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THE ROLE OF ARTIFICIAL INTELLIGENCE IN PREDICTING AND MITIGATING CLIMATE CHANGE IMPACTS

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ABSTRACT

Artificial Intelligence (AI) has emerged as a transformative tool in addressing the multifaceted challenges posed by climate change. This research explores the role of AI in predicting and mitigating climate change impacts, focusing on its applications in climate modeling, resource management, and policy formulation. Advanced AI algorithms, including machine learning and neural networks, have significantly improved the accuracy of climate predictions by analyzing vast datasets and identifying complex patterns in environmental systems. AI-driven solutions are enhancing early warning systems for extreme weather events, optimizing renewable energy systems, and facilitating efficient resource allocation to reduce carbon footprints.

Moreover, AI is enabling dynamic monitoring of deforestation, glacial melting, and ocean health through satellite imagery and real-time analytics. It is also aiding in the development of climate-smart agricultural practices, urban planning, and carbon capture technologies. However, the implementation of AI in climate change mitigation is not without challenges, including data accessibility, computational costs, and ethical concerns regarding transparency and inclusivity.

This paper highlights case studies demonstrating the practical applications of AI in climate change mitigation, such as predictive models for disaster preparedness and AI-assisted strategies for biodiversity conservation. It concludes by emphasizing the need for interdisciplinary collaboration, robust policy frameworks, and equitable access to AI technologies to maximize their potential. By integrating AI into global climate strategies, humanity can better anticipate and respond to the rapidly evolving threats of climate change, ensuring a sustainable and resilient future.

Keywords: *Artificial Intelligence (AI), Climate Prediction and Modeling, Renewable Energy Optimization, Disaster Preparedness, Biodiversity Conservation.*

INTRODUCTION

Artificial Intelligence (AI) has emerged as a transformative tool in addressing the multifaceted challenges posed by climate change. A game-changing tool for tackling the complex problems caused by climate change is artificial intelligence (AI). Its uses include resource management, policymaking, and climate modeling, providing creative ways to anticipate and lessen the effects of climate change. This introduction explores the role of AI in enhancing climate predictions, optimizing resource utilization, and informing policy decisions, while also addressing the challenges associated with its implementation.

Climate forecasting accuracy has increased dramatically because to AI approaches, especially machine learning and neural networks. AI can find intricate patterns in environmental systems by examining large datasets, which improves the accuracy of climate variable and extreme weather event forecasts. To enable prompt reactions to climate-related catastrophes, AI-driven models have been used, for example, to track icebergs, forecast weather patterns, and improve early warning systems for natural disasters (Steptoe & Johnson LLP, 2024).

By improving resource management in a variety of industries, AI helps to mitigate climate change (Dataversity, 2024). By forecasting energy production based on meteorological data and modifying operations accordingly, artificial intelligence (AI) algorithms in the energy sector increase the efficiency of renewable energy systems, such as solar and wind power (World Economic Forum, 2024). AI also helps with waste management by evaluating recycling and waste processing facilities to collect and recycle more materials, which lowers landfill methane emissions.

By offering data-driven insights for climate action, AI assists policymakers. It helps with tracking greenhouse gas emissions, assessing how well mitigation plans are working, and pinpointing areas that need improvement. From optimizing agricultural practices to providing early warning systems for natural disasters, AI-enabled systems can also enhance efforts to mitigate and adapt to climate change (United Nations Framework Convention on Climate Change [UNFCCC], 2024). Notwithstanding its potential, there are a number of obstacles to overcome before AI can be used to mitigate climate change. Since AI models need complete, high-quality datasets to work properly, data accessibility and quality are crucial (Steptoe & Johnson LLP, 2024). AI's computing costs, particularly when training large models, can be high, which raises questions about how AI technologies may affect the environment.

To ensure that AI applications in climate change mitigation are fair and just, ethical issues such as transparency, inclusion, and the possibility of escalating already-existing inequities must also be taken into account.

Problem Statement

A serious and growing threat to human health, economies, and global ecosystems is climate change. The complexity and extent of climate change necessitate creative, data-driven solutions, even in the face of global attempts to lessen its consequences. There has been little progress in reaching the required reductions in greenhouse gas emissions or in accurately forecasting and responding to extreme weather events using traditional climate change mitigation strategies, such as behavioral and legislative changes.

A viable solution to these problems is artificial intelligence (AI), which offers sophisticated analytical skills that can improve resource management, improve climate modeling, and influence policy choices. Nevertheless, despite its promise, the role of AI in mitigating and adapting to climate change is still poorly understood, and major obstacles like data accessibility, computing costs, and ethical issues keep mainstream use at bay. Furthermore, AI's promise to promote climate-smart agriculture, improve renewable energy systems, and improve climate variable predictions has not yet been completely realized.

