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Research Article

COMPARATIVE ANALYSIS OF INTERNET OF THINGS AND ARTIFICIAL INTELLIGENCE ALGORITHMS THROUGH MEASURES

[1,*]Sundas Naqeeb Khan, [2]Arooj Waseem, [2]Hina Altaf, [2]Sonia Arshad

[1]Department of Graphics, Computer Vision and Digital Systems, Silesian University of Technology, Gliwice, Poland
[2]Department of Computer Science, University of the Punjab, Jhelum Campus, Punjab, Pakistan

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Abstract

The prime concern of current research-based study is to inspect the comparative analysis between Internet of Thing (IoT) and Artificial Intelligence (AI) that might result in enhancement in motivation to check which one is the best. Most importantly, this study comprises brief overview of the research, its evaluation to identifying the issues between IoT and AI using the analysis of algorithms on text classification and MNIST datasets as well as the variables that perform their role in this regard. IoT and AI is mutually beneficial for both type of technology. Furthermore, it explains the issues which provides justification and improve decision making process. While IoT add values to AI through connectivity and data exchanging. In addition, it contains research questions, variables, specifiers of both IoT and AI, research objectives using the analysis of text classification data set and analyze the improvements.

Keywords: IoT, AI, DES, AES, ANN, Backpropagation.

INTRODUCTION

IoT is a part of automation that permit the position and ranking of environmental parameters through sensor and actuator. It narrates physical items with senses and interchanges data with other devices on top of other communications networks [1]. The circle of IoT is saturate numerous aspects of our lifestyle. IoT and associate automation are running after swiftly and their up-to-date occurrences and implementations are molding standard of living [2]. The greatest invention in the past related to IoT in 1832, "Baron Schilling" was designed first electromagnetic telegraph Russia. In 1833, "Carl Friedrich Gauss" and "Wilhelm Weber" innovated their own laws for communication about 1200 m within Gottingen, Germany [3].
Today, every human pursuit is no complicated due to the appearance of up-to-date and swift moving technologies. The field of computer science is registering procedures in daily routine. One of the popular automations is "AI" due to its enlarging implementation. It was first hatched by "John McCarthy" in 1956 during his first academic conference at "Dartmouth College" [4]. The idea of backpropagation is broadly used algorithm for coaching neuron and perceptualization was imagined in 1969, and modified in 1986 [5]. Over a past sixty years have been a huge advancement in searching algorithms, ML algorithms and integrating statistical analysis. Although these advancements were not so observable. The contribution of this research is to evaluate the connection between the IoT and AI. The researchers will apply the classifiers to check the performance of both IoT and AI on text classification dataset and then analyze the performance. Researchers will take the specifiers of IoT and AI and check the comparison between them which one is better through the help of analysis. The major concerned about the text classification dataset is, how to evaluate both of the field's algorithms through selected variables.

Corresponding Author:** ***Sundas Naqeeb Khan
Department of Graphics, Computer Vision and Digital Systems, Silesian University of Technology, Gliwice, Poland

After that it would be assumed the relationship between them. On the base of existence, then check its positive or negative impact.

LITERATURE REVIEW

The idea of IoT is rapidly evolving. In the scenario of IoT-enabled network, messages must be sent immediately between adjacent nodes, and for this to happen, the nodes must be within overlapping transmission range of one another. A review of the literature finds that has been done to explore the applications of the IoT and to comprehend its idea [6]. Automated systems make living on Earth easier for people. AI is a technology which used for every field of the science approximately. Automated devices are interconnected and enable a wide range of operations for businesses around the globe. The study clarifies the architecture, problems, and uses of the IoT [7]. The use of the IoT has helped to mitigate some of the epidemic's negative impacts and significantly boosted the economy [8]. The current strategy is therefore focused on categorizing pupils according to their preferred learning styles and assigning assignments in accordance with those preferences. The solution that is being proposed uses an IoT-based system to automatically classify students and keep track of their performance, assignments, submission histories, etc. By custom developing activities in accordance with the natural learning style of each student, this will assist reduce the number of faculty members needed while improving student performance by 5 to 42% [9]. A one-time authentication at the beginning of a session is typically inappropriate for the IoT because to the dynamic application situations and the possibility that a user may not be able to maintain physical control or even awareness of an IoT device with the same ease as with conventional computers. Users must therefore constantly be authorized and validated. Thankfully, the IoT presents intriguing possible answers for satisfying these demands [10]. The field of AI is constantly undergoing fascinating new research. This evaluation is by no means an

