The Evaluation of the Impact of IoT and AI: A Comprehensive SWOT Analysis in Economic, Environmental, and Healthcare Fields

Mabruka Ibrahim
Information Technology Al-Zaytouna
University of Tarhuna, Libya
Mabruka85@gmail.com

Hend ALmezoghy
Information Technology
Al-Zaytouna University of
Tarhuna , Libya
hendhadiaa@gmail.com

Abstract— ***Recent developments in Artificial Intelligence (AI) and the Internet of Things (IoT) are being used in almost every aspect of the environment, economics, and society. This research aims to present a concise and thorough overview of the developments and future possibilities in the connection between AI technologies and the IOT, as well as its applications in the domains of healthcare, the environment, and the economy. The strengths, weaknesses, opportunities, and threats of AIoT-driven technologies as enablers or impediments to their applications in various fields have been identified through a series of SWOT (Strengths, Weaknesses, Opportunities, and Threats) analyses that follow a thorough review of the body of existing literature. The research identified a number of benefits of using AI in various domains, such as improved monitoring, higher efficiency in repetitive operations, and improved data processing skills. Nevertheless, shortcomings, including the high upfront installation costs and data security issues, were noted. Among the opportunities was AIoT's ability to save expenses and enhance results. Threats, including opposition to technology advancement and moral conundrums surrounding AIoT decision-making procedures, however, were identified as possible obstacles to effective implementation. The complex terrain of AIoT adoption in each of the aforementioned domains is clarified by this research. The promise of AIoT must be fully realized by carefully considering the dangers and vulnerabilities that have been found and aggressively looking for ways to integrate it seamlessly.***

Key words: Artificial intelligence, Internet of Things, SWOT analysis, economic field, environmental field, healthcare field

I. Introduction

In the twenty-first century, there has been an unprecedented development of technology. Artificial intelligence (AI) has reached the head of this revolutionary wave after it previously appeared in science fiction [1]. The modern world is witnessing the increasing acceptance of sustainable development as a key determinant of the success of socioeconomic systems in terms of positioning sustainable development in the strategic framework of strategic systems. This is necessitated by the fact that the world is now more focused on innovation and economic development, especially with the emergence of state-of-the-art technology. Among them, the Internet of Things (IoT) and AI deserve particular attention because of the gigantic potential of changing the concept of sustainable development in a wholesome way. Nevertheless, to use these technologies to achieve sustainable growth, a careful reassessment of strategic goals and the methods of analysis used to understand the cyclical nature of economic systems is required [2].

One of the characteristics of digital technology is its ingenuity. They can change and transform to fit the various industries as their natural habitat, and as a result, it is possible to get new business models [3], [4]. Internet of Things, or IoT, is a phenomenon that is focused on connecting devices or objects to the Internet in order to monitor the environment and exchange data without the involvement of people. The Internet of Things had its first user in 1999, when Kevin Ashton described this concept and named it RFID (Radio-Frequency Identification) [5].

The IoT ecosystem is a constantly expanding network of physical objects, cars, household appliances, and other objects equipped with sensors, software, and electronics that allow them to communicate via the internet and exchange information. The devices connected to the network produce continuous loads of highly diverse data [6]. The healthcare industry, agriculture, smart homes, smart cities, education, smart grids, and smart enterprises are only a few of the sectors where IoT has developed a significant presence in recent years [7].

The use of artificial intelligence, such as a collection of AI-related technologies of deep learning, natural language processing, and machine learning [8], has soon become highly relevant in enhancing performance in education. It is not only possible to transform the education system through AI in terms of automation, personalization of learning experiences, and intelligent tutoring systems [9], but also the systemic issues of education, quality, and access can be addressed [10].

AI is shifting the way of thinking about the masses of IoT data. AI means the creation of computer systems, which can learn, decide, and solve problems, and these activities used to need human intelligence [7]. This concept of integrating AI and IoT systems is called the AIoT, the term that means a combination of two fast-changing technologies [11].

The intelligent analytical techniques make AI handy in enhancing the worth and functionality of IoT devices and assist them to learn and adapting to trends [12]. In an IoT healthcare system, e.g., personalized care plans and predictive healthcare analytics example, AI discovers trends within patient data [13].

AIoT refers to the interaction between devices in their surroundings and results in massive progress in numerous fields, including the environment, the health sector, industrialization, and agriculture. Sensors, actuators, and appliances are effective IoT devices that gather, share, and analyze information to reach the targets of users. The systems use AI to process and interpret the large amounts of data produced by IoT devices to make the systems more effective and efficient in decision-making. Combining the two technologies also brings new opportunities to automate and be intelligent in various aspects of application [14].

The modeling of AI/IoT over the past few years has proven to be a revolutionary strategy for enhancing system intelligence. In one of the studies, Ghosh A. (2018) [15] states that AI is essential to the IoT systems since it is able to handle very large volumes of data and make rational and autonomous decisions. Equally, the article by Era C. (2024) [16] offers a summary of AI in IoT, where AI improves the performance of the IoT system by making intelligent decisions, operating autonomously, and processing real-time data.

Through combining AI with IoT in intelligent data analysis, organizations can leverage the possibilities of connected devices and smart computing systems in enhancing the overall performance and the strategic decision-making process [17]. This possibility has raised the eyebrows of organizations, and it is expected that the AI-based IoT market will be heavily invested in. As Marengo (2024) [6] points out, the AI-based IoT market, including the case in point, is estimated at billions of dollars annually around the world in 2022 and is forecasted to grow to billions of dollars by 2032 with a Compound Annual Growth Rate (CAGR) value of 24.8.

However, the demand to reconcile the possibilities of data analysis and the provision of privacy remains a key issue that becomes more problematic with the advent of AI and IoT in terms of smart data analysis [18]. Deeper involvement of AI in accessing and processing personal information of networked devices increases the likelihood of infringement of privacy. A compromise between protecting individual privacy and using data to apply AI to users and stakeholders is needed to win the trust of the users and stakeholders [19].

We concentrate on identifying the present and the future tendencies in the application of AIoT technologies to various industries, which include the environment, the economy, and healthcare. This will rely on a critical analysis of the literature and be informed by the study findings. The primary task that we are going to complete is to identify and analyze, with the help of SWOT analyses, the greatest opportunities and threats to advance the application of IOT and AI to the industries mentioned above in all its aspects within the next decade, relying on the current advances in the AIoT environment.

In order to direct the stakeholders and policymakers with the implementation of AI in the healthcare, environmental, and economic spheres, this article is a strategic compass that analyzes it with a SWOT analysis. Assessing the merits, demerits, opportunities, and threats that come with the integration of AI, stakeholders can manage the resources well, make informed decisions, and reduce the risks involved.

II. LITERATURE REVIEW:

Artificial intelligence (AI) system

AI is the study of programming machines to do tasks that call for human intellect. The technology aims to simulate human thought processes. Information processing, human intelligence, the mind-body dilemma, memory, symbolic reasoning, the origins of language, and other fundamental questions are brought up by AI. Making the correct choice at the appropriate moment is the essence of artificial intelligence [7].

AI has gained a lot of popularity recently as a data processing technique. The way the human brain thinks has served as an inspiration for AI [20]. It has the ability to build intelligent systems that might behave, learn, and react similarly to human beings [21]. Actually, AI is a branch of intelligence systems that includes a variety of tools and methods that assist computers in carrying out certain tasks, in addition to data processing algorithms. Among the subfields of artificial intelligence are machine learning, natural language processing (NLP), deep learning, pattern recognition, optimization, robotics, and computer vision. AI is increasingly widely employed in many areas, including IoT, because of its capacity to tackle several complicated issues [22], [23].

Increased data exposure leads to experience, and AI systems develop strong problem-solving skills and the capacity to learn from data in ways that humans cannot. Although there are several different learning protocols, there are three main types of machine learning: supervised learning, unsupervised learning, and reinforcement learning [24]; Using a labeled input dataset, supervised training instructs the model to generate the correct output. Unsupervised training enables the computer to learn from the data by identifying patterns in the data that have an unknown outcome. In order to learn from the consequences of interactions, reinforcement training examines each action in turn and then assigns positive or negative weights for reinforcement [25].

In 1961, AI was used for the first time in the medical industry as a medical diagnostic decision support (MDDS) system to diagnose congenital cardiac disorders [26]. By 1969, the University of Leeds in the United Kingdom had created an MDDS system for diagnostics and simulations. Early in the 1970s, an expert system called MYCIN was created to recognize infectious bacteria and recommend potential medicines for treatment. Internal medicine, veterinary medicine, clinical pathology, psychology, radiology, and diagnostic imaging were among the numerous healthcare specialties that saw the development of further MDDS systems by the 1990s [25]. Unfortunately, mistakes are still quite prevalent and can have life-or-death effects even after years of diagnostic training [27]. In the United States, misdiagnosis accounts for at least 5% of cases and 10% of fatalities [27], [28].

Internet of Things (IoT) system

Physical objects, networks, communication, technologies, hardware (computers, devices), protocols, electronics, platforms, and applications are all part of the vast field of the Internet of Things (IoT), which connects everything from the physical environment (physical objects, animals, places, plants, machines, and people) to the internet in order to exchange data without requiring human interaction. IoT encompasses a wide range of domains, from industrial industries to human activities. The Internet of Things' primary objectives are to offer the greatest services to people, enable a wide range of intelligent new applications in the fields of medicine, industry, economics, education, and even daily life, and make it simple to automate interactions between people and their surroundings [29].

Applications Use scenarios offering the opportunity to practice predictive analytics strategies to improve the IoT application systems were discussed in several articles. These are smart farming [30], smart healthcare [31], [32], smart environments [22], [23], and smart agriculture [33].

Based on the proposed Telemetry dataset for the industrial IoT (IIoT) and Industry 4.0/IoT, Alsaedi A. et al. (2020) [34] evaluated the usefulness of a DL model and several popular machine learning methods in both multi-class and binary classification as an intrusion detector. Moreover, they proposed and characterized a dataset called TON IoT to cope with the lack of benchmark IIoT and IoT datasets to analyze IDS-enabled IoT systems. When compared to the other approaches, CART yields more results, with a score of 77% against all measures and 75% on F-score. The main finding of the evaluation was that, in all the measures, CART and RF were rated highest. The results indicate that both KNN and LSTM ranked second best amongst the other techniques.

This is one of the aims of smart environments, which involves predicting the future of the environment based on the past data collected by sensors. Imran et al. (2021) [23] proposed an IoT-based modeling system that predicts fire spread and areas burned in mountainous terrain as a step towards achieving this goal. Mumtaz et al. (2021) [22] introduced a system that is capable of predicting the level of air pollutants within an indoor environment. Also, Kocian et al. (2023) [33] introduced an IoT-based smart agricultural system. This technology was easy to use with a dynamic Bayesian technique to model the crop coefficients and estimate the crop evapotranspiration (ET) in a soilless medium. In order to predict the crop ET, it considers data collected using various sensors, including temperature, global radiation, and the weight of the crop.

Zhang Y. et al. (2019) [35] offer a deep belief network (DBN) and genetic algorithm (GA)-based Internet of Things-based intrusion detection model. Furthermore, the model and methods were tested on the NSL-KDD dataset. The detection rate of this approach is more than 99%. Nonetheless, the data is not necessarily representative of the IoT network traffic since it is not aimed at an IoT system in particular.

