Unlocking Solar Potential in West Africa:
A Comparative Analysis of Benin, Togo & Sierra Leone

10 Academy - Week 1 Challenge Report

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Introduction

MoonLight Energy Solutions is investing in solar infrastructure across West Africa. This week's challenge focused on analyzing environmental data from Benin, Togo, and Sierra Leone, aiming to identify high-potential regions for solar panel deployment using exploratory data analysis (EDA) and visual insights.

Task 1: Git & Environment Setup

- Initialized GitHub repo: solar-challenge-week1
- Branches created: eda-benin, eda-togo, eda-sierra-leone, compare-countries
- Virtual environment using venv
- GitHub Actions CI
- .gitignore for data and venv
- README documented setup

Task 2: EDA Per Country

Benin

- Highest average GHI: 240.56 W/m²
- Strong GHI <-> Mod correlation (0.99)
- Sensor cleaning impact positive
- High variability

Togo

- Avg GHI: 230.56 W/m²
- Less variability than Benin
- Positive cleaning impact

Sierra Leone

- Avg GHI: 201.96 W/m²
- More diffuse sunlight
- Correlations consistent, but weaker

Task 3: Comparison

- Benin has highest GHI, then Togo
- Sierra Leone lowest
- ANOVA p-value: 0.00000 (significant)

Summary Stats (Means)

Benin: GHI 240.56, DNI 167.19, DHI 261.71

Togo: GHI 230.56, DNI 151.26, DHI 250.96

Sierra Leone: GHI 201.96, DNI 116.38, DHI 218.65

Bonus: Streamlit Dashboard

- Interactive filter
- Summary stats table
- Boxplots for GHI, DNI, DHI
- Screenshot saved to: dashboard_screenshots/streamlit_ui.png

Key Takeaways

- Benin is the most promising region for solar deployment.

- Togo is close behind.

- Sierra Leone has lower potential but still viable.

- Cleaning boosts sensor performance across the board.

Deliverables

- Notebooks: EDA + Comparison

- app/: Streamlit dashboard

- Screenshot folder

- final_report.md + this PDF

Submitted by: Kirubel Gizaw

Week 1 complete!