Analyzing PI Data with Python using Jupyter Notebook

Presented By: Malvika Singh

Disclaimer

What this talk is

- It's for
  - People interested in data science
  - People with development skills
  - People who want to solve problems adhoc
- It's an example of reducing the cost of curiosity

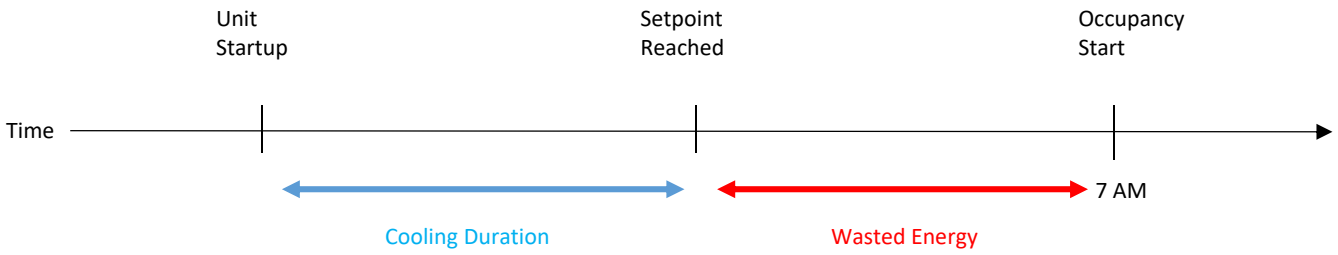
What it isn't

- It is *not* a "how-to" for data science.
- It is *not* an extensive deep dive into PI Web API
- Example shown is not a product, just an example!

Agenda

- Problem Statement
- Overview of tools (Jupyter Notebook)
- PI Web API and PI Web API GitHub samples
- How to use the GitHub sample?

