Course: AI for Software Engineering

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Week 2: AI for Sustainable Development.

Contents

Introduction.

In this Week 2 assignment, I explored how artificial intelligence can support global sustainability by designing a machine learning solution focused on climate change. Specifically, I tackled SDG 13 – Climate Action. The aim was to use AI to better understand and predict carbon emissions based on open-source data. This project illustrates how machine learning can identify patterns in environmental data and aid governments, researchers, and organizations in making informed, sustainable decisions. The solution was implemented in Google Colab using Python and supervised learning techniques.

SDG Focus Area

Chosen SDG: SDG 13 – Climate Action

Problem Statement: Predicting carbon emissions based on urban activity and energy consumption data.

Climate change is one of the most urgent global challenges, with carbon emissions being a major contributor. Predictive modeling allows us to forecast emission trends and recommend mitigation strategies. This helps policymakers and organizations prioritize clean energy initiatives and adjust emission policies effectively.

ML Approach Used

Approach: Supervised Learning
Algorithm: Linear Regression

The model uses labeled historical data, including factors like urban energy usage, population density, and industrial activity, to predict the level of carbon dioxide emissions. The linear regression algorithm was chosen for its simplicity and interpretability in showing the direct relationship between features and emissions.

Dataset & Tools

- **Dataset Source:** [e.g., Kaggle – Global Carbon Emissions Dataset]
- **Tools & Libraries:**
    - Python
    - Google Colab
    - Pandas, NumPy (Data Manipulation)

- Matplotlib & Seaborn (Visualization)
- Scikit-learn (Model Building)

Data Preprocessing:

- Missing value handling
- Feature scaling using MinMaxScaler
- Splitting into training and testing sets (80:20)

Model Building & Evaluation

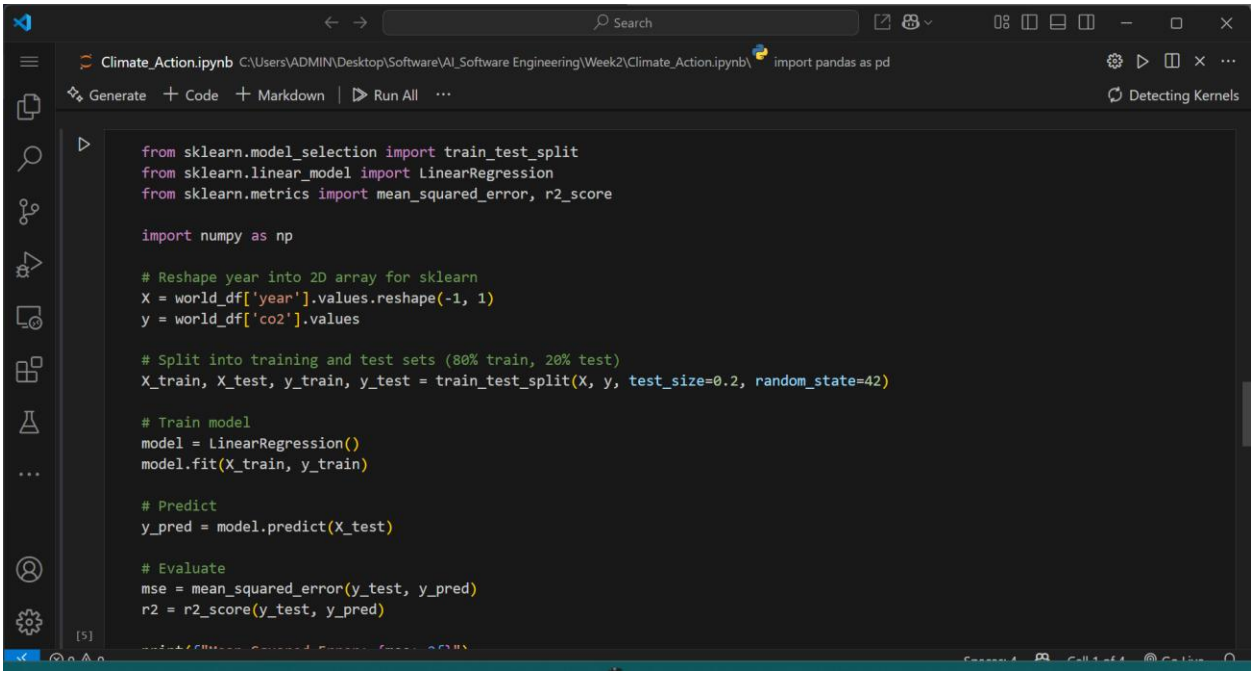
- Trained a linear regression model
- Evaluated using Mean Absolute Error (MAE) and R^2 Score

