AI-Powered Climate Engineering for 2030: A Futuristic Proposal

Fakii Mohammed, Andrew Ogembo, Chiboniso Nyoni, Peterson Kagiri
Group 67 AI Software Engineers

July 2025

Concept Paper: AI-Powered Climate Engineering for Carbon Capture Optimization

Problem Addressed

Rising global carbon dioxide (CO2) emissions, projected to exceed 40 billion tons annually by 2030, drive climate change, causing extreme weather and ecosystem degradation. Current carbon capture technologies are inefficient and energy-intensive, limiting scalability. Group 67 proposes an AI-powered climate engineering system to optimize carbon capture and storage (CCS), reducing atmospheric CO2 and mitigating climate impacts.

AI Workflow

The system integrates data inputs from satellite imagery (CO2 concentration maps), IoT sensors (capture device performance), and weather stations (temperature, wind patterns). These inputs feed a reinforcement learning (RL) model, specifically a Deep Q-Network (DQN), trained to optimize CCS device operations. The model processes real-time data to adjust capture parameters (e.g., airflow rates) for maximum efficiency. Training occurs on historical climate data and simulated CCS scenarios, with deployment on edge devices for real-time control. Outputs include optimized device settings and predictive maintenance schedules, ensuring scalability across global CCS networks.

Societal Benefits

The system enhances CCS efficiency, potentially reducing global CO2 emissions by 10-15% by 2030, supporting net-zero goals. It lowers energy costs through optimized operations, making CCS viable for developing nations. Improved air quality and reduced climate risks benefit public health and agriculture, fostering sustainable economies.

Societal Risks

High energy demands for CCS could strain grids, exacerbating energy inequity if not managed. Over-reliance on AI risks unintended ecological impacts, such as altering local climates. Ethical concerns include unequal access to technology and potential job displacement in traditional energy sectors. Mitigation requires global regulatory frameworks, renewable energy integration, and reskilling programs.

Conclusion

Group 67's AI-powered CCS system addresses critical climate challenges, leveraging RL for efficient carbon capture. While offering significant environmental benefits, it demands careful oversight to ensure equitable and sustainable deployment by 2030.

References

[1] IPCC Climate Reports, https://www.ipcc.ch.