AI-driven IoT (AIoT)

The initial stages of AI-driven IoT were focused on the enhancement of the functionality of IoT devices with the help of machine learning algorithms [36]. The emphasis shifted to the exploitation of the advanced sensors and secure communication networks, even though these primitive developments laid the foundation for the sophisticated integrations. The introduction of AI-based sensors changed the paradigm of AI applications to next-generation IoT applications, and IoT evolved substantially. This has spread to more advanced and radical uses, beyond the mere gadget functionality features [37].

Among the most prominent applications was the case of the agricultural industry, wherein AI and IoT revolutionized the traditional way of farming and advanced agriculture as a profitable business [38]. This initial success can be viewed as an illustration of how AI can transform processes and industries. With these developments, studies shifted to involve the incorporation of cloud computing, big data, artificial intelligence, and the Internet of Things, and with that came emerging issues. The trend pointed to a convergence that will affect the future of AI-driven IoT and not discrete technology breakthroughs [39].

Khadam U. (2024) [14] explains that artificial intelligence is transforming the healthcare sector by enhancing the quality and efficiency of healthcare. An example of AIoT devices used to boost diagnoses, replace manual tasks, and make evidence-based decisions is wearables and smart sensors. Diagnosis, authentication, and event recognition are the most commonly described sub-tasks when it comes to discussing AI tasks in the healthcare industry. Decision assistance is the second common AI activity in the healthcare sector, and more publications focus on operational rather than strategic decisions. Decision-making and action, primarily to control and allocate resources, were the third most common responsibility. Finally, artificial intelligence (AI) is applied in healthcare in data management, i.e., noise reduction, sensitive information removal, and data filling. At the same time, the safe smart wearable computing advances based on the AI-powered IoT and cyber-physical systems yielded promising results, especially in health monitoring [40].

According to Salah Uddin et al. (2019) [41], one practical example of the predictive capabilities is the presentation of the deployment of the Smart Indoor Agriculture System, where it is possible to note how predictive analysis can be effectively used in the IoT to ensure efficient management of the resources. It is an ideal illustration of how AI-based analytics goes beyond the theoretical framework and can be applied to the real-life scenario of resource optimization. Moreover, the article by Saadia D. (2021) [39] examines the sophisticated interaction of big data, cloud, IoT, and AI and sheds light on the emergent problems and research questions. The complexity in dealing with other technologies is reflected in this paper, and it makes the case of knowledge holistic to propel data analytics developments.

This integration promised benefits, such as higher security, transparency, and automation, which established the foundation of the integrated multifarious potential of these technologies [42]. Also, the fusion of AI and big data in the IoT has emerged as a force behind the enhancement of the processing and transmission of IoT data [43]. Koroniotis et al. (2019) [44] primarily focused on AI-based methods of detection of IoT networks. They introduced a new dataset, which they called Bot-IoT, and did binary classification and classified the forecast output of the models as attack or normal traffic. They compared their data set to other publicly available data sets. It was claimed that the proposed dataset will be the only one in the comparison that contains the IoT traces. The training of the classifier was based on SVM, LSTM, and RNN to determine the quality of the new dataset. As the RNN and LSTM implementations outperform the SVM implementation, the obtained results indicate that the Bot-IoT can be applied to train effective models. They did, however, not separate the output into the different types of assaults.

A security concern, which is a vital aspect of the integrated IoT technologies, is discussed by Ikharo (2021) [45] and presented as a groundbreaking model that ensures high security in the blockchain, AI, and IoT ecosystem. This paper has shown that robust security has to coexist with the agnostic data analytics innovation to build trust in the integrated IoT systems. Moreover, the paper by Ramasamy (2022) [40] provides an actual example of how AI impacts society in the context of IoT because it shows how AI-enabled IoT-CPS algorithms can be utilized effectively in health monitoring. This shows the feasibility of data analytics that are based on AI and how it can revolutionize health monitoring and the overall welfare of society.

The combination of AI with IoT, or AIoT, is a significant technical advancement that has the potential to revolutionize the healthcare, environmental, and economic spheres. The studied literature clearly shows the scope and depth of AIoT's impact, highlighting both new potential and underlying difficulties.

AIoT-driven automation and intelligent data analytics have a major positive impact on the economy. As previously said, AI's ability to process large and intricate information improves supply chain effectiveness and dynamic pricing tactics, which in turn creates a robust and competitive marketplace [46]. But at the same time, these developments increase socioeconomic gaps and pose threats like digital exclusion and workforce polarization, necessitating focused approaches to optimize positive outcomes and minimize negative ones [47].

Disaster response and sustainable resource management require real-time monitoring and predictive actions in the environmental context, which AIoT can provide. It is worth mentioning that AI-based sensors and drones are used to control pollution and preserve the environment [48]. Nevertheless, the environmental effects of mass production of the IoT devices and the complexity of the system interoperability are two significant barriers to scaled adoption [49]. As a way of ensuring a safer environment, the literature suggests more robust cybersecurity models alongside more sustainable design ideologies.

As remote patient monitoring, diagnostics, and personalized therapy advance and offer better patient care and efficiency in their activities, the medical sector remains among the possible fields of AIoT use [50]. Despite such significant therapeutic advances, such ethical dilemmas as those related to algorithmic bias and data leaks, and the shortage of skills in medical workers, remain challenging. To ensure the safety and trust of patients in AIoT applications in medicine, the evaluation highlights the importance of comprehensive training courses and legislation.

Taken together as a unit, the literature speaks in favor of a multidisciplinary, holistic approach to the implementation of AIoT, which combines technical innovation and socioeconomic aspects, ethical aspects, and sustainable development goals.

Related Work

Various background studies have contributed to the current research by shedding light on the characteristics and impacts of AIoT in most industries. The authors in the article by Tonde and Dwivedi (2025) [46] mention operational efficiencies and regulatory obstacles in their innovative SWOT analysis of smart city models. Their research is a great source of background about economic analysis, as they present the concept of AIoT in the urban industrial ecosystem background.

The more complex sensor integration and pollution prediction models introduced by Chen et al. (2023) [48] are presented in a better structured way in their comprehensive empirical study on the use of AI to monitor the environment. The input of AIoT in conserving the environment focuses on applying the technology to smart grids and the actual monitoring of the ecosystem in real-time. These studies inspire the environmental aspect of this study by identifying the technical potential and real constraints.

In addition, Olawade D. B. (2024) [51] presents a summary of the topicality of environmental monitoring, the issues of the traditional method, and the possible solutions, which are based on AI. The AIT technologies emphasized improving environmental monitoring through the understanding of the environmental risks, prediction, and prevention. Nevertheless, there are various challenges and barriers, such as the shortage of professional experts in AI and the environmental sphere, data access, management, and privacy, which impede reaching the full potential of AI. These issues are particularly apparent in the regions where the infrastructure in terms of technology is a developing phenomenon. They also ensure that, despite these challenges, AI in environmental monitoring boasts a bright future. It is anticipated that AI algorithms and data gathering, as well as processing power, can only make pollution monitoring and control more accurate and effective.

Smart manufacturing systems can be equipped with AI and IoT, and become much more productive and efficient in their operations. However, very little of this is associated with the effect of these new technologies on the environment, especially on the consumption of resources and energy. Therefore, Cate M. (2023) [52] performs an in-depth environmental impact analysis of AI and IoT integration in smart industries when the methodology of a Life Cycle evaluation (LCA) is used. They mention that a smart manufacturing system is efficient with energy at different points, including production, deployment, operation, and decommissioning when their usefulness runs out. They emphasize the importance of applying the principles of the circular economy to minimize the impact on the environment and to increase the energy efficiency of intelligent industries.

In the article, Kaushik (2021) [50] analyzes the impacts of AIoT on patient care quality and accessibility in the medical sector in detail because groundbreaking remote health monitoring and the improvement of diagnostic accuracy can be revolutionary. Their research contributes to the study of the medical profession, particularly in areas of training needs and legal matters.

Charfare R. (2024) [53] is a survey study; this offers a detailed analysis of the implementation of IoT-AI to healthcare, namely, the wearable technology (wristbands, smart bands) and health monitoring interventions. The results of AIoT use are significant achievements, including new solutions to data fusion and forecasting, models to improve the monitoring of patients, and innovative solutions to remote care. Also, it discusses in detail the key concerns such as data privacy, interoperability, and regulatory compliance, and evaluates their impact on the implementation and efficiency of AIoT healthcare systems in particular.

Within the framework of sustainable development, Shkalenko and Nazarenko (2024) [2] focus on the problem of examining the complex interaction of AI, the IoT, and the institutions. It discusses the effects of such technologies on social and economic development, which determines the positive and negative effects that are bound to be felt with such technologies. The findings reiterate the importance of institutional adaptation to achieve environmental sustainability and the necessity to integrate technical developments with broader social and environmental operations.

Also, more broad-based multidisciplinary perspectives by Acemoglu and Restrepo (2020) [47] dissolve the socio-economic effects of AI implementation, including labor market upheaval and the digital divide, and situate the economic consequences of AIoT within the inequality discourse of the world. Also, Trabelsi M. (2024) [54] ensures that AI contributes to economic growth and productivity. It can significantly improve decision-making and make it much more efficient by processing large volumes of data, but it also carries just as many threats of structural unemployment, the increase of inequality, polarization of the job market, and the creation of new imperfect industrial structures.

The existing research fills these significant gaps to present a comprehensive AIoT structure that helps to position the strategic implementation with less risk and more innovation-based development in healthcare, environmental, and economic settings.

III. Methodology

Research Design

In this research, the research design is a qualitative research design, which will be built on a systematic literature review and a SWOT (Strengths, Weaknesses, Opportunities, and Threats) framework of research. The aim is to measure holistically the present form and future prospects of AIoT (Artificial Intelligence of Things) in the economic, environmental, and health sectors.

Data Collection

An attentive analysis of scholarly articles on the topics of journal articles, conference papers, and authoritative reports published since 2017 has been performed. The keywords used to locate relevant literature at major academic databases, including ScienceDirect, IEEE Xplore, SpringerLink, and Google Scholar, were found. The keywords were Artificial Intelligence of Things, IoT applications, AI adoption, SWOT analysis in AIoT, and domain terms related to the area of the economic field, environmental monitoring, and healthcare technology.

Inclusion and Exclusion Criteria

The inclusion and exclusion criteria were as follows.

The inclusion criteria gave preference to peer-reviewed articles that:

- Talk about AIoT applications or concepts in the three selected industries.
- Present empirical data, case studies or extensive reviews that apply to SWOT aspects.
- Published in English and found in full text.

The exclusion criteria excluded sources with an insufficient level of methodological rigor or that dealt exclusively with technical aspects of AI or the Internet of Things without integration.

Data Analysis

The gathered literature was sorted in a systematic way to obtain the information related to each component of the SWOT structure:

- Strengths: In-house qualities and competencies of AIoT technologies that contribute to positive effects.
- Weaknesses: Internal restrictions and problems that influence AIoT performance or adoption.
- Opportunities: Environmental circumstances and trends that support AIoT growth and development.
- Threats: Exogenous dangers, obstacles, or negative elements that may impede the success of AIoT.

The content analysis has conducted a synthesis of the repetitive themes, convergent and divergent views between sources. This informed the detailed SWOT matrices, which are provided on the domains.

Limitations

This approach is based on published literature available and can be prone to publication bias and changing AIoT studies. There may be some very fast-growing or proprietary applications that are not entirely covered.

