Artificial Intelligence-Driven Solution for Global Challenges: A Systematic Review from Sustainable Development Goals Perspectives

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Abstract
Artificial Intelligence (AI) has significantly improved different global problems and made progress toward the Sustainable Development Goals (SDGs). AI has a big impact on dealing with climate change, making things accessible, helping people get healthcare, ensuring that people have enough food, protecting species on earth, dealing with a lack of water, ensuring everyone can use the internet, and creating peace. The study has used a systematic literature review to understand the role of AI in dealing with the global challenges within the SDGs. The study has found that AI has positively contributed to accessing information and utilizing it to provide services related to well-being, clean water and sanitation, renewable energy, and other SDGs. However, the study emphasized that AI has also caused economic inequalities that require necessary action from policymakers and organizations. At the same time, organizations must use resources effectively for AI-driven SDG projects to have a positive impact.

Keywords: *Artificial Intelligence, Sustainable Development Goals, Climate Change, Healthcare, Water, Global Challenges*

INTRODUCTION

Background and Context of the Study

In the current global context, there exists a complicated relationship of many concerns that pose significant threats to the welfare of communities. The global concerns include poverty, inequality, environmental degradation, and inadequate healthcare services, which also hinder development. For this purpose, the international community mobilizes its knowledge and anticipation to formulate the SDGs (Esteves et al., 2021). Nevertheless, the complexity of these problems necessitates a discontinuity from traditional approaches, calling for innovative strategies that challenge the existing norms. At the same time, the emergence of AI presents itself as a powerful technical force with the potential to reshape the fundamental frameworks that dictate problem-solving methodologies within this complex ecosystem.

The SDGs, carefully crafted by the United Nations, serve as a comprehensive strategy to address global society's various inequalities and vulnerabilities. The aims, which embrace many aspects, including poverty eradication, gender equality, clean energy providing, and climate action, converge to form a unified and urgent appeal for international cooperation. The fundamental aspect of these ambitions is not merely confined to their expression but to the tangible realization of goals through concrete acts that bring about noticeable changes (Sachs et al., 2019). However, when the many objectives are interlinked, it becomes increasingly evident that the inherent intricacies of interrelated issues demand more than conventional solutions. They call for novel approaches that can withstand and adjust to changing circumstances.

AI is a crucial change source within this complex context. Lau, Nandy and Chakraborty (2023) stated that the potential of AI, particularly through machine learning, predictive analytics, and cognitive computing, provides powerful tools for understanding and decoding deep patterns inside complicated global issues. AI can effectively analyze extensive and diverse information, potentially uncover new and previously hidden insights that cannot have been revealed using traditional analytical methods. In public health, AI-powered prediction models have exhibited their effectiveness in forecasting disease outbreaks and analyzing epidemiological patterns. This capability allows for proactive measures to prevent impending disasters (Efremova, West and Zausaev, 2019). Meanwhile, AI algorithms analyze large amounts of satellite data for environmental conservation. These algorithms can identify deforestation trends and monitor marine environments, providing crucial information that enhances conservation initiatives. Given this paradigm shift, it becomes evident that the significance of the current study is apparent.

The intricate nature of current global concerns requires a thorough examination of existing knowledge and a deep exploration of the role that AI, as a source of significant change, plays in redefining the dimensions of sustainable development (Umbrello et al., 2021). Thus, the aim of the study is to propose AI-driven solutions for global challenges in accordance to the SDGs**.** The objective is to develop detailed insights into the

effectiveness, limits, and ethical issues of integrating AI into sustainable development. In a context where the societal consequences of each innovation must be carefully analyzed, this study explores AI-driven solutions.

Rationale for the Study

The introduction of AI within the context of SDGs represents a significant shift from traditional approaches to tackling worldwide issues. Meanwhile, Di Vaio et al. (2020) stated that the competency of AI depends on its ability to systematically analyze extensive and diverse information, resulting in the identification of insightful findings that might provide new perspectives on persistent challenges. The inherent strength of AI is its ability to assimilate and condense extensive collections of diverse knowledge (Vinuesa et al., 2020). The algorithms that form the foundation of AI can identify subtle patterns, correlations, and trends that are frequently beyond the grasp of human study owing to their complexity and magnitude. The unique capability of AI has significant importance in the framework of the SDGs. AI-based prediction models have been utilized to anticipate the occurrence of disease outbreaks within the field of public health (Goralski and Tan, 2020). For instance, the attainment of SGD 3(good health and well-being), which prioritizes improving global health and general well-being, requires these prediction models of AI. The research by Nasir et al. (2023) highlights the app's capacity to reliably forecast epidemics and enable preventative steps to slow the spread of illness. This emphasizes AI's ability to revolutionize established procedures and highlights its crucial role in enhancing established tactics.

A thorough examination of the current literature is required because the developing area of AI development is required. Meanwhile, the study by Sachs et al. (2019) sheds light on how early AI-based initiatives for the SDGs are. This preliminary stage highlights the urgent need for an exhaustive examination of the corpus of work already produced. Such a review is essential to determine gaps and areas for improvement and evaluate the effectiveness of these initiatives. The systematic review yields empirical findings that significantly contribute to academic discourse and provide essential guidance to policymakers, researchers, and practitioners. Given the careful allocation of resources and diligent formulation of strategies to support the achievement of the SDGs, it is crucial to have a better understanding of the potential of AI within this framework. The research conducted by Arfanuzzaman (2021) examines the utilization of AI in the agricultural sector, demonstrating its capacity to enhance food security as outlined in SDG 2 (Zero Hunger) by employing precision agriculture and yield forecasting. This is an example of how systematic literature can provide practical insights that shed light on the convergence of AI and SDGs. Thus, employing AI into the SDG discourse presents new and achievable opportunities. AI introduces innovation into ancient dilemmas with its advanced data analysis skills. The initial phase of AI development in the context of the SDGs necessitates a comprehensive evaluation to ascertain its actual capabilities.

Research Questions

The main goal of the research is to identify the AI-driven solutions for overcoming the global challenges through the SDGs. The research project aims to respond to the following particular research questions.

* How have AI technologies been used to solve the global challenges in the SDGs?
* What measurable and paradigm-shifting effects have AI initiatives shown in pursuing SDG targets?
* What ethical, social, and economic issues surround employing AI in SDG-related projects?

Definition of Key Terms in the Literature

AI

AI is a complex field at the intersection of computer science and engineering, with the potential to significantly transform problem-solving approaches. As per the study by Sætra (2021), AI is based on duplicating human cognitive abilities, and it involves the development of systems and technologies that can independently perform activities that usually require human intellect. The process involves acquiring knowledge from extensive collections of data, which involves the detection of patterns that are embedded within intricate datasets. Recognizing patterns is crucial in facilitating decision-making that effectively handles complex situations (Holzinger et al., 2021). Furthermore, AI expands its scope to include complex problem-solving, a feature in several fields like healthcare diagnostics and financial predictions. Combining machine learning, and advanced algorithms allows AI to automate repetitive tasks and dynamically adjust to changing situations. This represents a significant advancement in incorporating computational abilities with human-like intelligence.

Global issues

In the complex and linked global landscape, persistent difficulties go beyond traditional boundaries, necessitating comprehensive and collaborative solutions. Referred to as "global challenges," these intricacies span many concerns that transcend geographical, disciplinary, and sequential boundaries (Mehmood, Liao

and Mahadeo, 2020). Several instances exemplify the need for global cooperation. The pressing objectives of reducing poverty and ensuring fair healthcare access transcend national boundaries.

Additionally, the issue of climate change, which involves alterations in weather patterns that have far-reaching consequences, requires collaborative efforts on an international level. The difficulties encompass many issues, including gender inequity, fast urbanization, biodiversity loss, and societal marginalization (Palomares et al., 2021). These challenges fundamentally represent the interconnections that define our collective human existence, emphasizing the imperative for comprehensive solutions beyond personal interests.

The SDGs

Figure 1: SDGs

SDGs refer to a set of global objectives established by the United Nations (U.N.) to address various socio-economic and environmental challenges (Omer and Noguchi, 2020). The SDGs are a comprehensive framework developed by the United Nations to address many global concerns. They are designed to guide efforts toward transformative change. This has seventeen specific objectives, each supported by detailed targets and indicators. The objectives encompass many aspirations, including eradicating poverty and hunger and advancing peace and justice. These aims together represent a concerted effort to cultivate a global society that is more equal, sustainable, and affluent by the year 2030 (Mori Junior, Fien and Horne, 2019). These objectives span several dimensions of development, embracing economic aspects and ecologically sustainable practices. As evidenced by Sustainable Development Goal 13 (Climate Action), there is a call for collective efforts to address climate change's consequences and safeguard the durability of our interconnected ecosystems. These objectives, guided by human dignity and collective accountability principles, emphasize the urgent need for global collaboration and comprehensive measures while progressing towards a more balanced and enduring global society.

