IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 2, October 2024

Exploring Artificial Intelligence as a Catalyst for Achieving Global Sustainability Targets

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Abstract: *The assessment of the impact of artificial intelligence (AI) on the attainment of the Sustainable Development Goals is necessitated by the emergence of AI and its progressively broader impact on numerous sectors. Through a consensus-based expert elicitation process, we have determined that AI has the potential to facilitate the completion of 134 targets across all objectives; however, it may also impede the completion of 59 targets. Nevertheless, significant components are obscured by the current research focus. Regulatory oversight and insight are essential for the rapid advancement of AI-based technologies in order to facilitate sustainable development. Failure to comply with this requirement could lead to deficiencies in ethical standards, safety, and transparency. The Sustainable Development Goals (SDGs) encompass 17 integrated priorities that establish global quantifiable targets by examining social, economic, and environmental development factors. A universal collection of metrics and a reference structure are intended to be employed by the international community to encourage initiatives and adoption by 2030. As a continuation of the Millennium Development Goals, which established a foundation for collaboration to eradicate extreme poverty, the United Nations established these targets in 2015. This new paradigm enables a long-term transition to more sustainable growth.*

Keywords: Artificial Intelligence, Sustainable Development Goals, empirical study

I. INTRODUCTION

The proliferation of artificial intelligence (AI) is generating an increasing number of enterprises. For example, the short- and long-term effects of artificial intelligence are expected to be felt in a variety of areas, including global productivity, environmental impact, equality and participation, and many others. The prospective impact of artificial intelligence on sustainability has been reported to have both positive and negative effects. Nevertheless, no published research has yet evaluated the extent to which AI, as defined in this study, could influence numerous aspects of sustainable development. These include the 17 international development objectives and specific target 169 that are endorsed by the 2030 Agenda for Sustainable Development (SDG). This is a critical research distinction when we discover that intellectual ability can impact the capacity to achieve any developmental goal. In this section, we demonstrate and deliberate on the extent to which AI can either facilitate or impede the attainment of all 17 objectives and 169 objectives outlined in the 2030 Agenda. Sustainable development. The social characteristics that can be attained by the expert's reporting criteria are detailed in the criteria published at the conclusion of this study. These criteria were used to establish the relationships between the Sustainable Development Goals, drawing on previous research. For the purposes of this investigation, we define AI as a software technology that possesses at least one of the following capabilities: understanding, prediction, extracting information from data, pattern recognition, interactive communication (e.g., social robots or catboats), and logical reasoning (e.g., site development). Machine learning is one of the numerous subfields that this theory extends to. Technological advancements have caused significant disruptions in numerous industries over the past decade. One of the primary actors is artificial intelligence (AI), a field of research that is swiftly establishing the groundwork for the future and propelling the Fourth Industrial Revolution (4IR) transformation. Our current reality is comprised of a variety of technologies, including medical diagnostics, social machines, and driverless vehicles. Therefore, it is not irrational to believe that AI could serve as a catalyst for the attainment of the United Nations Sustainable Development Goals (UN Sustainable Development Goals).

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AI & Climate Change:

The current state of modern technology is facilitating remarkable advancements in the realm of imagination. Artificial intelligence will facilitate the utilization of information and increase productivity in sectors including health, agriculture, education, and transportation. In addition, we observe how AI-powered informatics can assist physicians in the elimination of medical errors, the enhancement of efficiency, the distribution of expertise, and the education of students. In recent years, there has been a surge in interest in the fields of artificial intelligence and climate change. For instance, AI can be employed to mitigate environmental changes and their consequences in a variety of sectors and circumstances. Only a few of the potential applications include weather forecasting, environmental management and control, intelligent, decentralized renewable energy networks, and safer devices. According to research conducted by PwC and Microsoft in the United Kingdom, the global economy could benefit by US$ 5.2 trillion by 2030 as a result of the integration of artificial intelligence into environmental technologies. This represents a 4.4% increase from previous estimates.

AI in Health Care Sector:

Report on the identification of diseases The visual analysis of natural images, such as images of skin tissue, is used by researchers at Stanford University, Heidelberg University, and McKinsey to ascertain whether they are malignant via AI. Dermatologists were surpassed by knowledge-based specialists, according to the investigation. An additional illustration of the application of artificial intelligence in the field of health is a device that utilizes heart rate data to identify early indications of diabetes. This device has the potential to benefit over 400 million individuals worldwide with diabetes, provided that the cost is reasonable. Human error is also a significant issue in the healthcare sector. Large patient populations and incomplete medical records can result in fatalities. AI is resistant to these factors and is capable of predicting and diagnosing maladies at a quicker pace than the majority of physicians. For instance, in a single investigation, an artificial intelligence model that employed deep learning and algorithms was capable of identifying cancer at a rate that exceeded that of 11 physicians.

