

School of Computer Science Engineering and Technology

Course- B. Tech
Course Code- CSET369
Year- 3rd Year
Date- Week 5

Type- Specialization Elective
Course Name- Time Series Analysis
Semester- V

Lab Assignment -5

Experiment	CO1	CO2	CO3
Identify Noise and Apply Filtering Techniques		✓	

Objective: Identify noise in a given time series, apply filtering techniques (SMA, EWMA, low-pass), and compare original vs. filtered series for effectiveness.

Download the following time series dataset and read them as a python dataframe and print the heads.

✓ **Dataset: Electric Production dataset** (monthly U.S. electricity production)

Perform all the following tasks on the above dataset.

Tasks

Task 1 — Data Loading & Visualization

1. Load the dataset and set the datetime column as index.
2. Plot the raw time series.

Task 2 — Noise Identification

1. Plot the **ACF** and **PACF** of the raw data to detect random fluctuations.
2. Add **rolling statistics** (mean & variance with a window of 7 or 12 depending on data frequency) to visualize volatility/noise.
3. Discuss whether the noise seems **white noise** or **correlated noise**.

Task 3 — Filtering Techniques

1. Apply a **Simple Moving Average (SMA)** with appropriate window size.
 2. Apply **Exponential Weighted Moving Average (EWMA)** to smooth short-term fluctuations.
 3. Apply a **Butterworth Low and High-Pass Filter** (scipy.signal).
 4. Plot and compare original vs. filtered series.
 5. Re-compute the **ACF** of filtered data and compare with original.
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