Implementing anomaly detection framework in KNIME

11/9/2018
• Geographically diversified portfolio: Scale in America’s most competitive power markets
• Featuring one of smallest environmental footprints in America’s power generation sector
• Largest operator of combined heat and power (cogeneration) technology in America
• Largest geothermal power producer in America
How important is equipment prognostics

• 80+ Plants, several thousand rotating equipment, translating to several thousand potential failures
  – Better monitor thy equipment

• Since 2013 Calpine has been using a 3rd party Anomaly Detection framework based on NASA’s ORCA algorithm
  – Blind spots
  – No Fault Detection or Remaining Useful to speak of

• Improving on existing methods through a combination of DL and classical ML algorithms
Anomaly detection vs Fault Classification

Unknown unknowns

Unknown knowns

- Graph showing a temperature change over time with two points marked as anomalies.
- Cartoon of a person looking under the hood of a car with蒸汽 coming out, indicating a fault.
Anomaly detection in context

Maslow Pyramid of needs
Framework for equipment monitoring

BIG BROTHER IS WATCHING ME?

I AM CURRENTLY THE ELDEST SON OF MY FAMILY, SO THAT STATEMENT IS FALSE.
Improving Calpine Anomaly Detection Framework

Existing Algorithm

New supplemental Algorithm based on Autoencoders
Framework overview

KNIME Analytics Platform

Design

Get New Data

QC Data (Prep Training Data)

Deploy Model (write to KNIME Server)

Build

Publish Model architecture

Model Retrieval / Receive New Data

Score & Alert / Store

Calpine Corporation
Workflow - Training (Keras Network)
Workflow - Training (One Class Classification)
Workflow - Training (User Input)
Workflow - Training (Visualize Model Performance)
Workflow - Prediction (Rest API)