (Unsupervised), and reinforcement (semi-

supervised) learning (Galbusera et al., 2019; Jindal et al., 2019; Laha et al., 2020; Zantalis et al., 2019).

2.2 Types of machine learning

2.2.1 Supervised learning

Predicted learning is a technique used by machines to identify objects, circumstances, or issues based on relevant information extracted into devices (Laha et al., 2020). Because of the necessity, it is called such that the data explored is clearly labeled and the performance outcomes can be monitored or graded as accurate or wrong in this way. Supervised learning processes use the knowledge to produce specific predictions and practice the mapping between both the input and its comparative output while receiving feedback through learning prepares to identify items regarding the comparative features (Zantalis et al., 2019). Approaches are used in this section to predict an outcome or the potential or to assign the input to a collection of groups desired. The most popular approaches in this category are classification and regression algorithms, which can better approximate the relationship between input and output data (Hatcher & Yu, 2018; Jindal et al., 2019; Zantalis et al., 2019).

2.2.2 Unsupervised learning

There are no labels and no feedback signs in unsupervised learning. This technique is often used to discover the data's covered-up structure and collect it into comparative categories (Zantalis et al., 2019). Datasets given as input for machine learning are not labeled in either way that specifies a right or wrong result. Instead, the outcome should accomplish some wider desired objective that can help determine the relationship between both the data input and output, there is no impact or aim variable to predict. The primary target of this algorithm is to divide and group the data into a suitable collection of related characteristics and features (Jindal et al., 2019). Algorithms try to know plans for data testing and data clustering in this category or expect potential values (Alzubi et al., 2018; Galbusera et al., 2019; Jindal et al., 2019).

2.2.3 Reinforcement (semi-supervised) learning

It can be regarded as a medium between learning controlled and not controlled because, while knowledge is not clearly labeled (Alzubi et al., 2018). It may be a form of machine learning that, in a special case, learns and takes appropriate activities to increase rewards. By an agent, and find the best possible operation '(who moves around doing stuff)'. Near to the Human Nervous system (Laha et al., 2020). This style of implementation of machine learning is rewarded for excellent choices and punished for poor choices and teaching of each decision. The algorithms attempt to look forward to the outcome of an issue on the basis of the selection of design variables for this active learning. At that point, the approximate output has become input data and the new output is computed until the ideal output is reached. This type uses Deep Learning (DL) and Artificial Neural Networks (ANN) (Galbusera et al., 2019).

Table 1. Types of Machine Learning (Trestian, 2019).

S. N	Supervised Learning	Unsupervised Learning	Reinforcement (semi supervised) learning
1	Regular Target Variable	No Target Variable	Categorical Target Variable
2	Regression&Classification	Clustering&Association	Clustering&Classification
3	Prediction&Image processing	Segmentation&Analysis	Classification&Segmentation

3. Impact machine learning on IoT

IoT is a group of linked devices that can carry data through one another in order to optimize their performance. The aim of (IoT) is to evolve a smarter medium and simplified lifestyle by

saving power, money, and time. The costs in several businesses can be decreased, Through this technology. It consists of four parts: a) services, b) network processing, c) data analyzing, and, d) sensors (Mahdavinejad et al., 2018).

As several companies appreciate the revolutionary possibility of the IoT, they have started to notice a variety of challenges that they want to overcome to effectively impact it. A large number of businesses and manufacturers utilize ML, to exploit the IoT's potential. ML will reply to the numerous questions with the data, it determines the answers from the massive collection of data. Once merge the ML with IoT will accomplish more objectives for the beatification of the technology (Reddy, Mamatha, & Reddy, 2018). The IoT that is developed and strengthened by machine learning effectively multiplies the help and influence of this exchange, which takes over these integral technologies. In reality, AI is a complete element for success today. ML has various advantages, such as planning sensor systems, offering real-time analytics, increasing security, minimizing data flow, and all personalized user applications use the vast amount of data on the Internet (Laha et al., 2020). Beyond ML, the main goal is to automate the creation of various analytical models to allow algorithms to continuously learn with the aid of available knowledge. Affect ML on IoT advances plays a vital part in improving real-life smart applications. IoT implementations, however, face significant challenges due to the ambiguity and heterogeneity of the source of data (Xiao et al., 2018). In almost all domains, IoT applications are constantly evolving, e.g., agriculture, security, smart city, smart transport, industrial, health, etc.

