Reefer Analytics

Practical Learnings; Why, How and What

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We're Living in a Noisy World.

Isolated best practices

Traditional practices in a digital world

Lack of **analytical resources**

Proprietary systems and controls

Decision making can be subject to **individual bias**

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Siloed data in legacy systems

Business process efficiency

Trade lane complexity accelerating

Speed of decision making limited by **manual process constraints**

Risk management

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How to **leverage** for **commercial services**

Need to demonstrate **tangible gains** to drive acceptance

Return on investment realization

How to drive operational **efficiency**

End to end **data** acquisition still has **gaps**

Siloed data in legacy systems
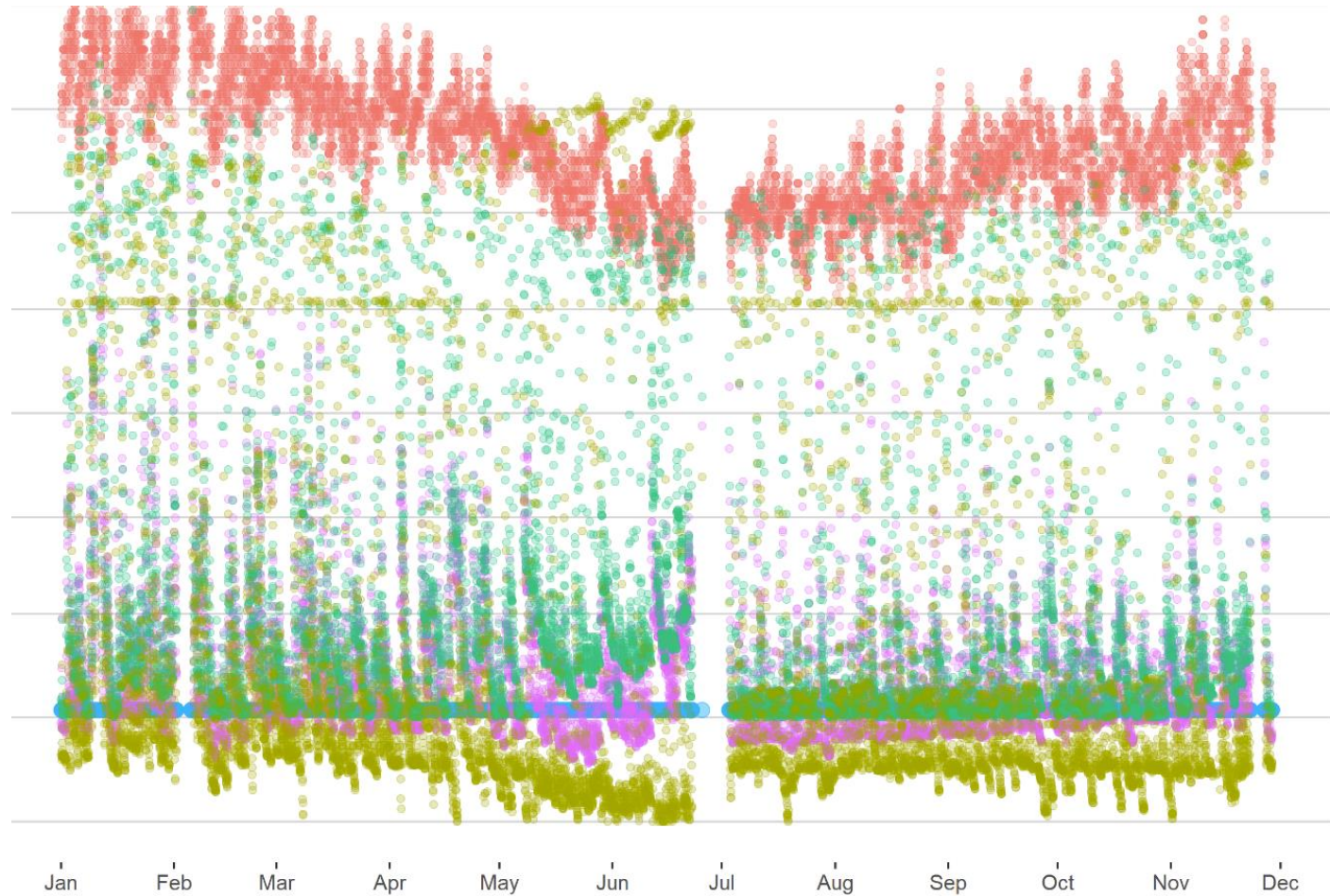
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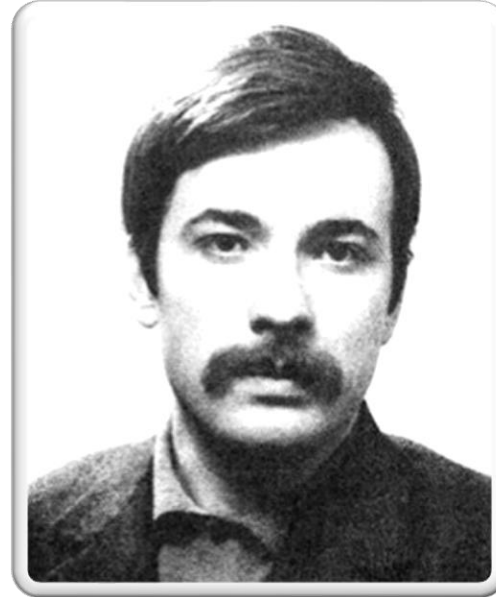# Data Without the Right Context? It's Just More Noise
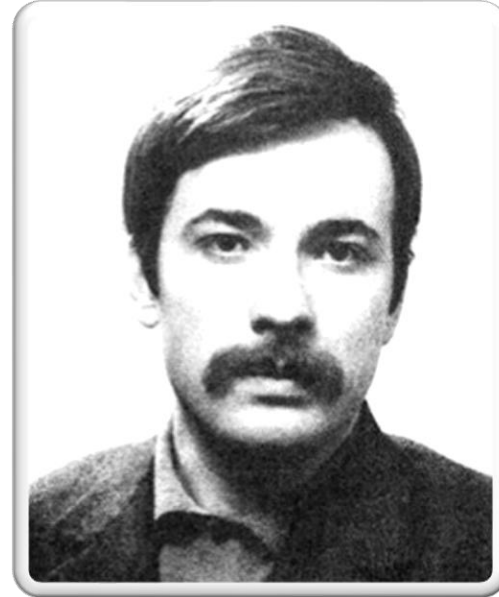
Do you know who this is?