IV. SWOT ANALYSIS

The study and evaluation of different strengths (S), weaknesses (W), opportunities (O), threats (T), and other aspects that impact a certain issue is known as a SWOT analysis. It correctly, thoroughly, and methodically explains the situation in which the subject is situated [55].

Based on the assessment's findings, this aids in the development of the related plans, strategies, and countermeasures [56]. This approach may be utilized to pinpoint existing issues, identify favorable and unfavorable circumstances and variables, identify the difficulties and barriers encountered, and create strategic plans to inform scientific judgments [57].

A realistic, fact-based, evidence-based, or empirical examination of an entity's internal and external variables, as well as its present and future potential, is therefore made easier by this instrument [25].

Analyze the use of AIoT in the economic field

Key components like work and advancements in working environments are linked to the economic and technical viewpoints. According to a review of the literature on these objectives, the industrial use of AI has contributed to already-existing problems like overuse of raw materials, contamination from industrial processes, and wage gaps between qualified and unqualified workers. It has also increased the risk of unemployment due to digital breaches [58]. Nevertheless, the aforementioned difficulties may be substantially resolved with the proper use of the benefits that AI offers under appropriate strategies [59], [60].

Higher education and formative itineraries under a scientific-technical profile are becoming increasingly necessary [61], [62], would signal a possible chance to ease the digital gap across professional sectors, promote employability driven by innovation, enhance professional mobility, and ultimately support economic success [47]. The significance of such formative itineraries should be viewed not only as a key weapon in the fight against the digital breach, but also as a way to protect vulnerable workers whose jobs or tasks may eventually be replaced by robots or algorithms, as well as by sectors of the population that have historically had greater access to them [63]. In the meanwhile, encouraging creative and added-value AI advancements may be seen as a successful strategy to create new labor tasks and, eventually, new jobs to replace those that may be lost as a result of automation [47].

A significant portion of the economy is made up of industry. The sector is now changing quickly, which will have an impact on people all around the world. Additionally, the industry and its subjects (consumers, investors, and employees) interact differently [64]. Every aspect of sustainable development—economic, social, environmental, and institutional—is significantly impacted by industry. However, the growth of trade and international competition, the availability of energy and raw materials, the need for their more efficient use, technological advancements, the workforce's skill set and qualification structure, and other factors also influence its state and development. Finding efficient practices, policies, and measures that would enable the industry's adaptability to shifting circumstances is its top goal in this dynamic environment [65], [66]. In order to minimize waste and pollutants, it is necessary to match 3D printing processes with highly regulated recycling policies and to concentrate electronics manufacturing on these policies [67].

Additionally, there are several opportunities pertaining to industrial processes and sustainable innovation. According to Palomares et al. (2021) [61], one of these is supporting innovative startups and SMEs with potential innovation projects for Industry 4.0 and the digital transformation of the economy. However, if this course of action is in accordance with the benefits of AI to automate and improve

DOI:10.5281/zenodo.17536693

the efficiency of punishment processes against infringers, smart contracts may be able to enforce regulations that are in line with pollutant reduction [68]. In order to impose highly regulated pollution reduction, it is also necessary to increase the presence of IoT and big data in industrial settings and transportation infrastructure [69], [70], [71]. Last but not least, it would be advantageous for the scientific community to support AI-guided R&D project evaluation procedures in order to identify possible effects of industrial and innovation processes and, as a result, support the funding of initiatives with more significant environmental, economic, or social ramifications in their suggested activities and portfolio [61]. The SWOT analysis of IoT use in the economic domain is shown in Table 1 below.

TABLE 1 SWOT ANALYSIS OF THE USE OF IOT IN THE ECONOMIC FIELD

Strengths	Weaknesses
- New technologies are appearing in emerging nations' industrial and primary sectors. - New STEM positions to increase economic crisis resilience. - Personalized social media ads make it easier to find employment openings. - Deep Learning as a powerful predictor of home income using data from mobile devices. - Flexible work schedules and effective commuting are made possible by smart cities and intelligent transportation systems. - Access to and use of AIoT in more industries is made possible by declining sensor prices and open data.	- Highlighted violations of unregulated AIoT implementation in work environments. - In the least developed nations, robots or algorithms are replacing underqualified labor. - Instability and institutional corruption as barriers to economic growth. - Inconsistency between quality metrics for innovation and scientific output. - The potential spread of AIoT in some applications is dismissed by current research on its effects on the workplace.
Opportunities	**Threats**
- AIoT and digital technology help the government make decisions that prevent economic violations. - One of the main drivers of job creation is digital labor and overseas outsourcing. - Secure online banking and e-commerce are accessible to anyone thanks to mobile technology. - Blockchain for government procedures that are open and free from corruption. - AIoT, machine learning, and ambient intelligence to predict workplace mishaps in high-risk situations. - Everywhere, Industry 4.0 fosters the growth of startups, small businesses, and medium-sized corporations. - Agriculture and food production are changing as a result of the digitization of crop and assembly chains. - Smart factories will boost the economy in poor nations by fostering inclusive and sustainable innovation. - Drones equipped with expert prediction systems for maintaining vital workplace resources.	- Professional polarization is exacerbated by limited access to education and learning opportunities. - Economic inequality and the rich-poor divide are exacerbated by automation processes. - The use of artificial intelligence and robotics in the workplace has led to a rise in inequality. - Because of employment losses, Industry 4.0 poses socioeconomic challenges to emerging nations. - Automation powered by AIoT may have an impact on low-wage workers. - AI-replaced labor duties create potential for criminality. - Unchecked growth in remote work may indicate organizational and psychological concerns. - Trade has become more technologically globalized, increasing the likelihood of economic inequity. - Child trafficking is used in the manufacture of certain elements, such as coltan, which are required for AI and IoT circuits.

Analyze the use of AIoT in the environmental field

Promoting sustainability has gained a lot of attention in light of the growing problems with climate change, environmental degradation, and ecological imbalances [72]. Sustainability has drawn more attention and support from people, organizations, and governments in recent years as environmental preservation has been more widely recognized. For instance, governments create environmental assessment systems to reinforce rules and create policies and regulations that support environmental sustainability [73]. Additionally, businesses and financial institutions are promoting environmental sustainability as a result of management, investors, and the general public's increased attention on corporate sustainability. In particular, social concerns push businesses to enhance their environmental performance and provide more environmental information [74].

Because it directly tackles important global issues, including waste management, pollution, and climate change, environmental sustainability is crucial [75]. Because it is concerned with the quality and health of the natural environment, the natural environment is also concerned with climate change and action, the health of life beneath the surface of the ocean, and the preservation and protection of life and biodiversity on terrestrial ecosystems.

An efficient use of natural resources is strongly related to protecting and conserving the environment, and AI has a lot to contribute in this regard [76]. However, it's also critical to consider the possible harm that catastrophic natural disasters might do to humanity in the context of our interaction with nature [77]. An impending incident may be predicted by AI models that are given sensor data, allowing for prompt decision-making and proactive measures to eventually save human lives. By maximizing the use of cleaner energy options, energy demand forecasting would also assist in taking proactive measures to reduce any potential adverse environmental consequences [78], [79].

The protection of the environment must unavoidably be accompanied by careful status monitoring. In this regard, the integration of robotics and artificial intelligence is essential [80]. The use of deep learning models on satellite image data to: (i) identify desertification-risk areas, (ii) prevent ocean degradation, (iii) identify fire-prone areas, and (iv) locate areas that may experience deforestation is a prime example of this [81], [82]. The degradation of ocean ecosystems in general and coral reefs in particular, which is mostly caused by plastic trash and oil dumping, may also be detected with the help of integrated usage of current AI technologies [83], [84]. Alternatively, to maintain balanced ecosystems, illicit fishing, deforestation, and animal and plant populations should be tracked and monitored [85], [86]. Identifying illnesses, pests, or anything else that might endanger an ecosystem's components' ability to survive [87]. In order to prevent deforestation in wild regions, farmers should also increase their production and use less water [88].

Additionally, academics have examined the advantages of IoT for environmental sustainability from a variety of angles, highlighting its significance in a range of applications, including intelligent waste management, smart cities, environmental monitoring, and energy management. For example, the use of IoT to build smart cities has been well documented, and a number of academics have demonstrated how IoT makes it possible to gather and analyze data in real time using network sensors, which enhances urban infrastructure and services [89]. Also, an analysis by Siemens of City Air Management systems demonstrates the importance of IoT in predicting air quality, which is beneficial in the pollution control efforts [90]. Other studies by Ja Ajith et al. (2020) also highlight the possibility of using IoT to provide real-time data on water and air quality and take timely measures and control pollution. Yang et al. (2020) [91] state that IoT can assist in managing energy by enabling the harmonious incorporation of renewable energy sources and streamlining the energy distribution. It, therefore, decreases carbon emissions and enhances energy efficiency.

Environmental monitoring is another essential field where IoT has proven to be quite promising [92]. As part of helping smart transportation networks and reducing their impact on nature, New York Waterway boats (as one example) are equipped with the Internet of Things (IoT), which gathers data on connected sensors [90]. Moreover, with the development of IoT technology, the topic of smart waste management has improved. Smart bins with sensors based on IoT can reduce greenhouse gases, conserve energy, and enhance the garbage collection route [93].

Alzahrani et al. (2025) [94] examined the feasibility, benefits, challenges, and implications of implementing AI-based waste management systems in such communities as another beneficial application. AI capabilities such as predictive analysis, optimization algorithms, and Internet of Things sensors can be used to develop innovative solutions to make the situation of garbage collection and recycling services and environmental conservation more effective. Nevertheless, socioeconomic issues, involvement of stakeholders, privacy issues, and infrastructural constraints are some of the significant challenges facing its successful implementation. They concluded that the most significant issues could be addressed in a more effective and sustainable way in the course of the collective planning and collaboration by including AI technology in the smart waste management and communicating with the most vulnerable population groups.

However, AI-IoT systems consume a lot of energy through data centers, communication networks, and millions of connected devices, which require constant electricity to operate and be connected. The processes and materials involved in the manufacturing of the IoT devices pollute the environment, and the rapid pace at which the technology is being developed does not help to control the lifecycle of the devices, besides the fact that it is hard to deal with the dumping of electronic waste. However, the same technologies offer previously unheard-of opportunities for optimization of resources, environmental measurements, as well as sustainable system management across industries and use cases [95]. Table 2 below displays the SWOT analysis of AIoT applications in the environmental sector.

