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AI- Carbon Footprint Calculator

Pradnya Thombare, Snehal Yadav, Sharvari Yevale, Payal Shendage
Students of Department of Information Technology
Dr. J. J. Magdum College of Engineering, Jaysingpur, Sangli,, India

Abstract: *The AI Carbon Footprint Calculator is a smart system designed to estimate the carbon emissions produced by an individual or organization. It uses artificial intelligence and user-provided information such as electricity usage, transportation, food habits, and lifestyle activities. The system calculates the approximate amount of carbon dioxide emissions generated from these activities. It helps users understand how their daily actions affect the environment. The calculator provides a simple and user-friendly way to measure carbon footprints. It also creates awareness about environmental sustainability and climate change.*

The proposed system uses AI-based techniques to analyze the collected data and provide accurate carbon footprint estimations. Users can enter information related to travel, energy consumption, waste generation, and other activities. The system processes this information using predefined emission factors and intelligent analysis. Based on the results, it identifies activities that contribute more to carbon emissions. The system can also provide personalized suggestions to reduce emissions. This makes the calculator useful for promoting environmentally responsible habits.

The main objective of the AI Carbon Footprint Calculator is to encourage users to reduce their environmental impact. It provides meaningful insights into carbon emissions and helps users make better lifestyle decisions. The system can compare emissions before and after adopting ecofriendly practices. It may also track changes in the user's carbon footprint over time. By combining AI with carbon emission analysis, the project supports sustainable living. Overall, the system provides an effective approach to creating awareness and encouraging carbon reduction..

Keywords: *Carbon Footprint Calculator.*

I. INTRODUCTION

The AI-Based Carbon Footprint Calculator is a proposed web-based application designed to calculate and monitor the carbon emissions produced by individuals through their daily activities. Carbon emissions are generated from various sources, including electricity consumption, transportation, fuel usage, food habits, and waste generation. Measuring these emissions is important for understanding the environmental impact of human activities. The proposed system helps users estimate their carbon footprint and understand how their lifestyle choices contribute to climate change.

Traditional carbon footprint calculations may require manual calculations or the use of separate tools, making it difficult for users to monitor their emissions regularly. Some existing calculators provide general estimates without offering detailed, personalized recommendations. The proposed system aims to overcome these limitations by providing a centralized and user-friendly platform that collects activity-related information, calculates approximate carbon dioxide equivalent (CO_2e) emissions, and identifies activities that contribute significantly to the user's carbon footprint.

The proposed application uses web technologies and AI-based analysis to process user information and provide personalized suggestions for reducing carbon emissions. It includes modules for electricity, transportation, diet, waste, fuel and heating, and water consumption. The system can display category-wise emissions, calculate the total estimated carbon footprint, and help users track their progress over time. Overall, the AI-Based Carbon Footprint Calculator aims to create environmental awareness, encourage eco-friendly habits, and support sustainable living by helping users make informed decisions to reduce their environmental impact.

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PROBLEM STATEMENT :

The increasing environmental impact of daily human activities has made carbon footprint calculation essential for promoting sustainable living. Individuals often face difficulties in estimating emissions from electricity consumption, transportation, diet, waste, fuel, and water usage. Existing methods may lack personalized recommendations and effective tracking features. Therefore, the proposed AI-Based Carbon Footprint Calculator aims to calculate total and category-wise carbon emissions, identify major emission sources, and provide personalized suggestions to reduce environmental impact. It also helps users monitor their carbon footprint over time and encourages environmentally responsible habits.

OBJECTIVES :

- To develop a user-friendly AI-Based Carbon Footprint Calculator for estimating individual carbon emissions.
- To calculate carbon emissions from electricity, transportation, diet, waste, fuel, and water consumption.
- To provide total and category-wise carbon footprint calculations using appropriate emission factors.
- To identify major sources of carbon emissions through AI-based data analysis.
- To provide personalized recommendations for reducing carbon emissions and promoting sustainable habits.
- To track carbon footprint changes over time and help users monitor their environmental impact.

II. RELATED WORK

Previous studies have explored different methods for calculating individual carbon footprints and promoting environmental awareness. Existing carbon footprint calculators help users estimate emissions from daily activities, but they may differ in calculation methods, emission factors, and accuracy. Some digital applications use user activity data to provide a better understanding of individual environmental impact.

Recent approaches focus on making carbon footprint calculators more accessible, user-friendly, and useful for sustainable decision-making. However, challenges remain in providing personalized recommendations, analyzing major sources of emissions, and tracking changes in carbon footprints over time.

The proposed AI-Based Carbon Footprint Calculator aims to address these challenges by estimating emissions from electricity, transportation, diet, waste, fuel, and water consumption. It uses AI-based analysis to identify major emission sources, suggest personalized ways to reduce emissions, and help users monitor their environmental impact over time.