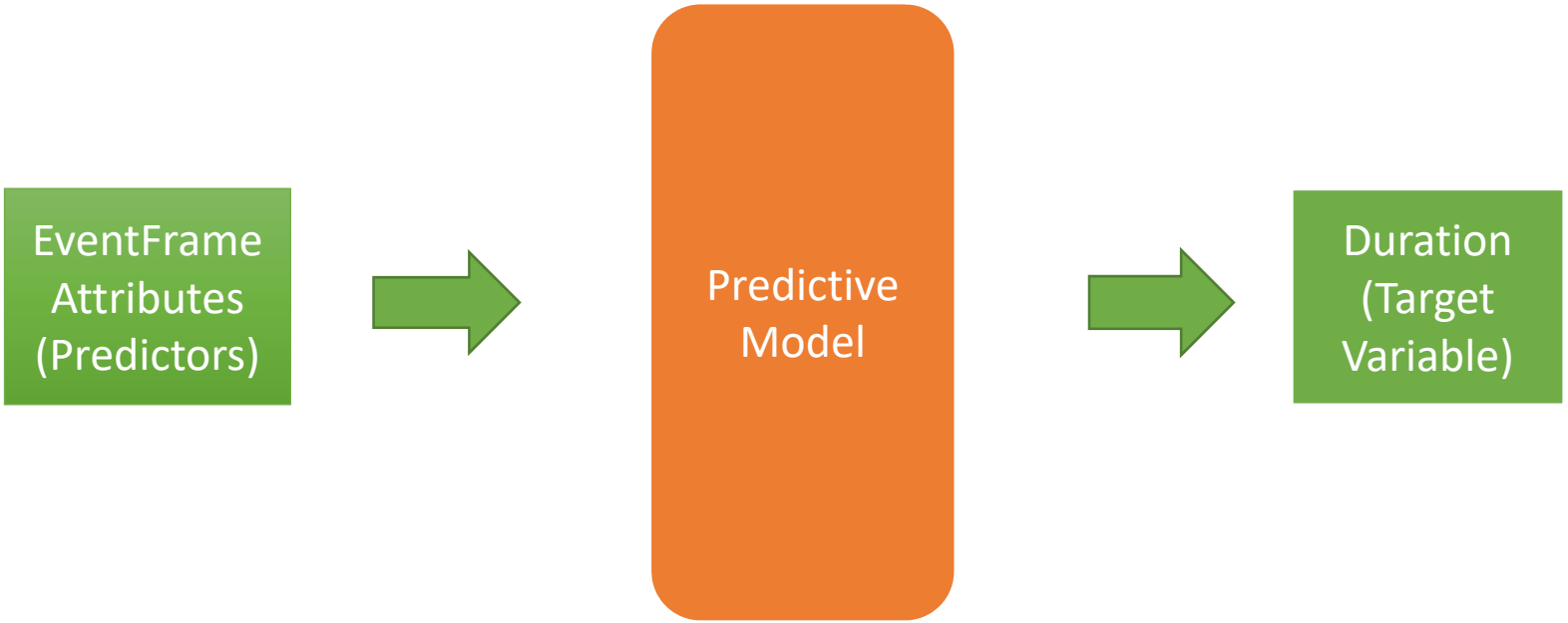
Problem Statement



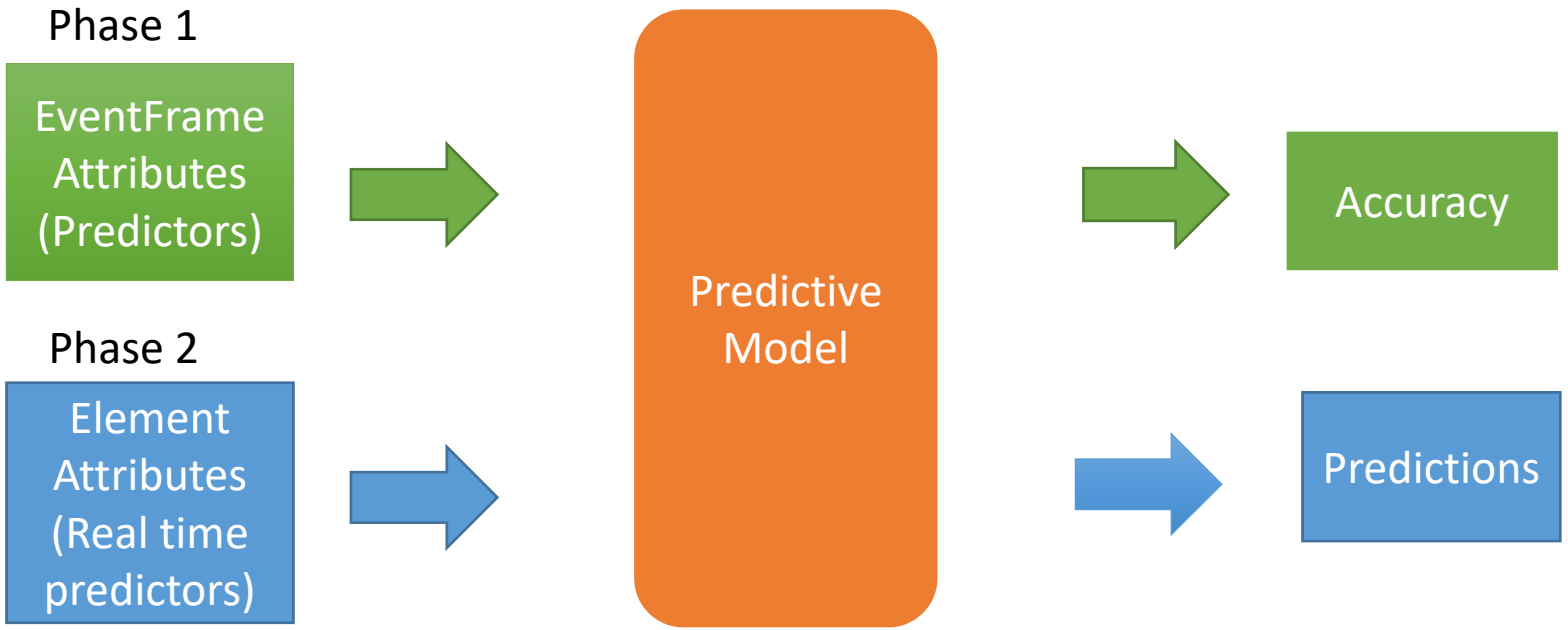
Objective

To predict time taken to reach the setpoint for various cooling units in the building so that energy usage is optimized and costs are reduced.

Our Model



How are we going to use the model?



Jupyter Notebooks – The what

- Stands for **Ju**lia, **Py**thon and **R**
- Open Source web-based interactive environment built upon IPython kernel
- OSIsoft doesn't own or support Jupyter Notebooks
- Project Jupyter

Jupyter Notebooks – The why

- Jupyter is free and backed by a large open source community
- Coding Environments can be intimidating
  - vim, IDE, REPL …. what do all these acronyms mean?
- Runs in your browser
- Shows the output right in the same document
- Everything lives in memory (can share results between code blocks)

PI Web API and PI Web API code samples

- The PI Web API is a RESTful and secure interface to the PI System.
- Gives client applications ***Read*** and ***Write*** access to their AF and PI data over HTTPS.

- PI Web API code samples are now live on GitHub in 5 languages!!
- PI Web API samples

Why PI Web API ?

- The PI Web API is secure.
- It is fast and data is just an HTTP call away!
- Provides ingress *and* egress.

Alternative Offerings from OSIsoft which egress data: PI Integrators, OCS DataViews, AFSDK, and PI SQL Data Access Server

The “Science” in Data Science

- As *Setpoint Offset at VAV start* and *% Cooling at VAV start* have a linear relationship with the target variable Event Frame Duration , we have chosen a linear regression model for predictive purposes.

- Trying to predict specific values ? -> Regression Models
- Trying to predict a category ? -> Classification Models

Evaluating the “Science” in Data Science

- Dataset is split into two parts: Training and Test data.
- Model is trained with Training Data first.
- Test Data is used to evaluate the accuracy of the model.

Using the “Science” in Data Science in Real World

- Predicted Cooling Time can be saved as an attribute of the cooling unit element in the PI system!
- Each cooling unit element’s *Predicted Cooling Time* attribute will change in real-time according to the model’s results.
- How to update *Predicted Cooling Time* in a secure, reliable manner?

Data Ingress Using PI Web API

PI Web API can be used to securely ingress data into the PI system.

It is a RESTful, performant and secure way to push data into the PI System.

DEMO

How to use the GitHub sample?

Saving Energy

CHALLENGES

- Energy efficiency of a building is compromised when cooling units are running to keep the temp at setpoint even when building is unoccupied.

SOLUTION

- Use data analysis and predictive models to predict how much time will be taken to reach the setpoint so the units are started as close to 7AM as possible.

BENEFITS

- Building Management uses data to influence decisions.
- Energy is saved resulting in reduced costs for building management.

> As per our calculations, we can theoretically save 5000 hours of operation per year using this exercise. This shows that a low accuracy model can also provide tremendous value to an organization if the predictors accurately align with the problem.

How to get started?

- PI Web API Code Samples
- Getting started with Jupyter Notebook
- How to prepare data and create models - Microsoft

Speaker

- Malvika Singh
- Software Developer II
- OSIsoft
- msingh@osisoft.com

Questions?

Please wait for the **microphone**

State your **name & company**

Please remember to…

Complete Survey!

Navigate to this session in mobile agenda for survey