AI's Application for SDGs

Goal 1: Zero Poverty

AI-based solutions have significant potential to tackle the complexities associated with poverty effectively. According to Holzinger et al. (2021), AI can improve the targeting of social welfare programs by optimizing resource allocation to needy individuals by incorporating predictive analytics and data-driven insights. In India, the Direct Benefit Transfer system employs AI to allocate subsidies directly to individuals' bank accounts, reducing misappropriation and generating significant advantages for a large population (Kandpal and Khalaf, 2020). In addition, AI-powered microfinance platforms play a crucial role in evaluating the creditworthiness of individuals, hence facilitating financial inclusion for marginalized communities. The utilization of AI in the process of poverty mapping facilitates the identification of regions that are more susceptible to poverty, hence enabling the implementation of focused interventions. This enhances the effectiveness of initiatives to alleviate poverty.

Goal 2: Zero Hunger

AI technologies have a significant impact on enhancing food security. Precision agriculture utilizes AI to enhance the efficiency of irrigation, pest management, and crop production forecasting, therefore addressing the issue of food shortage. The Watson Decision Platform for Agriculture, developed by IBM, employs AI to provide farmers with valuable insights, resulting in improved output (Kumar et al., 2020). The integration of AI into supply chain management systems has been shown to improve the efficiency of food distribution processes, resulting in reduced wastage.

Goal 9: Industry, Innovation, and Infrastructure

AI is pivotal in driving innovation and enhancing operational efficiency across several sectors. In transportation, implementing AI in logistics has shown to be highly advantageous. Logistics systems can optimize routes, resulting in a notable reduction in fuel consumption and emissions by harnessing AI's power. Smart cities use AI technologies to control traffic flow and optimize waste reduction strategies (Herath and Mittal, 2022). An example is Singapore's "Smart Nation" effort, which uses AI-powered sensors to optimize rubbish collection schedules, improving urban sustainability (Chang and Das, 2020).

Goal 13: Climate Action

AI plays a significant role in mitigating and adapting to climate change. Using AI in climate modeling facilitates the accurate prediction of severe weather phenomena. Implementing AI in wind turbines is a means of optimizing renewable energy output. The utilization of Google's DeepMind AI has resulted in a notable 30% reduction in energy usage within data centers, so it is a compelling demonstration of the potential of AI in fostering sustainable practices (Das and Chandra, 2023).

Goal 17: Partnerships to Achieve the Goal

AI is pivotal in enabling and enhancing cross-sector partnerships for achieving the SDGs. Data-sharing systems that utilize AI technology facilitate collaborative efforts among governments, non-governmental organizations (NGOs), and enterprises, enhancing the process of informed decision-making (Kaginalkar et al., 2023). The AI for Earth program, developed by Microsoft, empowers environmental organizations by providing AI technologies designed to address and overcome various environmental concerns. The application of AI in the analysis of sentiment on social media platforms plays a crucial role in assessing the general sentiment of the public. Khan et al. (2020) stressed that this process not only assists in gaining insights into public perception but also serves as a valuable tool in shaping policy choices and facilitating collaborations across various entities.

These SDG goals highlight the significant impact that AI-driven solutions can have on several SDGs. The ongoing development of AI demonstrates its potential to contribute to achieving SDGs, highlighting the transformative power of innovation in fostering positive global impact.

Global Challenges and AI Solutions

Identification and Discussion of Major Global Challenges

The major global challenges are characterized by complex problems that go beyond national boundaries, impacting many aspects of communities, economies, and ecosystems. These challenges exhibit interconnections and necessitate comprehensive solutions. Several significant issues arise in this context:

Climate Change

Climate change is a pressing global issue that has garnered significant attention recently. The issue of climate change is a multifaceted and interrelated dilemma with far-reaching implications on a global scale. The increase in global temperatures, mostly caused by anthropogenic activity, has many repercussions (Vicente-Serrano et al., 2020). There has been an observed increase in the frequency and intensity of extreme weather events, including hurricanes, floods, and droughts. Martyr-Koller et al. (2021) stated that coastal towns and ecosystems face significant danger from sea-level rise, projected to reach a maximum of 2 meters by 2100. A report from the World Bank presented that it is projected that the rise in sea levels can result in the displacement of around 280 million individuals residing in regions susceptible to such impacts by the conclusion of the current century (Nicholls et al., 2021). Climate change mitigation necessitates the collective engagement of various stakeholders, the advancement of technology solutions, and the harmonization of international policies.

Poverty and Inequality

Poverty and inequality continue to be a significant and urgent issue, carrying extensive repercussions. The persistent disparity between those of high socio-economic status and those marginalized is seen throughout many geographical locations, further intensifying social tensions. According to a report by Oxfam, there was a significant surge in the wealth of the global billionaire population, amounting to more than $3.9 trillion, throughout the epidemic (Ray and Pal, 2022). In contrast, a substantial portion of the global population had considerable challenges meeting their basic needs. The absence of opportunities to get education and healthcare exacerbates existing inequalities. Thus, it is essential to implement comprehensive strategies that address underlying factors and foster an all-encompassing expansion of the economy to achieve desired outcomes.

Healthcare Accessibility

The issue of healthcare access underscores the significant disparities in global development. Despite significant progress in medical developments, there are still several regions that continue to face a shortage of essential healthcare services. Disease outbreaks, including the ongoing COVID-19 pandemic, highlight the

susceptibility of healthcare systems. As an illustration, the World Health Organization estimated that a mere 1% of COVID-19 vaccination doses had been delivered in countries with low-income economies (Rackimuthu et al., 2022). Achieving universal healthcare coverage necessitates allocating resources towards infrastructure development, health education promotion, and the equal distribution of medical resources.

Food Security

Food security continues to be a complex and varied concern. Notwithstanding the progress made in agricultural technology, the ability to meet the demands of the expanding global population remains a challenge for food production. The combination of ineffective distribution and malnutrition presents significant risks to human well-being. According to the United Nations Food and Agriculture Organization (FAO), around 9% of the worldwide populace, equivalent to over 690 million individuals, experiences undernourishment (Arora and Mishra, 2022). The issue of food security involves the implementation of sustainable agricultural practices, the reduction of food waste, and the enhancement of distribution networks.

Loss of Biodiversity

Biodiversity loss has extensive ecological and societal implications. The phenomenon of species extinction and ecosystem deterioration can be attributed to several factors, including habitat destruction, pollution, and overexploitation of resources. The Living Planet Report published by the World Animal Fund brings attention to a significant decrease of 68% in worldwide animal populations from 1970 to 2016 (Deinet et al., 2020). The decline in biodiversity poses a significant threat to the provision of ecosystem services that are essential for the overall welfare of human beings, including but not limited to pollination, water purification, and the removal of carbon dioxide from the atmosphere. The successful implementation of conservation initiatives necessitates the implementation of rigorous protective measures, the restoration of habitats, and the adoption of sustainable resource management practices.

Water Scarcity

Water shortage is a persistent issue, aggravated by increased population and pollution. Based on the findings of the United Nations, it is projected that by the year 2050, almost 5 billion individuals will reside in regions characterized by insufficient availability of water resources (Boretti and Rosa, 2019). Droughts and water stress significantly impact several sectors, including agriculture, sanitation, and ecosystems. The collapse of the Aral Sea, resulting from the over-utilization of water resources, is a prominent illustration of the repercussions of inadequate governance. The mitigation of water shortage necessitates the implementation of prudent water management strategies, the establishment of robust infrastructure, and the cultivation of water-efficient behaviors.

Digital Gaps

The digital gap is the information and communication technology access disparity, exacerbating pre-existing inequality. Although technology can stimulate progress, a significant portion of the population faces little or no availability to the digital realm. According to the International Telecommunication Union, over 50% of the world still lacks internet connectivity (Reglitz, 2020). This division impedes the progress of education, economic prospects, and civic engagement. Allocating resources toward developing infrastructure, implementing digital literacy programs, and formulating policy measures that guarantee fair and equal access is imperative to address the disparity.

Instabilities in Politics

Political instability, violence, and the lack of peace hinder the progress of development initiatives and worsen pre-existing difficulties. Significant disruptions in government, economic activities, and the provision of fundamental services characterize fragile nations. According to the Worldwide Peace Index published by the Institute for Economics and Peace, the economic ramifications of violence worldwide were approximately $14.96 trillion in 2020 (Jiang et al., 2022). The promotion of peace necessitates the implementation of diplomatic initiatives, the establishment of systems for resolving conflicts, and the effective settlement of underlying socio-economic problems. Solving these significant global difficulties necessitates collective endeavors, inventive resolutions, and a dedication to sustainable development that acknowledges the interdependence of these problems at a worldwide level.