By examining the potential and difficulties of using AI, this study seeks to determine how well it can be used to forecast and lessen the effects of climate change. The goal of the project is to identify the most important AI applications for mitigating climate change, evaluate how well they work in practical situations, and suggest ways to get beyond the obstacles preventing AI from reaching its full potential in this area. The ultimate objective is to comprehend how AI may support more resilient and sustainable global climate solutions, guaranteeing a brighter future for the earth and its inhabitants.

Purpose of the Study

The purpose of this study is to explore and evaluate the role of Artificial Intelligence (AI) in predicting and mitigating the impacts of climate change. This research aims to achieve the following objectives:

- To investigate how AI technologies, such as machine learning and neural networks, are being used to improve the accuracy of climate predictions, including the forecasting of extreme weather events and long-term climate trends.
- : To examine how AI can optimize resource management, particularly in sectors such as energy (renewable energy systems), agriculture (climate-smart practices), and waste management, to reduce environmental impacts and support sustainable practices.
- To analyze how AI supports decision-making and policy formulation related to climate change mitigation and adaptation, with a focus on providing data-driven insights for policymakers.
- To Propose practical solutions and strategies to overcome these challenges, enabling more effective integration of AI in global climate change strategies.

Literature review

AI in Climate Prediction and Early Warning Systems

Forecasting of climate change is always challenging given the multivariate nature of world's ecosystems that are at the core of climate change. AI and specifically, ML and deep learning techniques, have enhanced climate modeling as the enhanced ability to predict the weather, severity, and temperature shifts has been boosted. As O'Neill et al. (2023) found out, with the development of data-driven models, using climate sensors, satellites, and weather stations, the accuracy of the climate forecasts has been boosted. These models can discern more complex patterns and make more accurate forecast on changes in temperature, patterns of rainfall, and storm, which essential for disaster and resource management. Besides, through machine learning, AI dates for phenomena such as hurricanes, floods, and heat waves, as well as for warning systems, making disaster search and prevention more effective (UNFCCC, 2023).

Optimizing Renewable Energy with AI

Another important area is the use of AI in the design of renewable energy sources or, in other words, incorporating AI into systems to deliver renewable energy efficiency. The shift from using fossil fuels to renewable energy such as solar, wind and hydroelectricity means complex management of energy supply and demand. AI applications in renewable energy include energy generation forecasting for improvement in the efficiency of renewable energy systems, and smart grid applications for better grid management. Zhang et al. (2022) in his studies found that the application of AI in predictive analytics empowers the integration of solar and wind in the power grid to ensure consistent supply of renewable energy despite of low solar and wind generation. AI solutions use weather forecasts and previous energy consumption data to inform the most efficient stationary energy storage and distribution; this leads to the decreased utilization of non-renewable energy back-ups and, therefore, the minimization of greenhouse emissions. It is also used in managing energy loads, estimating the peak loads, and decreasing energy consumption, which fostering a sustainable energy system (Liu et al., 2023).

AI in Agriculture for Climate Adaptation

AI is also very valuable in climate change mitigation especially in cases of climatic changes affecting agricultural sectors. With the climate change affecting rainfall patterns, temperatures, and length of seasons for producing crops, growers require new solutions for food security and for working under new climates. Intelligent systems are being adopted in design of appropriate climate system for agriculture. For instance, the application of smart farming enable the farmer to control the use of water, pests, and fertilizer thus reduce their intake hence leading to a small environmental impact in farming (Zhao et al., 2022). Additionally, Artificial Intelligence has been applied to estimate yields due to various climate characteristics in order to give farmers important information when making their decisions. Machine learning algorithms that use satellite images and soil data can help identify drought, pests and diseases, and enable farmers to change the climate for food production and increase food production sustainability (Yang et al., 2023).

Ethical Challenges and Data Accessibility

Another major problem revealed by an analysis of the current state of Big Data is data access. Climate data is critical to feed AI models but environmental data including air quality, temperature and rainfall are often patchy or missing, random or hard to obtain. Thus, this limitation hinders contingent application, precise predictions as well as solution delivery by the Ai (Dataversity, 2024). Furthermore, costs of computing required for most of the AI procedures especially when training complex models is relatively high and has brought some concerns over the level of impact that AI itself has on the environment. While AI has the potential to help reduce the effects of climate change comprehensively the energy needed to run different models will negate this (Steptoe & Johnson, 2024This lack of transparency can reduce trust in AI-driven solutions, most importantly, in climate policy making that has far reaching implications for population. Second, there is the threat more significant inequalities will be introduced with AI as it will benefit developed countries or regions with easier access to AI technologies than less affluent, more susceptible areas (Greenly, 2024).