4. Smart IoT applications powered by ML in different fields with examples.

4.1 Security

To provide advanced and intelligent services, IoT incorporates a range of devices into networks, protects user privacy, and solves security concerns such as DoS attacks, spoofing attacks, jamming, distributed (DoS) attacks, intrusions, eavesdropping, and malicious (Xiao et al., 2018). Over the past decade, IoT has evolved rapidly and protection has been described as one of the weakly distinct ones in IoT during development. The implementation of protection within an IoT network poses numerous difficulties.

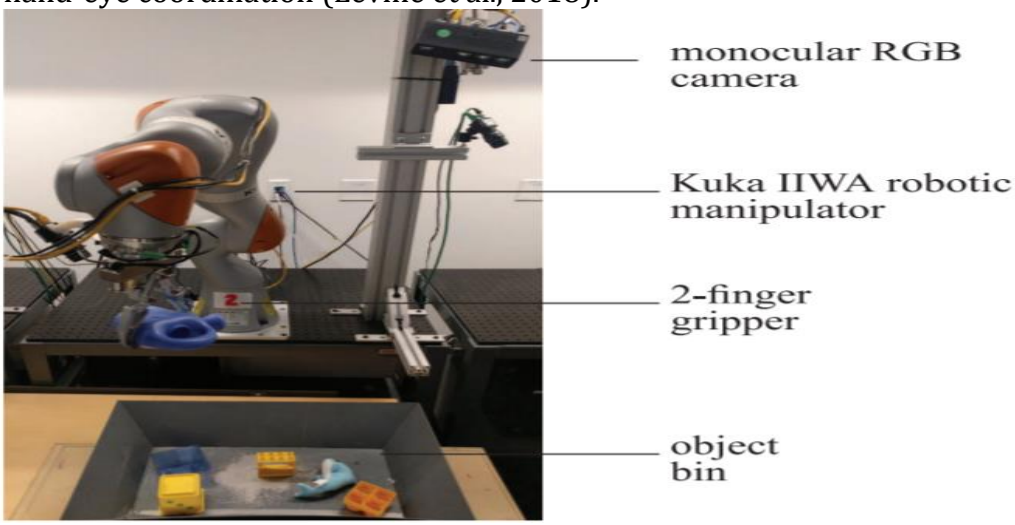
There are many types of devices in the heterogeneous IoT system, strategies of telecommunication, amount of information becoming shared and exchanged, various computer resource levels, and system configurations. Range of products connected, generally. Billions of machines linked together to tackle the challenges of protecting the IoT device use machine learning inside the IoT to help protect the system (Canedo & Skjellum, 2016; Sulaiman & Askar, 2015; Fares & Askar, 2016). The requirements for IoT system protection have become difficult because different technologies need to be protected and connected with other technologies, through wireless and physical devices communication to mobile and cloud implementations. The enhancement of ML and DL has allowed various robust analytical methods to be extended to enhance IoT security (Al-Garadi et al., 2020). On 21st October 2016, on Dyn, a leading DNS provider, a major attack was carried out. The attack was indeed a big DDoS attack that rendered about 85 big websites including Twitter, Netflix, Sony PlayStation, PayPal, unusable to users. This was a sequence of related attacks, impacting the East Coast with the first wave in the attack, California, the Midwest with the second wave, and Europe with the third wave remedied by Dyn. Through the use of big data in deep learning, it compares the traffic rate on the web at the current time with the rate of congestion from seconds ago if it finds a high rate, so it warns the web from attacks. This big assault could be mitigated. Generally, the DNS provider saves log data. These logs are for logging big data

technologies that able to accurately process and analyze data utilizing deep learning algorithms to detect any form of anomalous behavior (Amanullah et al., 2020).

4.2 Smart Home

Smart home facilitates the interconnection of ubiquitous smart home devices and is the home-based technological merging and services that organize to achieve the best quality of life. Within the latter a long time, in various smart home applications, a large number of systems have been developed to implement machine learning procedures (Ma et al., 2019). Home automation systems are a branch of daily computing that integrates smart technology for rest, protection, safety, energy reduction, and health. It serves to enhance user comfort as machine intelligence plans this application to provide situation-aware settings, administration, and facilitate remote control (Jaihar, Lingayat, Vijaybhai, Venkatesh, & Upla, 2020). Smart devices, such as smart locks, smart security cameras, intelligent openers for garage doors, and smart TVs (Jindal et al., 2019). Advanced expansion of the administration of robotized machine control and accessibility will improve the quality of life as well. Temperature, vibration, light, air pressure, a motion that serves as distinctive focuses of data sources can be detected by IoT containing various sensors. Since there is a large number of data available, ML could be integrated into existing home automation systems to produce particularly good output based on the feelings of the user (Jaihar et al., 2020). For an autonomous route to recognize markers or objects from pictures and videos. The authors have designed a modern approach to Human-Robot Interaction (HRI), utilizing procedures such as CNN for machine learning and pattern recognition. Along with the robot operating system and object orientation, computational intelligence procedures are carried out to explore these objects and markers using the camera (RGB-depth). On a screen mounted on the supported robot, several possible matching objects found by the robot through deep neural network object finders are shown, to advance and determine the hand-eye coordination of the object coping with development and to take action (Ma et al., 2019).