AI in Agriculture & Fight Hunger:

Global food production must increase by over 70% by 2050 to meet the world's food demand, as per the United Nations. The utilization of artificial intelligence services can expedite the quest for solutions, as time is of the essence. Our objective is to enhance the efficiency and affordability of sustenance. In the present day, a remarkable amount of food, approximately half of the world's food, is thrown away. The TOMRA Sorting Solutions devices are equipped with artificial intelligence and are capable of sorting food into "good" and "bad" categories. For instance, an algorithm may determine whether a tomato is appropriate for a salad when it is required to identify it. In the event that this fruit is insufficient for salads, it may also be employed to produce tomato liquid. The Nutrition Early Warning System (NEWS) also employs big data and machine learning to identify regions that are at risk of food shortages, drought, floods, rising food prices, and land degradation. It was dispatched to Colombia to serve as a warning to producers regarding the approaching floods and to notify them of the upcoming growing season. The sowing costs were significantly reduced for 170 farmers who adhered to the instructions throughout the drought season and did not neglect the planting season.

Increasing Equality & Ai Emotions:

Solutions that foster self-determination, diversity, and equality, such as the reduction or elimination of stigma based on race, gender, ethnicity, religion, and disability, are essential for the improvement of the quality of life for all global citizens. McKinsey referenced Affectiva (a MIT Media Lab competition) and Autism Glass (a Stanford University research project) in her report. These projects employ artificial intelligence to assist individuals with autism by identifying their thoughts and establishing connections. Communicate in a social setting. Another example is the introduction of an alternative form of identification, such as a driver's license, for individuals who do not possess one.

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Objective of the Study:

The primary objective of sustainability education is to ensure that the equilibrium and stability of natural processes are not compromised by the use of resources.

Research on the Sustainable Development Goals encompasses the reduction of inequalities, the promotion of health and well-being, and the provision of quality education.

Sustainable development options have been identified through research, which has the potential to resolve numerous issues.

It has the potential to address economic issues, such as destitution, as well as environmental issues, such as climate change, water damage, and greenhouse gas emissions.Adoption studies will enable us to evaluate the necessary ecosystem equilibrium.

II. LITERATURE REVIEW

Cui et al. (2018) conducted an analysis of 160 elements of social impact intelligence to examine the role of intelligence in health. Vinuesa et al. conducted an additional significant study that addresses all Sustainable Development Goals, despite the fact that there are few studies that have examined the impact of intelligence on various aspects of sustainable development. (2020). We evaluate the role of AI in the attainment of the Sustainable Development Goals by utilizing expert opinion and contend that AI has the potential to not only contribute to the achievement of 134 goals but also to influence the progress of 59 goals. Conversely, Ye et al. (2021) investigated the public's perception of the relationship between the two professions. Saetra (2021) conducted an additional investigation that classified the Sustainable Development Goals into five categories according to the extent of AI's influence. This increases the adverse effects of artificial intelligence that may result from the control of large corporations and individual countries, particularly in the area of artificial intelligence application management. Gupta et al. (2021) conducted a more comprehensive investigation into the utilization of artificial intelligence in the Sustainable Development Goals indicator. "Multi-Purpose Intelligent Energy Management for Microgrids" by Chaouachi et al. (2012) is another widely read book in this field. The authors proposed a system for the microgrid energy estimation and optimization problem that is based on linear programming, multi-objective optimization, artificial intelligence, and cognitive problem solving. The system was published in the IEEE Transactions on Industrial Electronics journal. An additional investigation investigates the influence of AI research on a variety of domains in which AI applications can enhance social relationships (Wamba et al., 2021). Goralski and Tan (2020) investigated the potential of artificial intelligence to enhance the efficacy and effectiveness of resource management in three research domains: water, agriculture, sanitation, and health. They compare intelligence to a double-edged sword, and stakeholders must exercise caution. This is particularly critical when AI is employed for sustainable development, which necessitates the development of well-defined models (Vinuesa and Sirmacek, 2021) or in intricate contexts such as diffusion (Vinuesa et al., 2020b). In particular, certain researches in this field examine the correlation between sustainable development and artificial intelligence in India (Singh et al., 2022) and China (Liengpunsakul, 2021). The utilization of these studies implies a thorough examination of the existing information and data. However, there are only a handful of recent quantitative analysis articles, including those by Wamba et al. (2021) and Liu et al. (2023). The "Artificial Intelligence for Sustainable Development Goals Think Tank10" was established to assess the positive and negative aspects of AI initiatives in the context of goal development.