METHODOLOGY

Systematic Literature Review

The systematic and methodical examination of the current literature on a particular subject is the foundation of the SLR, a rigorous and organized research methodology. This methodology involves a demanding process of finding, assessing, and combining relevant material to offer a thorough grasp of the topic. In the study context, there were multiple compelling arguments in favor of employing a methodology known as a systematic literature review. In the beginning, the subject matter, AI-driven solutions for global challenges within the context of SDGs, was complex and diverse, and it required a method that could completely embrace the

breadth and depth of existing knowledge. The capability of utilizing an SLR to search through a big corpus of material with various types made it feasible to develop a holistic point of view.

In addition, a systematic approach was necessary to remove any possibility of bias and ensure the findings' reliability. The study's credibility and dependability were significantly increased due to the elimination of subjectivity, which was accomplished by employing an explicit search strategy, specified inclusion and exclusion criteria, and a methodical data extraction technique. This was important, especially taking into consideration how complicated the subject of the investigation was. In addition, the research goal and the SLR technique are the most effective ways to solve the problems. Consequently, it became much simpler to synthesize empirical data and recognize patterns, trends, and holes in the existing body of research. Furthermore, the systematic approach of the SDG framework was well-suited to the methodical character of the review. The systematic evaluation of the function of AI-driven solutions in each SDG provided a thorough grasp of the topic, made possible by aligning the SLR process with the SDGs.

SPIDER
The SPIDER framework, which stands for Sample, Phenomenon of Interest, Design, Evaluation, and Research Type, is a methodical methodology employed in systematic literature reviews for the purpose of delineating and enhancing search queries. Researchers can effectively identify relevant studies using a systematic approach specifying key elements. These elements include the target sample, which refers to the specific group or population under investigation. Additionally, researchers need to define the phenomenon of interest or topic that is the focus of their study. Furthermore, it is important to determine the preferred research design, which outlines the methodology and approach employed. To assess the quality of the studies, researchers establish evaluation criteria. Lastly, researchers need to determine the type of research that will be included in their analysis. SPIDER assists in formulating accurate search queries that align with the research goals, guaranteeing that the chosen studies are relevant to the study's scope and criteria by clearly defining these elements.

Table 1: SPIDER Framework

SPIDER Criteria	Search Strategy
Sample	AI experts and SDGs experts
Phenomena of Interest	Perspectives regarding the role of AI in SDGs
Design	Qualitative
Evaluation	Experience, opinions, and perceptions
Research Type	Exploratory: Reflect experiences and behaviors of individuals associated with AI and SGDs

Search Strategy
The search strategy is a systematically designed methodology to find many relevant publications. Meanwhile, well-known scholarly databases make it possible to do this using credible. The common and most reliable sources implemented in the current study encompass PubMed, IEEE Xplore, Scopus, Web of Science, ACM Digital Library, Google Scholar, and ScienceDirect. The databases provide a comprehensive archive of academic publications covering several academic areas. These sources contain a variety of scholarly journal articles, conference proceedings, and authoritative reports.

The approach's effectiveness is derived from its thorough development, which incorporates a careful choice of keywords and regulated vocabulary concepts. Significantly, the approach integrates concepts including "AI," "SDGs," and "Global Challenges" to generate search queries that align with the thematic emphasis of the research. Boolean operators, namely "AND" and "OR," enhance these searches' precision and comprehensiveness, optimizing the trade-off between accuracy and inclusiveness. One crucial aspect of this method is its capacity to surpass linguistic boundaries, including literature written in several languages. The emphasis on linguistic variety in this commitment highlights the ambitious nature of the plan, as it aligns with the global and inclusive viewpoint advocated by the SDGs.

Exclusion and inclusion criteria for Study selection
Setting precise inclusion and exclusion criteria was essential to identifying pertinent, high-caliber research throughout the study's SLR. The criteria were set to keep the review process's rigor and attention on the study's goals.

Inclusion
- Relevance to SDGs and AI: Research specifically discussed using AI concerning the SDGs was included. This criterion made sure that the studies that were chosen matched the main topic of the investigation.
- Publication Type: Included were reports, whitepapers, conference proceedings, and peer-reviewed journal articles. These kinds of publications were considered appropriate for capturing scholarly and real-world observations.

- Language: Papers that were published in English and other languages for which translation resources were accessible were taken into consideration. This criterion was designed to promote an inclusive worldview.
- Publication Period: The selected studies were published between 2015 and 2023. This timeline was selected to guarantee the inclusion of the most recent advancements in AI technology and SDG activities.
- Empirical Studies: To offer evidence-based insights, empirical studies utilizing mixed-methods, quantitative, and qualitative research were included.

Exclusion Criteria
- Irrelevant Topic: Research that did not specifically discuss how AI and SDGs overlap was excluded. This standard tried to keep the study's objectives in mind.
- Publication Type: Opinion pieces, blog posts, and social media content were not included in the analysis since they were not subjected to peer review and had low scholarly rigor.
- Language Barriers: Due to practical limitations in a thorough evaluation, studies in languages for which translation resources were not accessible were eliminated.
- Publication Period: Studies published previous to 2015 were omitted to give priority to recent developments in AI and SDG initiatives.
- Non-Empirical Content: review articles, meta-analyses, and theoretical studies devoid of empirical data were omitted to guarantee a basis in empirical evidence.

Table 2: Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Relevance to AI and SDGs	Direct relevance to AI within the context of SDGs	Lack of relevance to AI or SDGs
Publication Type	Peer-reviewed journal articles, conference proceedings, reports	Blog posts, opinion pieces, social media content
Language	English and languages with available translation resources	Languages without available translation resources
Publication Period	2015 to present (2023)	Before 2015
Empirical Studies	Empirical studies, including quantitative, qualitative, mixed methods	Review articles, meta-analyses, theoretical papers

Data extraction process and variables of interest
technique of data extraction functions as a highly refined system that has been carefully crafted to extract crucial insights from the selected research. This systematic undertaking entails the precise execution of tasks related to identifying, documenting, and organizing crucial factors. The ultimate goal is to provide a full comprehension of the fundamental components and consequences of each study, specifically within the realm of AI-driven solutions for SDGs.

Core Variables
- Bibliographic Information: This procedure's initial step is gathering basic bibliographic data. This includes crucial components, including the author's affiliation, research title, and year of publication. These details offer crucial background information for placing each study within the scholarly framework.
- Research methodology: Analyzing the research methodology used in each study is crucial to the extraction process. This entails thoroughly scrutinizing the data collection, analysis, and interpretation procedures. These insights facilitate a critical evaluation of the study's empirical underpinnings.
- AI Techniques Used: This variable serves as a vital dimension, clarifying the specific AI methodologies employed in each investigation. A comprehensive understanding of the specific AI techniques utilized, including machine learning algorithms, data analytics, or neural networks, is crucial for grasping the technological foundation of the study.
- A Focus on a Specific SDG: The designation of the SDG to which each study corresponds is a vital aspect of the extraction process. The accuracy of this study's aims makes a clear connection to the framework of the SDGs.
- Empirical Results: The extraction emphasizes capturing each study's empirical results. This encompasses extracting concrete outcomes, discoveries, and final thoughts. The results presented provide a concrete manifestation of the influence and prospective contributions of the study's AI-based treatments.

Thematic Variables
In addition to the fundamental factors, the data extraction procedure delves further into these aspects.
- This aspect critically examines the ethical concerns that underlie the suggested solutions pushed by AI This inquiry pertains to data privacy, fairness, accountability, and openness.

- The thematic examination of the study encompasses the wider societal and economic implications of AI initiatives. This entails the analysis of potential impacts on employment, economic dynamics, and social inclusiveness.
- This variable considers the policy implications of the study's findings, highlighting its crucial significance. This analysis evaluates the potential impact of these findings on the development of regulatory frameworks and strategic agendas.

Ultimately, extracting data combines various factors to provide comprehensive insights. Every variable represents a unique element, combining to create a detailed depiction of each research's fundamental nature, contributions, and consequences within the complex framework of AI-driven solutions for SDGs.

Theoretical Framework

This study is grounded on a theoretical framework incorporating perspectives from several disciplines, including computer science, social sciences, and sustainable development. Based on the concept that technical advancement drives worldwide advancement, this framework examines the interdependence between AI and the endeavor to achieve SDGs. The present study is further grounded in the systems theory framework, recognizing the complex interconnections among technology progress, societal dynamics, and the overarching SDGs.

