



# Relating DGA & Work Requests to Network Transformer Failures with Machine Learning

Jon Garrity

November 4, 2019

## **4,664 network transformers**

Includes over 300M  
observations of loading,  
temperature, etc.

## **~700 failure examples**

In-service failures (**primarily open  
auto and open auto terminal**) &  
pre-emptive removals



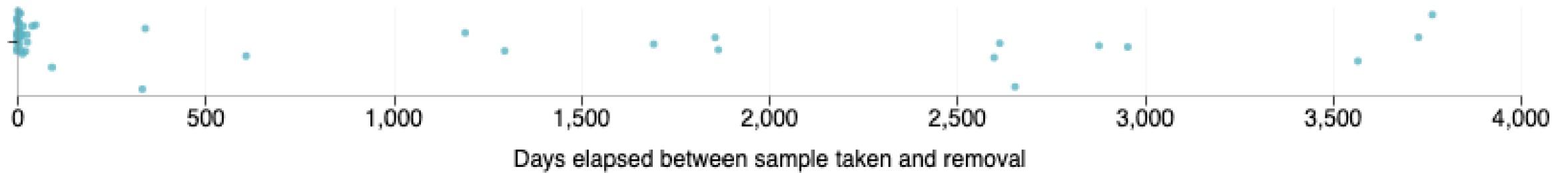


## Data Types Included

- Static features (e.g. nameplate)
- RMS (load, temperature, etc.)
- Gas Analysis (hydrogen, etc.)
- Work Requests (field crew comments)
- Weather
- Failure/removal examples