TABLE 2 SWOT ANALYSIS OF THE USE OF IOT IN THE ENVIRONMENTAL FIELD

Strengths	Weaknesses
- Classification of land and soil is a non-intrusive process by AIoT. - Remote use of predictive AIoT can help underdeveloped nations address climate-related issues. - Sensor-driven automated fire detection to cut costs and take safer, quicker action. - Modern instruments by AIoT for the sustainable and intelligent management of fisheries resources to maintain the equilibrium of ocean ecosystems. - AIoT for Water usage is greatly decreased via intelligent irrigation. - Early crop disease identification lowers the environmental impact and pesticide use. - AIoT models assist in improving judgments related to emergencies or catastrophe recovery. - Various AIoT methods, including neural networks, can effectively forecast water quality indicators, identify oil spills early, and estimate ocean acidification. - AIoT may be used in many ways to teach the next generation about climate change action.	- Climate prediction requires real-time, precise information that is not always inexpensive in some areas. - Emergency services find it challenging to deploy black-box AIoT models to support catastrophe prevention choices. - The difficulty of deploying extremely advanced drones that can function in challenging environments, such as reduced visibility brought on by flames. - Large-scale AIoT systems to minimize pollution emissions in cities are expensive and subject to political opposition. - The high price of installing smart sensor networks to cut down on farming water use.
Opportunities	**Threats**
- Early natural disaster prediction allows authorities to respond quickly and minimize damage. - AIoT-guided reforestation planning and early fire prevention to protect ecosystems and animals. - AIoT predicting the amount of rain in arid regions can help us better understand the tendencies of desertification. - AIoT's ability to forecast traffic and energy use helps cut down on pollutants that have a significant negative ecological impact. - Making use of monitoring data to gather information for forecasted decision-making around the sustainable use of marine resources. - Cultivation automation with intelligent robotics and routing. - Augmented reality and conversational AIoT agents might support youth education on climate change and the future.	- Climate change means AIoT algorithms that use data to forecast natural disasters will become outdated. - One of the biggest obstacles to using AIoT to stop deforestation in the least developed nations is that the accuracy of demand forecasts may be hampered by unforeseen events that impact energy usage. - Large forests and rainforests, like the Amazon rainforest, are extremely vulnerable to national economic conditions and governmental policy. - Uncontrolled disasters might result from malicious exploitation of AIoT digital technology and cyberattacks on prediction systems. - Maintaining current warning systems and supporting them with AIoT in land regions presents significant logistical challenges. - The computing cost of AIoT is

	inevitably high and energy-intensive.

Analyze the use of AIoT in the medical field

The medical industry uses a number of AIoT-based healthcare services, such as monitoring devices, diagnosis tools, telecare, and electronic health networks, and preventative and rehabilitative equipment. Radio frequency recognition systems and wireless body area networks are significant but not essential elements of Internet of Things technology. While studies in related domains have demonstrated that remote health monitoring is possible, the potential advantages in a range of situations are far more substantial. By tracking noncritical patients at home instead of at the hospital, remote health monitoring might ease the strain on hospital resources like doctors and beds [96]. By improving access to healthcare in rural regions it might be used to help older adults remain in their homes for longer. Essentially, it gives individuals greater control over their health and reduces the strain on healthcare facilities while also improving access to clinical treatments [97], [98].

AIoT has been applied in medicine to optimize critical clinical choices and deliver precise, real-time medical data. Cost-effective medical methods have been made possible by the technology, which has also made it easier to do duties like organizing appointments, translating clinical information, and keeping track of medical histories [25], [99], [100]. AI technology has helped healthcare institutions save time by speeding up clinical processes. It has also been used to evaluate large amounts of data for precise diagnosis, therapy, and disease outbreak prediction via a study [25].

Moreover, the healthcare sector is among the largest concerns regarding the use of AI in nursing care due to the fear of losing a job. The medical staff might fear that AI systems are going to lead to a reduction in the number of workers by automating or decreasing the need to hire them. However, one must address these issues in advance, emphasizing that AI is designed to complement nursing care, not to replace it [101]. Even though there are groups of the population, which are starting to grow worried that soon radiologists will be substituted by AI technology, the radiologists adopting AI will substitute the radiologists who do not adopt it [25].

The ability of personnel to utilize and communicate with these game-changing technologies is paramount to the successful implementation of AIoT into care. Nevertheless, addressing the prevalent issues of skill deficit among nursing personnel remains a major concern. This may be because many nurses lack the education and experience to utilize the vast potential of AIoT technologies [102]. Besides, the vast number of papers on the topic underlines the urgency of overcoming these skill gaps as quickly as possible [103], [104]. These skill gaps and the need to bridge them with the help of substantial spending in extensive training programs should be given great priority by healthcare organizations to improve the expertise of the workforce with AIoT. Such courses should be well-designed to provide nurses with the important information and skills that are required to utilize AIoT systems effectively [105].

AIoT has revolutionized radiation therapy in the medical imaging field, particularly cancer treatment. Machine learning techniques have been employed in managing cancer to detect diseases, assist in medical decision-making, and propose treatment options. The responsible use of AIoT has enabled medical imaging units and centers globally to enhance and expand vital processes, reduce administrative burden, and liberate physicians to focus on their core purpose of patient care [25].

One of the most important applications of artificial intelligence to medical imaging is to improve the competencies of doctors in poor countries [25]. Another issue that presents many healthcare organizations with significant challenges when it comes to using AI technologies is the initial high cost. Significant investments must be made to develop and implement AI infrastructure, buy AI software, and integrate it with the current healthcare systems [106]. This can be quite a task, especially for those healthcare institutions blessed with scarce resources. Moreover, to address this barrier, healthcare organizations must consider their financial capacity closely and prioritize AI investments based on their potential impact on patient care and operational efficiency [107]. Collaboration with other parties, such as IT companies or universities, may provide access to resources and cost-sharing opportunities that would otherwise not be available [108].

With the use of AI, diagnostic imaging modalities, including computed tomography, nuclear medicine, plain X-ray, magnetic resonance imaging, ultrasound, and others, are being applied in the following areas: monitoring the illness, identifying the medical condition, capturing pictures, segmentation, and analysis. Some of the benefits of AI in diagnostic imaging for revolutionizing radiation medicine in developing countries include classifying brain and other organ tumors, identifying breast cancers, detecting hidden fractures, detecting neurological abnormalities, and giving secondary opinions, among others [25].

One of the primary concerns of utilizing AI in healthcare is the protection of the data against breaches. Hackers are well-known targets in the healthcare industry since it holds too much sensitive patient data. To do their job right, AI systems need to be able to access a vast amount of patient data, which is also why they can be potential sources of bad actors [109]. Healthcare organizations need to invest heavily in robust cybersecurity measures to safeguard and preserve patient data. This includes intrusion detection systems, access controls, and encryption [110]. Moreover, security is to be considered in the design process of AI systems to ensure that the data is protected throughout the entire processing and storage [111]. Table 3 below shows the SWOT analysis of the application of IoT in the medical sector.

TABLE 3 SWOT ANALYSIS OF THE USE OF IOT IN THE MEDICAL FIELD

Strengths	Weaknesses
- A useful technique for a number of medical diagnosis jobs is predictive machine learning and AIoT. - Disease observation and forecasting. - Interpretable, data-driven decision support systems for critical care, especially newborn patients. - Medical forecasts are revolutionized by deep learning on medical picture data. - Advances in biomedicine are driven by machine learning using large data and expert judgment, as well as diagnostic imaging for tumor categorization. - The improvement of doctors' skills in underdeveloped nations. - AIoT to oversee scarce medical resources in rural regions.	- Continuous data collection is necessary for the prediction of cardiovascular or air pollutant variables; in many situations, the absence of data may be problematic. - High expenses for installation and upkeep, particularly in poor nations. - The dearth of crew members with professional qualifications in underdeveloped nations - Without human oversight, drug development automation is prone to mistakes.
Opportunities	**Threats**
- Smart settings powered by AIoT for senior care. - Extension of services to underprivileged areas. - AIDS prevention using social media trend analysis. - AIoT sensors, social media, and mobile devices in smart areas for early epidemic illness detection. - An examination of AI-powered image systems. - Wearable technology for data logging and activity tracking. - AIoT systems of recommendation and personalization are used to discourage tobacco use and encourage healthy lifestyle choices. - AIoT for vaccine development and precision medicine. - Educating medical personnel on reliable AIoT to improve decision-making.	- Mortality rates may be increased by false-positive results in high-risk pregnancies or cancer diagnosis. - Redundancy, perceived job losses, and job automation - Social media-based suicide prevention strategies jeopardize people's privacy. - A loss of human abilities might result from the overuse of AIoT technologies in surgical procedures. - The absence of regulatory systems and accountability - Ethical AIoT conundrums about "who to blame" for deadly decision results.

Theoretical Framework Integration

Using the clearly laid theoretical perspectives of technology acceptance and innovation diffusion, the results of the study on the adoption and impact of AIoT-integrated AI on the economics, environment, and healthcare sectors can be made clear.

As formulated by Davis (1989) [112], the Technology Adoption Model (TAM) gives a lot of emphasis on how the perceptions of consumers about the new technologies are influenced by the perceptions of usefulness and usability. This is closely connected with the SWOT opportunities and strengths of this study. The perceived utility is high and can be manifested through the ability of AIoT to enhance operational efficiency significantly, real-time data analytics, and customized healthcare [46], [50]. At the same time, the development of AI algorithms and the decrease in sensor prices make things easier to use, which stimulates their use in a number of industries.

Conversely, the threats and weaknesses, along with the high implementation costs, the privacy issues, and cybersecurity threats identified by the SWOT analysis, represent challenges that reduce behavioral intentions to the adoption of AIoT and influence the negative attitudes. These characteristics coincide with the Theory of Planned Behavior (TPB) that puts a focus on the impact that social norms and perceived behavioral control have on an individual's tendencies to employ technology [113]. Otherwise, the concerns related to the ethical dilemmas and data confidentiality breaches may undermine trust and reduce adoption levels [110]. Besides, one could adopt the Diffusion of Innovations (DOI) theory by Rogers (2003) [114] to imagine the distribution and growth of AIoT technologies across the industries that are studied.

Various factors such as trialability, observability, complexity, compatibility with existing systems, and relative benefit define the speed and extent of technological spread. As an example, the difficulty in linking various IoT devices and AI models discourages their general dissemination, whereas the benefits of environmental management and predictive healthcare are evident and speed up their acceptance [115]. The example of a way in which innovators and early adopters facilitate diffusion includes the opportunistic contribution of startups and digital labor to the economic digital transformation [47].

To maximize the harvests and minimize the environmental impact, smart farming, in this practical example, employs AIoT apps that tie the IoT sensors to AI-based analytics to control irrigation and the use of pesticides [33]. The perception of cost savings and ease of use of automated irrigation systems affects the adoption of the solutions by farmers positively; the complexity aspect of DOI presents as interoperability problems with the system.

Healthcare Remote Patient Monitoring, as one more practical example, has decreased the hospitalization rates, and more efficient individualized therapy has been demonstrated when the use of IoT-enabled wearables and AI analytics helps to cope with chronic diseases [116]. Patient and provider adoption requires clear perceptions of utility and data privacy control, which underscores the concepts of the TAM and TPB.

And to control energy, AIoT-powered smart grids would provide cost-efficient urban settings through dynamic optimization of the energy requirements and the renewable energy sources using sensor data and machine learning algorithms [117]. The trialability of experimental smart grid projects has facilitated their wider adoption by showing quantifiable benefits, and is in line with the innovation criterion of the DOI.

This study presents the synthesis of different frameworks with empirical SWOT findings to give a multifaceted picture of patterns of AIoT adoption. It focuses on the significance of minimizing risks by technical innovation, regulation, and education, and at the same time, enhances the benefits of technology and user perception. Such integration makes informed practices of supportive, efficient, and fair implementation of AIoT in complex real-world socio-technical ecosystems possible.

Summing up, an empirically based multifaceted framework is created through the synthesis of the empirical SWOT results and TAM, TPB, and DOI. This paradigm contributes to explaining the behavioral and contextual factors required to make the deployment effective and last long, as well as the technological and operational stimuli of AIoT implementation. The acquired knowledge will help the researchers, industrial leaders, and governments to create customized plans that will help in creating user-centered, scalable, and ethical AIoT systems in various industries.

