Green Intelligence for a Sustainable Future

Atiya Masood
Iqra University, Karachi, Pakistan
atiya.masood@iqra.edu.pk

ABSTRACT

As artificial intelligence (AI) becomes increasingly integrated into real-world systems, its energy consumption and environmental impact have emerged as significant sustainability concerns. While performance benchmarks such as accuracy and speed are often emphasized, the carbon footprint of AI models remains underreported especially in resource-constrained settings. This research evaluates and compares the carbon emissions of standard versus optimized AI models using publicly available datasets and carbon tracking tools.

INTRODUCTION

Sustainable AI research addresses the growing conflict between model performance and environmental impact, where conventional benchmarks overlook energy costs. This study introduces the Carbon-Accuracy Efficiency Metric (CAEM), a framework that balances accuracy with carbon emissions across diverse machine learning models. By integrating optimization methods and carbon tracking tools, the approach guides the development of efficient, low-emission AI solutions. ***This focus supports the Sustainable Development Goals (SDG-12 and SDG-13), reinforcing the role of AI as a tool for both innovation and environmental responsibility.***

OBJECTIVES & KEY METHODS

- Quantify carbon emissions for standard AI models
- Apply model optimization techniques and remeasure emissions
- Compare performance vs. emissions
- Propose a decision metric or dashboard for sustainability-aware ML design

Models: Random Forest, SVM, CNN, BERT

Tools: CodeCarbon, CarbonTracker

Optimizations: Pruning, Quantization, Distillation

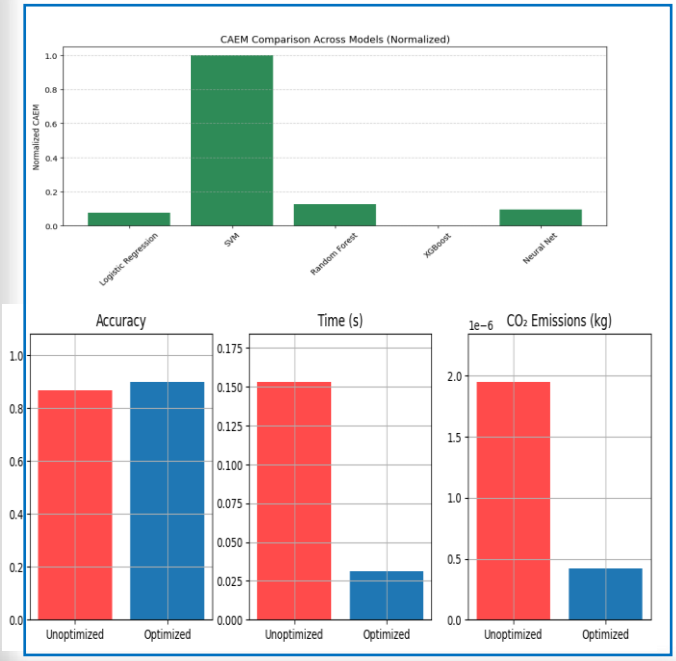
Metrics: Accuracy, F1, CO_2e, runtime, CAEM

WHY IT MATTERS

AI development is rapidly increasing global emissions. Institutions, researchers, and policymakers need clear guidelines for "greener" model choices.

By aligning AI research with sustainability, we support climate action, responsible innovation, and the Green AI movement.

RESULTS



Future Directions

Development of Green AI toolkits for industry & academia

Be part of a global initiative that drives AI innovation while protecting the planet.