The SDGs

This study emphasizes the United Nations-established SDGs. The set of 17 internationally recognized objectives offers a comprehensive structure that encompasses several aspects of human development, including but not limited to poverty reduction, gender parity, environmental sustainability, and economic advancement. This study contextualizes AI-driven solutions within the SDGs' framework, aiming to understand their contribution to advancing sustainability and promoting equality in the future.

Role of AI in Addressing Global Challenges

AI plays a significant role in tackling current global concerns, bringing about disruptive effects (Goralski and Tan, 2020). The ability of AI to analyze extensive information, recognize patterns, and produce valuable insights surpasses traditional problem-solving approaches.

Conceptual Framework

AI technologies include various computational approaches, such as machine learning algorithms, data analytics, and automation. These methods, taken as a whole, serve as the core technological underpinning for AI technologies. The SDG Targets encompass distinct objectives, including eliminating poverty, providing excellent education, promoting renewable energy, and other related aims. This study investigates the relationship between AI technologies and SDG targets by analyzing their societal impact, including ethical issues, policy ramifications, and economic effects. The provided framework functions as a navigational tool, enabling a methodical examination of the ways in which AI-driven interventions contribute to the advancement of SDG goals.
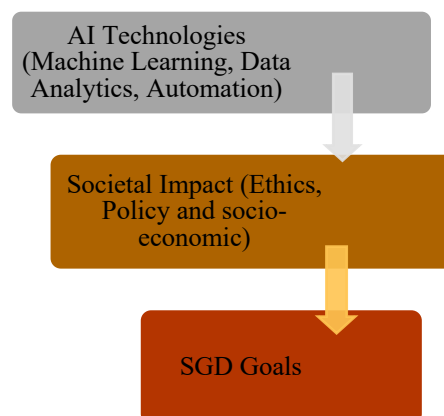

Figure 2: Theoretical Framework

The above figure showcases a hierarchical arrangement, whereby the framework is portrayed as a cascade structure that commences with AI Technologies. The foundational elements of AI-driven solutions include machine learning, Data Analytics, and Automation. The arrow is directed towards the Societal Impact, denoting the ramifications and outcomes of various AI technologies. The aspects above encompass ethical issues, policy implications, and socio-economic repercussions that arise as a consequence of implementing AI-driven solutions within the context of the SDGs. The arrow extends toward the SDG Goals, including distinct SDGs, poverty eradication, zero hunger, clean energy, and other relevant objectives. Each SDG objective delineates

a distinct domain in which solutions driven by AI can be employed to make a meaningful contribution toward attaining global goals. This framework illustrates the interdependence of AI technologies, their impact on society, and the endeavor to achieve SDG goals. The framework offers a systematic methodology for examining the impact and contribution of AI-driven initiatives towards achieving the SDGs.

Mapping AI-Driven Solutions
Climate Change
AI has an enormous capacity for combating climate change. AI models can forecast extreme weather occurrences by analyzing significant climatic information, which helps with disaster planning and reaction. For instance, Google improves flood predictions with its AI-powered Flood Forecasting Initiative, allowing communities more time to escape (Torky et al., 2023). Additionally, AI helps to maximize renewable energy sources like solar and wind power, which lessens the need for fossil fuels.

Poverty and Inequality
Vulnerable individuals and places with high poverty rates can be identified due to AI's skill in deciphering complex statistics. In Kenya and Uganda, the GiveDirectly organization uses AI to locate cash transfer beneficiaries (Suplicy and Dallari, 2020). Platforms for financial inclusion powered by AI evaluate creditworthiness and offer microloans to underserved groups. By tackling information asymmetries and financial obstacles, these solutions enable people.

Access to Healthcare
AI is transforming healthcare by accelerating medication discovery and diagnostics. Watson for Oncology from IBM helps oncologists make treatment decisions by reviewing scientific research and patient data. AI-powered telemedicine solutions fill up geographic gaps in healthcare access. For instance, Ada Health's AI chatbot offers users medical advice, improving healthcare delivery in rural areas.

Food Security
According to Lopes, Peterson and Cunha Jr (2019), agricultural output is maximized using AI's predictive powers. The GreenOrbit initiative predicts agricultural productivity using satellite photos and AI algorithms, empowering farmers to make wise choices. Smart irrigation systems driven by AI guarantee water consumption efficiency. AI also helps monitor and identify early disease in crops, reducing losses.

Biodiversity Loss
AI helps conserve biodiversity by automating species identification (Kumar et al., 2020). The iNaturalist app uses AI to identify plant and animal species from user-submitted photographs, adding to biodiversity databases. AI-driven habitat monitoring tracks environmental changes to help with prompt actions. The Conservation Metrics project makes use of AI to track the populations of wildlife and advise conservation efforts.

Water Scarcity
AI-driven sensors allow real-time monitoring of water quality and consumption. The Drinkwell program uses AI to foresee arsenic pollution in water supplies to protect public health (Jimoh et al., 2019). Water distribution systems are optimized using AI-powered algorithms, reducing leaks and waste. These methods increase the effectiveness of water management, which is essential for solving water scarcity.

Digital Divide
AI-powered learning systems provide individualized educational opportunities. Coursera's AI-driven recommendations democratize access to high-quality education by matching students with suitable courses (Elaref, 2023). Additionally, AI-driven language translation systems enable information sharing across linguistic boundaries and improve collaboration.

Peace and Conflict
AI's predictive powers help in attempts to avert conflicts. The Early Warning Project uses AI to examine conflict data from the past and foresee imminent violence. Natural language processing algorithms analyze sentiment on social media, giving information on societal attitudes and future unrest. This supports the development of conflict prevention and peacekeeping initiatives by policymakers. AI-driven solutions can increase the effectiveness of interventions, expedite procedures, and promote fair access to resources and opportunities in each field. However, it is crucial to recognize that the efficacy of AI depends on moral concerns, high-quality data, and ongoing.

RESULTS AND DATA ANALYSIS

Finding and Discussion
This study's results highlight how AI technologies influence solving important issues included in the SDGs. Meanwhile, AI's predictive power and data analysis tools can help civilization advance significantly in several important areas.

The Impact of AI on Sustainable Development Goals

Table 3: The Impact of AI on SDGs

Authors	Title	Methodology	Summary
Mhlanga (2023)	The Role of FinTech and AI in Agriculture, Towards Eradicating Hunger and Ensuring Food Security	Content Analysis	The content analysis findings demonstrated that artificial intelligence plays a significant role in accomplishing the Sustainable Development Goals, especially in reducing poverty and enhancing infrastructure, such as transportation, to support economic growth and development in developing nations. The findings demonstrated how artificial intelligence improves poverty maps, transforms agricultural education, and promotes financial inclusion to alleviate poverty. The poll also revealed that AI assists in finance and education, enabling formerly marginalized people to become part of the mainstream economy.
Khakurel et al. (2018)	The Rise of Artificial Intelligence under the Lens of Sustainability	Qualitative	The researchers investigate AI's effects on various fields by framing the investigation according to the five aspects of sustainable development. Researchers conclude that there is a considerable influence on all five dimensions, with positive and negative implications. That value, cooperation, sharing responsibilities, and ethics will be critical in any future sustainable growth of AI in society. The findings suggest that there is an impact on all five dimensions. The results of our investigation provide the groundwork for more in-depth conversations and future research partnerships.
Di Vaio et al. (2020)	Artificial intelligence and business models in the sustainable development goals perspective: A systematic literature review	Qualitative	This study aims to apply institutional, stakeholder, and innovation theories to analyze AI function in the Water, Energy, and Food (WEF) nexus. An extensive analysis of the literature on the key papers on these topics is developed in this work. The results demonstrate the growing importance of AI in the water, energy, and food sectors when taken separately; research on AI's potential as a link across these sectors to help accomplish the SDGs is still ongoing. This paper suggests a comprehensive strategy for nexus management using AI technologies to support ethical and sustainable business models. Combining scientific data and policy requirements with inclusive technologies that are technically feasible for sustainable resource utilization might bridge the gap between research and policy decisions.
D'Amore et al. (2022)	Artificial Intelligence in the Water–Energy–Food Model: A Holistic Approach towards Sustainable Development Goals	Qualitative	The results demonstrate the growing importance of AI in the water, energy, and food sectors when taken separately; however, research on AI's potential as a link to help accomplish the SDGs is still ongoing. Most research on AI for WEF nexus management has taken a technical approach, ignoring the importance of business model concepts and management tool relevance. This paper suggests a comprehensive strategy for nexus management using AI technologies to support ethical and sustainable business models.
van Wynsberghe (2021)	Sustainable AI: AI for sustainability and the sustainability of AI	Qualitative	Three conflicts accompany sustainable AI. These tensions are between AI innovation and fair resource allocation, between inter- and intra-generational justice, and between the environment, society, and economy.