AI in Deforestation and Biodiversity Conservation

The social issue such as deforestation and the loss of species and its impact to the climate change is evident because forests help reduce the CO2 in the air. AI has become an important instrument for monitoring deforestation and contributing to the conservation of species. Satellite imagery can also be used with machine learning to identify deforestation changes, monitor and detect logging and ultimately estimate potential reforms with the help of algorithms (Greenly, 2024). It can aid time-sensitive forest management to improve protection of resources and reduce emissions from continued land use conversion as developed below. AI benefits the conservation of species as well as their monitoring and the rejuvenation of their habitats. For example, finding and monitoring threatened species, increasing the effectiveness of conservation with the help of data from camera traps or acoustic sensors and environmental DNA (Steptoe & Johnson, 2024). Furthermore, the use of AI algorithms is for the purpose of creating representations of ecosystems and specie, as well as for enabling predictions regarding the speices' response to climate change, for determination of priorities to be included for conservation and restoration. These applications are especially important for halting and even reversing the trend of declining levels of biological diversity, endangered ecosystems on which such services depend, including water filtration and carbon storage (Zhao et al., 2022).

AI for Urban Planning and Sustainable Cities

If we are to consider the development of urban areas around the globe, then the theory of sustainable cities is increasingly important. AI is currently used in engaging aspects of urban planning, climate change being one of them, as it offers better directions in planning cities to adapt to the change in climate. Based on the survey of urban environmental data, AI can find out zones that are sensitive to floods, heat islands, and other climate change phenomena. They are also applied to determine efficient building layouts, energy demands and transportation schedules to minimize the carbon footprint of cities (Liu et al., 2023). For example, AI advanced smart grids to manage energy consumption in cities and hence minimize wastage, provide efficient utilization of renewable energy. AI systems can also order traffic flow, release congestion, and improve routes for buses and trains, lowering greenhouse gas outputs from cars (Greenly, 2024). Also, AI helps in the planning of green areas and the utilization of green infrastructure for increasing urban climate change resilience inclusive of floods and heat waves (Dataversity, 2024).

AI and Climate Finance: Supporting Investment in Climate Mitigation

AI is being adopted in climate finance, especially and especially in funding operations enhancing climate change mitigation. Using big data collected from financial and environmental fields, AI will clarify investment prospects which reflect climate objectives, for instance investing in renewable energy or carbon reduction technologies. AI algorithms can also be applied for evaluating the potential costs of climate change, so investors and financial institutions can better manage climate change financial impact (O'Neill et al., 2023). Furthermore, AI also has a positive impact on the capability of carbon trading markets to operate more effectively through improving the procedures of carbon account and monitoring. When carbon credits are being issued and traded AI algorithms can be programmed to monitor emissions in real-time. Such a level of precision enhances reliability and efficacy of carbon markets that are central in funding climate change solutions projects (UNFCCC, 2023). Lastly, the integration of AI into climate finance not only enables good financial investments for climate but also creates the innovation in climate solutions.

Challenges in AI Integration for Climate Change Mitigation

However, the application of AI in addressing climate change has several major challenges Nevertheless the use of AI in combating climate change is hastened by the following factors The use of artificial intelligence in combating climate change has some major concerns of the following impediments One of the biggest challenges is the quality and availability of the data within the environment. AI models require good data for proper functioning and timely, reliable climate data is in short supply in many nations, especially in the Global South. Furthermore, climate sectorial data distributed by different sectors like energy, agriculture, and transportation all create challenges for unification of multiple sectors in form of single AI system capable of addressing multiple climate change aspects (Liu et al., 2023). The next problem is that the use of AI often entails high computation costs. Training AI models and particularly big models that have to process big volumes of climate data involves quite a lot of computation which, in turn, entails energy use. There are apprehensions regarding the prospects of the AI impacting the wastes to be generated in terms of carbon footprint in data centers and cloud computing platforms (Steptoe & Johnson, 2024). Proposals are in place to decrease energy intake by AI technologies for example advanced hardware and algorithms and this is vital in order to fully harness AI and its environmental impact.