PROPOSED SYSTEM

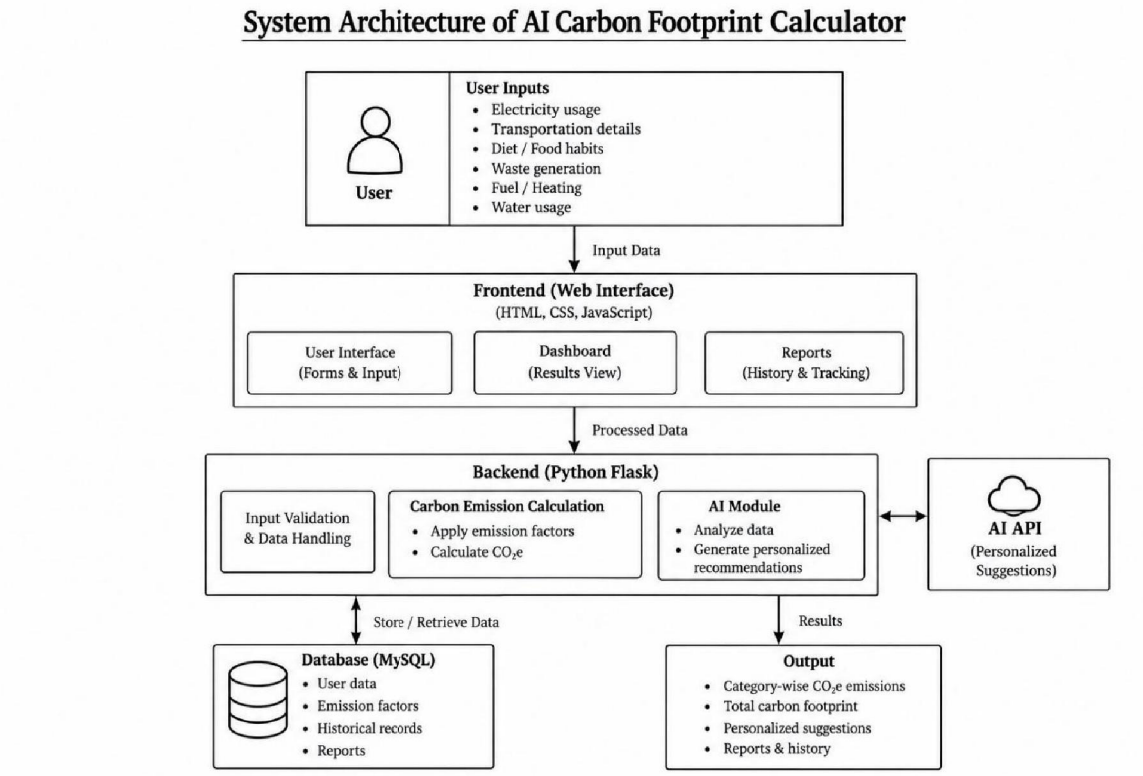
- Main Objectives of the Proposed System

1. To develop a user-friendly AI-Based Carbon Footprint Calculator for estimating individual carbon emissions.
2. To calculate carbon emissions from electricity, transportation, diet, waste, fuel, and water consumption.
3. To identify major sources of carbon emissions through AI-based data analysis.
4. To provide personalized recommendations for reducing carbon emissions.
5. To display total and category-wise carbon footprints through an interactive dashboard.
6. To track carbon footprint changes over time and promote sustainable lifestyle practices.

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III. METHODOLOGY

• Proposed System Architecture



• **List of Modules-**

Sr. No.	Module Name	Purpose
1	Problem Identification	Identifies the need to measure individual carbon emissions and the major sources, including electricity, transportation, diet, waste, fuel, and water.
2	Requirement Analysis	Identifies user requirements, defines input data and expected outputs, and specifies the six carbon footprint calculator modules.
3	Technology Selection	Selects HTML, CSS, and JavaScript for the frontend, Python Flask for the backend, and MySQL for database management.
4	System Design	Designs the system architecture, database structure, user interface, and carbon emission calculation workflow.
5	Implementation	Develops the six calculator modules, implements emission-factor calculations, and connects the application to the MySQL database.
6	Testing and Validation	Tests each calculator module, verifies calculation accuracy, and checks database operations and user inputs.

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7	Result and Deployment	Displays category-wise and total CO_2e results and deploys the completed application for users.
8	Maintenance and Future Enhancement	Fixes errors, improves system performance, and adds new features based on user feedback.

• Explanation of Modules

1. Problem Identification

This module identifies the need to measure individual carbon emissions and understand their environmental impact. It focuses on major emission sources, including electricity, transportation, diet, waste, fuel, and water consumption.

