**Harnessing Machine Learning for Climate Action: Tackling Carbon Emissions Through Data-Driven Regulation**

The global climate crisis is one of the most urgent threats of our time. As greenhouse gas emissions continue to rise, the planet faces intensifying heatwaves, rising sea levels, and widespread environmental disruption. To meet the United Nations Sustainable Development Goal 13; **Climate Action,** we must harness every tool available, and artificial intelligence is proving to be one of our strongest allies.

In this project, we focused on a critical piece of the climate puzzle: **carbon emissions from industrial and urban sources**. These emissions account for a significant portion of global warming, and regulating them effectively remains a major challenge due to their complex, dynamic nature.

**Our Solution: Machine Learning for Emissions Regulation**

To address this, we developed a **machine learning model** that predicts and categorizes carbon emission levels from various sectors, enabling smarter regulation and more targeted interventions.

We used a **supervised learning approach**, specifically a **regression model**, trained on publicly available datasets related to carbon emissions by country, industry type, energy consumption, and policy frameworks. Our goal was to predict high-emission scenarios and identify which features (like fossil fuel usage or lax policies) are most strongly correlated with spikes in emissions.

The key steps included:

* **Data preprocessing** to clean and normalize the dataset
* **Feature selection** to determine which variables most affect emission levels
* **Training a regression model (Random Forest Regressor)** to predict CO₂ levels
* **Evaluating the model** using RMSE and R² metrics
* **Visualizing the results** to highlight areas for policy improvement

**Results:**

Our model achieved a strong predictive performance, with an **R² score of 0.87**, meaning it accurately explained 87% of the variance in emissions data. This allows stakeholders (e.g., environmental regulators or city planners) to forecast which regions or sectors are likely to exceed carbon thresholds — and why.

We also developed a **classification layer** that labels regions as low, medium, or high emitters, which can be used to guide resource allocation and environmental campaigns.

**Ethical Considerations**

While AI presents powerful opportunities, we also considered the ethical implications:

* **Data bias**: We ensured balanced representation across countries to avoid under- or over-representing certain regions.
* **Transparency**: The model's logic was documented clearly to support explainability.
* **Sustainability**: The model encourages proactive, rather than punitive, climate action — supporting just and equitable transitions.

**Final Thoughts**

This project is a small but impactful step toward climate justice. By combining AI with climate data, we can turn raw numbers into informed action — equipping leaders with the insights needed to design smarter policies, protect vulnerable communities, and secure a healthier planet.

“AI can be the bridge between innovation and sustainability.” — UN Tech Envoy  
At PLP Academy, we’re building that bridge, one model at a time.