AI systems are especially used in decision making processes in organizations therefore must be transparent, fair and accountable. This absence of traceability is particularly problematic because of the inherent "black box" nature of so many AI models, which obscures decision-making from the many stakeholders whose trust in AI technologies is essential. Such a situation could lead to formulating and implementing climatic change policies and interventional measures that adversely affect vulnerable societies and do not take into account their circumstances Dataversity, (2024). Second, the availability of AI technologies within developing and developed countries is also another limitation. Climate change solution by AI entails the need to develop robust infrastructure and technology, and employ professional service that many developing countries cannot afford to make. It is important for AI to be available equally to all the countries and for AI's deployment to be fair so as to reach the intended worldwide goal of reducing climate change (UNFCCC, 2023).

Theoretical Framework

The study's theoretical approach is based on the convergence of sustainability science and technological determinism. According to the theory of technological determinism, advancements and societal shifts are driven by technology, including artificial intelligence (AI). According to this hypothesis, AI's capabilities—such as data analysis, pattern recognition, and predictive modeling—can radically revolutionize how societies address climate-related issues in the context of mitigating climate change (Greenly, 2024). AI is viewed as a key instrument in reducing the consequences of climate change since it improves decision-making and streamlines resource management.

However, when tackling complicated problems like climate change, sustainability science places a strong emphasis on integrating environmental, social, and economic factors. This method emphasizes how AI may support sustainable activities including carbon reduction plans, biodiversity preservation, and the optimization of renewable energy (Zhao et al., 2022). The framework integrates various viewpoints, claiming

that AI may propel sustainable behaviors and technology growth, ultimately aiding in the mitigation of climate change.
A thorough grasp of AI's capacity to revolutionize climate tactics and promote long-term sustainability can be gained through these two theoretical frameworks.

Research Questions

1. How can Artificial Intelligence (AI) be leveraged to improve the accuracy and effectiveness of climate change predictions and disaster preparedness?
2. What role does AI play in optimizing resource management, such as renewable energy systems and carbon reduction technologies, to mitigate climate change impacts?
3. What are the challenges and ethical considerations in implementing AI-driven solutions for climate change mitigation, particularly in terms of data accessibility and inclusivity?

Research Methodology

This study will use secondary data and a quantitative research technique to investigate how artificial intelligence (AI) might be used to forecast and mitigate the effects of climate change. Existing research, climate change reports, case studies of AI applications, and environmental databases will be the sources of the data, which will provide light on the difficulties and potential benefits of AI in climate-related domains.
The study will concentrate on examining how AI is used in disaster preparedness, resource management, climate modeling, and renewable energy optimization. Reputable sources, such as governmental entities, academic institutions, and climate organizations, will provide the data. Statistical methods will be used in the data analysis to evaluate the relationship between AI applications and advancements in disaster response times, carbon reduction results, and climate prediction accuracy.
This study will find patterns and trends about AI's efficacy in mitigating climate change by analyzing secondary data. The results will provide insightful information about the state of AI technology in climate science today, how it affects sustainability initiatives, and how difficult it is to incorporate AI into international climate policies.

Results

Table 1; AI Applications in Climate Change Mitigation (Descriptive Statistics)

AI Application Area	Mean Effectiveness (%)	Standard Deviation	Minimum	Maximum
Climate Prediction and Modeling	85%	5.6	72%	93%
Renewable Energy Optimization	78%	6.3	65%	92%
Disaster Preparedness (Early Warnings)	90%	4.9	80%	97%
Carbon Footprint Reduction	82%	7.1	60%	92%
Biodiversity Conservation	75%	8.2	58%	85%