exhaustive account of the development during the previous ten years. Numerous fields of AI exist as well. A significant portion of the research discussed in this review may be useful for creating powerful AI. It is crucial to develop a system that can comprehend the ideas hidden behind the words since it enables more natural discussions and better translation. The study of recognizing human emotions from aural and visual signals is extremely fascinating. This study, in particular, offers a thorough analysis of current advancements in the field of AI and its applications. The work is intended for those just starting out in the field of AI [11]. People are feeling as though they no longer have control over their lives. Important aspects of digital living are automatically handed to code-driven, "black box" devices. People are uninformed about the context in which the tools work and lack input. They give up their autonomy, privacy, and power in exchange for the right to make their own decisions; they have no control over these procedures. This influence will grow stronger as automated systems become more widespread and sophisticated. In complex systems, data use and surveillance are intended to be profitable or to exercise power. The majority of AI technology are and will continue to be in the hands of power-hungry governments or profit-driven enterprises. Often, electronic systems that make judgments for individuals lack morals and values. These systems are networked internationally and are challenging to control [12]. With the advancement of AI, medical professionals are gradually using this technology to help with disease diagnosis and surgery. This has sped up the development of precision medicine. This research examines the surgical system based on augmented reality and AI. Future minimally invasive surgery systems will intelligently aid surgeons in performing procedures and achieving their goals. These systems will be based on artificial and augmented reality [13].

In the age of the most recent technological revolution, research into facial expression recognition is still ongoing. Face expression conveys a person's mood or timeless beauty. Recognition of facial expressions of emotion is crucial for computer vision and ML. Numerous applications have been developed using this technology. It is applicable to a variety of fields, including robotics, security, entertainment, and HMI. The most crucial cognitive process that our brain is really good at is facial emotion identification. Under the skin of the face, the human face has a posture called a facial expression. Although any emotion can be detected in a person's voice, hands, or body language, the human face is the only place where the majority of expressions can be seen. There are about 300 recognized emotions, but in our work, we have focused on six fundamental ones, including all three primary colors: anger, contempt, fear, happiness, sorrow, and surprise. For our situation, we initially trained the system using some photographs with similar face expressions or some typical images. The sample image is then used as our input. After that, we utilize the feature extraction approach to pre-process the image. The classification algorithm is then used to compare the training and test sets of data. As a result, we may quickly obtain the face emotion as a result. Software called MATlab was used for all of our simulation work [14]. The rapid spread of AI technologies raises the bar for students' all-around abilities, requiring them to develop their computational thinking, programming prowess, and interpersonal skills, all of which contribute significantly to the development of students' media literacy in this intelligent world. Junior high schools should offer courses in media literacy, STEM education, and entrepreneurship to lay the groundwork for AI training as science and technology advance quickly. Junior high schools should offer AI courses that take into account the kids' physical and psychological growth and conduct training in this area in a simple-to-complex and superficial-to-deep way. The adoption of exploratory learning, organic integration of scientific, IT, and general practice courses, and creation of AI curricula that adhere to school requirements should all be priorities in AI education [15]. Reusability of components in software development has been successfully achieved by mining of software engineering data. A broad application domain of software engineering operations is enhanced by AI. For the intelligent computation of software engineering tasks, intelligent knowledge discovery mixes AI with data mining. Software Intelligence is the result of combining data mining and AI to enable software engineering applications. This study examines three AI strategies that support automated software reuse in software development by utilizing data mining, business intelligence, and ML. The usage of business intelligence technologies allows for the intelligent discovery of code that will be used to make applications and component reuse possible. For automatic software reuse, numerous AI strategies are analyzed in the software engineering field [16].

The rise of AI has posed hitherto unheard-of challenges to the morality, law, social order, and governmental administration of today. The main issue with regard to patent law is whether the creation of AI qualifies for a patent. The most significant technological advancement in the field of AI is computer technology [17]. But ever since the 2014 Alice judgement, US courts and the USPTO have tended to view computer-related discoveries that are focused on abstract concepts as ineligible for patent protection. Patent applicants should concentrate their construction of the claims to manifest what technical issues the invention is solving or identify the specific improvements that the claims are making in order to increase the likelihood that AI related inventions will be granted a patent [18]. One of the crucial steps in the development of a software project is an accurate effort estimation. It has a direct effect on the length and price of software projects. This essay gives a thorough assessment of the literature on software effort employing ML for estimation. Presented here gives a discussion of the ML research trends. Estimating software effort was influenced by learning. The outcomes of a scientific assessment have identified prominent machine benchmark datasets, size measurements, and learning strategies methods of validation, etc., employed in software effort estimating [19]. AI commonly referred to as the industrial revolution, will alter not just the way we go about our daily lives and interact with others, but also how we view ourselves. This research will first define AI, then analyze how it has affected the industrial, social, and economic developments that have affected humanity in the twenty-first century, before proposing a set of ethical guidelines for AI. The IR of the 18th century sparked a significant social transformation without immediately affecting interpersonal connections. However, contemporary AI has a significant impact on our daily activities as well as how we interact with one another. In order to overcome this difficulty, new AI bioethics principles must be taken into consideration and created in order to offer rules for the AI technology to adhere [20]. A new service called mobile Internet uses mobile wireless connectivity and clever mobile terminals to get services and services. It is the collective term for activities that use and incorporate mobile communication technologies with Internet platform, business model, and application. In order to