Fig1: HRI hand-eye coordination (Levine et al., 2018).



4.3 Agriculture

Currently, it is truly hard to deal with agriculture and its requirements. The plurality of the country's inhabitance depends completely on farming. Production of food must be enhanced as the world populace is continually developing. Recent mechanical progress has had a major effect on farming (Garg & Alam, 2020). Improvement of different technologies such as the IoT, ML, and Deep Learning (DL) has attracted the investigator's care to put these methods to agriculture. Intelligent farming is one of IoT's developing regions. Observing soil moisture and controlling microclimate conditions in order to optimize the control and generation of temperature and mugginess (Jindal et al., 2019). Detecting the temperature of ground(soil),

supplements, and wet, controlling and analyzing water utilization for the development of plants are some of the recognized IoT-based analytics applications (Cui & Gao, 2020). IoT devices produce and combine wide quantities of data for different domains and applications. IoT sensors can gather valuable data on weather conditions and moisture level, humidity level, temperature level. At that point, the data collected can be analyzed to provide critical real-time components, such as observation of water quality, monitoring of soil constituents, infection, automatic irrigation, and trouble observing (Al-Garadi et al., 2020). Various agriculture problems can be fixed by applying IoT technologies and deep learning in the agriculture field. To regulate the development of weeds on farms, various types of weed approaches are suggested that the detection of weeds using image processing techniques, the classification of weeds highly dependent on texture quality through a robotic device and the identification of weed species using different characteristics should be included. An automatic robot is a weed control system (WCS) proposed quantity of herbicides for weed monitoring and spraying of the necessary weeds throughout farms as per the weed density. In this system, the agriculturalist tried to enter and start the WCS program. The camera fitted inside the robot, which is supported as an image preparation input, captures images consisting of weeds. Depending on multiple escalated stages, to get a histogram, RGB channels are calculated. These intensities are interpreted as source images that are mainly used by a robotic device on the principle of texture using image processing techniques for weed location and weed classification. Then, these characteristics are given for weed classification by an artificial neural network (ANN) (Din et al., 2019).

4.4 Health care

One of the world's earliest passing factors is an unhealthy lifestyle, depending on the World Health Organization (WHO) survey, and thus avoiding unhealthy habits can be a severe problem. The new wellness techniques observation face numerous challenges because of limited intelligence (Din et al., 2019). Subsequently, too – ordinary the health status of the patients with regard to physiological and mental conditions, an intelligent system is required. The information collected would provide assistance in the customized review of the well-being of an individual to battle disease through remote observation (Jindal et al., 2019). Advances have occurred in increasing the precision of remote sensor measurements by using data from widely sent intelligent IoT devices. Deep learning has been used by smartphones and wearables for illustration to check the effectiveness of photoplethysmography (PPG) heart rate estimation through exercise. The researchers combine accelerometer data and PPG and use deep conviction systems composed of Restricted Boltzmann Machines (RBMs) executed within the cloud to separate the signals from the PPG into subsets. At that point, the PPG signal undergoes sample filtering to estimate the pulse rate over time. (Hatcher & Yu, 2018).

4.5 Smart Transportation

Now with aid of IoT systems, intelligent or smart transport systems have wound up being feasible. The most important aim of smart transport is to track day-to-day traffic in intellectual cities by analyzing data with good sensors involved in different locations and implementing data mixes (accelerometers, mobile devices, gyroscope-based applications GPS, data from CCTV, and climate sensors). The data are at that point investigated and integrated to give intelligence choices to drivers (Al-Garadi et al., 2020). One of the foremost critical ranges of interest in smart transportation is route or navigation optimization. Utilizing data from the users' portable devices or with side units set in indicated locations on the street applications attempt to appraise traffic congestion and propose optimal route alternatives to minimize traveling times, and so decrease car emissions and energy utilization. Moreover, to

bolster the energy consumption reduction, street lights are proposed that can identify activity conditions and work appropriately, rather than being constantly on with a time plan (Zantalis et al., 2019). IoT devices have been most used to make smart stopping systems(parking), too. Utilizing camera, or other wireless sensors like IR sensors or magnetic field (Wu et al., 2007).

