

TRANSFORMING ENVIRONMENT - POWER OF AI

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Artificial intelligence & Environment

"Artificial Intelligence (AI) encompasses systems and machines capable of performing tasks that traditionally rely on human intelligence and continuously improving themselves through data-driven insights," explains David Jensen, who leads the United Nations Environment Program's (UNEP) Digital Transformation sub-programme.

AI stands as a transformative technology, endowing machines with human-like cognitive abilities, enabling them to acquire knowledge from data, engage in logical reasoning, make informed decisions, and excel across a multitude of domains. Its versatility is evident in applications ranging from natural language processing and computer vision to the realms of robotics and autonomous systems. AI has ushered in a wave of innovation across industries, elevated the quality of healthcare services, and ushered in personalized user experiences. As AI continues its evolution, its far-reaching impact on society and the economy is poised to be transformative, fundamentally shaping the way we exist, labor, and interact with technology.

In recent times, Artificial Intelligence (AI) has risen as a groundbreaking force within the realm of environmental science and conservation.



Fueled by its unmatched ability to process vast datasets, AI is in the process of revolutionizing our comprehension of the natural world. It is proving instrumental in addressing pressing ecological issues and guiding us toward sustainable practices. From the surveillance of wildlife and anticipation of natural calamities to the optimization of resource consumption and the fight against climate change, AI is swiftly becoming an essential tool in the preservation of our planet and the protection of its fragile ecosystems.

How is AI helping?

• Providing Real-time analysis-

AI proves invaluable in acquiring real-time information and predicting future natural events, encompassing shifts in glacier mass, rising sea levels, atmospheric CO2 levels, and more. As a crucial environmental indicator, AI contributes significantly to our efforts to enhance the quality of life on our planet.

Moreover, AI has the capacity to analyze extensive datasets from satellites, sensors, and diverse sources, delivering up-to-the-minute data on environmental parameters such as air quality, water quality, and temperature.

This wealth of information is instrumental in monitoring the advancement of environmental projects, identifying areas requiring enhancement, and shaping effective policy choices.

• **Measuring environment footprints-**

AI plays a transformative role in assessing and computing the environmental and climate impacts of products, enabling businesses to make well-informed and efficient decisions in this regard. This capacity extends to evaluating a product's footprint throughout its entire lifecycle and supply chain, empowering both businesses and consumers to make informed and effective choices. This data proves indispensable for promoting sustainable practices on e-commerce platforms like Amazon.com, Shopify, and Alibaba.

• **Tracking air quality-**

AI has the capability to oversee air pollution levels and provide valuable insights into the immediate consequences of air quality, enabling individuals to proactively safeguard themselves. This has the potential to expedite worldwide environmental efforts by furnishing precise data. AI's role in air quality control extends to sophisticated algorithms that analyze vast datasets from monitoring stations, satellites, and IoT sensors. By processing this data, AI can generate highly accurate air quality forecasts, alerting communities and authorities to potential health risks and facilitating timely interventions. This technology is particularly vital in urban areas, where air quality management is of paramount concern due to its impact on public health and the environment.

• **Monitoring methane emissions-**

One of the initiatives spearheaded by the United Nations Environment Programme (UNEP) within the WESR digital framework is the International Methane Emissions Observatory (IMEO). This groundbreaking effort harnesses the power of artificial intelligence (AI) to transform the way we track and reduce methane emissions.

IMEO serves as a comprehensive worldwide repository of methane emissions that have been empirically verified. AI plays a pivotal role in this endeavor by skillfully linking this data to actions grounded in science, transparency, and policy. This synergy facilitates the formulation of data-driven decisions, enabling more effective strategies for monitoring, mitigating, and ultimately reducing methane emissions—a crucial step in addressing climate change and its associated environmental impacts.

• **AI for energy-**

AI is increasingly emerging as a critical player in the drive to harness renewable energy efficiently. Its role extends beyond mere energy generation; it encompasses managing the inherent intermittency of renewable sources, addressing power fluctuations, and optimizing energy storage.