III. RESEARCH METHODOLOGY

Research design- Secondary research

Statistical tool used- Quantitative methodology

Source of data- Secondary

Data presentation- Graphs & tables

The second portion shows how this research obtained its findings. "Is there evidence that AI can support this mission?" This answers the question. For each of the 17 SDGs' 169 goals. To this purpose, we produced suggestions based on expert requests and Butler et al. (67) and Morgan (68) research on Sustainable Development Goal-implementation interaction strategies. Engineers, natural scientists, and social scientists who specialize in elicitation methods wrote this

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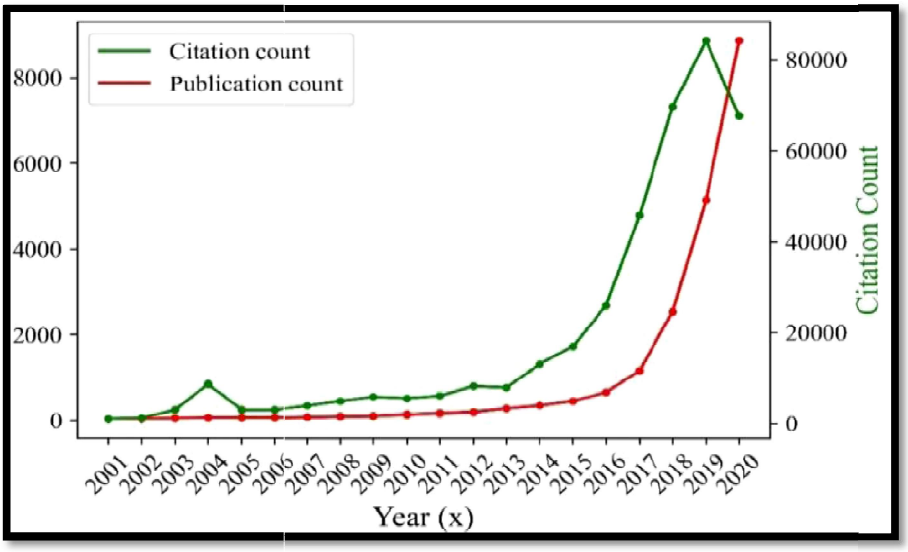
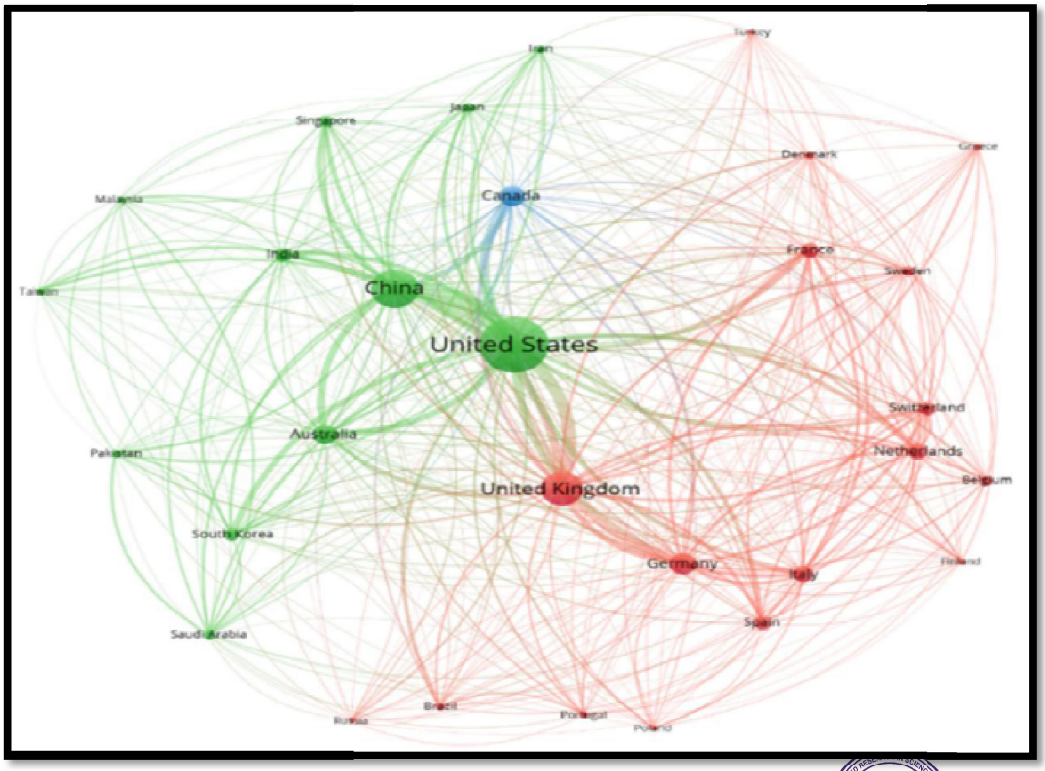
paper. The following are evidence from expert-driven data study supporting the link between AI and multi-purpose use: We authorized more real-world research that included site quality. Publications in the review are good enough); Published evidence on control/clinical status (we confirmed that the publications in the analysis were of sufficient quality, given the difference in quality across sites); reports by recognized organizations (such as the UN or government organizations) and written business-level practices. These details are not original recommendations: predictive learning, use of research without analysis; news, public opinion, etc.



