Exploratory Data Analysis of Smart City IoT Sensor Data

Dataset Source:
Grant No. BR24992852 – “Intelligent models and methods of Smart City digital ecosystem for sustainable development and the citizens’ quality of life improvement”.

Description:
IoT data collected every 5 seconds using sensors connected to an ESP Arduino microcontroller. Each day contains 17,280 CSV records. The dataset spans 7 days (~120,960 rows).

Sensors Used:
- Temperature
- Humidity
- Light
- pH
- Electrical Conductivity (EC)

Goal: Perform Exploratory Data Analysis (EDA) to find trends, correlations, and statistics.

EDA Steps Conducted:
1. Loaded all daily CSV files.
2. Added date & hour columns.
3. Checked data structure and missing values.
4. Generated summary statistics.
5. Time-series plots of temperature, humidity, and light.
6. Day–night light cycle investigation.
7. Temperature vs humidity scatter analysis.
8. Correlation heatmap across all sensors.

Findings:
- No missing values found.
- Sensor values stayed within realistic ranges.
- Light did not show a clear day–night cycle (possible synthetic dataset).
- Weak correlation values indicated mostly independent sensor readings.

Conclusion:
The dataset is clean and useful for simulation or modeling. No strong relationships were detected, but meaningful trends and structured time-series data exist for potential machine learning tasks.