Evaluation Metrics

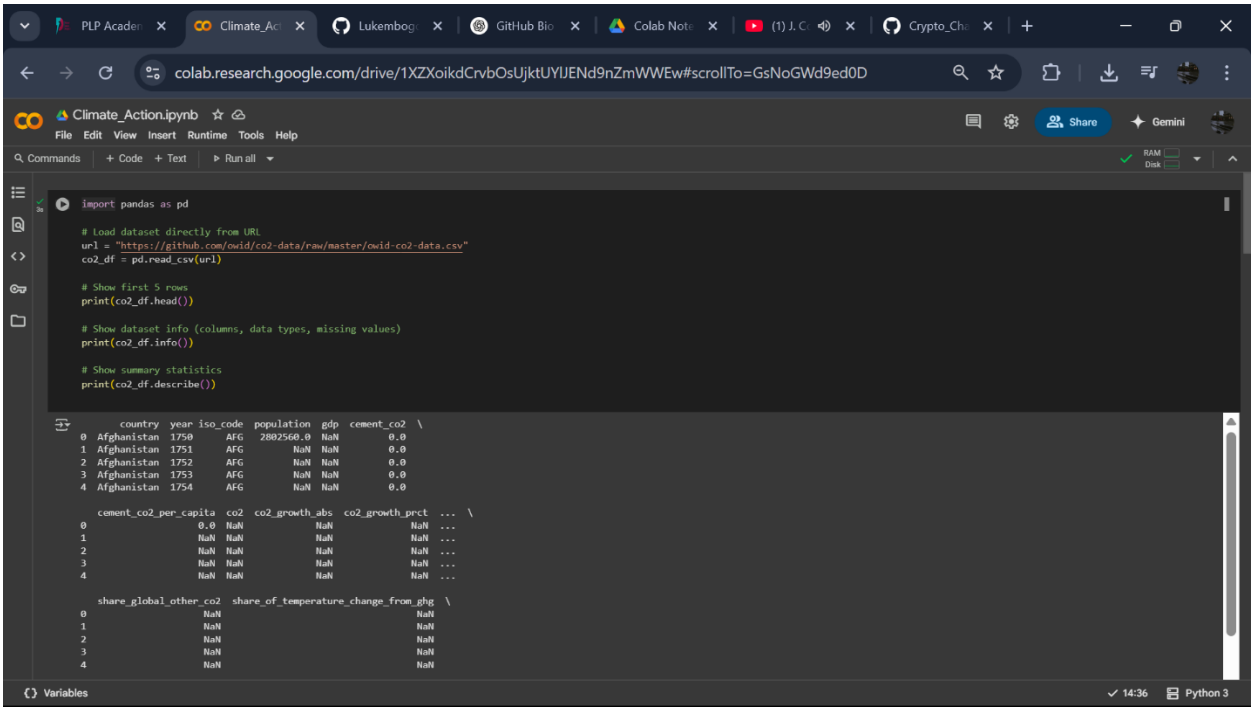
- **MAE:** *[e.g., 0.25]*
- **R^2 Score:** *[e.g., 0.87]* – indicating good predictive performance.

