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Footprints of Artificial Intelligence in Climate Change

Nikita Saklani[1], Kanchan Bade[2]
[1]*Visiting Faculty,* [2]*Associate Professor, Department of Applied Electronics & Software Technology, L.A.D. and Smt. R.P. College for Women, Nagpur, Maharashtra.*

Abstract: ***Climate change and digital modifications are the two most dominant trends of our century and have become a global concern. The strategy in which humans can manage them, and their enlarged interactions will play a key role in mankind's future. Primarily we have to make pathways to combine the climate and digital transformations in a way that validates our social and democratic values. In the present situation, climate change is the major concern that leads to the depletion of various environmental resources which is an alarming situation for living beings. Technology has changed a lot in the past few decades, changing our lives and us along with it. Artificial Intelligence is already playing a key role in Education, Health, and various other industries. Artificial intelligence (AI) is bringing about many changes in our perception of technology and lifestyle. Advancements in AI and Machine Learning (ML) are promising, and their applications are continually redefining the way we interact with our devices, people, and the planet. Various initiatives of Artificial Intelligence for tackling climate change have started, like the UN Climate Change Initiative on Artificial Intelligence for Climate Action. These investigate how AI might be used as a potent instrument to advance and intensify climate action that is revolutionary in poor nations. This paper mainly identifies the effective impacts of Artificial Intelligence on climate change and its sustainability.***
Keywords: Artificial Intelligence (AI), Climate, Sustainability, Climatic predictions, weather occurrences, Machine Learning (ML), Adaptation, Resilience.

I. INTRODUCTION

Everybody's life is being significantly impacted by technology. We utilize technology to quickly and conveniently do a variety of things in our everyday lives like daily routine activities, Health, Climate, and various other industries and professions. Climate change is an incident that experiences changes in patterns [1]. Human and various other natural effects have a great role in climate change. In the present situation, greenhouse gases play a key role in climate change, they trap heat and keep temperature intact to live life. Artificial Intelligence is an important key term in this changing technology era. Artificial Intelligence is a broad-ranging term that cannot be defined accurately every individual defines it differently. John McCarthy define it as "making a machine behave in ways that would be called intelligent if a human were so behaving". IBMs define it as "anything that makes machines act more intelligently".

ML is a part of AI which allows computer programs to gain an understanding of data and refine their performance without being precisely programmed. Arthur Samuel explains ML as the "Area of study that gives computers the ability to learn without being explicitly programmed". Various ML approaches can help predict extreme weather conditions with correctness. Data-driven approaches of machine learning [3] can help with accurate weather forecasting and people can be made well aware and responsive to various extreme disasters.

One of the serious challenges of the present circumstances is climate change, which needs quick action over numerous communities and methods. This paper seeks to illuminate the coordinated relationship between Artificial Intelligence and climate change. Artificial Intelligence [2] surrounds a range of various technologies, which include ML, natural language processing, and data analytics, which can be used to establish climate data, increase predictive models, and inform various climate policies. These technologies will play a crucial part in present and future generations. The major reasons why Artificial Intelligence is blooming day by day can be its decision, learning capabilities, and ability to modify the data based on previous data.

II. AIM & OBJECTIVE

The main aim of this research is to explore various steps of Artificial Intelligence that can be used in climatic change. AI can play an important role in different conditions due to its understanding capabilities.