Do you know who this is?

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Jimmy Fallon

Turkish revolutionist Mahir Cayan

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Any Revolutionists here?

How about these people?

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Data Scientists Have Used Machine Learning To Help

Machine Learning

Find patterns in data
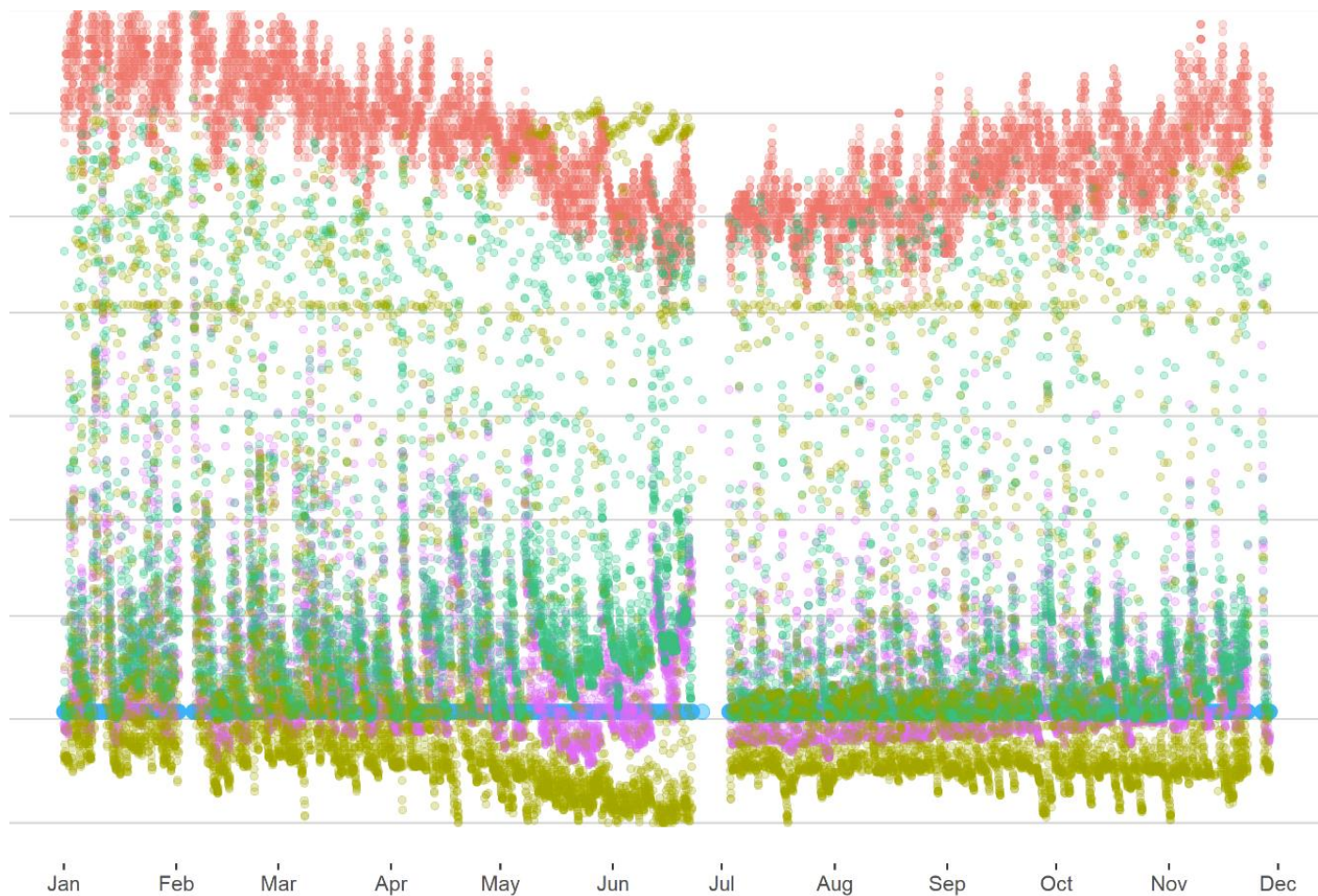
Create predictive models

Can We Trust It?