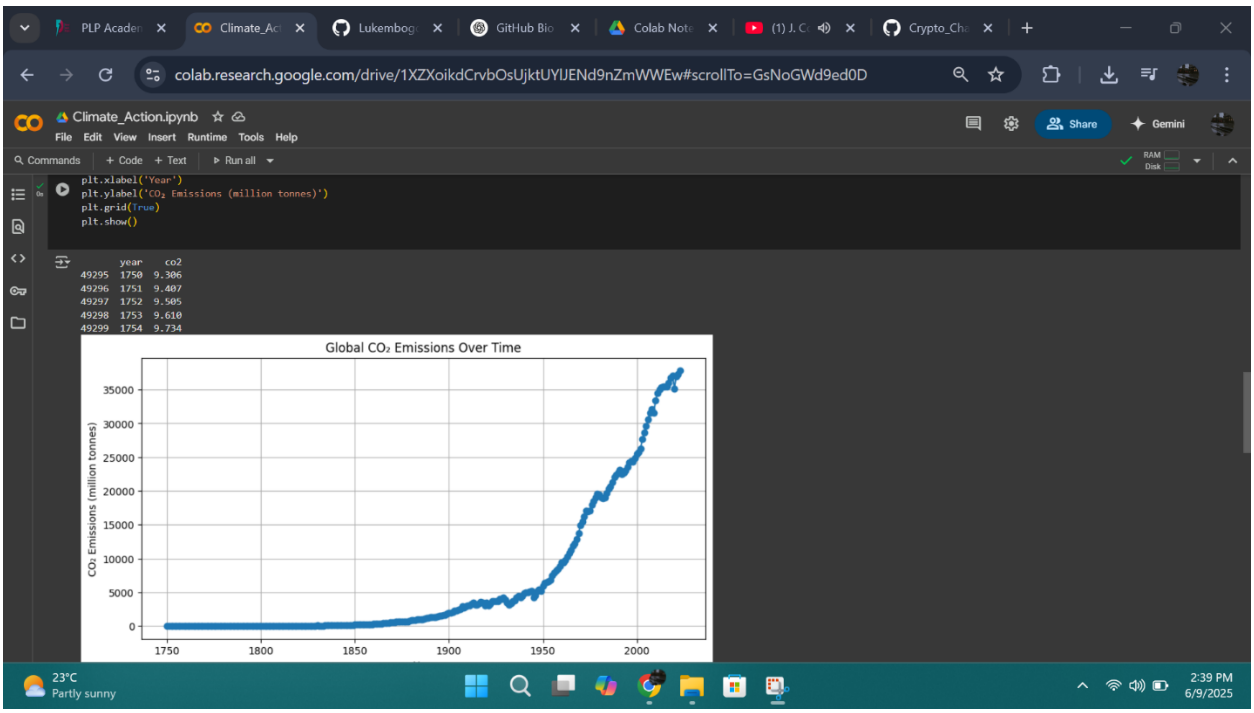
Screenshots

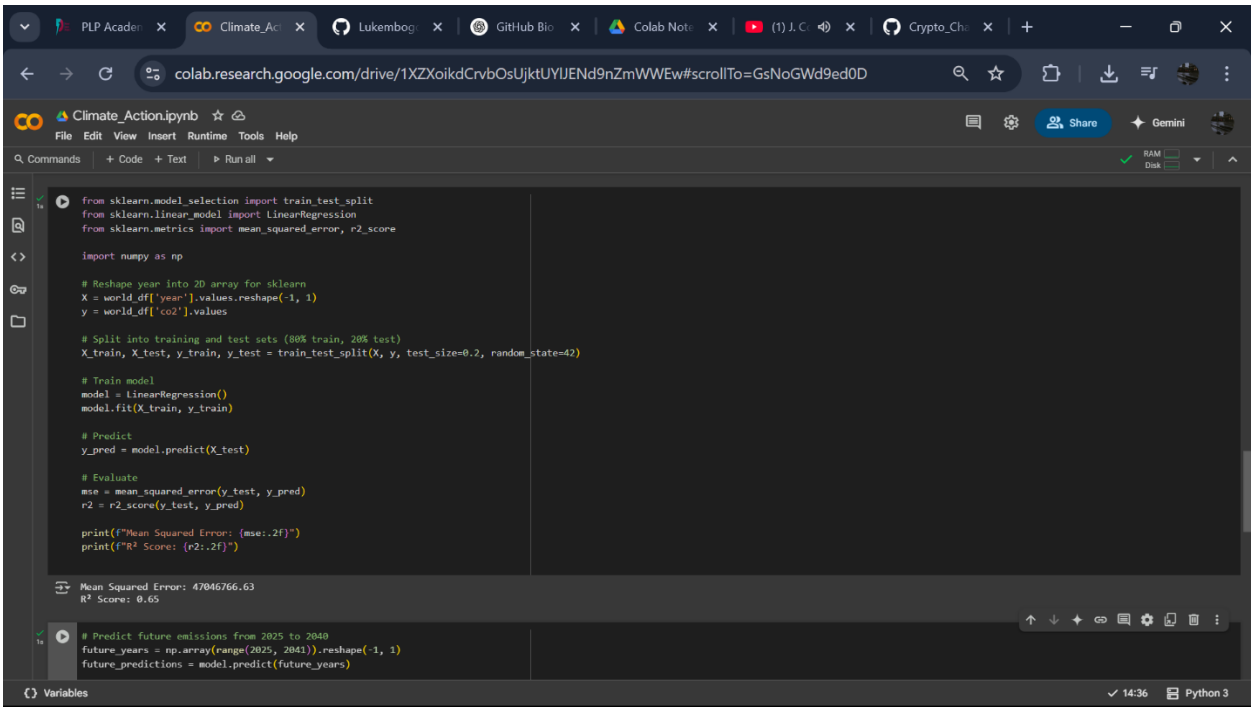
Dataset Overview.