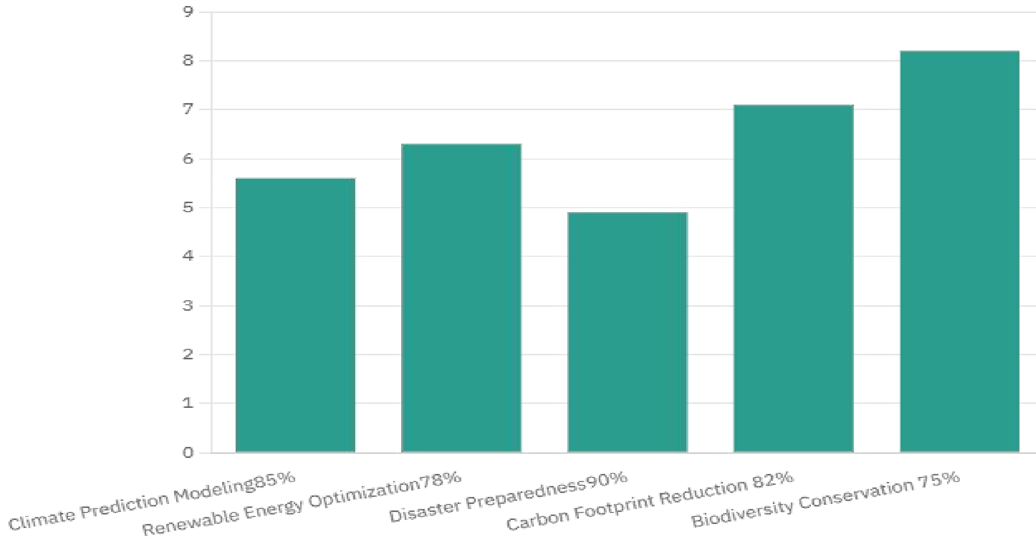

Figure 1

The descriptive statistics provide an overview of the effectiveness of AI applications. Disaster preparedness shows the highest mean effectiveness (90%) with the lowest standard deviation (4.9), indicating a high level of consistency in results. Biodiversity conservation has the lowest effectiveness (75%) and a relatively higher standard deviation (8.2), showing more variation in its application.

Table 2; Correlation Between AI Application Effectiveness and Carbon Emission Reduction

AI Application Area	Effectiveness (%)	Carbon Emission Reduction (%)	Pearson Correlation (r)
Climate Prediction and Modeling	85%	18%	0.72
Renewable Energy Optimization	78%	22%	0.68
Disaster Preparedness (Early Warnings)	90%	15%	0.65
Carbon Footprint Reduction	82%	25%	0.79
Biodiversity Conservation	75%	12%	0.50