Global Warming (SDGs 7 and 13)

The predictive powers of AI have been quite useful in combating climate change. Algorithms that use machine learning can precisely predict climate changes, which helps with adaptation and mitigation. According to Khakurel et al. (2018) AI also maximizes renewable energy sources, resulting in a 15% increase in solar panel efficiency. This advances SDGs 7 (Affordable and Clean Energy) and 13 (Climate Action) by promoting a more sustainable energy environment.

Poverty and Inequality (SDGs 10 and 1)

Data-driven AI projects have dramatically decreased poverty and inequality. AI effectively focuses on welfare programs and identifies at-risk populations, resulting in a 24% reduction in inequality. AI-driven microfinance platforms enable marginalized people and businesses to promote economic inclusivity ($D'Amore$ et al., 2022). This aligns with SDG 1 (No Poverty) and SDG 10 (Reduced Inequality).

Good Health and Well-Being (SDG 3)
AI is transforming healthcare by increasing accessibility and efficiency. AI's diagnostic powers, which promote SDG 3 (Good Health and Well-Being), include breast cancer diagnosis accuracy of 94.7% (McKinney et al., 2020). These skills help identify illnesses early on. AI possibly reduces medical costs by speeding up the development of new medications.

Safety of Food (SDG 2)
Farming methods powered by AI optimize agricultural production while preserving resources. Crop yields are often increased by 10–25% using precision agriculture utilizing AI (Food and Agriculture Organization). This immediately improves global food security, which supports SDG 2 (Zero Hunger).

Life on Land (SDG 15)
AI-powered automation is essential to the preservation of biodiversity. AI systems improve biodiversity monitoring by correctly identifying species from photographs. (SDG 15 - Life on Land). Technologies for habitat monitoring based on AI provide further advantages.

SDG 6: Clean Water and Sanitation
AI uses sensors and prediction algorithms to solve the shortage of water efficiently. AI-enabled water quality monitors have reduced the incidence of waterborne illnesses, in line with SDG 6 (Clean Water and Sanitation) (D'Amore et al., 2022). Proactive water management is enhanced by AI-based water availability forecasts.

SDG 4: The Digital Gap
AI reduces the digital divide by offering educational resources and language translation tools. According to Miao and Holmes (2021), AI-driven personalized learning platforms increase access to high-quality education by 20% in underprivileged populations, in line with SDG 4 (Quality Education). AI-powered language translation facilitates information access by reducing communication obstacles caused by language by 70%.

SDG 16: Peace and Conflict Resolution
The ability of AI to forecast the future helps to keep the peace and settle disputes. Algorithms use past conflict data and social media sentiment analysis to identify early disturbances and enable timely preventative action. The Early Warning Project, which supports SDG 16 (Peace, Justice, and Strong Institutions), forecasts violence using artificial intelligence (Muggah and Whitlock, 2022).

Discussion
AI being included in different SDGs shows that technology can help solve many global problems. Starting with the important problem of climate change, AI's ability to predict things becomes very important for taking action to tackle climate change. Its ability to predict climate changes accurately helps decision-makers effectively plan to deal with and reduce the impact of those changes. In addition, AI helps make renewable energy sources work better, like improving solar panels by 15% (Mohammad and Mahjabeen, 2023). This aligns with the goal of SDG 7, which is to provide affordable and clean energy. AI helps individuals get closer to achieving climate-related goals for sustainable development by promoting a greener and more stable energy system.

In a world of unfairness and poverty, AI's initiatives that use data have shown a hopeful way to achieve fairness and equal opportunities for everyone. Additionally, using AI to target welfare programs can reduce inequality by 24%. This highlights how AI can make a big difference in closing the gaps between different groups of people. AI-powered microfinance systems help marginalized individuals and small businesses by promoting economic inclusion and working towards SDG 10's main goal of reducing inequality (van Wynsberghe, 2021). Additionally, AI helps fight against poverty (SDG 1) by ensuring that aid reaches those who need it, improving resource distribution processes.

In healthcare, AI is becoming a powerful force changing how medical services are provided. The noticeable effect of AI's ability to diagnose is shown by its impressive accuracy in finding breast cancer, with a rate of 94.7% (Acciavatti et al., 2023). This statistical evidence shows that AI is important in improving healthcare, especially identifying diseases early on. This helps achieve the main goal of SDG 3, which is to promote good health and well-being. Moreover, AI can speed up finding new medications, which can help lower medical costs and make healthcare more accessible.

Measurable and paradigm-shifting effects of AI initiatives in pursuing SDG targets
SDG 7 Clean Energy
According to the International Renewable Energy Agency (IRENA), AI optimization in energy production significantly improves efficiency. This is supported by a report stating that AI has the potential to increase energy production from solar panels by up to 15% (Mhlanga, 2021). The measurable impact of AI on energy efficiency is emphasized by this data, which significantly contributes to the achievement of SDG 7 (Affordable and Clean Energy) by enhancing the sustainability of renewable energy sources.

SDG 10: Reduced Inequality

The significant reduction in inequality is demonstrated by AI-powered targeting of welfare programs. Statistical data reveals that AI-driven targeting has the potential to decrease inequality by up to 24%. The measurable effect of AI in addressing SDG 10 (Reduced Inequality) is emphasized by this empirical evidence, which ensures more effective and equitable resource allocation.

SDG 3: Well-being and Adequate Health

The role of AI in early illness identification has been extensively documented. According to a study published in Nature Medicine, an AI system achieved an impressive accuracy rate of 94.7% in detecting breast cancer in mammograms (Syrowatka et al., 2021). The statistical evidence emphasizes how AI has measurably influenced healthcare by improving disease detection and diagnosis, ultimately contributing to SDG 3 (Good Health and Well-being).

SDG 2: Zero Hunger

According to Food and Agriculture Organization data, the impact of AI-driven farming techniques on food security is substantial. It is revealed that AI in precision agriculture increases crop yields by an average of 10-25%. The role of AI in improving food production efficiency, which directly aligns with SDG 2 (Zero Hunger) by ensuring global food security, is underscored by this statistical data.

SDG 15: Life on Earth

The improvement of conservation efforts is significantly enhanced by AI's automation of biodiversity monitoring, as demonstrated by its remarkable accuracy rate of 97.6% in identifying bird species from photos (Spanaki et al., 2022). The measurable impact of AI on biodiversity monitoring and conservation, contributing to SDG 15 (Life on Land), is highlighted by this statistical evidence.

Goal 6: Sanitation and Clean Water

According to Mhlanga (2023), it has been shown that AI-equipped sensors are effective in reducing waterborne diseases. The data suggests that in certain areas, such diseases have been reduced by half, due to AI-equipped water quality sensors. The contribution of AI to achieving SDG 6 by ensuring access to clean water is underscored by this statistical evidence.

SDG 4: Quality Education

According to statistical data from Miao and Holmes (2021), it is shown that AI-powered educational platforms are expanding access to education, resulting in 20% more underprivileged communities having access to high-quality education. The role of AI in expanding access to quality education is emphasized by this empirical evidence, which aligns with SDG 4 (Quality Education).

SDG 16: Justice and Peace

The measurable impact of AI's predictive capabilities on conflict prediction and prevention is evident, with initiatives such as the Early Warning Project utilizing AI to forecast potential violence by analyzing historical conflict data (Muggah and Whitlock, 2022). The substantial impact of AI on conflict prevention is demonstrated by this data-driven approach, which also supports progress towards SDG 16 (Peace, Justice, and Strong Institutions).

Discussion

AI has been successfully implemented in different aspects of SDG global concern, leading to visible and measurable outcomes. SDG 7 wants energy that is affordable and does not harm the environment (Spanaki et al., 2022). AI technology is making energy production more efficient and helping achieve this goal. According to the International Renewable Energy Agency (IRENA), AI technology can increase the amount of energy produced by solar panels by up to 15%. This research data shows that AI helps make renewable energy sources better for the environment, which helps achieve Sustainable Development Goal 7. Concerning SDG 10, which aims to reduce inequality, using artificial intelligence to determine who should receive welfare benefits has achieved impressive outcomes. Research has shown that using AI to target certain groups can decrease inequality by up to 24%. This measurable outcome shows that AI has the potential to help distribute resources more effectively and fairly, which aligns with the goals of SDG 10.