V. DISCUSSION

The synthesis of artificial intelligence and the Internet of Things. This discussion exhaustively discusses the issues of pros and cons, opportunities, and threats that AI has presented to areas of economics, the environment, and medicine.

Economic field

IoT and AI technologies have much to provide the economy, such as the greater efficiency of operations, immediate data analytics, and the automation of processes, which lead to the reduction of costs and the increase of production. These benefits give businesses a chance to grow and evolve in ruthless marketplaces. The disadvantages, however, are the high cost of implementation, privacy concerns about the data, and the need to have some expertise, which may block widespread use.

Using data-driven decision-making, IoT and AI in the economic sector offer previously unknown levels of operational efficiency. Using big data, e.g., real-time transactions and international news feeds, AI-driven predictive analytics is helping financial institutions make predictions about stock market trends, making investment decisions more accurate than traditional methods. An example is how businesses track their supply chains down to each and every level through the IoT sensors and artificial intelligence, maximizing resource allocation and reducing waste. Moreover, AI-based dynamic pricing algorithms are heavily utilized by the travel and e-commerce industry, adjusting rates in real-time to maximize profits guided by competition and demand information. This synergy enhances economic productivity, although it might be limited to large-scale deployment due to the expensive nature of implementing it initially and data security [46].

The prospects are in the increasing financial projections, resource management smarts, and market intelligence guided by AI that can transform traditional economic paradigms. However, in order to guarantee long-term growth, the risks that may represent a threat to it, such as the risks of cybersecurity and regulatory uncertainty, need to be reduced.

Environmental field

The positive impact of IoT and AI on nature is that it is possible to track and control the natural resources and establish proper management, introduce sustainable approaches, and rely on analytics to respond to disasters. The strong points of the area include real-time data collection of the environment and smart system reactions that will contribute to environmental and urban resilience. IoT and AI can offer a critical improvement in environmental factors because of better monitoring and prediction. The satellite images and meteorological data can be used to improve air quality models and predict pollution more accurately due to AI-driven sensor systems [48]. An example of this is the use of AI by smart grids and renewable energy sources to optimize energy distribution and minimally affect the environment [118].

Non-invasive methods to monitor endangered species and deforestation are also supported by AI-powered drones that help in conservation. The primary procedures that could be applied because of the necessity to reduce greenhouse gas emissions radically and considerably are the real-time monitoring of pollution and automated air purification systems relying on the use of IoT and AI. However, to achieve the ultimate goal of environmental utility, vulnerabilities, including cybersecurity threats and interoperability with other sensor systems, must be removed [49]. Moreover, the problem of the environmental impact of the manufacturing and disposal of IoT devices is of interest as well. Because of AI-based analytics, many possibilities of innovation in intelligent agriculture, sustainable energy, and pollution control are available. Data security breaches and misuse of environmental data should be handled to maintain the trust of stakeholders.

Healthcare and Medical field

The IoT and AI in healthcare are transforming the way patients are received through accurate diagnosis and remote monitoring. Some of the advantages of the IoT and AI in the medical industry include improved patient monitoring, personalized care, and strategic diagnosis. One of its greatest aspects is the ability of these technologies to analyze large amounts of health data in real-time and make accurate and timely decisions, thereby improving health outcomes [50].

Information science and libraries IOT SWOT analysis. Anthology of Research on the Digital Service, Collaboration, and Resource Management for the Sustainability of the Library. Wearable technology with Internet of Things functionality, as observed through the wide use of IoT glucose devices among diabetic patients, is a constantly tracking device of vital signals such as heart rate and glucose that are crucial in the treatment of chronic diseases [119]. Remote patient monitoring devices deliver health information directly to health care professionals, resulting in timely treatments and reducing hospital readmission rates [120]. Moreover, medical imaging, i.e., IoT-connected MRI machines, supports the use of AI-assisted diagnostic accuracy with the help of real-time data analytics and machine learning [121], [122].

The IoT-based smart infusion pumps enhance patient safety by accurately delivering drugs to the patient and enabling remote control [123], [124]. Although these developments can be revolutionary, it is necessary to still resolve ethical issues, data security, and regulatory integrity [61]. Among the disadvantages (however) are data privacy, ethical concerns, and a demand to adhere to regulations in medical facilities. The opportunities with drug development, AI-aided surgery, and remote health care are a few and can entirely change the nature of healthcare provision. Conversely, threats such as the potential bias of the AI systems and the importance of data security remain among the challenges.

VI. RESEARCH CONTRIBUTION

Analyzing the convergence of artificial intelligence and the Internet of Things in three key areas, economic, environmental, and healthcare, this research will be a unique and comprehensive contribution to the topic of AIoT. This study is also based on vast expanse of multidisciplinary literature in such a way to offer an integrated SWOT analysis methodology specifically tailored to the issues of AIoT adoption and opportunities, unlike many of the other studies in the past that have restricted their scope to focus on a single technology or a single application domain.

Its distinctive methodology joins a technological mastery with socio-economic and ethical factors and provides in-depth suggestions on not just the efficiency of operations and technical capabilities but also upon vital frailties, risks to society, and regulatory factors. The report is valuable to the academic community, business practitioners, and policymakers as it makes practical recommendations by offering detailed, field-specific SWOT matrices with current empirical evidence and case studies.

The article also provides the foundation of future transdisciplinary research by identifying key gaps in research that are not adequately examined, including a shortage of labor skills, data security concerns, and interoperability challenges. Also, it sheds light on recent innovations and trends introduced by AIoT implementations, helping stakeholders to take advantage of technology and minimize its risks.

This integrative perspective enhances the theoretical and practical knowledge of AIoT significantly because it integrates strategic analysis and practical applicability in a wide range of industries. By extension, it is an important asset to ensure sustainable and responsible AIoT-driven innovation.

VII. STUDY LIMITATION

As helpful as the current SWOT analysis tool was in the context of providing a systematic account of the strengths, weaknesses, opportunities, and threats of AIoT technologies, it has several inherent limitations. Published literature makes the review highly reliant, and this may lead to publication bias, as well as limit the scope to fast-moving or proprietary AIoT applications. To provide remedies to these deficiencies, the application of applied research approaches, such as action research, ought to be applied. Such approaches stimulate the iterative development and experimental testing of AIoT systems in a manner that scientific rigor would not conflict with practical relevance.

The applications of AIoT in the future have colossal interdisciplinary research prospects, which integrate computer science, engineering, economics, environmental science, and healthcare. The key concerns that should be explored in the upcoming studies are privacy of data, susceptibility to cyberattacks, ethics, and interoperability with heterogeneous IoT devices and AI algorithms aimed at supporting scalable and reliable deployments.

VIII. IMPLICATION AND FUTURE DIRECTION

As we have already mentioned above, the AIoT has considerable implications regarding both applied applications and research in the future in a wide range of industries. To manage complex socio-technical systems, AIoT offers novel possibilities of multidisciplinary research integrating computer science, engineering, economics, environmental science, and healthcare. AIoT promotes innovative hybrid types, consisting of the integration of cloud-based infrastructures and edge computing, that enable real-time processing of data, maintain device compatibility, and reduce latency. Through enhanced personalization in all industries, the application of open-source AI systems, and neuromorphic computing devices drives the commercial growth of AI in IoT devices. This intersection demands applying such methods of research as action research, which promotes the development and evaluation of AIoT systems in the conditions of real life, allowing the development of solutions that are both empirically viable and scientific.

Future research should focus primarily on mitigating the existing AIoT issues, such as data privacy, breaches of security, ethical considerations, and system interoperability. In particular, the deployment of scalable and reliable solutions will require the formulation of norms and models that will enable smooth collaboration among all IoT devices and AI algorithms. Also, the socioeconomic implications of AIoT should be put on the agenda of the research, and the implications of automation of labor markets, automation of the workplace, and equitable access to technology must be considered.

In real practice, the implementation of AIoT would mean that practitioners embrace lifelong learning and adaptability to the rapidly evolving technology. The use of AIoT-driven data can help businesses achieve better predictive maintenance, more efficient resource control, and personalized customer service. As an example, the healthcare sector provides telehealth and remote monitoring applications through AIoT, which are cost-saving and lead to improved patient outcomes, requiring new care delivery frameworks and training medical professionals in digital competency.

To render AIoT applications acceptable in a morally and legally sound manner, policymakers and stakeholders have to cooperate in ensuring the establishment of an ethical and legal framework that could assist in attaining social acceptability. Responsible innovation can be facilitated by the participation of end users in co-design processes in terms of efforts to address user problems and the usability of technologies.

IX. CONCLUSION

A summary, broad perspective, and analysis of the function and effects of AIoT and related technologies in achieving the expansion of the environmental, healthcare, and economic domains were provided in this study. Based on a thorough review of pertinent literature and a number of SWOT analyses to illustrate the relationship between AIoT technologies and the aforementioned fields, the study offered a position analysis of the difficulties and advancement prospects brought about by these technologies, taking into account various aspects of each field's requirements. A promising scenario is shown by the SWOT analysis of AIoT adoption in the domains of healthcare, the environment, and the economy. AIoT's advantages, such as its capacity to evaluate enormous volumes of data, can greatly improve communication in the aforementioned domains. Additionally, by managing repetitive processes, AIoT may lessen the workload for employees. But there are also significant drawbacks to take into account. Implementing AIoT involves large financial outlays, and successful integration and training are essential. To avoid breaches or misuse, privacy and data security issues should also be thoroughly addressed. There are several benefits to integrating AIoT in many industries, such as better decision-making, lower costs, and better results. AIoT's ability to analyze data in real time can result in preventative measures that save money and lives. However, the dangers are too great to be ignored. Significant obstacles include system resistance to change, the possibility of technological failures, and moral conundrums relating to AIoT decision-making processes.

REFERENCES

[1] M. K. K. Rony et al., “Strengths, weaknesses, opportunities and threats (SWOT) analysis of artificial intelligence adoption in nursing care,” Journal of Medicine, Surgery, and Public Health, vol. 3, p. 100113, Aug. 2024, doi: 10.1016/j.glmedi.2024.100113.

[2] A. V. Shkalenko and A. V. Nazarenko, “Integration of AI and IoT Into Corporate Social Responsibility Strategies for Financial Risk Management and Sustainable Development,” Apr. 2024, doi: 10.20944/preprints202404.0804.v1.

[3] S. Makridakis, “The forthcoming Artificial Intelligence (AI) revolution: Its impact on society and firms,” Futures, vol. 90, pp. 46–60, Jun. 2017, doi: 10.1016/j.futures.2017.03.006.

[4] F. M. Bublitz et al., “Disruptive Technologies for Environment and Health Research: An Overview of Artificial Intelligence, Blockchain, and Internet of Things,” Int J Environ Res Public Health, vol. 16, no. 20, p. 3847, Oct. 2019, doi: 10.3390/ijerph16203847.

[5] M. Hind, O. Noura, K. M. Amine, and M. Sanae, “Internet of Things,” in Proceedings of the 3rd International Conference on Networking, Information Systems & Security, New York, NY, USA: ACM, Mar. 2020, pp. 1–5. doi: 10.1145/3386723.3387876.

[6] A. Marengo, “Navigating the nexus of AI and IoT: A comprehensive review of data analytics and privacy paradigms,” Internet of Things, vol. 27, p. 101318, Oct. 2024, doi: 10.1016/j.iot.2024.101318.