Wind energy companies are increasingly turning to AI-driven solutions to enhance the performance of individual turbines. By analyzing real-time weather data and operational information, AI algorithms enable turbines to adjust their propeller angles dynamically. Moreover, researchers at institutions like the Department of Energy and the National Oceanic and Atmospheric Administration (NOAA) are employing AI to gain a deeper understanding of atmospheric conditions. By leveraging AI, they can more accurately forecast the energy output of wind farms, thus improving their overall efficiency and reliability.

• **Agriculture-**

The agricultural sector is not immune to the far-reaching effects of rising temperatures. However, a transformation is underway with the integration of AI. Field sensors, tasked with tracking critical data like crop moisture, soil quality, and temperature, are at the forefront of this revolution. AI leverages this data to enhance agricultural productivity by determining optimal watering schedules and other crucial factors. When coupled with information from drones, which monitor conditions from above,

AI systems become increasingly adept at automating decisions related to planting, pesticide application, and harvest timing. This synergy between AI, sensors, and drones promises to elevate agricultural efficiency, boost crop yields, and reduce the overall consumption of water, fertilizers, and pesticides, presenting a sustainable path forward for the agricultural industry.

• **Climate Prediction**

As the climate undergoes significant changes, the need for precise climate projections becomes increasingly critical. Traditional climate models often yield divergent predictions, primarily due to disparities in data segmentation, process coupling, and the multitude of spatial and temporal scales considered. Presently, the Intergovernmental Panel on Climate Change (IPCC) relies on an averaging approach to consolidate these models in their reports.

Enter AI, a game-changer in the realm of climate modeling. AI contributes by discerning the reliability of climate models, granting greater significance to those with a proven track record of accurate predictions while reducing the influence of underperforming models. This approach holds immense potential for elevating the precision of climate change projections.

Furthermore, AI, in conjunction with deep learning, is revolutionizing weather forecasting and the anticipation of extreme weather events. These technologies excel in accommodating the complexities of real-world climate systems, encompassing factors like atmospheric and ocean dynamics, as well as ocean and atmospheric chemistry. This capability substantially sharpens the accuracy of weather and climate models, rendering simulations considerably more valuable for policymakers and decision-makers in the quest to address the challenges posed by climate change.

• **Natural disaster prediction and management**

AI has the capacity to examine data obtained from various sources, including sensors and satellites, with the aim of detecting indicative patterns signaling the potential occurrence of natural disasters such as hurricanes, floods, and wildfires. This information proves invaluable in the issuance of timely warnings, facilitating evacuations from affected areas, and efficiently allocating resources to regions at higher risk.

Artificial Intelligence (AI) is at the forefront of a transformative shift in natural disaster management, driven by its ability to analyze extensive datasets for early warnings and pattern recognition. Through machine learning, AI processes real-time data originating from sensors, satellites, and even social media, resulting in highly accurate predictions and proactive responses to a spectrum of disasters including earthquakes, hurricanes, wildfires, and floods. AI also employs natural language processing to gauge public sentiment, thereby enhancing adaptive strategies. Moreover, AI-driven drones and remote sensing technologies expedite damage assessment and search-and-rescue missions, ushering in a paradigm shift in disaster response. In essence, AI is elevating disaster preparedness, response mechanisms, and mitigation strategies to new levels of effectiveness and efficiency.

INFORMATIVE INSIGHTS-

- In India, AI has significantly boosted groundnut yields per hectare for farmers by providing guidance on land preparation, fertilizer application, and optimal sowing dates, resulting in a remarkable 30% increase.
- Norway has harnessed AI to create a highly adaptable and self-regulating electric grid, facilitating the seamless integration of renewable energy sources.
- Climate AI models have projected a potential 60% increase in the intensity of extreme rainfall events in the tropical Pacific Ocean, highlighting AI's role in climate change impact assessment.