2. Requirement Analysis

This module identifies the functional requirements of the system. It defines the input data required from users, the expected outputs, and the six calculator modules needed to estimate carbon emissions.

3. Technology Selection

This module selects the technologies required to develop the application. HTML, CSS, and JavaScript are used for the frontend, Python Flask is used for backend processing, and MySQL is used to store user information and calculation results.

4. System Design

This module defines the overall structure and workflow of the application. It includes designing the system architecture, database tables, user interface, and calculation process for estimating carbon emissions.

5. Implementation

This module involves developing the six calculator modules: Electricity, Transportation, Diet, Waste, Fuel/Heating, and Water. It implements emission-factor calculations and connects the application to the MySQL database to process and store data.

6. Testing and Validation

This module checks whether the application functions correctly and produces reliable results. Each calculator is tested individually, calculation accuracy is verified, and database operations, input validation, and error handling are checked.

7. Result and Deployment

This module displays the calculated carbon footprint to users through total and category-wise CO_2e results. After testing, the application is deployed so that users can access it and understand their environmental impact.

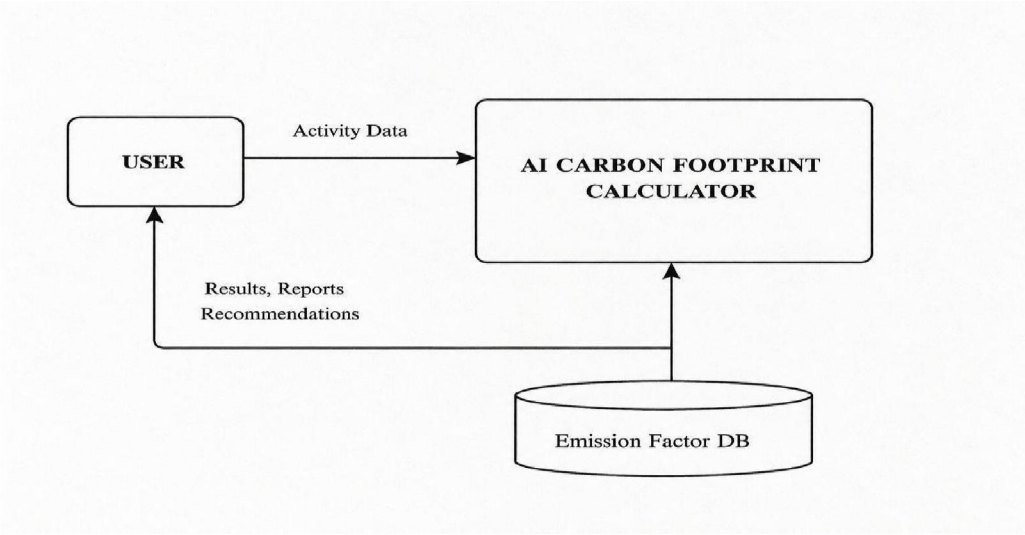
8. Maintenance and Future Enhancement

This module focuses on maintaining and improving the application after deployment. It includes fixing errors, improving performance, updating emission factors when needed, and adding new features based on user feedback.

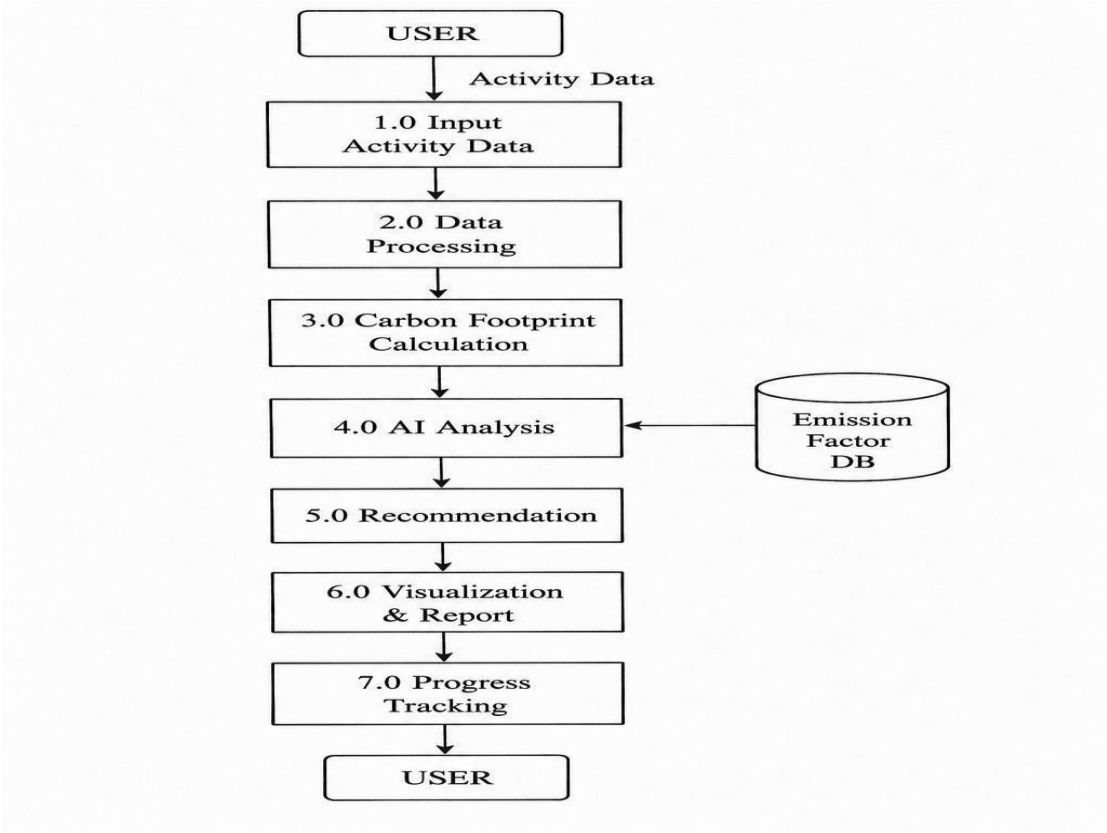
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Dataflow Diagrams