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III. LITERATURE REVIEW

1) David G. Victor. How artificial intelligence will affect the future of energy and climate.
https://www.brookings.edu/articles /how-artificial-intelligence-will-affect-the-future-of energy-and-climate/
This article defines widely different terms like the impact of AI on energy supply, different policies that are made for climate change, and climate modeling which can help the environment [7]. It also says the climatic changes that are taking place these days are the largest market failures that anyone has seen to date because of various gas emissions that have global consequences.
2) Adhikari KE, Shrestha S, Ratnayake DT, Budhathoki A, Mohanasundaram S, Dailey MN (2021) Evaluation of artificial intelligence models for flood and drought forecasting in arid and tropical regions. Environ Model Softw 144:105136. https://www.sciencedirect.com/science/article/abs/pii/S1364815221001791?via%3Dihub
This paper incorporates various AI-based approaches [8] that can be used for flood and drought conditions. Disaster management is one of the main domains enfolding the techniques of AI. The AI-based approaches used in this paper are convolutional Neural Network (CNN), Long-Short Term Memory network (LSTM), and Wavelet decomposition functions added with the Adaptive Neuro-Fuzzy Inference System (WANFIS) are contrasted in flood as well as drought forecasting.
3) Alimissis A, Philippopoulos K, Tzanis CG, Deligiorgi D (2018) Spatial estimation of urban air pollution with the use of artificial neural network models. Atmos Environ 191:205–213.
https://doi.org/10.1016/j.atmosenv.2018.07.058
This paper explains the decreasing urban air quality which is a matter of great concern worldwide and is considered as a foremost environmental issue. Different methodologies like Artificial Neural Network, and Multiple Linear Regression [9] are used.
4) Cheong S-M, Sankaran K, Bastani H (2022) Artificial intelligence for climate change adaptation. Wiley Interdiscip Rev: Data Min Knowl Discov 12:e1459.
https://doi.org/10.1002/widm.1459
Paper emphasis on different multimodal approaches [11] for climate change adaptations. The main focus is on supervised learning, Transfer learning, and reinforcement learning.
5) Pham BT, Le LM, Le T-T, Bui K-TT, Le VM, Ly H-B, Prakash I (2020) Development of advanced artificial intelligence models for daily rainfall prediction. Atmos Res 237:104845.
https://doi.org/10.1016/j.atmosres.2020.104845
Rainfall is the main factor that has a large impact on agriculture fields, hydroelectric production, and water resource management [12]. The paper deals with different models namely Particle Swarm Optimization, Artificial Neural network, and Support Vector machines. These approaches will be helpful for quick along with accurate prediction of rainfall.

IV. ARTIFICIAL INTELLIGENCE IN CLIMATE CHANGE

Artificial Intelligence hype is increasing day by day, governments must be very active in making developments in climate change actions. Every individual country should take clear actions and make proactive decisions with the collaborations among multiple organizations that deal with various digital transformations that can help the government. Each sector like Academia, NGOs, Academia .private sectors, and various civil societies should support the decisions and help the government.

Artificial Intelligence has a good prospective potential to allow climate-changing strategies, but it also moves closer to having risks and various types of dangers that are attached to the moment. At the later stage, we can say AI is just a tool not a last goal, we should use it in a fair manner and at the correct time. The first and foremost step should be to carefully examine the problem and various other contexts that human beings try to address. Attention should also be paid to problem framing and this fact should be known that Artificial Intelligence [11] is not a solution. Environment and Climate Change are interlinked with Artificial Intelligence on various levels.

Important Artificial Intelligence features for climate

There are many key factors that AI can be used for climate changes

1) Filtering raw data into useful information. AI can pick out useful information that is surrounded by large amounts of data which is commonly very difficult for human beings.
2) Improving complex systems. Artificial Intelligence approaches are used for good enhancement to obtain certain aims which is specified by a complicated system that has a lot of variables that control simultaneously.

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3) Upgrading predictions. Artificial Intelligence can be used to predict the data from the past and by using this data the happenings of the future can be forecast.

For Example: In Monsoon, the Meteorological Department predicts the present rainfall and its conditions with the help of past data. It also can predict various elements related to temperature conditions like humidity.

V. SOLUTIONS

A. Prepare low-carbon electricity

Lower-carbon electricity-originating sources are crucial to gear up for climate change. The following resources come in 2 parts controllable and Variable. Variable source movement which is based on external factors, can be understood by taking the example of solar panels which work only when the sun shines, and turbines of wind work only when the wind flows. Meanwhile, Controllable sources like Thermal plants, nuclear plants, and geothermal plants can be turned on & off physically. Both sources affect the system of electricity differently.

B. Buildings in cities and AI

Energy consumed in Buildings is responsible for a part of the global energy emissions. Buildings [4] can be differentiated based on duration, construction, usage, and possession. So that suitable methods can be made to reduce greenhouse emissions. Providing good infrastructure [5], increasing energy standards, urban planning, and financial incentives can help to reduce greenhouse gas emission effects. Machine Learning and Artificial Intelligence can help at the level of managing the building it can select the best and most useful strategies for individual buildings with the help of a smart control system. With Urban Planning, Machine Learning can be used to collect structured or unstructured data and provide it to policymakers to make a good transition in buildings in the future with low carbon.

C. Forests, Farms and AI

Plants, Bacteria, Nematodes, and various other microorganisms were taking CO_2 through the atmosphere for many years. Many parts of this carbon are continuously broken and circulated again across the carbon cycle, and a certain amount is stored as coal & oil in deep ground, but a huge amount of the carbon is in trees & soil. Our present economic situation is stimulating the freeing up of isolated carbon in deforestation and agriculture which is unsustainable. For this type of large-scale problem, AI and ML can play a key role in some areas like exactness in agriculture can help in the reduction of carbon release from the soil which can minimize carbon release from the soil and enhance the crop field which decreases deforestation. ML can be used to observe forests' health [10] and predict various risks like fire in forests and many more.