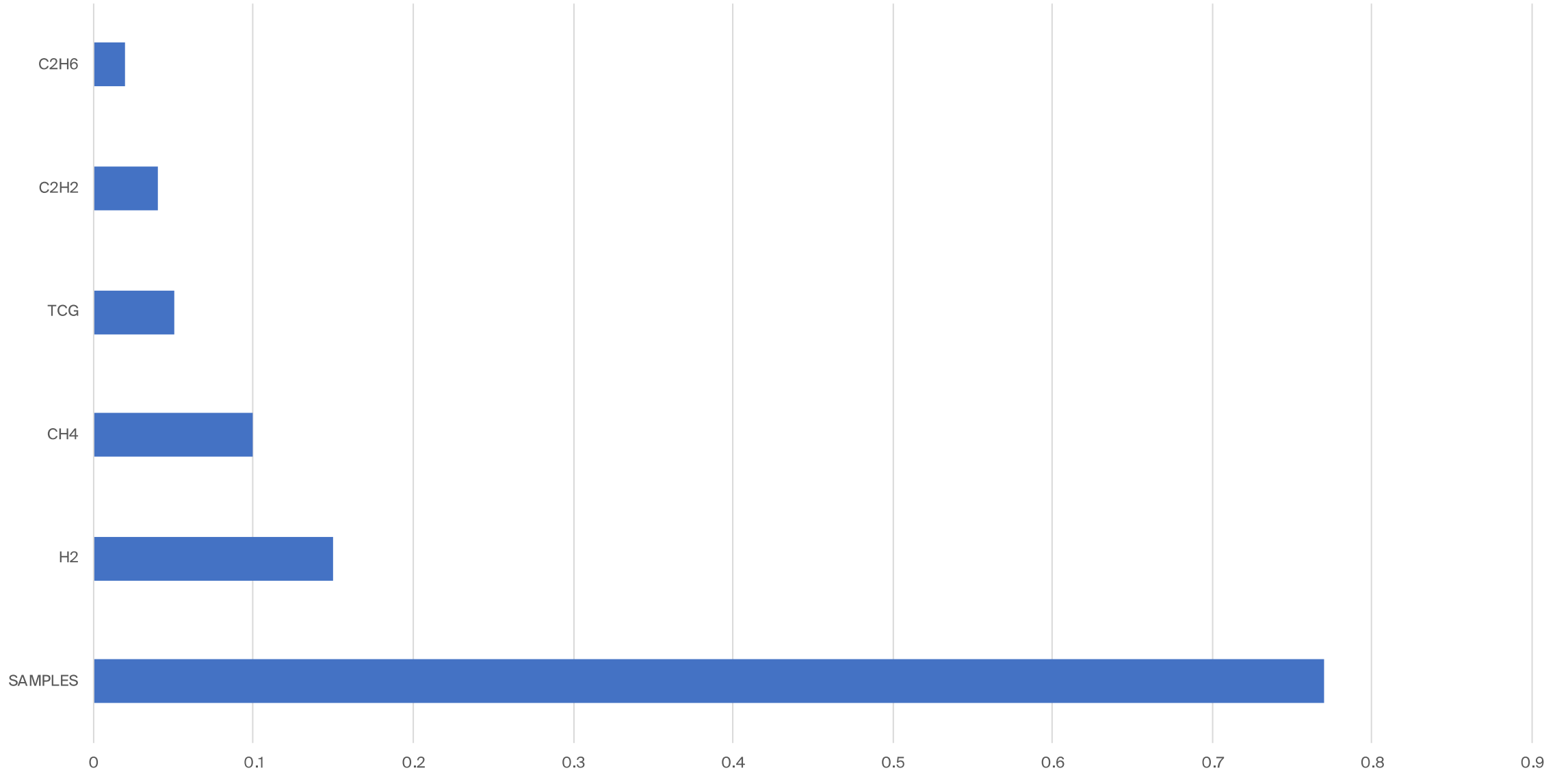


# LIMS data audit

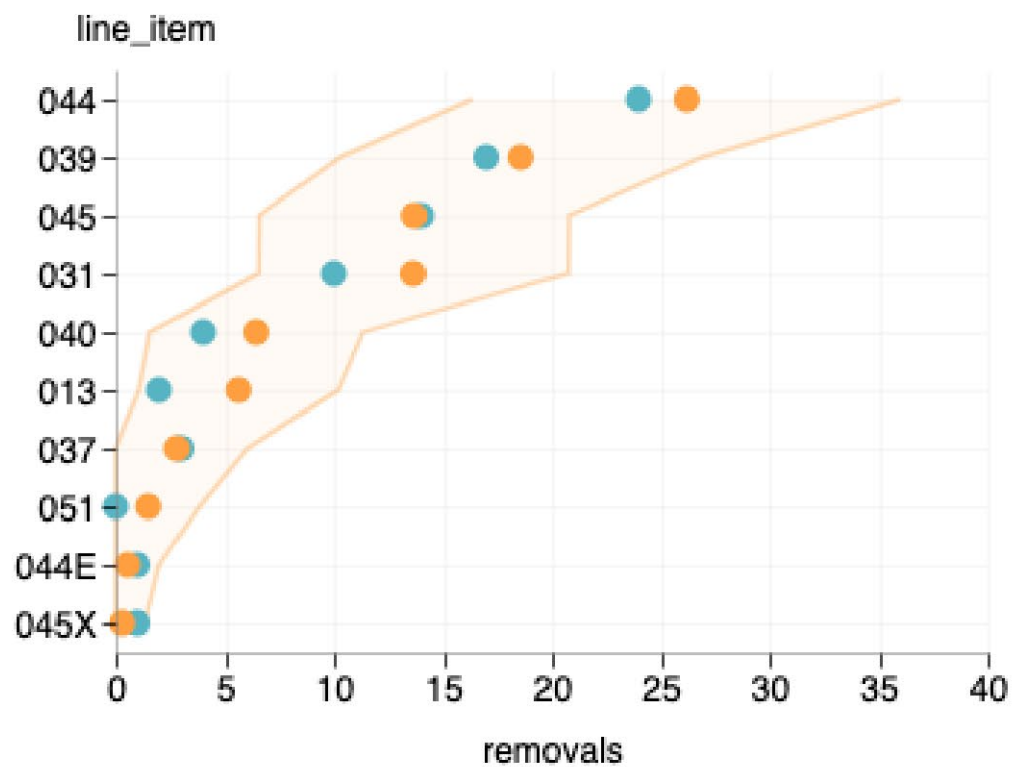


- 8,017 total dissolved gas records
- 71.6% of transformers in sample with at least one record
- Features included: Hydrogen, Methane, Ethane, Acetylene, etc.