create a more reliable and rigorous model, AI technology efficiently addresses the issues of data organization and environment. It also exerts its advantages in application universality, autonomy, and iteration. People's lives are moving faster in the digital age, and the PC Internet falls well short of their needs. Users want to have access to convenient network information services whenever and wherever they choose. The researchers begin with AI technology and examines the significant role it has had in the development of mobile internet this encourages the growth of the internet in our nation [21].

The manufacturing sector values innovation and adaptation greatly. This advancement ought to result in the use of innovative technologies for sustainable production. Smart manufacturing calls for a global perspective on the technology being used to it in order to achieve sustainability. In this context, numerous AI-based techniques, such ML, have already been established in the industry to achieve sustainable manufacturing thanks to significant research efforts in the field of AI Therefore, the purpose of the current study was to conduct a comprehensive analysis of the scientific literature pertaining to the use of ML and AI in industry. In fact, with the advent of Industry 4.0, ML and AI are seen as the main forces behind the smart factory revolution. The classification of the literature, including publication year, authors, scientific field, nation, organization, and keywords, was the goal of this review. The SCOPUS and Web of Science databases were used for the analysis. To emphasize the evolution of the subject before and after the advent of Industry 4.0, from 1999 to the present, a literature review on ML and AI empirical research published in the previous century was carried out. There were 82 papers reviewed and categorized. The increased quantity of works published by the USA and the rise in interest following the creation of Industry 4 are two initial intriguing results [22].

The rise of several intelligent goods and services over the past few years, as well as their commercial viability and socioeconomic effects, have led some to wonder if the current advent of AI is merely marketing hype or truly has the potential to revolutionize society. The study examines the numerous implications of AI and explores both the positive and negative effects on organizations, communities, and people. The whole effects of AI, from research and innovation to implementation, are examined in this paper. The article discusses significant academic advancements and breakthroughs in the area of AI, as well as how they have affected business ventures and the global economy. The paper also makes a contribution to the study of the causes of AI development. Two lists of the top 100 AI start-ups are taken into consideration for the investigation of entrepreneurial actions related to AI. The conclusions drawn from the study will help people better comprehend the developments and the effects of AI on businesses and society at large. Additionally, it will improve awareness of how AI might alter company processes and subsequently the world economy [23]. AI is a fast-evolving technology that can improve present processes and make them accurate and autonomous in this rapidly evolving period of adopting new technologies to better way of life. This essay will discuss the fundamentals and background of AI, the ongoing research on AI, the evolution of AI, and ML, as well as some of the applications of AI that are being employed in a variety of sectors. It is crucial to comprehend the principles of AI for future study in this area, and this paper will go over the fundamentals needed [24].

MATERIALS AND METHODS

The application layer, which is also the top level of the IoT architecture, includes various user interfaces, display devices, and other administration tools. It can interact with the administration and operation platforms of various industries in accordance with user needs, and integrate associated content services in accordance with the properties of diverse applications. The Figure 1 depicts the hierarchical structure of the IoT [25].

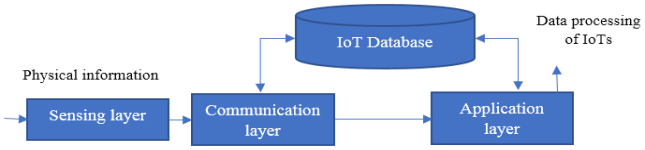

Figure 1. Schematic diagram of composition hierarchy of IoTs

The methodology employed combines social network, content analysis, and bibliometric tools. In order to understand how the level of interest in the issue has evolved before and after the advent of Industry 4.0, the period from 1999 to 2019 are taken into consideration for the publishing time span. Some phases regarding this methodology are as follows:

Phase 1: Three steps made up the current phase are; Identification, screening, and inclusion. This phase involved gathering bibliometric information.

Phase 2: Then, based on the study areas deemed intriguing and important, a screening of the whole result is conducted to determine which documents can be taken into consideration.

