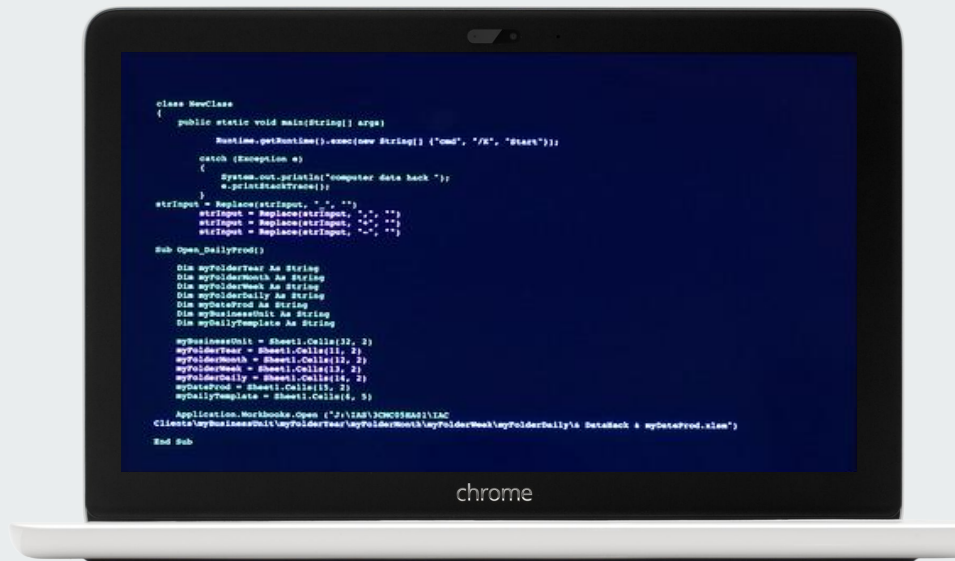


# Project Summary

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# Outline

Project Background

Objectives

Data Management and Security

Data Overview

Data Issues and Solutions

Statistics

Recommendations



# Project Background

**Analyze residential power usage data over a 4 year period.**

Our client claims to not have been occupying a specific residence at the time of an undisclosed even during the summer of 2008.

We are given the residential power usage data from the years 2007 to 2010 for the three sub-meters at the residence.

Can we use this data to support the client's claims?

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# Objectives

1. Analyze the given data to determine what typical power usage patterns look like for the residence.
2. Determine whether these typical patterns are different for the time period in question - Summer 2008
3. Look for trends and outliers in the data that help support (or refute) the client's claims.



# Data Management and Security

- Data was accessed from an SQL Database provided by the law firm
- IOT Analytics implements a variety of security measures including big data encryption tools and an Intrusion Protection System (IPS) in order to keep data and projects safe
- All personnel are trained to regard the security of the data and the privacy of the individual as of utmost importance, and are proactive about ensuring that the data remains confidential



# Data Overview

- Data consists of power usage information from 3 submeters in the residence, measured in watt-hours (W/h).
  - ◆ Submeter 1 = Dishwasher, oven (stovetop is gas powered), and microwave
  - ◆ Submeter 2 = Washing machine, dryer, refrigerator
  - ◆ Submeter 3 = Electric water heater, air conditioner
- Data covers the time period from December 2006 - November 2010 (47 months)



# Data Issues and Solutions

- Data for the years 2006 and 2010 are incomplete.
  - ◆ These years will be removed, leaving years 2007-2009 for analysis.
- Data is missing in approximately 1.25% of rows.
  - ◆ Rows with missing data will be removed -- this should not affect our analysis
- Measurements were made every minute, which would create a lot of noise for our analysis
  - ◆ Only data readings taken every 15-45 minutes will be analyzed (a final number will be narrowed down upon deeper analysis)