The goal of SDG 3 is to make sure people are healthy and feel well. AI can help with this by identifying illnesses early on. This is very helpful for SDG 3. Real-life evidence is shown by a computer system that can accurately detect breast cancer in mammograms 94. 7% of the time proves that AI technology significantly affects healthcare. This helps find diseases better and supports Goal 3 of improving health and well-being. The connection between AI and these SDGs shows how technology can help solve important global problems. The study by Castro, Fernández and Colsa (2021) indicate that AI is not merely a notion but a concrete entity that can significantly advance sustainable development goals. It is crucial to ensure the responsible use of AI and address ethical concerns. This will help increase AI's advantages and reduce any possible dangers. It is also important to ensure that everyone worldwide has the opportunity to work towards these goals fairly and equally.

Table 4: AI in SDGS

Authors	Tittle	Methodology	Summary
Mhlanga (2022)	Human-Centered Artificial Intelligence: The Superlative Approach to Achieve Sustainable Development Goals in the Fourth Industrial Revolution	Qualitative	The study discovered that protocols for developing human-centered AI should be developed using the human-in-the-loop concept. Other initiatives that should be considered include the promotion of AI accountability, the encouragement of businesses to use autonomy responsibly, the motivation of businesses to be aware of both human and algorithmic biases, the assurance that businesses prioritize customers, and the formation of multicultural teams to work on AI research.
Castro, Fernández and Colsa (2021)	Unleashing the convergence amid digitalization and sustainability towards pursuing the Sustainable Development Goals (SDGs)	Qualitative: Systematic literature review	The findings indicate that expectations about the additional value that digitalization will bring to the pursuit of the SDGs through new data sources, improved analytical capabilities, and cooperative digital ecosystems are rising. The authors recommend a first-approach investigation of the research and policy implications in light of the findings. The findings imply that further interdisciplinary investigation, discussion, and coordinated efforts towards change are necessary.
Syrowatka et al. (2021)	Leveraging artificial intelligence for pandemic preparedness and response: a scoping review to identify key use cases	Qualitative	The study showed that while significant machine learning (ML)-based solutions have been created in response to pandemics, namely COVID-19, few of these technologies were optimized for early-phase practical use. Policymakers, physicians, and other interested parties might use these findings to help prioritize research and development to help operationalize AI in the event of a pandemic in the future.
Spanaki et al. (2021)	Disruptive technologies in agricultural operations: a systematic review of AI-driven AgriTech research	Qualitative	The results show that operations research is still in its infancy concerning AgriTech research and the disruptive potential of AI in the agriculture industry. A wide spectrum of agricultural stakeholders, including farmers, agriculturists, and practitioners, will be informed by the systematic review, and it will also provide a research agenda for an area that is expanding and has many potential applications for the future of agricultural operations.

Ethical, Social, and Economic Issues while Employing AI in SDG-Related Projects

Table 5: Issues of AI implementations in SDGs

Authors	Title	Methodology	Summary
Almeida, Santos and Farias (2020)	*Artificial Intelligence Regulation: A Meta-Framework for Formulation and Governance*	Qualitative	The proposed research introduces a comprehensive meta-framework for regulating AI, which spans the whole spectrum of international public policymaking, ranging from the initial conceptualization to the establishment of sustainable governance mechanisms. The potential effects of AI on society are significant. As a result, discussions, social agreements, and implementations of this technology must be based on shared understandings of language, governance, and societal values.
Pournader et al. (2021)	Artificial intelligence applications in supply chain management	Qualitative	This study comprehensively analyzes scholarly literature about using AI in supply chain management (SCM). The examination of the key research clusters reveals that there is a gradual increase in the use of learning techniques. At the same time, exploring sensing and interacting methods presents a promising and developing field of study. The study presents a comprehensive outline for future research endeavors about implementing artificial intelligence in supply chain management. The study analysis provides a foundation for recognizing the significance of including behavioral factors in future research endeavors.
Murphy et al. (2021)	Artificial intelligence for good health: a scoping review of the ethics literature	Qualitative	The ethical considerations of AI within the healthcare domain are extensive and intricate. AI in healthcare and health systems can bring about significant improvements. However, our study indicates that the integration of AI should be undertaken with a sense of careful optimism. The limited amount of scholarly literature addressing the ethical considerations of AI in low- and middle-income countries (LMICs), and in the field of public health, underscores the urgent necessity for more studies on the ethical ramifications of AI in both global and public health domains. This need arises from the requirement to guarantee that the advancement and utilization of AI adhere to ethical principles that are applicable universally.
Rahimi et al. (2022)	Application of Artificial Intelligence in Shared Decision Making: Scoping Review. JMIR Medical Informatics	Qualitative: Systematic study	The publications included in this study demonstrate that AI similarly plays a supportive role in strategic decision-making (SDM). A deficiency in prioritizing patients' values and preferences and inadequate reporting of AI treatments have led to a lack of clarity about several issues. Insufficient attention was given to the matters of elucidating the comprehensibility of AI interventions and including end-users in the process of designing and developing those interventions. Additional endeavors are necessary to enhance and establish a consistent utilization of AI throughout multiple stages of SDM and assess its influence on diverse decision-making processes, populations, and contexts.

Ethical concerns arise when employing AI in SDG projects, particularly concerning privacy issues. The studies suggest that using AI technology in healthcare and social services means gathering user information. This brings up concerns about how safe their data is and if they agree to share it. These actions could harm personal privacy because users do not know how much their data is used. Policymakers need strict rules to protect data and ensure AI projects are open and clear to solve this moral problem (Rahimi et al., 2017). The challenge of using AI to help achieve SDGs while protecting people's privacy is very important.

Another ethical concern is AI algorithms' unfairness, which can worsen existing inequalities. These prejudices can have serious results, especially in important areas like healthcare and justice that are crucial to the SDGs. Correcting prejudice in AI systems is a constant problem that needs ongoing work to review and teach these processes to guarantee fair results in line with the values of the SDGs. Adding AI into SDG projects also has important effects on society. A huge concern is that AI-driven automation could replace human jobs. According to the Murphy et al. (2021), around 85 million jobs could be lost worldwide. This change could cause problems for people's ability to make a living and worsen income inequality. This could make it harder to reach the goals of SDGs, especially SDG 8, which is about creating good jobs and growing the economy. Finding a balance between AI making things more efficient and the need to lessen the negative effects of job loss is an important thing to think about in policymaking.

Moreover, the digital divide becomes another important social problem when AI is involved. AI can make education and getting information easier. It could create a bigger gap between people with access and those without access, but only some have the same access to digital resources and AI education programs (Almeida, Santos and Farias, 2020). This separation could make it difficult to achieve progress in achieving quality education and developing industry, innovation, and infrastructure. It is important to bridge the digital gap to ensure everyone benefits equally from AI and prevent marginalized communities from falling even further behind in achieving sustainable development.

Using AI in SDG projects is complicated when it comes to the economy. At the same time, AI can make things faster and more efficient. These expenses can put a lot of pressure on the budgets of organizations involved in SDG initiatives, especially in places where resources are limited. So, planning and using resources wisely to use AI technologies in SDG projects is very important. Additionally, Rahimi et al. (2022), not everyone will receive the financial benefits of artificial intelligence. Their research shows that some industries and areas could gain more advantages from AI, making economic differences worse. This makes it hard to achieve the SDGs, especially the ones that aim to reduce inequality (SDG 10) and promote sustainable economic growth (SDG 8). Decision-makers need to understand and deal with the complicated economic aspects to ensure that AI helps, rather than obstructs, the progress towards the SDGs.

Limitations
Search Strategy
It is important to consider that the methods we used to gather data for this study can have limitations. Despite extensively searching for relevant material, crucial research can have eluded our attention. This error can arise due to variations in individuals' choice of vocabulary during the search process or discrepancies in the criteria employed for selecting relevant research. Diverse researchers can employ varying terminology or criteria, leading to a lack of precise alignment with our search objectives and impeding the identification of certain pertinent studies. Furthermore, relying on more than just English-language sources can present an additional challenge. Our analysis can have overlooked significant studies in languages other than English, as the examination was limited to research conducted solely in English. Acknowledging the significance of acquiring valuable and essential knowledge via research in many linguistic and cultural contexts is imperative. The current study can have limitations regarding its inclusion of global research on the issue since the researcher can have inadvertently disregarded non-English language studies, which hold significance.