Phase 3: Following this phase, the third stage intended to choose the documents that would be thoroughly examined.

The IoT-enabled AI system comprises of a layer of apps, applications and apps for decision-making and healthcare data. These layers contain information such as financial management, diagnostic imaging, equipment and materials managerial staff, medication managerial staff, physical separation management, pathology, radiography, evaluation and ambulatory managerial staff.

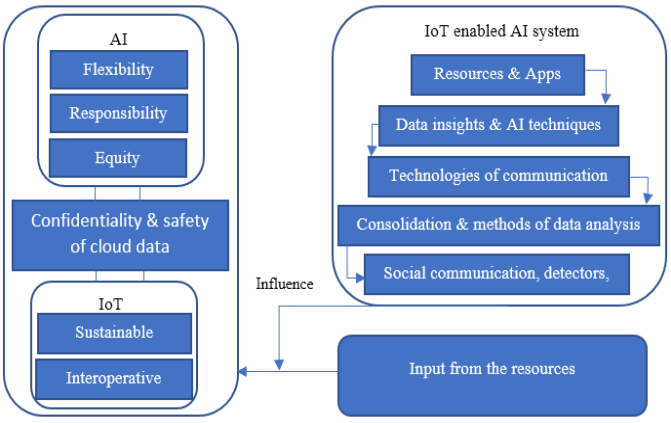

Figure 2. IoT and AI integration framework for the research data

The security facility is integrated by a regulatory and policy layer focusing particularly on the confidence element of the internal structure, including privacy, confidentiality, durability, scalability, sustainable, trustworthiness and confidence. It

makes it possible that contractual arrangements, regulations, regulations and ethics will be effectively involved. Some key security components are considered safety-by-design methods, mandated policy, permission, identification and threat intelligence. Here Figure 2 illustrated about the IoT hybridized with AI and it gives more better results in different fields especially medical.

Types of machine learning approaches

The ML approaches are used in different fields of the research where the researchers get better and more better findings through empirical testing. Figure 3 described the main portion of the learning approaches of the ML. It can be roughly divided into four groups of approaches and these are as follows:

- Supervised learning
- Unsupervised learning
- Semi-supervised learning
- Reinforcement learning

Supervised Learning

In supervised learning, an algorithm seeks to establish certain connections and dependencies between the input and output features in order to be able to predict the output values for brand-new data. The data in this type of learning are labelled and can be utilized to address both classification and regression issues.

Unsupervised Learning

In unsupervised learning, the algorithm looks for rules and patterns in the existing dataset to better characterize the data because there is no tagged output. This kind of algorithm, which trains with unlabeled data and has no concept of the expected outcomes, can be used primarily to address clustering and association-related issues.

Semi-supervised Learning

In this type of learning, the database contains both labelled and unlabeled data. However, the majority of the data are not labelled because doing so is expensive and requires special knowledge. The major sorts of issues resolved using this type of learning are classification and clustering. The algorithm is trained to find a model.

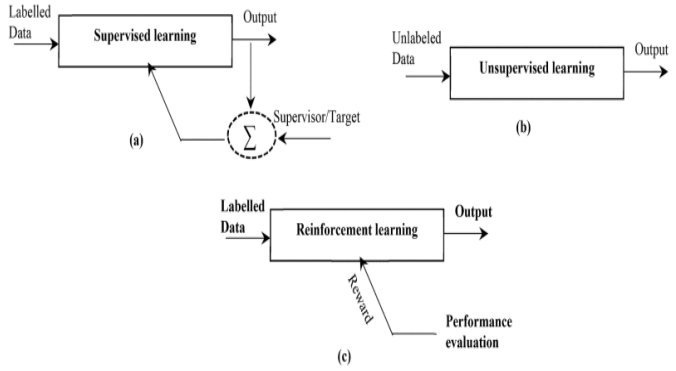

Figure 3. Learning: a) Supervised learning b) Unsupervised learning c) Reinforcement Learning

Reinforcement Learning

Reinforcement learning is the final phase. For purposes of analysis or visualization, this kind is mostly employed to produce high dimensionality from lower dimensional data. Despite the lack of training data sets, an agent continuously gains knowledge from its surroundings in an iterative manner. Problems with classification and control can be resolved with this method of learning.

Classes of approaches

The support vector machine, k-nearest neighbor, linear regression, logistic regression, choices trees, naive Bayes, neural networks, and random forest are examples of ML techniques that fall within the first class. The second class of algorithms consists of hierarchical clustering, fuzzy c-means, and k-means. Generative models, graph-based models, and other models are grouped together in the third ML class. Q-learning, deep q networks, Markov decision processes, and other techniques are included in the fourth class. Hence, Figure 4 presented the major ML approaches along their application in detail.

