Energy Consumption Prediction in the Home

Sprint 3

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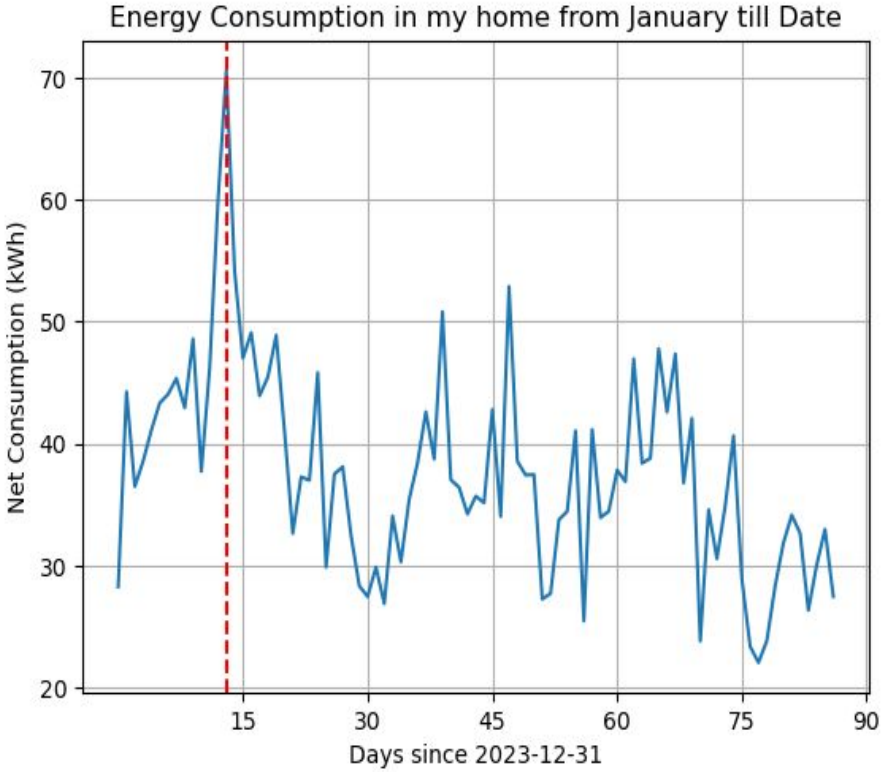
Introduction: Electricity Use in my Home

- Average daily electricity use in a BC household is 30-45 kWh (BC Hydro)
- 70 kWh on 14 January, 2024 (temperatures across BC plummeted)
- BC Hydro serves over 5 million people ~ 1 million customers
- System ratings:
  - 3.5 GW (normal operations)
  - 7 GW (Jan 12-14, 2024)
  - 11 GW (BC Hydro capacity)



Source: BC Hydro

Introduction

Problem Statement

We do not comprehensively understand how we use electricity in our homes

Goal

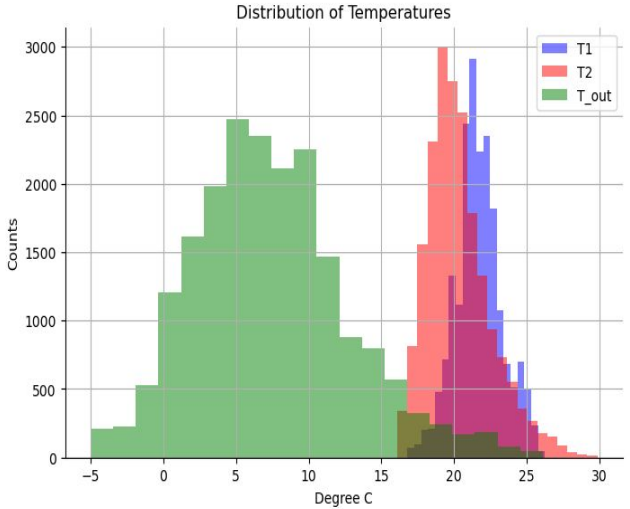
Create predictive models to explore the relationship between energy consumption of appliances and various predictors