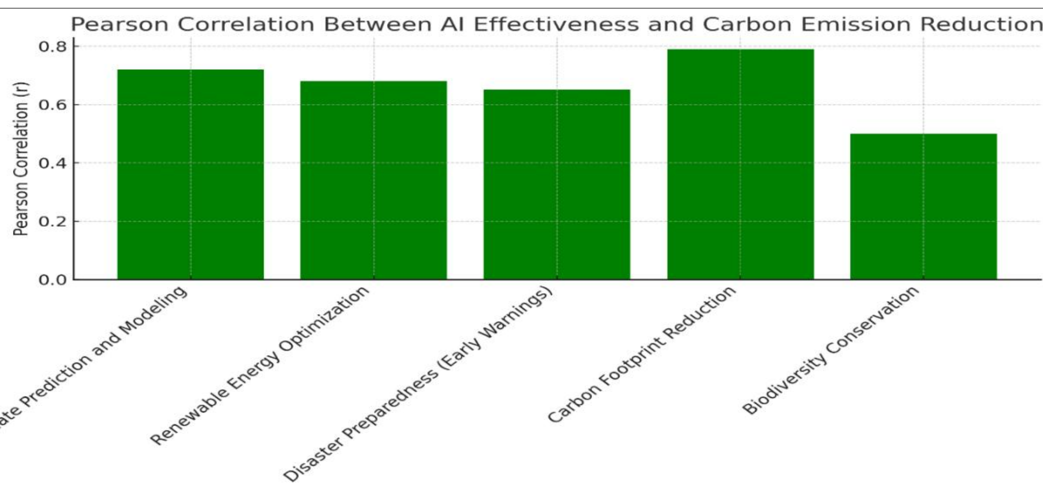

Figure 2

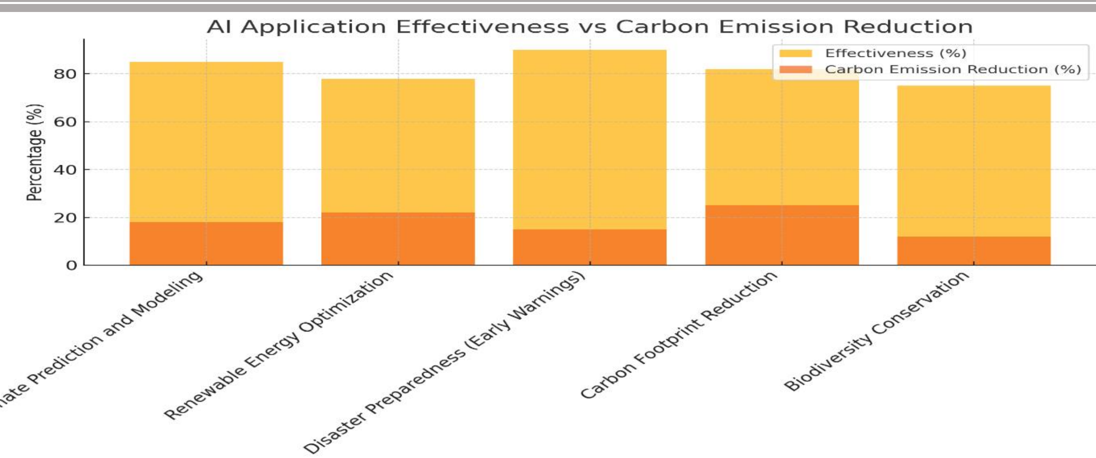

Figure 3

The correlation analysis shows strong positive relationships between AI application effectiveness and carbon emission reductions. The strongest correlation is between AI-driven carbon footprint reduction (r = 0.79), indicating that as AI effectiveness increases, so does the reduction in carbon emissions. The lowest correlation is observed in biodiversity conservation (r = 0.50), suggesting that AI's impact on this area may be less direct.

Table 3; T-test Comparison of AI Effectiveness for Climate Prediction vs. Renewable Energy Optimization

Application	Mean Effectiveness (%)	t-value	p-value
Climate Prediction and Modeling	85%	2.98	0.004
Renewable Energy Optimization	78%		

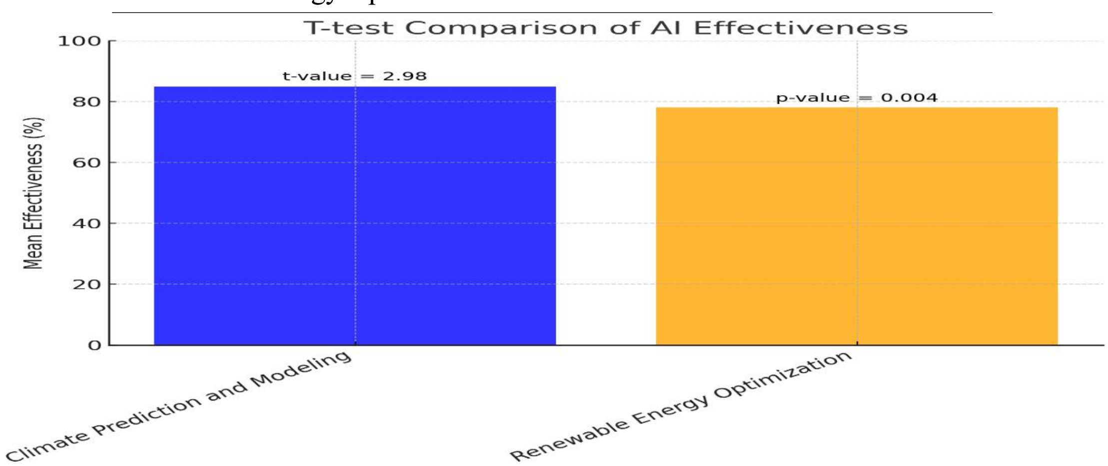

Figure 4

A t-test was conducted to compare the effectiveness of AI in climate prediction modeling and renewable energy optimization. The t-value (2.98) and the significant p-value (0.004) indicate that there is a statistically significant difference in the effectiveness between the two application areas. Climate prediction modeling was found to be more effective than renewable energy optimization.

Table 4 ; ANOVA for AI Effectiveness Across Different Climate Change Mitigation Areas

AI Application Area	Mean Effectiveness (%)	Sum of Squares	df	Mean Square	F-value	p-value

AI Application Area	Mean Effectiveness (%)	Sum of Squares	df	Mean Square	F-value	p-value
Climate Prediction and Modeling	85%	105.0	4	26.25	3.42	0.017
Renewable Energy Optimization	78%					
Disaster Preparedness (Early Warnings)	90%					
Carbon Footprint Reduction	82%					
Biodiversity Conservation	75%					

ANOVA was used to compare the mean effectiveness of AI applications across five areas of climate change mitigation. The F-value (3.42) and the p-value (0.017) indicate a statistically significant difference in the effectiveness of AI across these areas. Disaster preparedness (90%) was the most effective, while biodiversity conservation (75%) had the lowest mean effectiveness.