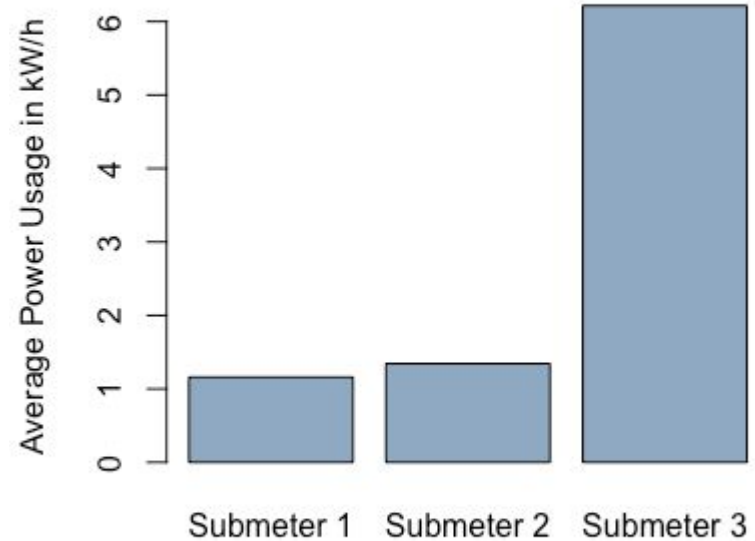
# Preliminary Statistics

Submeter 3 uses the most power on average. This submeter measures the AC and water heater.

However, the maximum power usage for both Submeter 1 and Submeter 2 is around 80, while the maximum power usage for Submeter 3 is closer to 30.

Submeter 3 likely uses less power over a longer period of time, while the others use more power in a short period.

**Average Power Usage for Each Submeter**

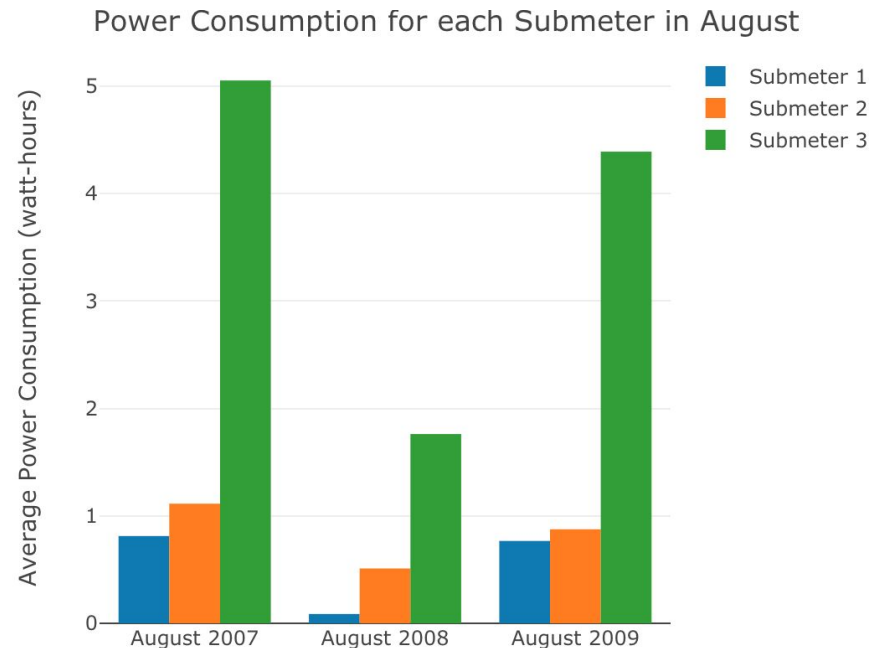




# Preliminary Statistics

After comparing the average power usage for each submeter for the summer months (Jul/Aug) of years 2007-2009, it appears that power was used significantly less for the month of August in the year 2008 compared to the typical usage in other years. (There wasn't much difference in the power usage for July).

This leads us to believe that it is possible that the client was not at the residence during the month of August 2008.





# Recommendations

- It would be useful to understand the way the client typically uses the appliances in the residence.
  - For example, there may be a seasonal pattern to appliances like the air conditioner. Does the client typically use the AC more in the summer than in the winter?
  - Other appliances may have a pattern of usage -- the washer/dryer for example may only be used once weekly, while cooking appliances may be used multiple times daily.
- Appliances such as the refrigerator may not be useful to our analysis, since they are likely not to change their power usage regardless of whether the client is at home or not.
  - Since the refrigerator is on the same submeter as the washer/dryer, this may make interpreting the data more difficult.



# What next?

- Narrow down the number of datapoints by utilizing measurements from every 15-45 min (instead of every minute)
- Perform a deeper analysis, plot and visualize each submeter's activity over a period of a year, month, week, day, etc.
- Perform a time series analysis with each submeter
- Present results

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**Questions?**