[7] H. Meziane and N. Ouerdi, “A survey on performance evaluation of artificial intelligence algorithms for improving IoT security systems,” Sci Rep, vol. 13, no. 1, p. 21255, Dec. 2023, doi: 10.1038/s41598-023-46640-9.

[8] S. S. Sohail, D. Ø. Madsen, Y. Himeur, and M. Ashraf, “Using ChatGPT to navigate ambivalent and contradictory research findings on artificial intelligence,” Front Artif Intell, vol. 6, Jul. 2023, doi: 10.3389/frai.2023.1195797.

[9] H. S. AlSagri and S. S. Sohail, “Evaluating the role of Artificial Intelligence in sustainable development goals with an emphasis on ‘quality education,’” Discover Sustainability, vol. 5, no. 1, p. 458, Dec. 2024, doi: 10.1007/s43621-024-00682-9.

[10] F. Sarshartehrani, E. Mohammadrezaei, M. Behravan, and D. Gracanin, “Enhancing E-Learning Experience Through Embodied AI Tutors in Immersive Virtual Environments: A Multifaceted Approach for Personalized Educational Adaptation,” 2024, pp. 272–287. doi: 10.1007/978-3-031-60609-0_20.

[11] J. Zhang and D. Tao, “Empowering Things With Intelligence: A Survey of the Progress, Challenges, and Opportunities in Artificial Intelligence of Things,” IEEE Internet Things J, vol. 8, no. 10, pp. 7789–7817, May 2021, doi: 10.1109/JIOT.2020.3039359.

[12] N. Kaur, S. Sahay, and S. Dixit, “Role of Artificial Intelligence (AI)-aided Internet of Things (IoT) Technologies in Business and Production,” in Advanced IoT Technologies and Applications in the Industry 4.0 Digital Economy, Boca Raton: CRC Press, 2024, pp. 29–41. doi: 10.1201/9781003434269-2.

[13] Hema D., “Smart Healthcare IoT Applications Using AI,” 2022, pp. 238–257. doi: 10.4018/978-1-7998-9132-1.ch014.

[14] U. Khadam, P. Davidsson, and R. Spalazzese, “Exploring the Role of Artificial Intelligence in Internet of Things Systems: A Systematic Mapping Study,” Sensors, vol. 24, no. 20, p. 6511, Oct. 2024, doi: 10.3390/s24206511.

[15] A. Ghosh, D. Chakraborty, and A. Law, “Artificial intelligence in Internet of things,” CAAI Trans Intell Technol, vol. 3, no. 4, pp. 208–218, Dec. 2018, doi: 10.1049/trit.2018.1008.

[16] C. A. A. Era, M. Rahman, and S. T. Alvi, “Artificial Intelligence of Things (AIoT) Technologies, Benefits and Applications,” in 2024 4th International Conference on Emerging Smart Technologies and Applications (eSmarTA), IEEE, Aug. 2024, pp. 1–6. doi: 10.1109/eSmarTA62850.2024.10638992.

[17] V. Balas & R. Kumar & R. Srivastavs., Recent Trends and Advances in Artificial Intelligence and Internet of Things, vol. 172. Cham: Springer International Publishing, 2020. doi: 10.1007/978-3-030-32644-9.

[18] F. Shi et al., “Recent Progress on the Convergence of the Internet of Things and Artificial Intelligence,” IEEE Netw, vol. 34, no. 5, pp. 8–15, Sep. 2020, doi: 10.1109/MNET.011.2000009.

[19] S. Sepasgozar et al., “A Systematic Content Review of Artificial Intelligence and the Internet of Things Applications in Smart Home,” Applied Sciences, vol. 10, no. 9, p. 3074, Apr. 2020, doi: 10.3390/app10093074.

[20] D. Hassabis, D. Kumaran, C. Summerfield, and M. Botvinick, “Neuroscience-Inspired Artificial Intelligence,” Neuron, vol. 95, no. 2, pp. 245–258, Jul. 2017, doi: 10.1016/j.neuron.2017.06.011.

[21] M. R. Belgaum, Z. Alansari, S. Musa, M. Mansoor Alam, and M. S. Mazliham, “Role of artificial intelligence in cloud computing, IoT and SDN: Reliability and scalability issues,”

International Journal of Electrical and Computer Engineering (IJECE), vol. 11, no. 5, p. 4458, Oct. 2021, doi: 10.11591/ijece.v11i5.pp4458-4470.

[22] R. Mumtaz et al., “Internet of Things (IoT) Based Indoor Air Quality Sensing and Predictive Analytic—A COVID-19 Perspective,” Electronics (Basel), vol. 10, no. 2, p. 184, Jan. 2021, doi: 10.3390/electronics10020184.

[23] Imran, N. Iqbal, S. Ahmad, and D. H. Kim, “Towards Mountain Fire Safety Using Fire Spread Predictive Analytics and Mountain Fire Containment in IoT Environment,” Sustainability, vol. 13, no. 5, p. 2461, Feb. 2021, doi: 10.3390/su13052461.

[24] B. Wahl, A. Cossy-Gantner, S. Germann, and N. R. Schwalbe, “Artificial intelligence (AI) and global health: how can AI contribute to health in resource-poor settings?,” BMJ Glob Health, vol. 3, no. 4, p. e000798, Aug. 2018, doi: 10.1136/bmjgh-2018-000798.

[25] A. Nashirudeen Mumuni, F. Hasford, N. Iniobong Udeme, M. Oluwaseun Dada, and B. Omotayo Awojoyogbe, “3 A SWOT analysis of artificial intelligence in diagnostic imaging in the developing world: making a case for a paradigm shift,” in Basic Sciences for Sustainable Development, De Gruyter, 2023, pp. 51–84. doi: 10.1515/9783110913361-003.

[26] A. Harfouche, P. Saba, G. Aoun, and S. F. Wamba, “Guest editorial: Cutting-edge technologies for the development of Asian countries,” Journal of Asia Business Studies, vol. 16, no. 2, pp. 225–229, Mar. 2022, doi: 10.1108/JABS-04-2022-494.

[27] F. Raso, H. Hilligoss, V. Krishnamurthy, C. Bavitz, and L. Y. Kim, “Artificial Intelligence & Human Rights: Opportunities & Risks,” SSRN Electronic Journal, 2018, doi: 10.2139/ssrn.3259344.

[28] G. J. Shafer, H. Singh, E. J. Thomas, S. Thammasitboon, and K. S. Gautham, “Frequency of diagnostic errors in the neonatal intensive care unit: a retrospective cohort study,” Journal of Perinatology, vol. 42, no. 10, pp. 1312–1318, Oct. 2022, doi: 10.1038/s41372-022-01359-9.

[29] H. Meziane, N. Ouerdi, M. A. Kasmi, and S. Mazouz, “Classifying Security Attacks in IoT Using CTM Method,” 2021, pp. 307–315. doi: 10.1007/978-3-030-53440-0_32.

[30] G. Patrizi, A. Bartolini, L. Ciani, V. Gallo, P. Sommella, and M. Carratu, “A Virtual Soil Moisture Sensor for Smart Farming Using Deep Learning,” IEEE Trans Instrum Meas, vol. 71, pp. 1–11, 2022, doi: 10.1109/TIM.2022.3196446.

[31] A. A. Nancy, D. Ravindran, P. M. D. Raj Vincent, K. Srinivasan, and D. Gutierrez Reina, “IoT-Cloud-Based Smart Healthcare Monitoring System for Heart Disease Prediction via Deep Learning,” Electronics (Basel), vol. 11, no. 15, p. 2292, Jul. 2022, doi: 10.3390/electronics11152292.

[32] A. F. Subahi, O. I. Khalaf, Y. Alotaibi, R. Natarajan, N. Mahadev, and T. Ramesh, “Modified Self-Adaptive Bayesian Algorithm for Smart Heart Disease Prediction in IoT System,” Sustainability, vol. 14, no. 21, p. 14208, Oct. 2022, doi: 10.3390/su142114208.

[33] A. Kocian, G. Carmassi, F. Cela, S. Chessa, P. Milazzo, and L. Incrocci, “IoT based dynamic Bayesian prediction of crop evapotranspiration in soilless cultivations,” Comput Electron Agric, vol. 205, p. 107608, Feb. 2023, doi: 10.1016/j.compag.2022.107608.

[34] A. Alsaedi, N. Moustafa, Z. Tari, A. Mahmood, and A. Anwar, “TON_IoT Telemetry Dataset: A New Generation Dataset of IoT and IIoT for Data-Driven Intrusion Detection Systems,” IEEE Access, vol. 8, pp. 165130–165150, 2020, doi: 10.1109/ACCESS.2020.3022862.

[35] Y. Zhang, P. Li, and X. Wang, “Intrusion Detection for IoT Based on Improved Genetic Algorithm and Deep Belief Network,” IEEE Access, vol. 7, pp. 31711–31722, 2019, doi: 10.1109/ACCESS.2019.2903723.

[36] F. Jamil, H. K. Kahng, S. Kim, and D.-H. Kim, “Towards Secure Fitness Framework Based on IoT-Enabled Blockchain Network Integrated with Machine Learning Algorithms,” Sensors, vol. 21, no. 5, p. 1640, Feb. 2021, doi: 10.3390/s21051640.

[37] S. C. Mukhopadhyay, S. K. S. Tyagi, N. K. Suryadevara, V. Piuri, F. Scotti, and S. Zeadally, “Artificial Intelligence-Based Sensors for Next Generation IoT Applications: A Review,” IEEE Sens J, vol. 21, no. 22, pp. 24920–24932, Nov. 2021, doi: 10.1109/JSEN.2021.3055618.

[38] K. Agarwal, K. Agarwal, A. K. Jha, and I. Joshi, “Intelligence and Internet of Things with 5G Technology: Application and Development,” in 2022 International Conference on Electronics and Renewable Systems (ICEARS), IEEE, Mar. 2022, pp. 762–766. doi: 10.1109/ICEARS53579.2022.9752190.

[39] D. Saadia, “Integration of Cloud Computing, Big Data, Artificial Intelligence, and Internet of Things,” International Journal of Web-Based Learning and Teaching Technologies, vol. 16, no. 1, pp. 10–17, Jan. 2021, doi: 10.4018/IJWLTT.2021010102.

[40] L. K. Ramasamy, F. Khan, M. Shah, B. V. V. S. Prasad, C. Iwendi, and C. Biamba, “Secure Smart Wearable Computing through Artificial Intelligence-Enabled Internet of Things and Cyber-Physical Systems for Health Monitoring,” Sensors, vol. 22, no. 3, p. 1076, Jan. 2022, doi: 10.3390/s22031076.

[41] Md. Salah Uddin, Md. Asaduzzaman, R. Farzana, Md. Samaun Hasan, M. Rahman, and S. M. Allayear, “Implementation of Smart Indoor Agriculture System and Predictive Analysis,” 2019, pp. 424–435. doi: 10.1007/978-981-13-9939-8_38.

[42] A. Marengo and A. Pagano, “Investigating the Factors Influencing the Adoption of Blockchain Technology across Different Countries and Industries: A Systematic Literature Review,” Electronics (Basel), vol. 12, no. 14, p. 3006, Jul. 2023, doi: 10.3390/electronics12143006.

[43] M. G. S. A. C. Z. W. Wei, “Guest Editorial: Special Section on Integration of Big Data and Artificial Intelligence for Internet of Things,” IEEE Trans Industr Inform, vol. 16, no. 4, pp. 2562–2565, Apr. 2020, doi: 10.1109/TII.2019.2958638.