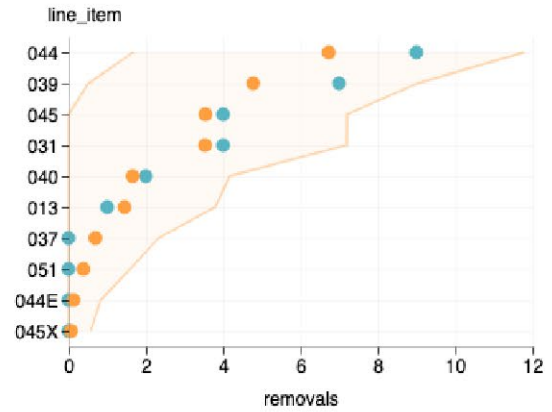
# Representative Feature Importance



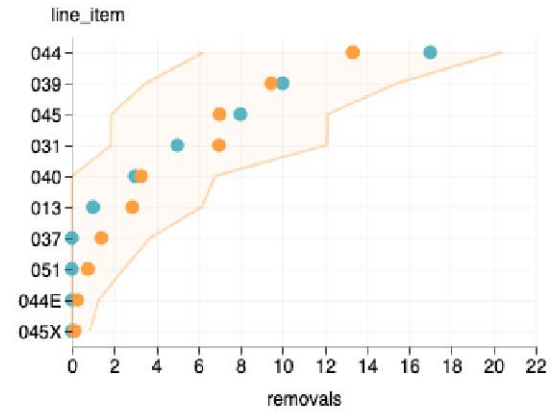
# 1 year



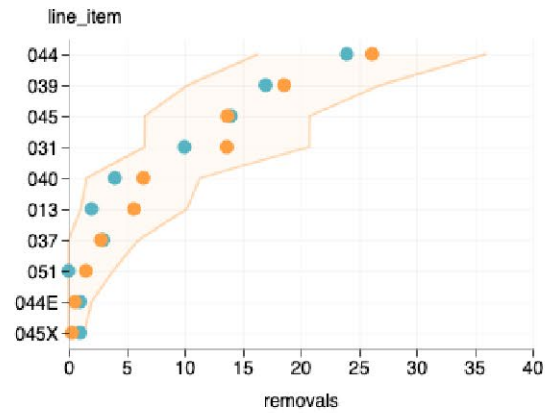
### 3 month



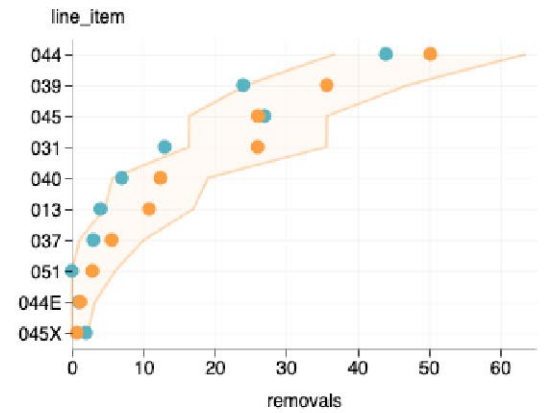
### 6 month



### 1 year



### 2 year



---

<b>Model</b>	<b>CI</b> <b>(3mo)</b>	<b>CI</b> <b>(6mo)</b>	<b>Calibration</b> <b>WMSE (1yr)</b>	<b>Calibration</b> <b>WMSE (2yr)</b>	<b>Line Item</b> <b>MAE (6mo)</b>	<b>Line Item</b> <b>MAE (1yr)</b>
<b>(1)</b>	<i>0.73</i>	<i>0.78</i>	<i>0.07</i>	<i>0.18</i>	<i>0.91</i>	<i>1.7</i>
<b>(2)</b>	<i>0.75</i>	<i>0.79</i>	<i>0.05</i>	<i>0.17</i>	<i>0.91</i>	<i>1.77</i>
<b>(3)</b>	<i>0.77</i>	<i>0.81</i>	<i>0.05</i>	<i>0.08</i>	<i>0.99</i>	<i>1.67</i>
<b>(4)</b>	<i>0.77</i>	<i>0.81</i>	<i>0.04</i>	<i>0.1</i>	<i>0.99</i>	<i>1.68</i>
<b>(5)</b>	<i>0.77</i>	<i>0.81</i>	<i>0.04</i>	<i>0.1</i>	<i>0.99</i>	<i>1.67</i>

---



Jon Garrity

CEO

jon@tagup.io

+1 617 804 1401