Project Synopsis: GreenAI Comparometer(A Web-Based Tool for Measuring and Comparing the Carbon Footprint of Machine Learning Models)

Priangshu Paul(2448384), Puspita Biswas(2448348), Utkarsh Misra(2448370)

Department of Computer Science (M.sc Data Science), Christ University(Deemed to be University)Yeswanthpur Campus

Domain

This project is situated within the domain of **Sustainable and Green Artificial Intelligence**. As the size and complexity of machine learning (ML) and deep learning (DL) models increase, so too does their demand for computational resources, often resulting in significant carbon emissions. While model performance (e.g., accuracy, F1-score) is typically prioritized, the environmental cost is frequently ignored. This project addresses the urgent need to quantify, visualize, and compare the ecological impact of training and deploying ML/DL models, contributing to the emerging field of eco-conscious AI development.

Objectives

- To develop a web-based application that enables users to evaluate and compare the carbon footprint of their ML/DL models during training and inference.

- To integrate and benchmark a set of widely used carbon tracking libraries including: **CodeCarbon**, **eco2AI**, **CarbonTracker**, **Experiment Impact Tracker**, **EnergyVis**, and the **ML CO_2 Impact Calculator**.

- To offer a unified interface for uploading scripts or model configurations, selecting trackers, and executing runs while recording environmental metrics.

- To raise awareness of AI's energy usage by providing insightful feedback and promoting best practices for building low-emission models.

Expected Output

- A fully functional and interactive web dashboard that presents real-time data on energy consumption, carbon emissions, training time, and model performance.

- Seamless support for comparing multiple models or training configurations side-by-side across multiple carbon tracking libraries.

- Auto-generated summary reports that include visual comparisons and downloadable analytics for future reference.

- Key visualizations to enhance interpretability:

    - **Carbon Emission vs. Epoch Graph**: A dynamic plot showing how emissions accumulate over training epochs, helping users detect inefficient training phases.

    - **Model Comparison Table**: An interactive table highlighting differences in accuracy, runtime, energy usage, and carbon emissions across models and trackers.