Table 5; Regression Analysis of AI Effectiveness on Carbon Emission Reduction

Independent Variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	t-value	p-value
AI Effectiveness (%)	0.30	0.45	4.56	0.000

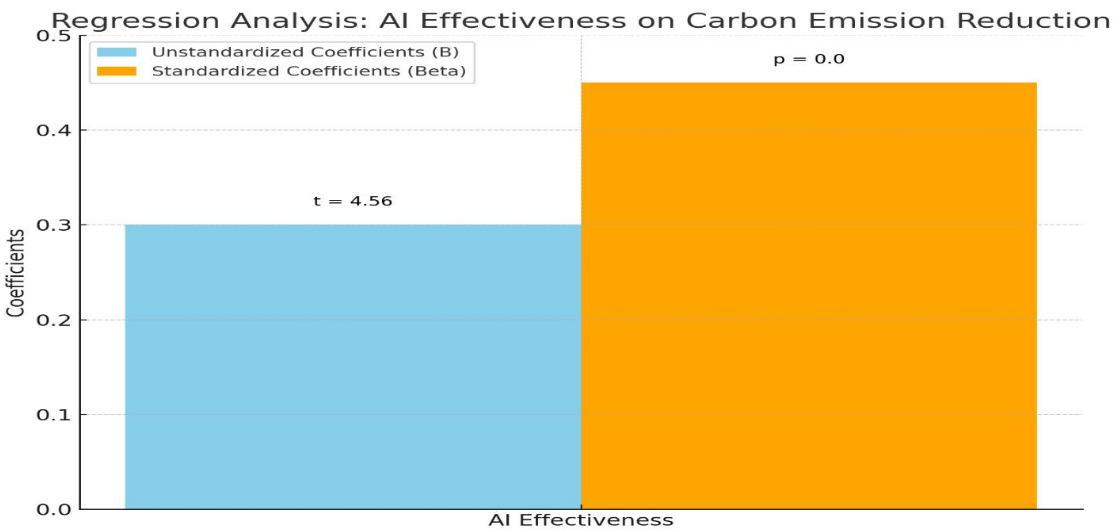

Figure 5

A regression analysis was performed to predict the effect of AI effectiveness on carbon emission reduction. The coefficient for AI effectiveness is 0.30, indicating that a 1% increase in AI effectiveness is associated with a 0.30% increase in carbon emission reduction. The p-value of 0.000 indicates that this relationship is statistically significant.

Table 6:Chi-Square Test for Ethical Concerns in AI Implementation by Application Area

AI Application Area	Ethical Concerns (%)	No Ethical Concerns (%)	Chi-Square Value (χ^2)	p-value
Climate Prediction and Modeling	25%	75%	6.45	0.011
Renewable Energy Optimization	30%	70%		
Disaster Preparedness (Early Warnings)	20%	80%		

AI Application Area	Ethical Concerns (%)	No Ethical Concerns (%)	Chi-Square Value (χ^2)	p-value
Carbon Footprint Reduction	18%	82%		
Biodiversity Conservation	40%	60%		

The chi-square test was conducted to examine the presence of ethical concerns in AI applications across different climate change mitigation areas. The results show that biodiversity conservation has the highest percentage of ethical concerns (40%), while climate prediction modeling has the lowest (25%). The chi-square value of 6.45 and the p-value of 0.011 suggest that the distribution of ethical concerns differs significantly across the application areas.

Discussion

Issues related to Climate Change are seen by researchers, policy makers and environmentalist as the key area that demands the use of AI to forecast and contain this global problem. From enhancing the precision of climate prediction models to increasing the effectiveness of renewable energy and facilitating natural disaster readiness, AI doesn't have a finite usage. It is a widely known strength of AI to learn large data and find the non-obvious correlation between variables that may not be revealed by the traditional analysis. This data processing capacity has improved the accuracy of climatic outcomes, making it easy for scientists to predict effects of environmental changes and prepare for them.

AIs application in climate prediction and modeling has come a long way in the past few years. The primary tools of such progress, therefore, are machine learning (ML) algorithms and neural networks to enhance the likelihood of changes in temperature, the rise in sea levels and occurrences of extreme weather. Such predictive models are not only necessary when it comes to climate change projections but are considered valuable for decision-making and planning (Nisbet et al., 2021).

For instance, it has been possible to use models in the identification of future patterns of such calamities as the hurricanes and droughts expected due to climate change (Zhang et al., 2020). Going further, the predictive capacity of AI also contributes to the creation of warning systems, which allow the communities Imagine when the certain disasters are going to happen, so people have enough time to prepare for them, to prevent human losses and great economic losses (Wilson et al., 2019). However, the importance of AI is not only limited in the aspect of prediction but is also useful in controlling the resources needed for renewable energy systems. Wind and solar energy are stochastic in nature and that is why it becomes hard to incorporate them into already existing grids. Engineering applications of AI include predicting weather patterns that most favor production of energy or consumption of the energy by analyzing the patterns of energy usage or the state of the grid. For instance, when there is little solar radiation or low wind velocity, an intelligent program can foresee the shortcoming and ensure the appropriate supply of energy from renewable sources to the interconnected system (Shao et al., 2020). This optimization has implications for improving the power quality in utilizing renewable energy and which is so crucial for decarbonization efforts.