5. Conclusion

In recent years, academics and industrialists have taken IoT and machine learning into consideration because of the positive effects of these two technologies on people's lives. In combination with machine learning, IoT creates a way of communicating with supporters in which small devices generate knowledge, that is validated through machine learning applications. After considering (reviewed) a few types of research where machine learning methods have been utilized for way better performance of IoT. An attempt was made by this review to address the machine learning overview with its types and then the effect of machine learning on IoT applications with some examples. We conclude that machine learning with IoT from many areas of our life has a positive and good effect and makes life easy.

References

Adi, E., Anwar, A., Baig, Z., Zeadally, S. J. N. C., & Applications. (2020). Machine learning and data analytics for the IoT. 1-29.

Al Majeed, S., Askar, S., Fleury, M. (2014). H.265 Codec over 4G Networks for Telemedicine System Application. UKSim-AMSS 16th International Conference on Computer Modelling and Simulation (UK), Cambridge (pp. 292-297), doi: 10.1109/UKSim.2014.59.

Al-Garadi, M. A., Mohamed, A., Al-Ali, A., Du, X., Ali, I., Guizani, M. J. I. C. S., & Tutorials. (2020). A survey of machine and deep learning methods for internet of things (IoT) security.

Al-Turjman, F., & Baali, I. J. T. o. E. T. T. (2019). Machine learning for wearable IoT-based applications: A survey. e3635.

Alzubi, J., Nayyar, A., & Kumar, A. (2018). Machine learning from theory to algorithms: an overview. Paper presented at the Journal of physics: conference series.

Amanullah, M. A., Habeeb, R. A. A., Nasaruddin, F. H., Gani, A., Ahmed, E., Nainar, A. S. M., . . . Imran, M. J. C. C. (2020). Deep learning and big data technologies for IoT security. 151, 495-517.

Askar S., Zervas, G., Hunter, D. K., & Simeonidou, D. (2011). Evaluation of Classified Cloning Scheme with self-similar traffic. 3rd Computer Science and Electronic Engineering Conference (CEEC), Colchester, 2011, pp. 23-28, doi: 10.1109/CEEC.2011.5995819.

Askar, S. (2016). Adaptive Load Balancing Scheme For Data Center Networks Using Software Defined Network. Journal of University of Zakho, Vol. 4(A), No.2, Pp 275-286,

Askar, S. (2017). SDN-Based Load Balancing Scheme for Fat-Tree Data Center Networks. Al-Nahrain Journal for Engineering Sciences (NJES), Vol.20, No.5, pp.1047-1056

Askar, S., Zervas, G., Hunter, D. K., & Simeonidou, D. (2011). Service differentiation for video applications over OBS networks. 1*6th European Conference on Networks and Optical Communications*, Newcastle-Upon-Tyne, pp. 200-203.

Askar, S., Zervas, G., Hunter, D. K., & Simeonidou, D. (2011). A novel ingress node design for video streaming over optical burst switching networks. Optics Express, Vol. 19 (26), pp. 191-194

Askar, S., Zervas, G., Hunter, D. K., & Simeonidou, D. (2011). Adaptive Classified Cloning and Aggregation Technique for Delay and Loss sensitive Applications in OBS Networks. in Optical Fiber Communication Conference/National Fiber Optic Engineers

Conference 2011, OSA Technical Digest (CD) (Optical Society of America, 2011), paper OThR4.

Canedo, J., & Skjellum, A. (2016). Using machine learning to secure IoT systems. Paper presented at the 2016 14th annual conference on privacy, security and trust (PST).

Cui, L., Yang, S., Chen, F., Ming, Z., Lu, N., Qin, J. J. I. J. o. M. L., & Cybernetics. (2018). A survey on application of machine learning for Internet of Things. 9(8), 1399-1417.

Cui, X., & Gao, Z. (2020). A Standard Architecture of Agricultural Big Data for Deep Learning. Paper presented at the 2020 IEEE International Conference on Advances in Electrical Engineering and Computer Applications (AEECA).