[44] N. Koroniotis, N. Moustafa, E. Sitnikova, and B. Turnbull, “Towards the development of realistic botnet dataset in the Internet of Things for network forensic analytics: Bot-IoT dataset,” Future Generation Computer Systems, vol. 100, pp. 779–796, Nov. 2019, doi: 10.1016/j.future.2019.05.041.

[45] B. Ikharo, A. Obiagwu, C. Obasi, S. U. Hussein, and P. Akah, “Security for Internet-of-Things Enabled E-Health using Blockchain and Artificial Intelligence: A Novel Integration Framework,” in 2021 1st International Conference on Multidisciplinary Engineering and Applied Science (ICMEAS), IEEE, Jul. 2021, pp. 1–4. doi: 10.1109/ICMEAS52683.2021.9692368.

[46] H. Shankar and P. Tonde, “IoT Frameworks for Smart Cities: SWOT Analysis,” Int J Comput Appl, vol. 186, no. 76, pp. 975–8887, 2025.

[47] D. Acemoglu and P. Restrepo, “The wrong kind of AI? Artificial intelligence and the future of labour demand,” Cambridge Journal of Regions, Economy and Society, vol. 13, no. 1, pp. 25–35, May 2020, doi: 10.1093/cjres/rsz022.

[48] H. Chen, R. C.-K. Wong, S. Park, and R. Hugo, “An AI-based monitoring system for external disturbance detection and classification near a buried pipeline,” Mech Syst Signal Process, vol. 196, p. 110346, Aug. 2023, doi: 10.1016/j.ymssp.2023.110346.

[49] Z. Zahed et al., “Organic and Inorganic Mulches Combination Improves the Productivity, Quality and Profitability of Rainfed Potato in the Temperate Himalayan Region,” Gesunde Pflanzen, vol. 74, no. 4, pp. 1109–1122, Dec. 2022, doi: 10.1007/s10343-022-00650-1.

[50] A. Kaushik, “SWOT Analysis of Internet of Things in the Library and Information Science Environment,” 2021, pp. 1–12. doi: 10.4018/978-1-5225-9825-1.ch001.

[51] D. B. Olawade, O. Z. Wada, A. O. Ige, B. I. Egbewole, A. Olojo, and B. I. Oladapo, “Artificial intelligence in environmental monitoring: Advancements, challenges, and future directions,” Hygiene and Environmental Health Advances, vol. 12, p. 100114, Dec. 2024, doi: 10.1016/j.heha.2024.100114.

[52] M. Cate, “Environmental Impact Assessment of AI and IoT Integration in Smart Factories: A Life Cycle Approach to Energy Efficiency,” 2023, [Online]. Available: https://www.researchgate.net/publication/391108487

[53] R. H. Charfare, A. U. Desai, N. N. Keni, A. S. Nambiar, and M. M. Cherian, “IoT-AI in Healthcare: A Comprehensive Survey of Current Applications and Innovations,” International Journal of Robotics and Control Systems, vol. 4, no. 3, pp. 1446–1472, Aug. 2024, doi: 10.31763/ijrcs.v4i3.1526.

[54] M. A. Trabelsi, “The impact of artificial intelligence on economic development,” Journal of Electronic Business & Digital Economics, vol. 3, no. 2, pp. 142–155, Jun. 2024, doi: 10.1108/JEBDE-10-2023-0022.

[55] S. T. , A. J. Teoli D., “SWOT Analysis,” StatPearls [Internet], 2025.

[56] M. Jasiulewicz-Kaczmarek, “SWOT analysis for Planned Maintenance strategy-a case study,” IFAC-PapersOnLine, vol. 49, no. 12, pp. 674–679, 2016, doi: 10.1016/j.ifacol.2016.07.788.

[57] J. Wang and Z. Wang, “Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis of China’s Prevention and Control Strategy for the COVID-19 Epidemic,” Int J Environ Res Public Health, vol. 17, no. 7, p. 2235, Mar. 2020, doi: 10.3390/ijerph17072235.

[58] M. A. Goralski and T. K. Tan, “Artificial intelligence and sustainable development,” The International Journal of Management Education, vol. 18, no. 1, p. 100330, Mar. 2020, doi: 10.1016/j.ijme.2019.100330.

[59] J. Choi et al., “Multi-objective green design model to mitigate environmental impact of construction of mega columns for super-tall buildings,” Science of The Total Environment, vol. 674, pp. 580–591, Jul. 2019, doi: 10.1016/j.scitotenv.2019.04.152.

[60] C. B. Frey and M. A. Osborne, “The future of employment: How susceptible are jobs to computerisation?,” Technol Forecast Soc Change, vol. 114, pp. 254–280, Jan. 2017, doi: 10.1016/j.techfore.2016.08.019.

[61] I. Palomares et al., “A panoramic view and swot analysis of artificial intelligence for achieving the sustainable development goals by 2030: progress and prospects,” Applied Intelligence, vol. 51, no. 9, pp. 6497–6527, Sep. 2021, doi: 10.1007/s10489-021-02264-y.

[62] L. Liu, M. Han, Y. Zhou, R. M. Parizi, and M. Korayem, “Blockchain-Based Certification for Education, Employment, and Skill with Incentive Mechanism,” 2020, pp. 269–290. doi: 10.1007/978-3-030-38181-3_14.

[63] S. L. Tamers et al., “Envisioning the future of work to safeguard the safety, health, and well-being of the workforce: A perspective from the CDC’s National Institute for Occupational Safety and Health,” Am J Ind Med, vol. 63, no. 12, pp. 1065–1084, Dec. 2020, doi: 10.1002/ajim.23183.

[64] A. Szalavetz, “Intangible investments at multinational companies? manufacturing subsidiaries: do they promote innovation-based upgrading?,” Equilibrium. Quarterly Journal of Economics and Economic Policy, vol. 12, no. 1, pp. 63–80, Mar. 2017, doi: 10.24136/eq.v12i1.4.

[65] K. Sachpazidu-Wójcicka, “Innovation as a determinant of the competitiveness of Polish enterprises,” Oeconomia Copernicana, vol. 8, no. 2, pp. 287–299, Jun. 2017, doi: 10.24136/oc.v8i2.18.

[66] M. Behun, B. Gavurova, A. Tkacova, and A. Kotaskova, “THE IMPACT OF THE MANUFACTURING INDUSTRY ON THE ECONOMIC CYCLE OF EUROPEAN UNION COUNTRIES,” Journal of Competitiveness, vol. 10, no. 1, pp. 23–39, Mar. 2018, doi: 10.7441/joc.2018.01.02.

[67] C. G. Machado, M. P. Winroth, and E. H. D. Ribeiro da Silva, “Sustainable manufacturing in Industry 4.0: an emerging research agenda,” Int J Prod Res, vol. 58, no. 5, pp. 1462–1484, Mar. 2020, doi: 10.1080/00207543.2019.1652777.

[68] J. Leng et al., “Blockchain-empowered sustainable manufacturing and product lifecycle management in industry 4.0: A survey,” Renewable and Sustainable Energy Reviews, vol. 132, p. 110112, Oct. 2020, doi: 10.1016/j.rser.2020.110112.

[69] W. Lu, “Big data analytics to identify illegal construction waste dumping: A Hong Kong study,” Resour Conserv Recycl, vol. 141, pp. 264–272, Feb. 2019, doi: 10.1016/j.resconrec.2018.10.039.

[70] G. Liu, J. Yang, Y. Hao, and Y. Zhang, “Big data-informed energy efficiency assessment of China industry sectors based on K-means clustering,” J Clean Prod, vol. 183, pp. 304–314, May 2018, doi: 10.1016/j.jclepro.2018.02.129.

[71] H. Sadatsafavi, A. A. Kim, S. D. Anderson, and P. Bishop, “Scenario Planning Application in US Highway Transportation Industry,” Journal of Infrastructure Systems, vol. 25, no. 2, Jun. 2019, doi: 10.1061/(ASCE)IS.1943-555X.0000474.

[72] C. Li and W. Lao, “Internet of Things’ sustainability effects: quantile and temporal insights,” Humanit Soc Sci Commun, vol. 12, no. 1, p. 396, Mar. 2025, doi: 10.1057/s41599-025-04665-7.

[73] N. O. D. Ellili, “Bibliometric analysis of sustainability papers: Evidence from Environment, Development and sustainability,” Environ Dev Sustain, vol. 26, no. 4, pp. 8183–8209, Mar. 2023, doi: 10.1007/s10668-023-03067-6.

[74] X. Zhao, R. Zhu, Q. Li, and J. Hu, “Unleashing the impact of environmental information disclosure on corporate green innovation: The role of audit quality and media attention,” Environ Dev, vol. 52, p. 101078, Dec. 2024, doi: 10.1016/j.envdev.2024.101078.

[75] S. R. WU, G. Shirkey, I. Celik, C. Shao, and J. Chen, “A Review on the Adoption of AI, BC, and IoT in Sustainability Research,” Sustainability, vol. 14, no. 13, p. 7851, Jun. 2022, doi: 10.3390/su14137851.

[76] S. Sahoo, T. A. Russo, J. Elliott, and I. Foster, “Machine learning algorithms for modeling groundwater level changes in agricultural regions of the U.S.,” Water Resour Res, vol. 53, no. 5, pp. 3878–3895, May 2017, doi: 10.1002/2016WR019933.

[77] C. Huntingford, E. S. Jeffers, M. B. Bonsall, H. M. Christensen, T. Lees, and H. Yang, “Machine learning and artificial intelligence to aid climate change research and preparedness,” Environmental Research Letters, vol. 14, no. 12, p. 124007, Dec. 2019, doi: 10.1088/1748-9326/ab4e55.

[78] M. Mokhtarzad, F. Eskandari, N. Jamshidi Vanjani, and A. Arabasadi, “Drought forecasting by ANN, ANFIS, and SVM and comparison of the models,” Environ Earth Sci, vol. 76, no. 21, p. 729, Nov. 2017, doi: 10.1007/s12665-017-7064-0.

[79] A. McGovern et al., “Using Artificial Intelligence to Improve Real-Time Decision-Making for High-Impact Weather,” Bull Am Meteorol Soc, vol. 98, no. 10, pp. 2073–2090, Oct. 2017, doi: 10.1175/BAMS-D-16-0123.1.

[80] K. Topouzelis, A. Papakonstantinou, and S. P. Garaba, “Detection of floating plastics from satellite and unmanned aerial systems (Plastic Litter Project 2018),” International Journal of Applied Earth Observation and Geoinformation, vol. 79, pp. 175–183, Jul. 2019, doi: 10.1016/j.jag.2019.03.011.

[81] C. W. Salame, J. C. B. Queiroz, G. de Miranda Rocha, and M. M. Amin, “Mapping the Risk of Burning in the Brazilian Amazon with the Use of Logistic Regression and Fuzzy Inference,” Math

Geosci, vol. 44, no. 3, pp. 241–256, Apr. 2012, doi: 10.1007/s11004-012-9386-5.

[82] M. Marghany, "Utilization of a genetic algorithm for the automatic detection of oil spill from RADARSAT-2 SAR satellite data," Mar Pollut Bull, vol. 89, no. 1–2, pp. 20–29, Dec. 2014, doi: 10.1016/j.marpolbul.2014.10.041.