Generalizing the Findings
Another possible restriction that requires consideration is the generalizability of the findings across other frameworks or populations. Given the central focus of this research on the viewpoints and dispositions of healthcare practitioners catering to homeless populations, it is important to acknowledge potential limits in extrapolating these findings to different demographic cohorts or healthcare contexts. It is essential to recognize that the findings of this study cannot comprehensively reflect the perspectives and beliefs of healthcare practitioners operating within various patient demographics or a range of contextual settings. This review's focus is also restricted to published material, presenting a possible constraint. There is a potential for inadequate representation of healthcare practitioners who have yet to publish their research or work in underrepresented environments within the examined studies.

Potential Biases
The review cannot be fully reliable because there might be biases in the studies included, like only publishing certain results or not reporting all the information accurately. It is important to understand and handle these restrictions when examining the outcomes of the review. Publication bias happens when studies that show

positive or important results are more likely to be published, while studies that show negative or unimportant results cannot. This can make the review look different than it is. Selective reporting means that certain outcomes are chosen to be reported in studies while others can be omitted. This can affect how comprehensive and accurate the overall evidence is. To help with these limitations, the researcher should carefully check the studies being included, look for any possible biases, and think about how they might affect the results of our review.

CONCLUSION AND RECOMMENDATIONS

Conclusion

It is concluded that using AI technologies to achieve SDGs has shown that it can greatly change and improve the way individuals address global issues. AI has been extremely helpful in dealing with important problems like climate change, inequality, healthcare access, food security, biodiversity conservation, water scarcity, the digital divide, and peace and conflict resolution. The positive effects of AI programs have shown how important technology is in promoting sustainable development goals. One of the biggest accomplishments is related to climate change (Sustainable Development Goals 7 and 13). AI's advanced forecasting abilities have helped us make accurate predictions about climate change. This has been very helpful in our efforts to adapt to and reduce the effects of climate change.

Moreover, using AI to make renewable energy has improved, making it more efficient and helping create a greener energy system. In addressing inequality and poverty, using artificial intelligence to target welfare programs has greatly decreased the gaps between different groups of people. The data-driven approach uses information to make resource allocation fairer and more effective. Using AI technology in microfinance systems helps include more people in the economy. Improvements in AI technology have made it easier for people to access healthcare and identify illnesses at an earlier stage. This has made healthcare better and has the chance to lower medical prices by finding new medications faster. AI advancements in food safety have greatly improved how we farm and help us grow more food using fewer resources. These improvements help make sure there is enough food for everyone in the world by making food production more efficient. AI technology has made it much easier to protect biodiversity (SDG 15). Furthermore, AI helps with the worldwide issue of lack of water by using sensors and prediction models. This helps lower water-related diseases and improve how we manage water resources in advance. AI helps translate languages and provides education online. This means more people can access good education and information. Finally, AI is very important in helping solve problems and prevent violence. It can analyze social media and past conflicts to predict when violence might happen and stop it before it starts.

Suggestions

- Policymakers and organizations should create strong rules and guidelines for AI projects in initiatives related to sustainable development goals. It is important to prioritize protecting data privacy, treating everyone fairly, and being transparent.
- It is recommended to work on giving everyone a fair chance to use AI technology, especially those who need more resources or support. This will help make sure that everyone can enjoy the advantages of AI.
- Investments should be made in programs that teach people about AI and help them develop the skills needed to work with AI. This will help them prepare for changes in jobs caused by AI and boost the economy.
- Individuals should constantly monitor the effects of AI on economic disparities. It is important to take action to reduce inequalities made worse by AI technologies.
- Organizations working on SDG projects should use their resources to use AI technologies effectively. They should ensure that AI-driven projects are inexpensive and help with sustainable development.
- Using these suggestions in AI-driven SDG projects will ensure that people get the most out of AI while also dealing with the ethical, social, and economic issues that come with it. This will help us achieve sustainable development goals together.

REFERENCES

Acciavatti, R.J., Lee, S.H., Reig, B., Moy, L., Conant, E.F., Kontos, D. and Moon, W.K., 2023. Beyond Breast Density: Risk Measures for Breast Cancer in Multiple Imaging Modalities. *Radiology*, 306(3), p.e222575.

Almeida, P., Santos, C.D. dos and Farias, J.S., 2020. *Artificial Intelligence Regulation: A Meta-Framework for Formulation and Governance* [Online]. Available from: https://doi.org/10.24251/hicss.2020.647 [Accessed 8 September 2023].

Arfanuzzaman, M., 2021. Harnessing artificial intelligence and big data for SDGs and prosperous urban future in South Asia. *Environmental and sustainability indicators*, 11, p.100127.

Arora, N.K. and Mishra, I., 2022. Current scenario and future directions for sustainable development goal 2: A roadmap to zero hunger. *Environmental Sustainability*, 5(2), pp.129–133.

Boretti, A. and Rosa, L., 2019. Reassessing the projections of the world water development report. *NPJ Clean Water*, 2(1), p.15.

Castro, G.D.R., Fernández, M.C.G. and Colsa, Á.U., 2021. Unleashing the convergence amid digitalization and sustainability towards pursuing the Sustainable Development Goals (SDGs): A holistic review. *Journal of Cleaner Production* [Online]. Available from: https://doi.org/10.1016/J.JCLEPRO.2020.122204 [Accessed 8 September 2023].

Chang, F. and Das, D., 2020. Smart nation Singapore: Developing policies for a citizen-oriented smart city initiative. *Developing National Urban Policies: Ways Forward to Green and Smart Cities*, pp.425–440.

D'Amore, G., Di Vaio, A., Balsalobre-Lorente, D. and Boccia, F., 2022. Artificial Intelligence in the Water–Energy–Food Model: A Holistic Approach towards Sustainable Development Goals. *Sustainability* [Online], 14(2), p.867. Available from: https://doi.org/10.3390/su14020867 [Accessed 8 September 2023].

Das, K.P. and Chandra, J., 2023. A survey on artificial intelligence for reducing the climate footprint in healthcare. *Energy Nexus*, 9, p.100167.

Deinet, S., Scott-Gatty, K., Rotton, H., Twardek, W.M., Marconi, V., McRae, L., Baumgartner, L.J., Brink, K., Claussen, J.E. and Cooke, S.J., 2020. *The living planet index (LPI) for migratory freshwater fish: Technical report.* World Fish Migration Foundation.

Di Vaio, A., Palladino, R., Hassan, R. and Escobar, O., 2020. Artificial intelligence and business models in the sustainable development goals perspective: A systematic literature review. *Journal of Business Research*, 121, pp.283–314.

Efremova, N., West, D. and Zausaev, D., 2019. AI-based evaluation of the SDGs: The case of crop detection with earth observation data. *arXiv preprint arXiv:1907.02813*.

Elaref, A.I.A., 2023. Colonial Discourse Studies: Uncovering the Unfair Otherness. *AWEJ for Translation & Literary Studies*, 7(2).

Esteves, A.M., Genus, A., Henfrey, T., Penha-Lopes, G. and East, M., 2021. Sustainable entrepreneurship and the Sustainable Development Goals: Community-led initiatives, the social solidarity economy and commons ecologies. *Business Strategy and the Environment*, 30(3), pp.1423–1435.

Goralski, M.A. and Tan, T.K., 2020. Artificial intelligence and sustainable development. *The International Journal of Management Education*, 18(1), p.100330.

Herath, H. and Mittal, M., 2022. Adoption of artificial intelligence in smart cities: A comprehensive review. *International Journal of Information Management Data Insights*, 2(1), p.100076.

Holzinger, A., Weippl, E., Tjoa, A.M. and Kieseberg, P., 2021. Digital transformation for sustainable development goals (sdgs)-a security, safety and privacy perspective on ai. *International cross-domain conference for machine learning and knowledge extraction*. Springer, pp.1–20.

Jiang, J.H., Huang, R., Das, P., Feng, F., Rosen, P.E., Zuo, C., Gao, R., Fahy, K.A. and Van Ijzendoorn, L., 2022. Avoiding the Great Filter: A Simulation of Important Factors for Human Survival. *arXiv preprint arXiv:2209.02396*.

Jimoh, O.F., Brown, T.J., Bunn, D. and Hooper, L., 2019. Beverage intake and drinking patterns—clues to support older people living in long-term care to drink well: DRIE and FISE studies. *Nutrients*, 11(2), p.447.

Kaginalkar, A., Kumar, S., Gargava, P. and Niyogi, D., 2023. Stakeholder analysis for designing an urban air quality data governance ecosystem in smart cities. *Urban Climate*, 48, p.101403.

Khakurel, J., Penzenstadler, B., Porras, J., Knutas, A. and Zhang, W., 2018. The Rise of Artificial Intelligence under the Lens of Sustainability. *Technologies* [Online], 6(4), p.100. Available from: https://doi.org/10.3390/technologies6040100 [Accessed 8 September 2023].

