EcoTrack AI - Carbon Footprint Prediction Project Report

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1. Project Overview

EcoTrack AI is a Machine Learning-based web application that predicts an individual's estimated carbon footprint based on user lifestyle inputs such as transportation usage, electricity consumption, and travel frequency. The goal of the project is to raise environmental awareness using data-driven insights.

2. Problem Statement

Climate change is a major global issue. Many individuals are unaware of how daily activities contribute to carbon emissions. This project helps users estimate their carbon footprint quickly and understand their environmental impact.

3. Dataset Used

A structured dataset containing numerical lifestyle features such as monthly electricity usage, vehicle distance, and air travel frequency was used. The dataset was preprocessed by handling missing values and splitting into training and testing sets.

4. Model Used: Linear Regression

We used Linear Regression because it is simple, interpretable, and beginner-friendly. It works well for predicting continuous values such as carbon emissions. It also allows us to understand how each feature contributes to the prediction.

5. Why Not Other Models?

Random Forest Regressor: More powerful but computationally heavier and less interpretable.
Decision Tree Regressor: Can overfit easily on small datasets.
Neural Networks: Powerful but unnecessary for small structured datasets and harder for beginners

to understand.
Support Vector Regression: Good performance but more complex to tune.

6. Model Training Process

1. Imported necessary libraries (pandas, numpy, sklearn).
2. Loaded dataset.
3. Selected input features (X) and target variable (y).
4. Split data into training and testing sets.
5. Trained Linear Regression model.
6. Evaluated model performance using metrics like R^2 score.

7. Streamlit Web Application

The trained model was integrated into a Streamlit web application. The app takes user inputs via sliders and number inputs, predicts carbon footprint, and displays the result in an interactive UI.

8. Code Explanation

The app.py file loads the trained model using joblib or pickle. User inputs are collected through Streamlit widgets. These inputs are converted into a NumPy array and passed to the model's predict() function. The predicted value is displayed using st.metric or st.success components.

9. Future Improvements

• Use larger real-world datasets.
• Add visualization dashboards.
• Deploy online (Streamlit Cloud or AWS).
• Add personalized reduction tips.
• Upgrade to advanced models like Gradient Boosting.

10. Conclusion

EcoTrack AI demonstrates how Machine Learning can be used for social good. It is beginner-friendly yet impactful, combining data science with environmental awareness.