[83] M. González-Rivero et al., "Monitoring of Coral Reefs Using Artificial Intelligence: A Feasible and Cost-Effective Approach," Remote Sens (Basel), vol. 12, no. 3, p. 489, Feb. 2020, doi: 10.3390/rs12030489.

[84] S. Kako, S. Morita, and T. Taneda, "Estimation of plastic marine debris volumes on beaches using unmanned aerial vehicles and image processing based on deep learning," Mar Pollut Bull, vol. 155, p. 111127, Jun. 2020, doi: 10.1016/j.marpolbul.2020.111127.

[85] C. Rodríguez-Soto, A. Velazquez, O. Monroy-Vilchis, P. Lemes, and R. Loyola, "Joint ecological, geographical and cultural approach to identify territories of opportunity for large vertebrates conservation in Mexico," Biodivers Conserv, vol. 26, no. 8, pp. 1899–1918, Jul. 2017, doi: 10.1007/s10531-017-1335-7.

[86] Y. Ampatzidis, V. Partel, and L. Costa, "Agroview: Cloud-based application to process, analyze and visualize UAV-collected data for precision agriculture applications utilizing artificial intelligence," Comput Electron Agric, vol. 174, p. 105457, Jul. 2020, doi: 10.1016/j.compag.2020.105457.

[87] M. A. Ebrahimi, M. H. Khoshtaghaza, S. Minaei, and B. Jamshidi, "Vision-based pest detection based on SVM classification method," Comput Electron Agric, vol. 137, pp. 52–58, May 2017, doi: 10.1016/j.compag.2017.03.016.

[88] S. Wolfert, L. Ge, C. Verdouw, and M.-J. Bogaardt, "Big Data in Smart Farming – A review," Agric Syst, vol. 153, pp. 69–80, May 2017, doi: 10.1016/j.agsy.2017.01.023.

[89] A. P. Plageras, K. E. Psannis, C. Stergiou, H. Wang, and B. B. Gupta, "Efficient IoT-based sensor BIG Data collection–processing and analysis in smart buildings," Future Generation Computer Systems, vol. 82, pp. 349–357, May 2018, doi: 10.1016/j.future.2017.09.082.

[90] G. Lanfranchi, A. Crupi, and F. Cesaroni, "Internet of Things (IoT) and the Environmental Sustainability: A Literature Review and Recommendations for Future Research," Corp Soc Responsib Environ Manag, Jul. 2025, doi: 10.1002/csr.70098.

[91] C.-H. Yang, H.-L. Lee, W.-H. Tsai, and S. Chuang, "Sustainable Smart Healthcare Information Portfolio Strategy Evaluation: An Integrated Activity-Based Costing Decision Model," Sustainability, vol. 12, no. 24, p. 10662, Dec. 2020, doi: 10.3390/su122410662.

[92] I. N. Kosovic, T. Mastelic, and D. Ivankovic, "Using Artificial Intelligence on environmental data from Internet of Things for estimating solar radiation: Comprehensive analysis," J Clean Prod, vol. 266, p. 121489, Sep. 2020, doi: 10.1016/j.jclepro.2020.121489.

[93] S. Mousavi, A. Hosseinzadeh, and A. Golzary, "Challenges, recent development, and opportunities of smart waste collection: A review," Science of The Total Environment, vol. 886, p. 163925, Aug. 2023, doi: 10.1016/j.scitotenv.2023.163925.

[94] A. Alzahrani, P. Kostkova, H. Alshammari, S. Habibullah, and A. Alzahrani, "Intelligent integration of AI and IoT for advancing ecological health, medical services, and community prosperity," Alexandria Engineering Journal, vol. 127, pp. 522–540, Aug. 2025, doi: 10.1016/j.aej.2025.05.046.

[95] H. Sørensen, "Sustainable AI-IoT Systems: Environmental Impact, Green Computing, and Circular Economy Solutions for Digital Transformation," Article in International Journal of Engineering and Technology, vol. 15, no. 9, p. 2023, 2023, doi: 10.7863/IJET.

[96] R. C. A. Alves, L. B. Gabriel, B. T. de Oliveira, C. B. Margi, and F. C. L. dos Santos, "Assisting Physical (Hydro)Therapy With Wireless Sensors Networks," IEEE Internet Things J, vol. 2, no. 2, pp. 113–120, Apr. 2015, doi: 10.1109/JIOT.2015.2394493.

[97] E. M. Onyema, P. K. Shukla, S. Dalal, M. N. Mathur, M. Zakariah, and B. Tiwari, "Enhancement of Patient Facial Recognition through Deep Learning Algorithm: ConvNet," J Healthc Eng, vol. 2021, pp. 1–8, Dec. 2021, doi: 10.1155/2021/5196000.

[98] A. A. Pise et al., "Enabling Artificial Intelligence of Things (AIoT) Healthcare Architectures and Listing Security Issues," Comput Intell Neurosci, vol. 2022, pp. 1–14, Aug. 2022, doi: 10.1155/2022/8421434.

[99] C. Curtis, C. Liu, T. J. Bollerman, and O. S. Pianykh, "Machine Learning for Predicting Patient Wait Times and Appointment Delays," Journal of the American College of Radiology, vol. 15, no. 9, pp. 1310–1316, Sep. 2018, doi: 10.1016/j.jacr.2017.08.021.

[100] H. Lin and L. Yu, "Medical artificial intelligent research: translating artificial intelligence into clinical practice," Ann Transl Med, vol. 8, no. 11, pp. 695–695, Jun. 2020, doi: 10.21037/atm-2020-mair-21.

[101] W. K. Antwi, T. N. Akudjedu, and B. O. Botwe, "Artificial intelligence in medical imaging practice in Africa: a qualitative content analysis study of radiographers' perspectives," Insights Imaging, vol. 12, no. 1, p. 80, Dec. 2021, doi: 10.1186/s13244-021-01028-z.

[102] C. E. Ronquillo et al., "Artificial intelligence in nursing: Priorities and opportunities from an international invitational think-tank of the Nursing and Artificial Intelligence Leadership Collaborative," J Adv Nurs, vol. 77, no. 9, pp. 3707–3717, Sep. 2021, doi: 10.1111/jan.14855.

[103] K. B. Johnson et al., "Precision Medicine, AI, and the Future of Personalized Health Care," Clin Transl Sci, vol. 14, no. 1, pp. 86–93, Jan. 2021, doi: 10.1111/cts.12884.

[104] K. Seibert et al., "Application Scenarios for Artificial Intelligence in Nursing Care: Rapid Review," J Med Internet Res, vol. 23, no. 11, p. e26522, Nov. 2021, doi: 10.2196/26522.

[105] C. Buchanan, M. L. Howitt, R. Wilson, R. G. Booth, T. Risling, and M. Bamford, "Predicted Influences of Artificial Intelligence on Nursing Education: Scoping Review," JMIR Nurs, vol. 4, no. 1, p. e23933, Jan. 2021, doi: 10.2196/23933.

[106] H. W. Loh, C. P. Ooi, S. Seoni, P. D. Barua, F. Molinari, and U. R. Acharya, "Application of explainable artificial intelligence for healthcare: A systematic review of the last decade (2011–2022)," Comput Methods Programs Biomed, vol. 226, p. 107161, Nov. 2022, doi: 10.1016/j.cmpb.2022.107161.

[107] G. Secundo, S. M. Riad Shams, and F. Nucci, "Digital technologies and collective intelligence for healthcare ecosystem: Optimizing Internet of Things adoption for pandemic management," J Bus Res, vol. 131, pp. 563–572, Jul. 2021, doi: 10.1016/j.jbusres.2021.01.034.

[108] J. Choi, S. Woo, and A. Ferrell, "Artificial intelligence assisted telehealth for nursing: A scoping review," J Telemed Telecare, vol. 31, no. 1, pp. 140–149, Jan. 2023, doi: 10.1177/1357633X231167613.

[109] B. Murdoch, "Privacy and artificial intelligence: challenges for protecting health information in a new era," BMC Med Ethics, vol. 22, no. 1, p. 122, Dec. 2021, doi: 10.1186/s12910-021-00687-3.

[110] S. S. Bhuyan et al., "Transforming Healthcare Cybersecurity from Reactive to Proactive: Current Status and Future Recommendations," J Med Syst, vol. 44, no. 5, p. 98, May 2020, doi: 10.1007/s10916-019-1507-y.

[111] J. Andraško, M. Mesarčík, and O. Hamuľák, "The regulatory intersections between artificial intelligence, data protection and cyber security: challenges and opportunities for the

EU legal framework," AI Soc, vol. 36, no. 2, pp. 623–636, Jun. 2021, doi: 10.1007/s00146-020-01125-5.

[112] F. D. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," MIS Quarterly, vol. 13, no. 3, p. 319, Sep. 1989, doi: 10.2307/249008.

[113] I. Ajzen, "The theory of planned behavior," Organ Behav Hum Decis Process, vol. 50, no. 2, pp. 179–211, Dec. 1991, doi: 10.1016/0749-5978(91)90020-T.

[114] E. M. . Rogers, Diffusion of innovations. Free Press, 2003.

[115] S. I. Siam et al., "Artificial Intelligence of Things: A Survey," ACM Trans Sens Netw, vol. 21, no. 1, pp. 1–75, Jan. 2025, doi: 10.1145/3690639.

[116] W. Olabiyi, "IoT-Enabled Wearable Devices for Real-Time Health Monitoring Using AI Analytics." [Online]. Available: https://www.researchgate.net/publication/391644367

[117] F. A. Alaba, U. Sani, E. G. Dada, and B. H. Mohammed, "AIoT-Enabled Smart Grids: Advancing Energy Efficiency and Renewable Energy Integration," 2024, pp. 59–79. doi: 10.1007/978-3-031-53433-1_4.

[118] S. M. Popescu et al., "Artificial intelligence and IoT driven technologies for environmental pollution monitoring and management," Front Environ Sci, vol. 12, Feb. 2024, doi: 10.3389/fenvs.2024.1336088.

[119] H. Taherdoost, "Wearable Healthcare and Continuous Vital Sign Monitoring with IoT Integration," Computers, Materials & Continua, vol. 81, no. 1, pp. 79–104, 2024, doi: 10.32604/cmc.2024.054378.

[120] L. P. Serrano et al., "Benefits and Challenges of Remote Patient Monitoring as Perceived by Health Care Practitioners: A Systematic Review," Perm J, vol. 27, no. 4, pp. 100–111, Dec. 2023, doi: 10.7812/TPP/23.022.

[121] A. Clement David-Olawade et al., "AI-Driven Advances in Low-Dose Imaging and Enhancement—A Review," Diagnostics, vol. 15, no. 6, p. 689, Mar. 2025, doi: 10.3390/diagnostics15060689.

[122] M. Zonayed et al., "Machine learning and IoT in healthcare: Recent advancements, challenges & future direction," Adv Biomark Sci Technol, vol. 7, pp. 335–364, 2025, doi: 10.1016/j.abst.2025.08.006.

[123] B. Mu et al., "Design research on a smart infusion device to reduce medical workload and enhance patient safety," Sci Rep, vol. 15, no. 1, p. 9265, Mar. 2025, doi: 10.1038/s41598-025-93911-8.

[124] Dr. G. Sudha, "IOT Based Infusion Pump for Controlling the Drug Delivery," Int J Res Appl Sci Eng Technol, vol. 13, no. 5, pp. 2458–2466, May 2025, doi: 10.22214/ijraset.2025.70717.