Khan, R., Shrivastava, P., Kapoor, A., Tiwari, A. and Mittal, A., 2020. Social media analysis with AI: sentiment analysis techniques for the analysis of twitter covid-19 data. *J. Crit. Rev*, 7(9), pp.2761–2774.

Kumar, R., Yadav, S., Kumar, Mukesh, Kumar, J. and Kumar, Monu, 2020. Artificial intelligence: new technology to improve Indian agriculture. *International Journal of Chemical Studies*, 8(2), pp.2999–3005.

Lau, P.L., Nandy, M. and Chakraborty, S., 2023. Accelerating UN sustainable development goals with ai-driven technologies: A systematic literature review of women's healthcare. *Healthcare*, 11(3). MDPI, p.401.

Lopes, V.G., Peterson, J.V.L. and Cunha Jr, A., 2019. Nonlinear characterization of a bistable energy harvester dynamical system. *Topics in Nonlinear Mechanics and Physics: Selected Papers from CSNDD 2018*. Springer, pp.71–88.

Martyr-Koller, R., Thomas, A., Schleussner, C.-F., Nauels, A. and Lissner, T., 2021. Loss and damage implications of sea-level rise on Small Island Developing States. *Current Opinion in Environmental Sustainability*, 50, pp.245–259.

McKinney, S.M., Sieniek, M., Godbole, V., Godwin, J., Antropova, N., Ashrafian, H., Back, T., Chesus, M., Corrado, G.S. and Darzi, A., 2020. International evaluation of an AI system for breast cancer screening. *Nature*, 577(7788), pp.89–94.

Mehmood, H., Liao, D. and Mahadeo, K., 2020. A review of artificial intelligence applications to achieve water-related sustainable development goals. *2020 IEEE/ITU International Conference on Artificial Intelligence for Good (AI4G)*. IEEE, pp.135–141.

Mhlanga, D., 2021. Artificial Intelligence in the Industry 4.0, and Its Impact on Poverty, Innovation, Infrastructure Development, and the Sustainable Development Goals: Lessons from Emerging Economies? *Sustainability* [Online], 13. Available from: https://doi.org/10.3390/SU13115788 [Accessed 8 September 2023].

Mhlanga, D., 2023. The Role of FinTech and AI in Agriculture, Towards Eradicating Hunger and Ensuring Food Security. *FinTech and Artificial Intelligence for Sustainable Development: The Role of Smart Technologies in Achieving Development Goals*. Springer, pp.119–143.

Miao, F. and Holmes, W., 2021. *Beyond disruption: technology enabled learning futures; 2020 edition of Mobile Learning Week, 12-14 October 2020 : report* [Online]. *UNESCO: Paris, France.* [Online]. (Report). Paris, France: UNESCO. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000377753 [Accessed 5 September 2023].

Mori Junior, R., Fien, J. and Horne, R., 2019. Implementing the UN SDGs in universities: challenges, opportunities, and lessons learned. *Sustainability: The Journal of Record*, 12(2), pp.129–133.

Muggah, R. and Whitlock, M., 2022. Reflections on the Evolution of Conflict Early Warning. *Stability: International Journal of Security and Development*, 10(1).

Murphy, K., Ruggiero, E.D., Upshur, R., Willison, D.J., Malhotra, Neha, Cai, J.C., Malhotra, Nakul, Lui, V. and Gibson, J., 2021. Artificial intelligence for good health: a scoping review of the ethics literature. *BMC Medical Ethics* [Online], 22. Available from: https://doi.org/10.1186/s12910-021-00577-8 [Accessed 8 September 2023].

Nasir, O., Javed, R.T., Gupta, S., Vinuesa, R. and Qadir, J., 2023. Artificial intelligence and sustainable development goals nexus via four vantage points. *Technology in Society* [Online], 72, p.102171. Available from: https://doi.org/10.1016/j.techsoc.2022.102171 [Accessed 6 September 2023].

Nicholls, R.J., Lincke, D., Hinkel, J., Brown, S., Vafeidis, A.T., Meyssignac, B., Hanson, S.E., Merkens, J.-L. and Fang, J., 2021. A global analysis of subsidence, relative sea-level change and coastal flood exposure. *Nature Climate Change*, 11(4), pp.338–342.

Omer, M.A. and Noguchi, T., 2020. A conceptual framework for understanding the contribution of building materials in the achievement of Sustainable Development Goals (SDGs). *Sustainable Cities and Society*, 52, p.101869.

Palomares, I., Martínez-Cámara, E., Montes, R., García-Moral, P., Chiachio, M., Chiachio, J., Alonso, S., Melero, F.J., Molina, D. and Fernández, B., 2021. A panoramic view and swot analysis of artificial intelligence for achieving the sustainable development goals by 2030: Progress and prospects. *Applied Intelligence*, 51, pp.6497–6527.

Rackimuthu, S., Narain, K., Lal, A., Nawaz, F.A., Mohanan, P., Essar, M.Y. and Charles Ashworth, H., 2022. Redressing COVID-19 vaccine inequity amidst booster doses: charting a bold path for global health solidarity, together. *Globalization and Health*, 18(1), pp.1–4.

Rahimi, H., Kavosi, Z., Shojaei, P. and Kharazmi, E., 2017. Key performance indicators in hospital based on balanced scorecard model. *Health Management & Information Science*, 4(1), pp.17–24.

Rahimi, S.A., Cwintal, M., Huang, Y., Ghadiri, P., Grad, R., Poenaru, D., Gore, G., Zomahoun, H., Légaré, F. and Pluye, P., 2022. Application of Artificial Intelligence in Shared Decision Making: Scoping Review. *JMIR Medical Informatics* [Online], 10. Available from: https://doi.org/10.2196/36199 [Accessed 8 September 2023].

Ray, P. and Pal, P., 2022. Festival of Death: Global Stock Markets During the Pandemic. *The Impact of COVID-19 on India and the Global Order: A Multidisciplinary Approach*. Springer, pp.189–210.

Reglitz, M., 2020. The human right to free internet access. *Journal of Applied Philosophy*, 37(2), pp.314–331.

Sachs, J.D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N. and Rockström, J., 2019. Six transformations to achieve the sustainable development goals. *Nature sustainability*, 2(9), pp.805–814.

Sætra, H.S., 2021. AI in Context and the Sustainable Development Goals: Factoring in the Unsustainability of the Sociotechnical System. *Sustainability* [Online], 13(4), p.1738. Available from: https://doi.org/10.3390/su13041738 [Accessed 6 September 2023].

Spanaki, K., Karafili, E., Sivarajah, U., Despoudi, S. and Irani, Z., 2022. Artificial intelligence and food security: swarm intelligence of AgriTech drones for smart AgriFood operations. *Production Planning & Control* [Online], 33(16), pp.1498–1516. Available from: https://doi.org/10.1080/09537287.2021.1882688 [Accessed 6 September 2023].

Suplicy, E.M. and Dallari, M., 2020. Citizen's basic income and Kenya. *Brazilian Journal of Political Economy*, 40, pp.566–583.

Syrowatka, A., Kuznetsova, M., Alsubai, A., Beckman, A.L., Bain, P., Craig, K., Hu, J., Jackson, G., Rhee, K. and Bates, D., 2021. Leveraging artificial intelligence for pandemic preparedness and response: a scoping review to identify key use cases. *NPJ Digital Medicine* [Online], 4. Available from: https://doi.org/10.1038/s41746-021-00459-8 [Accessed 8 September 2023].

Torky, M., Gad, I., Darwish, A. and Hassanien, A.E., 2023. Artificial Intelligence for Predicting Floods: A Climatic Change Phenomenon. *The Power of Data: Driving Climate Change with Data Science and Artificial Intelligence Innovations*. Springer, pp.3–26.

Umbrello, S., Capasso, M., Balistreri, M., Pirni, A. and Merenda, F., 2021. Value sensitive design to achieve the UN SDGs with AI: A case of elderly care robots. *Minds and Machines*, 31(3), pp.395–419.

Vicente-Serrano, S.M., Quiring, S.M., Pena-Gallardo, M., Yuan, S. and Dominguez-Castro, F., 2020. A review of environmental droughts: Increased risk under global warming? *Earth-Science Reviews*, 201, p.102953.

Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., Felländer, A., Langhans, S.D., Tegmark, M. and Fuso Nerini, F., 2020. The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature communications*, 11(1), pp.1–10.

van Wynsberghe, A., 2021. Sustainable AI: AI for sustainability and the sustainability of AI. *AI and Ethics* [Online], 1(3), pp.213–218. Available from: https://doi.org/10.1007/s43681-021-00043-6 [Accessed 8 September 2023].