• DFD Level 0 –



• DFD LEVEL 1 –



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IV. BALANCE CALCULATION

In the proposed AI-Based Carbon Footprint Calculator, the system calculates the carbon emissions generated by each user activity and determines the total carbon footprint. Similar to the balance calculation section in the provided IJARSCT research paper, which calculates individual balances by
combining and comparing values, this system combines the emission values from six categories to determine the user's overall carbon footprint.
The emissions for each category are calculated by multiplying the activity data by its corresponding emission factor. The total carbon footprint is calculated by adding the emissions from electricity, transportation, diet, waste, fuel/heating, and water consumption.
Formula:

$$\text{Total Carbon Footprint} = E\text{electricity} + E\text{transportation} + E\text{diet} + E\text{waste} + E\text{fuel} + E\text{water}$$

Illustrative Example:

Activity Category	Estimated Emissions (kg CO_2e)
Electricity	106.5
Transportation	20.0
Diet	50.0
Waste	5.0
Fuel/Heating	15.0
Water	2.0
Total Carbon Footprint	198.5

The total is calculated as:

$$106.5 + 20 + 50 + 5 + 15 + 2 = \mathbf{198.5}\ \text{kg}\ CO_2e$$

Therefore, the user's estimated monthly carbon footprint is 198.5 kg CO_2e. The AI analysis module can then identify the largest emission category—in this example, electricity—and suggest ways to
reduce its impact. All values other than the electricity example are hypothetical and are included to demonstrate the calculation method, not as actual experimental results.

V. LIMITATIONS AND FUTURE SCOPE

Limitations: The accuracy of the AI-Based Carbon Footprint Calculator depends on the correctness of the data entered by users and the reliability of the emission factors used. Outdated or regionally unsuitable emission factors may affect the estimated results. Detailed information about diet, waste disposal, fuel, and water consumption may not always be available, which can limit calculation accuracy. Additionally, the quality of personalized recommendations depends on the AI analysis implemented and the availability of user activity records for tracking changes over time.
Future Scope: In the future, the system can be enhanced by integrating advanced AI and machine learning techniques to provide more personalized recommendations and analyze user activity patterns. Region-specific and regularly updated emission factors can improve the relevance of calculations. The application can also be extended to mobile platforms and integrated with smart meters or IoT devices for automatic data collection. Additional features, such as monthly and yearly reports, graphical progress tracking, and personalized emission-reduction plans, can help users monitor their environmental impact and adopt more sustainable lifestyles.

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VI. CONCLUSION

The AI-Based Carbon Footprint Calculator is designed to help users understand and reduce the environmental impact of their daily activities. The system estimates carbon emissions from electricity consumption, transportation, diet, waste generation, fuel usage, and water consumption, providing both category-wise and total carbon footprint results. By using AI-based analysis, it can identify major sources of emissions and suggest personalized measures to reduce them. The user-friendly dashboard and historical tracking features aim to support better environmental awareness and encourage sustainable lifestyle choices. In the future, the system can be improved through advanced AI techniques, updated regional emission factors, and automatic data collection to provide more accurate estimates and effective recommendations. Overall, the proposed system aims to promote responsible resource consumption and contribute to a more sustainable environment.

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