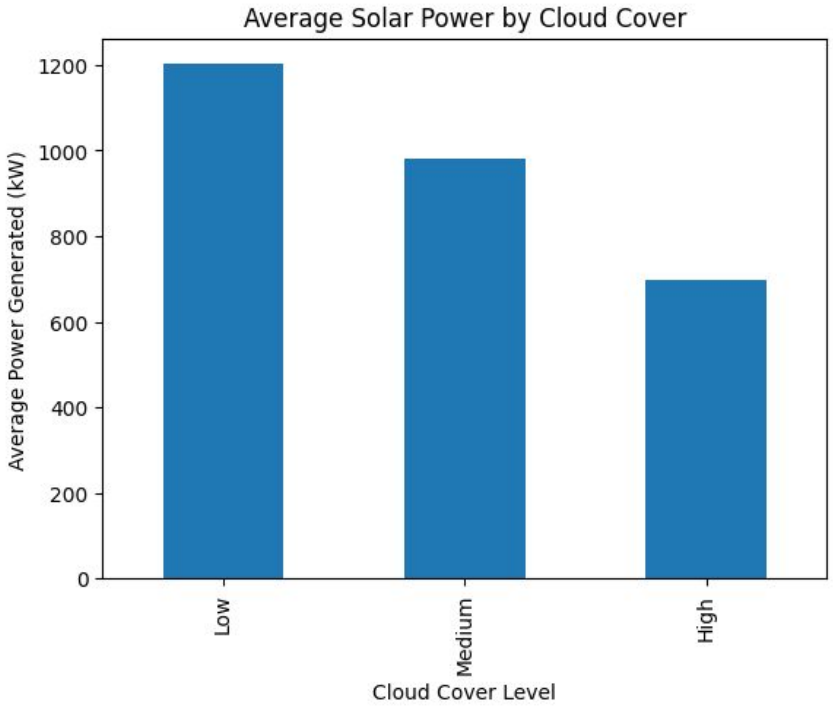
Data Visualization Pitch

Student Individual Assignment



Solar Energy Power Generation Analysis

Understanding the Impact of Weather and Solar Factors on Solar Power Output

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Research questions

How do environmental factors, particularly solar radiation and temperature, influence solar power generation?

- Is there a measurable relationship between solar radiation levels and electricity output?
- How does temperature variability affect the distribution and stability of power generation?
- Are there observable patterns or outliers that indicate inefficiencies or extreme operating conditions?

About Data

Dataset Overview:

- The dataset was sourced from Kaggle and focuses on solar energy production (Solar energy power generation dataset)
- It contains measurements related to:

    - Solar radiation
    - Ambient temperature
    - Generated solar power

Data Characteristics:

- Structured tabular data (CSV format)
- Continuous numerical variables
- Suitable for exploratory and descriptive analysis

Data Quality Considerations:

- Missing values were identified and removed
- Duplicate records were eliminated
- Post-cleaning dataset ensured improved reliability and consistency

Methodology

Data Collection:

- Dataset downloaded manually from Kaggle (publicly available dataset)

Data Processing & Cleaning:

- Analysis conducted using **Python**
- Libraries used:
    - pandas for data manipulation
    - numpy for numerical operations
    - matplotlib and seaborn for visualization
- Cleaning steps included:
    - Removal of missing values
    - Removal of duplicate observations

Methodology

Analytical Approach:

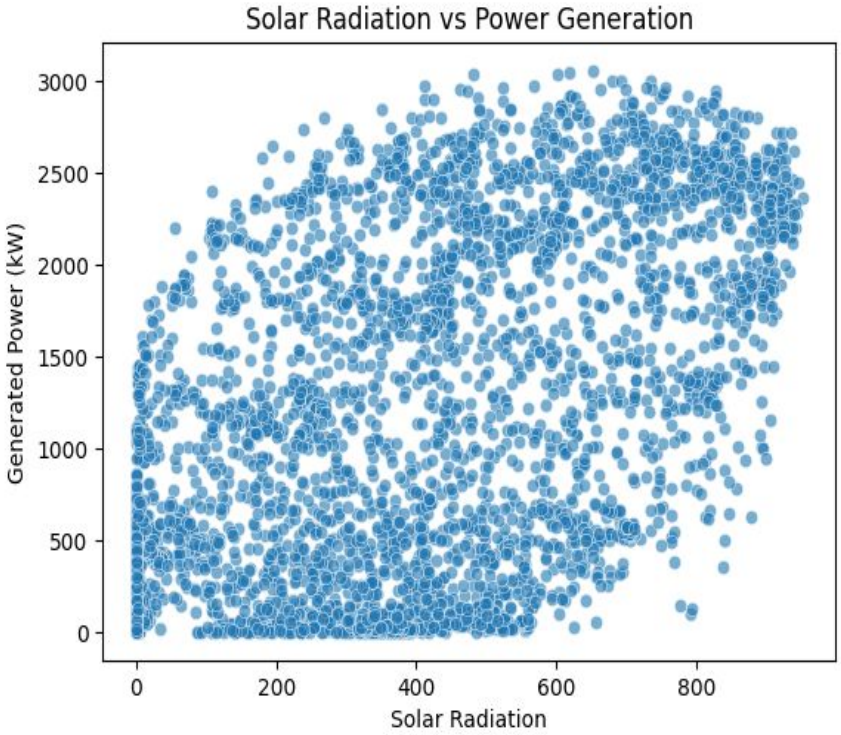
- Exploratory Data Analysis (EDA)
- Comparative and trend-based visualization
- Visual inspection for relationships and anomalies

Insights from the Data

- Solar radiation exhibits a strong positive relationship with electricity generation, indicating it as the most influential factor in solar power output.
- Power generation increases consistently with higher radiation levels, with peak values observed during high-radiation conditions.
- Temperature affects the variability of power generation but does not solely determine maximum output levels.
- The presence of outliers in power output suggests performance fluctuations under extreme environmental conditions.
- Data cleaning procedures enhanced the clarity and reliability of the observed patterns.

Solar Radiation vs Power Generation Trend

- This visualization illustrates the relationship between **solar radiation levels** and **generated solar power**.
- The data highlights how power output changes as radiation intensity increases.
- Observations are based on cleaned and aggregated environmental data.



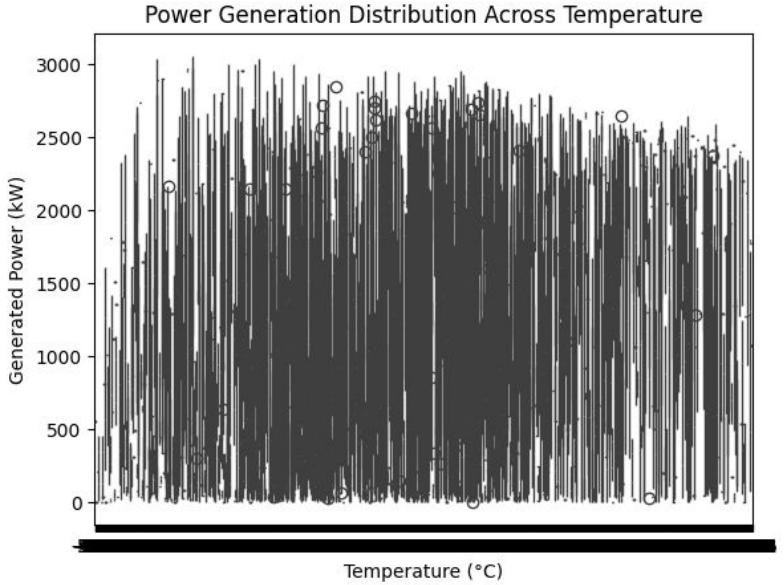
Key Insights:

- Solar radiation shows a **strong positive relationship** with power generation.
- Higher radiation levels consistently result in increased electricity output.
- This visualization confirms solar radiation as the primary driver of solar energy production.
- The trend can support energy forecasting and system optimization in renewable energy planning.

Temperature vs Power Generation Distribution

- This visualization shows the yearly trend of total **crime incidents in Baltimore** from **2012 to 2017**.
- The x-axis represents years, and the y-axis represents the total number of crimes reported each year.
- The **line chart** with markers highlights changes in crime numbers over time.

- **Key Insights:**
  - Power generation varies across temperature ranges, showing increased variability at extreme values.
  - Outliers indicate unstable or less efficient operating conditions.
  - Temperature influences power stability but is secondary to solar radiation.



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