D. Transportation accompanied by AI

About one-fourth of energy-associated carbon dioxide emissions are connected to transportation [6] related industry. The number of vehicles is day by day as the population increases. ML techniques can be used to reduce the distance traveled i.e. distance travel should be reduced when not needed and various other things should be reduced. Video surveillance systems should be used to count bikes, cycles, and other vehicles. It can also help in predicting traffic patterns so that proper solutions can be made.

VI. CONCLUSION

One of the most hyped topics in the present era is AI and ML, it is being widely used in applications like Health, Climate change, Education, and many more. This paper quotes some key features of AI in a climate with solutions and how it is helpful with human capabilities. In present years climatic change has become a serious issue and is increasing in a faster manner this paper provides some solutions to it.

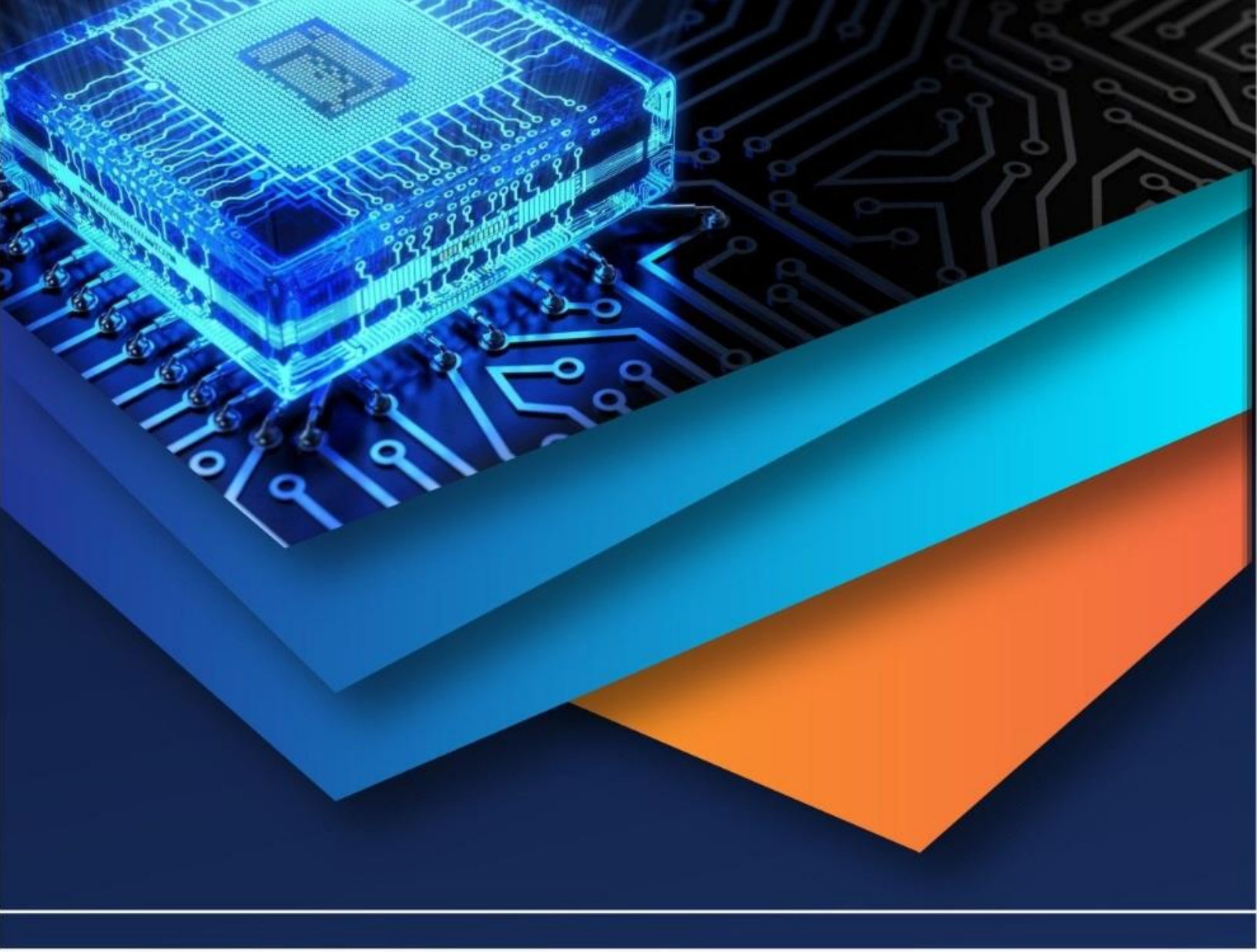
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