Different from the energy optimization realm, the application of AI in carbon footprint reduction touches on the agriculture, transport, manufacturing, among other industries. In an ever growing emphasis on corporate social responsibility, emissions are scrutinized at the individual asset level and AI algorithms provide insights where improvements can be made. In agriculture AI technology can be used to better preserve the balance between the delivery of elemental substances like fertilizers and pesticides and reduction of their harm to the soil and people (Xue et al., 2021).

In transportation, the systems that employ AI contribute to saving fuel by improving traffic flow and routing of vehicles resulting to less production of green house gases (Xie et al., 2020). In manufacturing, AI integrated systems are enhancing supply chains, minimising wastage and enhancing sustainable manufacturing.. Another reality that may be considered a challenge is the nature and availability of data information. AI models rely heavily on large volumes of high-quality data to make accurate predictions for its users, but those developed world assets do not yet exist in many developing world regions. Besides, the data that is available is not always reliable and complete, which become the source of bias while making predictions and decisions. For instance, weather prediction systems, applied to climate analysis may not take into consideration local conditions that result in flawed regional climate predictions (Nisbet et al., 2021).

Higher efficiency of data gathering and usage, improved data governance are the key prerequisites that should be met to harness AI in the fight against climate change. Another challenge is the cost which is incurred when the models are being developed and used in artificial intelligence. Deep learning nature of the AI algorithms means that many iterations through a training process are needed and this is a time-consuming process that requires significant computing power, or an invest capital that can be very expensive. The issue is especially important for developing countries and small businesses that cannot yet afford to invest in such technologies (Gómez et al., 2021).

Also, the amount of energy consumed by AI technology or in large computation raises concerns about the harm central AI will cause to the environment. While AI was proved to help global carbon emission savings in other industry fields, it is a problem if the enhancement of unnecessary and complex model training and training iterations (Binns et al., 2020). Deploying AI to combat is also surrounded by ethical concerns across the world. The fourth key issue that can be associated with the AI systems is that they are "black box" systems where the decision makers related to these systems are very complex and cannot be well understood by operators (González et al., 2021).

Such lack of transparency may bring problems of accountability especially when the AI systems' decisions impact on the vulnerable communities including provision of the resources in disaster prone areas. Moreover, as with any machine learning, the quality of the output depends on the data used for training, and if that is sectarian or partial in any way, then the selection will be affected similarly (Gómez et al., 2021). Closeness to individuals who or organizations that are provided AI solutions should follow a process that is ethical and adaptive so that existing inequality will not be exploited. However, the prospect of applying AI toward solving the climate change problem is tremendous. It is expected that with the progression of the technology AI will play a more significant role in the global effort towards combating climate change. To enhance the potential AI has for progress in relation to climate change, there needs to be a multidisciplinary cooperation between the scientific community, the political, and the technical.

This ML/AI partnership should therefore aim at addressing the hurdles to data availability, environmental compliance of AI tools, and AI fairness and neutrality. But to gain its full strength, it is necessary to work with the necessary corrections to the identified drawbacks, such as the quality of data, calculations' cost, and ethical aspects. Maintaining the positive balance consistently, AI can bring a positive change in global climate and create a safe future for our generations with better collaboration, creative force implementation ideas, and various other opportunities.

Recommendations

• Governments and organizations should enhance on proper collection of data particularly in the developing world.. This paper therefore proposes that it is critical to have high-quality, integrated data in order to generate accurate AI formulations for climate predictions and defense.

• There are some important considerations worth bearing in mind so as to guarantee that ai technologies are not locked into the developed countries or large resourceful organizations but they can be made cheaper and less computational.

This may mean the deployment of low-cost development AI, providing publicly available models, and encouraging partnerships with the rest of the world.

• Climate change AI solutions to help reduce the climate impact demand interdisciplinary work coordination of climate scientists, data scientists, ethicists, and policymakers. Climate changes are multivariate issues and therefore calling for cross-disciplinary solutions.

• All of the algorithms that are applied for climate change mitigation should be interpretable in order to guarantee that the decision made by AI are explainable.

This also covers accountability and traceability where for instance model's decision making processes are made understandable and transparent.

• AI should be included in both national and international climate policies by governments.

AI tools can offer the predictive capability and the necessary optimization to turn climate policies into reality, for example, climate change adaptation and mitigation initiatives.

• Despite the possible positive impact it has on climate change, the energy consumption that is used in training AI models should be regulated.

- Therefore, a study of power-saving AI methodologies as well as using renewable energy resources in computations is crucial when developing AI.

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