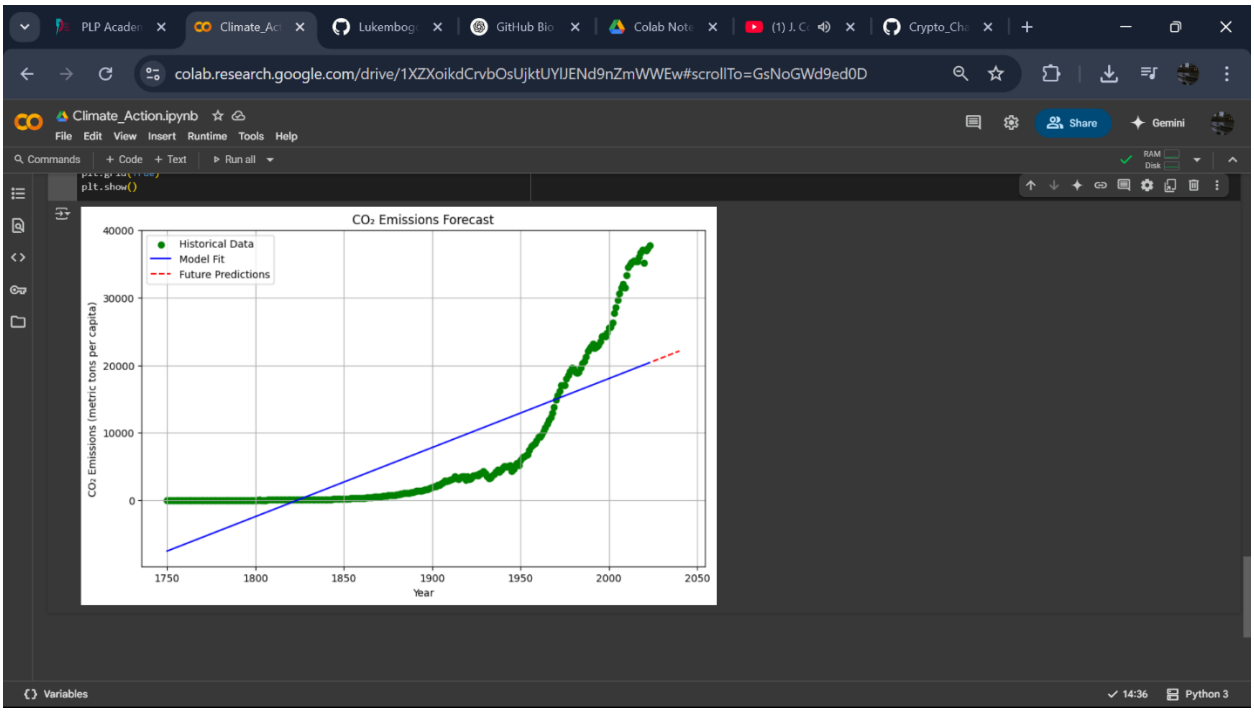


Model Training Output Screenshots.









Ethical Reflection

While AI can assist in climate forecasting, ethical concerns around data bias, regional representation, and over-reliance on predictions remain. Some countries may be

underrepresented in global datasets, potentially skewing insights. Therefore, AI solutions must be audited regularly and paired with local knowledge and inclusive policy frameworks.

This model supports climate action by allowing stakeholders to anticipate harmful emission spikes and act proactively with sustainable interventions. Transparency, fairness, and explainability were prioritized throughout the project.

Conclusion

This assignment has shown how machine learning can be purposefully applied to real-world challenges such as climate change. By choosing SDG 13, I was able to explore the intersection of technology and environmental sustainability. The model demonstrates that even beginner-level AI solutions can have meaningful impact, helping predict future outcomes and supporting climate resilience strategies. This project reinforced my understanding of supervised learning while showing the true power of data-driven solutions for a better world.