Dharinya, S. S., & Ephzibah, E. (2020). Machine Intelligence and Automation: Deep Learning Concepts Aiding Industrial Applications. In Internet of Things for Industry 4.0 (pp. 237-248): Springer.

Din, I. U., Guizani, M., Rodrigues, J. J., Hassan, S., & Korotaev, V. V. J. F. G. C. S. (2019). Machine learning in the Internet of Things: Designed techniques for smart cities. 100, 826-843.

Fares, N., Askar, S. (2016). A Novel Semi-Symmetric Encryption Algorithm for Internet Applications. Journal of University of Duhok, Vol. 19, No. 1, pp. 1-9

Fizi, F., & Askar, S. (2016). A novel load balancing algorithm for software defined network based datacenters, International Conference on Broadband Communications for Next Generation Networks and Multimedia Applications (CoBCom), Graz, 2016, pp. 1-6, doi: 10.1109/COBCOM.2016.7593506.

Galbusera, F., Casaroli, G., & Bassani, T. J. J. s. (2019). Artificial intelligence and machine learning in spine research. 2(1), e1044.

Garg, D., & Alam, M. (2020). Deep Learning and IoT for Agricultural Applications. In Internet of Things (IoT) (pp. 273-284): Springer.

Hatcher, W. G., & Yu, W. J. I. A. (2018). A survey of deep learning: Platforms, applications and emerging research trends. 6, 24411-24432.

Jaihar, J., Lingayat, N., Vijaybhai, P. S., Venkatesh, G., & Upla, K. (2020). Smart home automation using machine learning algorithms. Paper presented at the 2020 International Conference for Emerging Technology (INCET).

Jindal, M., Gupta, J., & Bhushan, B. (2019). Machine learning methods for IoT and their Future Applications. Paper presented at the 2019 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS).

Keti, F., Askar, S. (2015). Emulation of Software Defined Networks Using Mininet in Different Simulation Environments. *6th International Conference on Intelligent Systems, Modelling and Simulation*, Kuala Lumpur, 2015, pp. 205-210, doi: 10.1109/ISMS.2015.46.

Laha, S., Chowdhury, N., & Karmakar, R. (2020). How Can Machine Learning Impact on Wireless Network and IoT?–A Survey. Paper presented at the 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT).

Levine, S., Pastor, P., Krizhevsky, A., Ibarz, J., & Quillen, D. J. T. I. J. o. R. R. (2018). Learning hand-eye coordination for robotic grasping with deep learning and large-scale data collection. 37(4-5), 421-436.

Ma, X., Yao, T., Hu, M., Dong, Y., Liu, W., Wang, F., & Liu, J. J. I. A. (2019). A survey on deep learning empowered IoT applications. 7, 181721-181732.

Mahdavinejad, M. S., Rezvan, M., Barekatain, M., Adibi, P., Barnaghi, P., Sheth, A. P. J. D. C., & Networks. (2018). Machine learning for Internet of Things data analysis: A survey. 4(3), 161-175.

Reddy, R. R., Mamatha, C., & Reddy, R. G. (2018). A Review on Machine Learning Trends, Application and Challenges in Internet of Things. Paper presented at the 2018

International Conference on Advances in Computing, Communications and Informatics (ICACCI).

Sulaiman, S., Askar, S. (2015). Invetigation of the Impact of DDoS Attack on Network Efficiency of the University of Zakho. Journal University of Zakho, Vol. 3(A) , No.2, Pp 275-280.

Trestian, R. (2019). Next-generation wireless networks meet advanced machine learning applications: IGI Global.

Wu, Q., Huang, C., Wang, S.-y., Chiu, W.-c., & Chen, T. (2007). Robust parking space detection considering inter-space correlation. Paper presented at the 2007 IEEE International Conference on Multimedia and Expo.

Xiao, L., Wan, X., Lu, X., Zhang, Y., & Wu, D. J. I. S. P. M. (2018). IoT security techniques based on machine learning: How do IoT devices use AI to enhance security? , 35(5), 41-49.

Zantalis, F., Koulouras, G., Karabetsos, S., & Kandris, D. J. F. I. (2019). A review of machine learning and IoT in smart transportation. 11(4), 94.

Cite this article:

Zhala Jameel Hamad & Shavan Askar (2021). Machine Learning Powered IoT for Smart Applications. *International Journal of Science and Business, 5*(3), 92-100. doi: https://doi.org/10.5281/zenodo.4497664

Retrieved from http://ijsab.com/wp-content/uploads/689.pdf

Published by

IJSAB International