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Greening Telecom: Harnessing the Power of Artificial Intelligence for Sustainable Communications.

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SUMMARY

The article explores AI's potential to reduce the environmental impact of the ICT industry, highlighting its potential to optimize energy efficiency and promote sustainable practices, despite some faced challenges.

INTRODUCTION

The Intergovernmental Panel on Climate Change (IPCC) warns that climate change is expected to worsen in the coming decades. Current strategies include reducing greenhouse gas emissions through renewable energy sources, energy-efficient practices, and research. The Paris Agreement aims to limit global warming to 1.5 degrees Celsius. Information and Communication Technology (ICT) plays a critical role in climate change mitigation and adaptation. ICT emissions have grown alongside global emissions, with the International Telecommunication Union (ITU) calling for ICT companies to reduce emissions to zero by 2050. The article explores the potential of artificial intelligence (AI) technologies based on cognitive technology solutions in green telecommunications ttechnologies.

APPROACH

When conducting the study, a systematic qualitative approach is used, which examines AI technologies used in the operation of telecommunications infrastructure. The work used such general scientific methods as analysis and synthesis. We divide the object under consideration into its component parts, examine them, and then, through synthesis, recreate a single holistic picture. The study also used empirical approach, examined sources of information and observation results, and analyzed the information obtained.

METHODS

The article uses methods of qualitative research to achieve a deeper understanding of the nuanced underlying meanings, experiences through the collection and analysis of non-numeric empirical data. The main method applied in the article is literature review. This method helps to gain an understanding of the existing research and achievements in the worldwide green ICT technologies and identify existing gaps in knowledge, barriers and possibilities for future development.

RESULTS AND ANALYSIS

We have identified and analyzed 3 the most important areas in green telecom, where cognitive AI technologies are applied: mobile networks, data centers and end-user devices.

Mobile networks: Mobile networks use Energy Saving Features (ESFs) to reduce energy consumption. AI is crucial for 24/7 activation and adaptability. It analyzes traffic for each cell, making predictions about future changes. AI can optimize network performance, reduce the telecommunications industry's carbon footprint, and prevent congestion. Data analytics and machine learning algorithms enable predictive maintenance.

Data centers: Data centers are a major contributor to the ICT sector's carbon footprint, with estimates suggesting they could consume four times more electricity by 2030. By analyzing data center temperature patterns, airflow, and environmental variables, AI can optimize cooling, monitor power usage, predict equipment failures, and optimize server performance. Additionally, AI can help identify optimal times to connect to the grid and leverage renewable energy sources.

End-user devices: AI can optimize end-user devices like smartphones and laptops for energy efficiency, reducing environmental impact by adjusting power usage, implementing power-saving modes, smart charging, optimizing apps, and automating tasks.

Overall, the analysis suggests that AI plays a vital role in maximizing energy efficiency and minimizing the environmental impact of mobile networks, data centers, and end-user devices. By leveraging AI technologies in these areas, the telecommunications industry can make significant strides towards sustainability and reducing carbon emissions.

DISCUSSION

The integration of AI in the greening ICT sector faces several challenges, including data quality, limited data availability, limited computing power, complex modeling, ethical and privacy concerns, and integration with legacy systems. Accurate and reliable data is crucial for AI to perform optimally, but inconsistencies or outdated data sets can lead to inaccurate predictions. Limited computing power can be costly and time-consuming, while complex modeling requires expertise in both technology and AI. Ethical considerations and compatibility with legacy systems are also significant challenges. Despite these obstacles, integrating AI into telecom networks can offer significant benefits in sustainability and efficiency.

CONCLUSIONS

1. The use of artificial intelligence (AI) technologies in green telecommunications has significant potential to reduce the environmental impact of the industry.
2. AI can optimize energy efficiency, reduce carbon footprint, and promote sustainability in networks, data centers, and end-user devices.
3. Addressing challenges such as data quality, limited computing power, and ethics is vital for maximizing AI-powered green technologies' potential in telecom.

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