PREDICTING THERMAL FLUCTUATIONS OF ELECTRIC GRIDS AT DELTA THERMAL

- JAY MOTKA

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Delta Thermal, Inc.


Credit: deltathermalinc.com

- An industrial IoT company.
- Provides remote infrared monitoring & perimeter security for electrical substations and the mining industry.
- A startup founded in 2018.
- A vision of providing automation technology that provides a simpler, more effective way of monitoring power plants and substations.

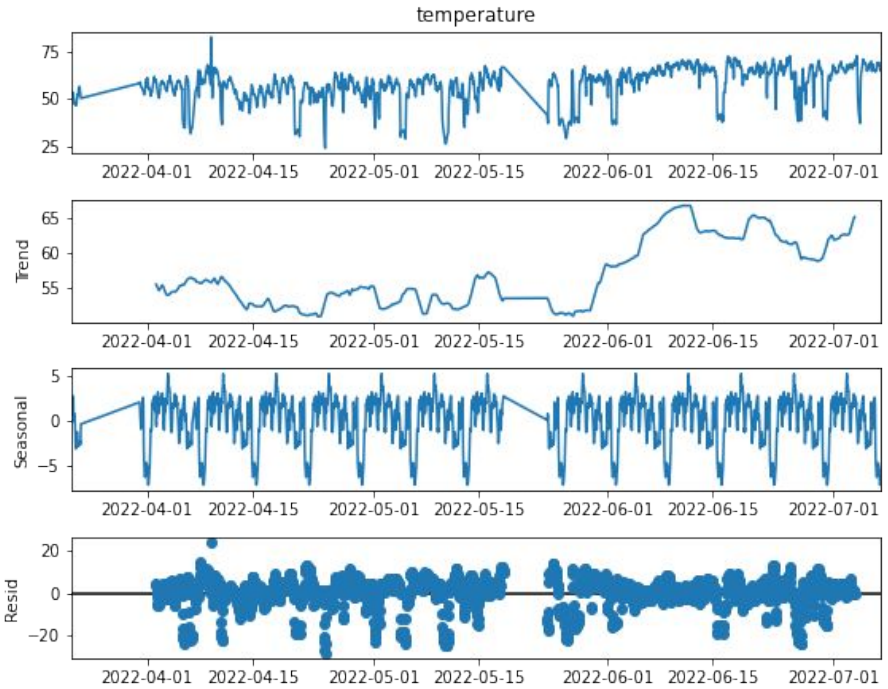
TESTING SOLUTION FOR AN IOT NETWORK

- Addressed two objectives:
  - Determining whether all the systems in an IoT network are in sync or not.
  - Alerting if there are any errors or shut downs in any of the devices in the network.
- Got familiar with:
  - SSH (Secure Shell) for navigating in between the devices.
  - NTP (Network Time Protocol) for synchronizing the devices in a network.
- The final product:
  - Python script extracting info of device activities and errors.
  - Wrapped in a Bash script interacting with the devices in the system.

BUILDING & IMPLEMENTING FORECASTING TOOLS

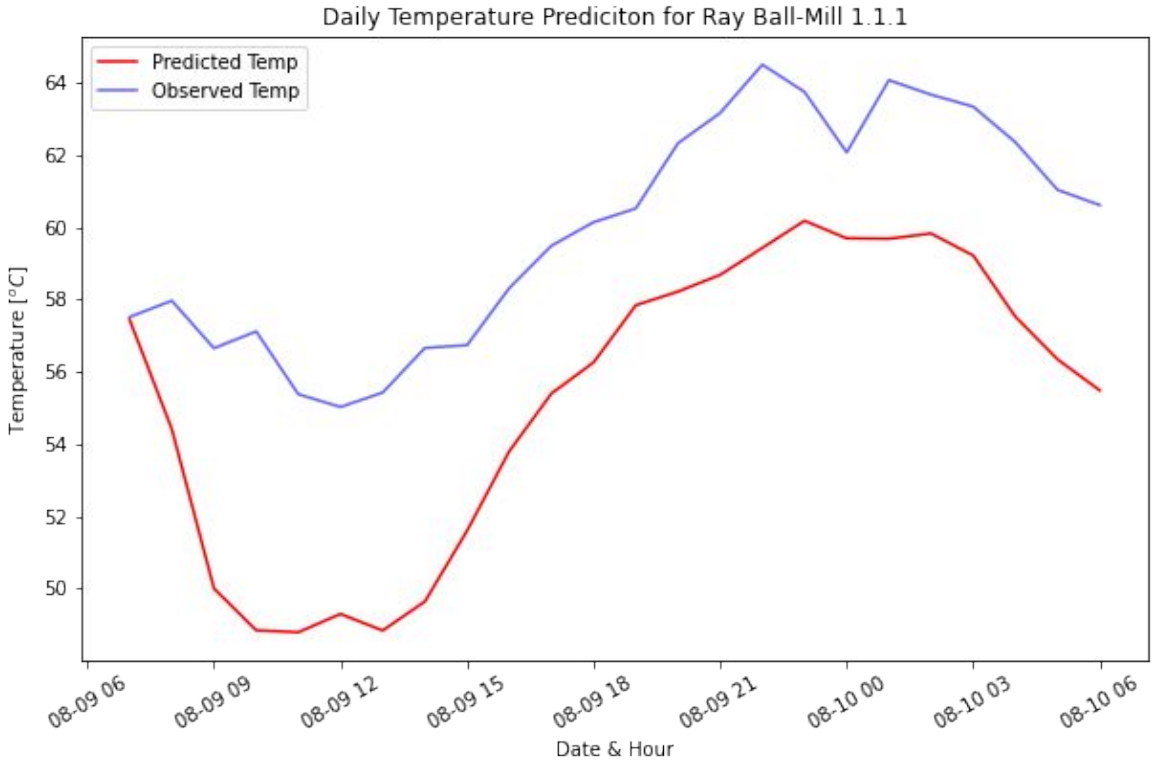
- Three components:
  - A time series analysis on a historic thermal data.
  - Two machine learning models to predict the thermal data.
  - A workflow for the models' repetitive use built using AWS.

CHALLENGES



- Learning the use of AWS and how to forecast time series.
- Tried various algorithms and models but nothing worked:
  a. Moving Average
  b. Auto Regression
  c. fbProphet
  d. SARIMA
  e. Long Short-Term Memory networks (LSTMs)
- Solution: Forecasted different components of the time series separately!

OUTCOME



- R^2 score = - 1.6045
- RMS error = 4.93 °C

WHAT I LEARNED

How to apply my skills and knowledge in software testing and development.

New technical skills in cloud computing using AWS' products: S3, DynamoDB, Lambda, and SageMaker.

How IoT networks work as well as doing time series analysis and forecasting.

Helped decide that I would like to continue in academia.

THINGS THAT PREPARED ME

My Research Experiences	▪ Machine Learning ▪ Data Processing ▪ Data Visualization
Core Physics & Astronomy Courses	▪ Problem Solving
CSC 110 - 120 PHYS 305	▪ Programming

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THANK YOU

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