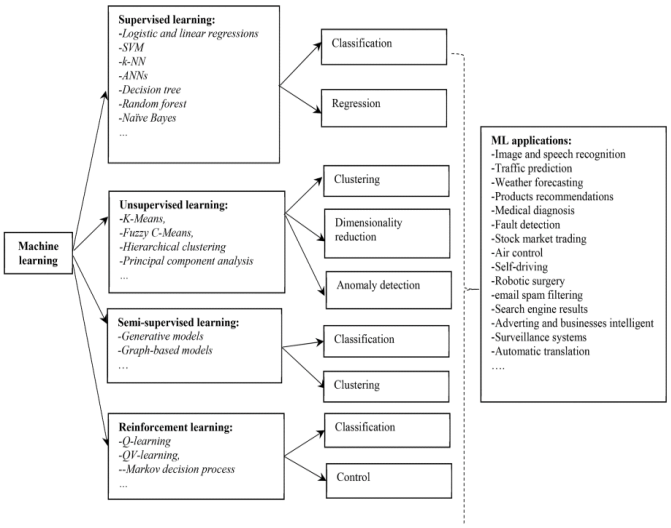

Figure 4. Major ML approaches and their applications

NUMERICAL RESULTS WITH ANALYSIS

Implementation is immense importance in research as it depicts the outcomes of what was assumed in hypothesis development. Primarily, data is prepared by applying all the basic steps like: data screening, coding, details of algorithms and their results, development, data analysis, etc. Hence, this study provides a comparative analysis of the IoT and AI approaches along ML. Table 1 is show the main selected algorithm according to their fields and provide the focal point which is comparison, as accuracy on text classification as experimental based implementation.

Table 1. Selected algorithm evaluation regarding accuracy on text classification

Area of interest	Algorithms	Accuracy
IoT	DES	0.92%
	AES	0.95%
AI	ANN	0.98%
	Backpropagation	0.96%

Here two cryptographic algorithms of IoT are selected and these are Data Encryption Standard Algorithm (DES) as well as Advanced Encryption Standard Algorithm (AES). Both are encryption algorithms based on three parameters which are: input data, secret key and it is not used in ECB mode. The replication of human intelligence functions by machines, particularly computer systems, is known as AI. For the purpose of creating and refining ML algorithms, AI requires a foundation of specialized hardware and software. Three cognitive abilities learning, reasoning, and self-correction are the main points of AI programming. Two of the algorithms named Artificial Neural Networks (ANN) and Backpropagation are selected in this research. Parameters involved in ANN algorithm and Backpropagation Algorithm are: the number of layers, number of neurons per layer, the number of training iterations, and the number of hidden neurons, the learning rate and momentum rate and activation functions.

Empirical Testing Dataset

Benchmark dataset is used in this research. An objective function, a list of datasets, and a list of solvers are the three parts of a benchmark. To find the best solution for a specific biomedical image processing problem, benchmark datasets are produced for machine vision algorithm development, testing, and performance comparison.

Usage of Dataset: In order to compare key performance areas, organizations frequently employ benchmarking data. This enables executives to evaluate and either confirm current practices or highlight prospective areas for improvement. In particular when it comes to financial matters, benchmarking supports organizational openness.

Attributes of Dataset: Datasets have three general characteristics: dimensionality, sparsity, and resolution. The dimensionality of a data set is the number of attributes that the objects in the data set have. For some datasets, such as those with asymmetric features, most attributes of an object have values of 0; in many cases, fewer than 1% of the entries are non-zero. Such data is known as sparse data, or the data set has sparsity. The patterns in the data are determined by the level of resolution. A pattern may be invisible or buried in noise if the resolution is too fine; if the resolution is too coarse, the pattern may disappear.

CONCLUSION

This section essentially summarizes the research's findings, justifies them, and indicates whether they are consistent with or distinctive from earlier studies undertaken by researchers. It is based on technology support using benchmark dataset and perform algorithms to check the evaluation of interconnection between IoT and AI. Therefore, assumptions with respect to relationship among variables of the study are made on the basis of findings of previous researchers. The IoT's system is the fusion of all technologies with computer and internet, enabling the intelligent data collection, transmission, analysis, and execution of actions as well as the real-time sharing of environment and state information across items. The performance of various approaches is examined in order to resolve the concerns about how to evaluate the interconnection between IoT and AI and challenges that these strategies have in attaining the required values of objective functions. A few algorithms of IoT and AI are picked and provides some datasets and checked the evaluations as well as now clarify the results through these datasets. The solutions to these problems are depicted in accordance with these situations.

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