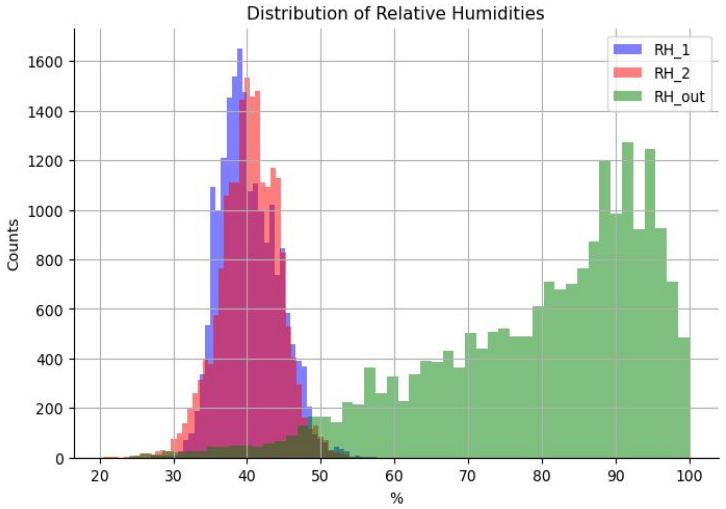
Scope

Due to dataset limitation, the project model is for a specific house

Background: Understanding the Dataset

- Energy consumption of a house in Belgium from **Jan-May 2016**
- Data source: temperature and humidity sensors, nearby weather station
- Features: energy use, temperature, relative humidity, wind speed
- The dataset contains 19,735 rows and 29 attributes (columns)





Baseline Model: Linear Regression

ML Methods	R2 Train	R2 Test
Linear regression	0.16	0.15
Polynomial regression	0.36	0.35
RF regressor	0.92	0.48
GB regressor	0.88	0.46
Neural Network	-0.022	-0.017
SVC regressor	0.88	0.25

Ensemble models have the best performance

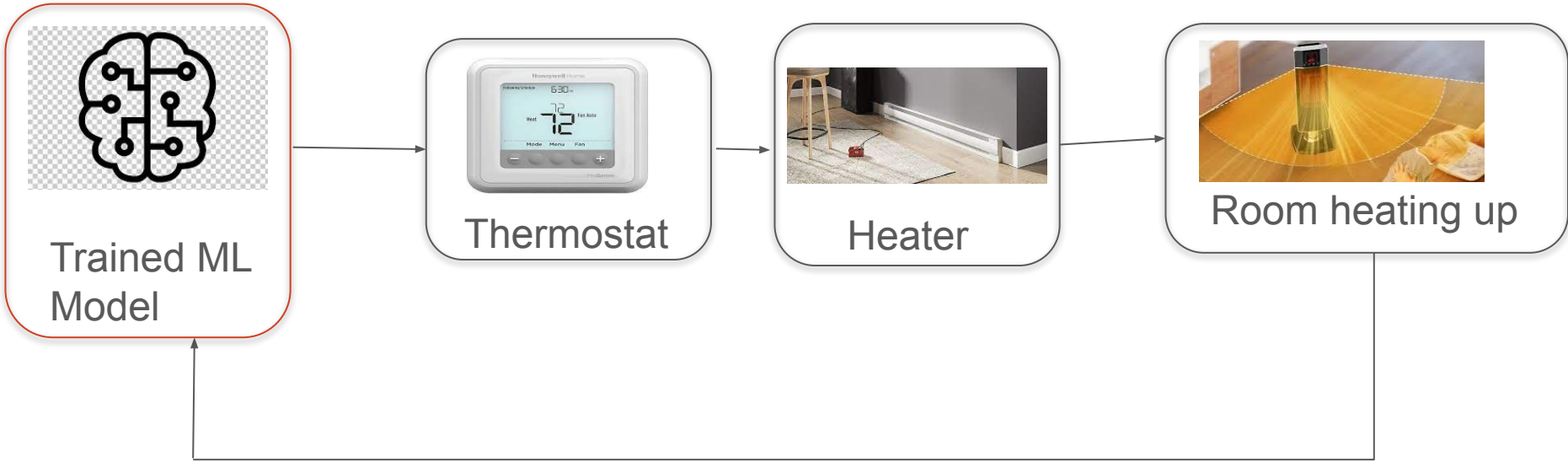
Potential Impact of Solution: Current Control System

Thermostat

Heater

Room heating up

Potential Impact of Solution: ML Model for Predictive Control



- Up to 30% savings in electricity and energy cost
- Detect abnormal electricity use
- Data sharing with hydro to enhance grid stability

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