The annual trend in AI SDG paper publishing numbers. After SDGs were adopted in 2015, publications increased sharply from 2016: AI, AI; SDGs, Sustainable Development Goal.



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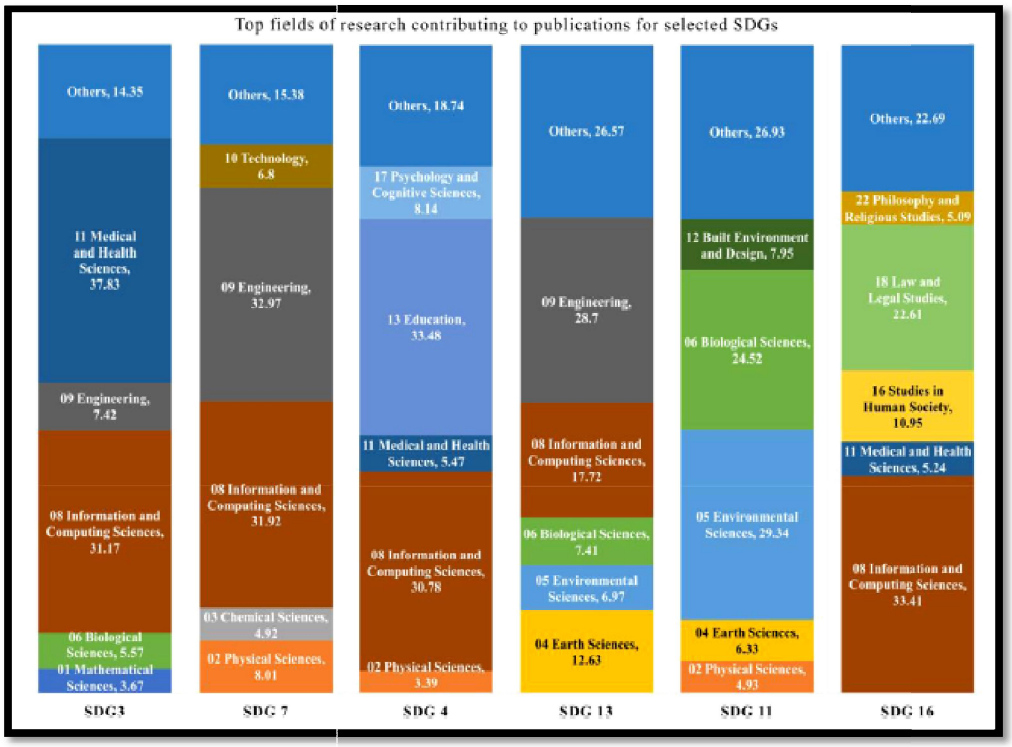
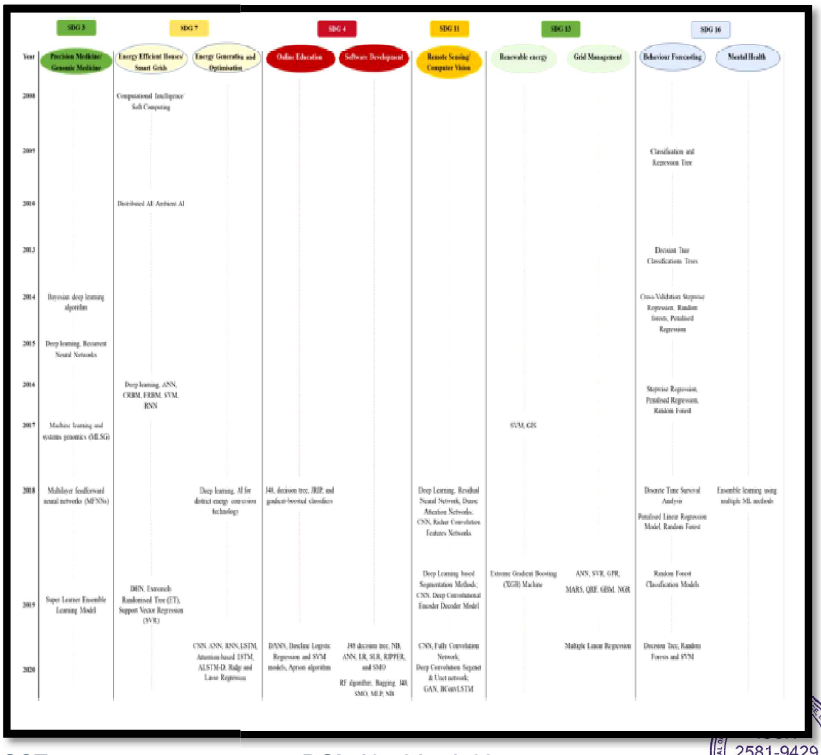
Arcs indicate regional publications and cooperation in AI for SDGs research: AI, artificial intelligence; SDGs, Sustainable Development Goals.



