Time Series Analysis & Forecasting Methods 99106

Project Proposal: Time Series Analysis of Household Electric Consumption with ARIMA and ARMA Models

Students:

Asaf Levi 200967677

Haim Elbaz 311141162

Introduction & Motivation

An accurate prediction of Household electricity consumption can help energy companies to optimize their energy production over time, and improve energy production and supply efficiency, cost savings, and power grid management. This type of research is particularly relevant in the context of renewable energy integration, climate change, and the deployment of smart grid technologies.

In our project, we seek to replicate the methodology used in an article that examined household electricity consumption through the application of ARMA and ARIMA techniques. These techniques were taught to us in class, and we will employ our own code to reproduce the results. Our primary objective is to determine if we can achieve similar outcomes to those presented in the article.

Dataset

The article uses the following publicly available dataset:

https://archive.ics.uci.edu/ml/datasets/individual+household+electric+power+consumption

This large dataset contains information about 2,075,259 measurements of a specific household located in Sceaux, France, gathered across a period of 47 months, between December 2006 and November 2010. The dataset contains house-overall power data (kW), voltage (V), intensity (Ampere), and energy (kW/hr) data for sub-regions of the house such as the kitchen or the laundry room.

Tools and methods

Preprocessing of the data will include data cleaning, such parsing the txt into a DataFrame, imputation of missing values and grouping of the minute-resolution data to the time scopes described in the article (daily, weekly, monthly or quarterly). This will result in several smaller datasets which are ready to be decomposed into trend, seasonal, and residual components. Furthermore, the authors have fitted parameters for the ARMA & ARIMA models, and we will fit these parameters ourselves and see if we can get the same results.

Research question

The objective of the authors' study was twofold: to develop a reliable forecasting model and to determine the appropriate forecasting period and timeframe, such as daily, weekly, monthly, or quarterly.