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AI-BASED CARBON FOOTPRINT TRACKER FOR INDIVIDUALS

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Abstract

In an increasingly eco-conscious world, individuals are looking for ways to minimize their environmental impact. A key metric in this effort is the carbon footprint, which measures the total greenhouse gas emissions associated with an individual's activities. This project proposes the development of an AI-based Carbon Footprint Tracker that helps individuals monitor, manage, and reduce their carbon emissions through data-driven insights and personalized recommendations.

Problem Statement

Individual carbon footprints are often difficult to track due to the complexity of various contributing factors, such as travel, energy usage, and consumption patterns. Without an effective tracking mechanism, individuals may remain unaware of their environmental impact and struggle to make informed decisions about how to reduce their carbon emissions. There is a need for a tool that simplifies this process and offers tailored solutions to individuals, empowering them to contribute positively to the environment.

Objective

- The primary objective of the proposed AI-based carbon footprint tracker is to provide individuals with an intuitive, real-time platform that:
- Tracks their carbon emissions across various activities.
- Offers personalized, actionable recommendations to reduce their carbon footprint.
- Helps users monitor their progress toward sustainability goals.
- Promotes a more eco-conscious lifestyle by integrating AI with everyday habits.

Data Collection and Preparation

- To train the AI model and develop the tracker, data needs to be gathered from various sources:
- Manual Data Entry: Users input information regarding their transportation (car, public transit, walking), energy consumption (electricity, heating, cooling), food choices, and purchases.
- Automated Data Collection: Integration with smart devices (e.g., smart thermostats, electric meters, wearables) can collect real-time data on energy consumption, transportation habits, and physical activities.
- External Data Sources: Emission factors and regional data are used to calculate the carbon impact of each activity (e.g., CO_2 emissions per kilometer driven, electricity emissions based on the local grid).
- Data Processing: The collected data is cleaned, pre-processed, and anonymized to ensure privacy and prepare it for input into the AI models.

Proposed Solution (Methodology)

An AI-based carbon footprint tracker solves this issue by automating the process of tracking and calculating emissions in real-time through integration with smart devices and user input. The system uses machine learning to provide personalized recommendations for reducing emissions, such as energy-saving tips, sustainable transport options, and eco-friendly food choices. It also features gamification elements to engage users, track progress, and encourage long-term sustainable habits. This solution makes carbon footprint management simple, personalized, and motivating for individuals.

Model Performance Evaluation

- To ensure the effectiveness of the AI-based carbon footprint tracker, several evaluation metrics will be used:
- Accuracy of Carbon Footprint Estimation:
- Measure how closely the app's carbon footprint estimations match real-world emissions data.
- Compare against known carbon footprint calculators for different activities (e.g., travel, food consumption).
- User Engagement and Retention:
- Track user interaction with the app, including frequency of usage, progress updates, and goal completions.
- Measure how well users follow the AI’s recommendations and adjust their behavior.

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Screenshots / Demonstration (video)

Future Scope

- Expanded Data Sources: The inclusion of more IoT devices, such as smart refrigerators, washing machines, and wearable devices, can provide additional insights for a more holistic understanding of a user’s footprint.
- Collaboration with Businesses: Partnering with eco-friendly businesses or services to offer discounts or incentives to users who make sustainable choices.
- Global Emission Factor Databases: Incorporating global emission databases to make the tool more versatile across different countries and regions.

Conclusion

The AI-based carbon footprint tracker aims to empower individuals to take control of their environmental impact through an easy-to-use, data-driven platform. By combining real-time data collection, machine learning, and personalized recommendations, the tracker not only helps users understand their carbon footprint but also provides actionable steps to reduce it. This approach encourages sustainable behavior, contributes to global climate goals, and offers users a rewarding experience that motivates long-term eco-friendly habits. As the system evolves, it has the potential to further enhance its capabilities and broaden its impact by integrating more data sources, improving user engagement, and collaborating with organizations that promote sustainability.
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