Team 5: Electrical Blower Machine Energy Consumption

1 Introduction

The `5.csv` **Electrical Blower Machine Energy Consumption** dataset records energy consumption patterns of a blower motor over time. This data is collected using an IoT-based monitoring system, capturing power usage in **10-15 minute timeslots**. The dataset provides insights into operational patterns, machine downtime, and overall energy efficiency. Understanding these consumption patterns is essential for optimizing energy usage, predicting failures, and improving industrial efficiency.

2 Dataset Description

This dataset captures the energy consumption of an electrical blower machine using a time-series approach. The key attributes include:

- **Timestamp** – The recorded time at each interval (10-15 minutes apart).
- **Energy Consumption** – The measured energy usage between the current and previous timestamp.
- **Machine Status** – Inferred from energy consumption:
  - If the energy consumption is **null or less than 0.5**, the machine was **OFF** during that time slot.
  - If the energy consumption is **0.5 or greater**, the machine was **ON**.
- **Stationary Time Series** – The dataset follows a stationary pattern over time since the blower motor operates at a fixed **kWh (KiloWatt-Hour) capacity**.

3 Tasks and Requirements

To analyze and extract meaningful insights from the dataset, the following tasks are required:

3.1 Data Exploration and Preprocessing

- Load and inspect the dataset.
- Handle missing or inconsistent energy consumption readings.
- Perform exploratory data analysis (EDA) to understand consumption patterns.
- Convert timestamps into a structured time-series format.

3.2 Time-Series Analysis and Modeling

- Identify trends and seasonality in the energy consumption pattern.
- Detect machine usage cycles and predict potential downtimes.
- Develop forecasting models to predict future energy consumption.
- Apply anomaly detection techniques to identify unusual spikes or drops in consumption.

3.3 Visualization and Reporting

- Generate time-series plots and rolling average graphs for trend analysis.
- Use histograms and boxplots to examine energy usage distribution.

4 Submission Requirements

- A well-structured report detailing the methodology, results, and analysis in a given report format.
- Python code is used for implementation.
- A presentation summarizing key findings and recommendations in a given presentation format.