Top research disciplines publishing on the six SDGs. Dimensions data shows each field's % contribution and categorization code.



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Path analysis discovered publications on AI, artificial intelligence, and SDGs 3, 4, 7, 11, 13, and 16.

IV. FINDINGS

The paper provides a comprehensive view of AI research and implementation toward the SDGs. Some practical applications of the findings are listed below.

AI has the ability to transform human work life in today's globe.

This technique offers potential benefits and corns to be obtained. Studies from 1990-2019 indicate that AI will be a valuable benefit for people, impacting their life cycle and job life.

Artificial intelligence is when machines and software are programmed to replicate human decision-making processes.

It can help humans discover new solutions by using advanced data processing. As a result, it can help fight against climate change through means of problem-solving, predictability, and forecasting.

• AI can analyze deforestation potential using satellite images and algorithms, considering variables like distance to water supplies and cities. The global number of AI for SDG publications has risen, with a focus on six SDGs (3, 4, 7, 11, 13, & 16). AI was mainly used in SDG 3 (Good Health & Well-being) and SDG 7 (Affordable and Clean Energy). Many notable research employed simple machine learning and data analytics methods as Decision Tree, Random Forest, SVM, SVR, Multiple linear regression, etc. J48, SVM, and other models were employed for recommendation analysis in several research. SDG AI today employs more advanced deep learning methods like neural networks and computer vision, such as GAN, CNN, ANN, and its derivatives. In recent years, researchers have developed combinatorial (SegUNet, LSTM two-way convolution) and generic (GBM, XGB) approaches to allow deep learning and machine learning. Additionally, application methods differ each application.

V. CONCLUSION

AI for SDG literature is extensively analyzed in this research. The path-analysis and content-analysis sections indicate key activity areas and the most influential publications. This study quantifies global AI for SDGs research, evaluates how it has evolved over time, identifies locations that are working on AI applications to SDGs, and how they interact (1 and 1). Our findings show a global increase in AI-for-SDGs publications. SDGs 3 (excellent health and well-being) and 7 (affordable and sustainable energy) are where AI is most used. AI is used in SDG 4 (quality education), SDG 13 (climate action), SDG 11 (sustainable cities and communities), and SDG 16 (peace, justice, and strong institutions). The report also examined knowledge flows in AI research for SDGs and identified main application areas, AI methodologies, and models for SDG objectives.

These findings may help academics and institutions invest in emerging or neglected SDG research fields, including AI. Based on national and regional preferences, governments might redirect policies and programs to support specific activities. Some findings, particularly from the content-analysis section, are subjective and may alter in future studies based on the researchers' analytical framework, but they give vital insights into the discipline's growth and evolution. Future research may examine other methodologies for these analyses. Researchers may use domain-specific research to examine progress in certain fields. Similar studies may look at regional research patterns to provide country/region-specific policy and governance suggestions (Goh & Vinuesa, 2021) to accelerate SDG development.

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