You may have used it on the way here
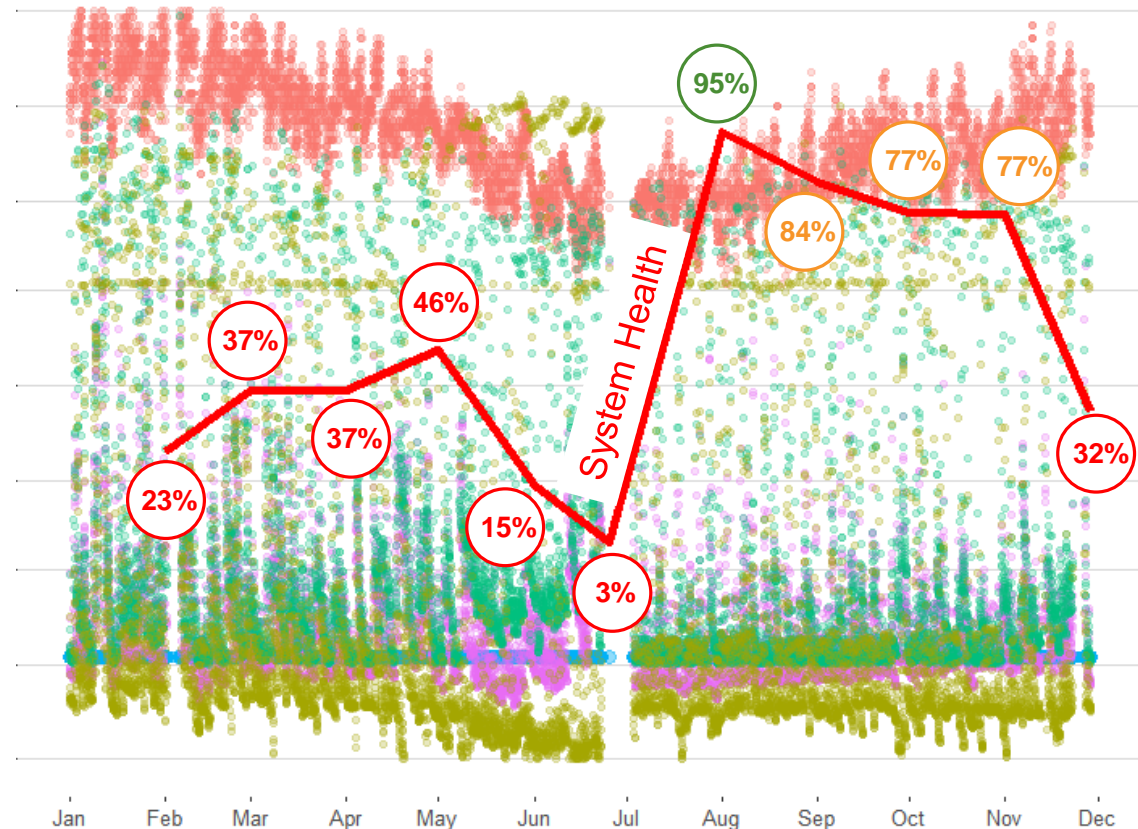

What About Our Industry?

Using Machine Learning To Give Data Context

Did it have problems this year?
When did it have problems? Why Did it have problems?

Data Science Uncovers the Story

- System Health was poor 6 months before failure

- It's clear when the unit was fixed.

- It's clear the fix wasn't permanent
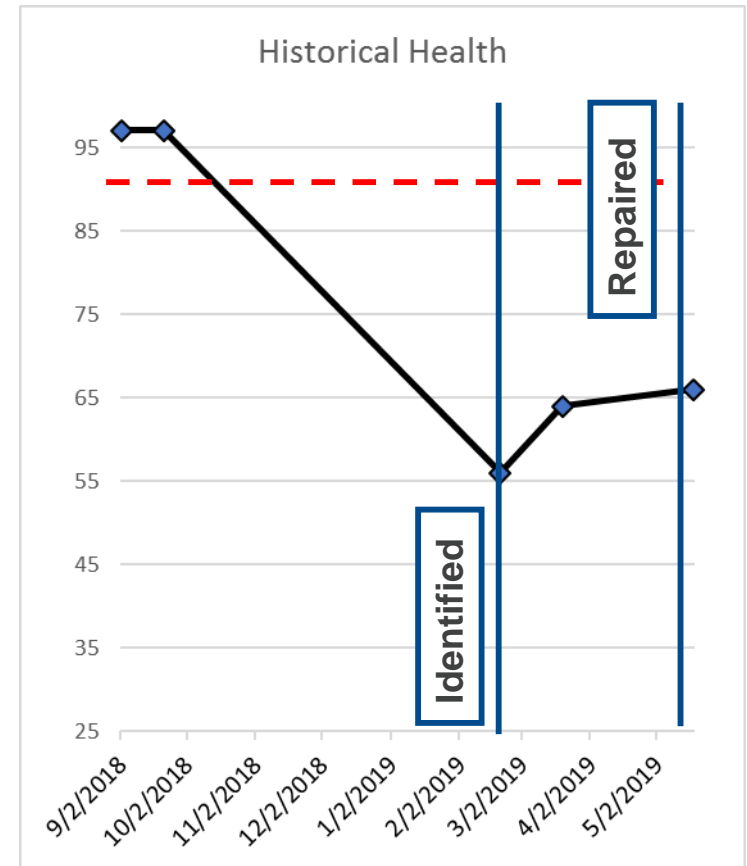
- It's clear the unit will fail again soon

Data + Application Knowledge + Machine Learning = Health Status

Field Example:
## Condenser Coil Assembly Emergency Replacement

- Identified Poor Unit Health
  - February 2019

- Emergency Repair of Condenser Coil
  - May 2019

- Issue Identified 2 Trips Prior To Repair

Historical Health

Trip Start	Trip End	Setpoint	Health	Comment
8/29/2018	9/2/2018	-1.5	97	NA
9/2/2018	9/21/2018	-1.2	97	NA
12/29/2018	2/20/2019	2.2	56	Poor Supply, Return, & Power Health
3/1/2019	3/20/2019	4.4	64	Poor Supply, Return, & Power Health
5/11/2019	5/18/2019	13.3	66	Pulldown Separation Example

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Field Example:
Refrigerant Leak

- Health Score of 61%
  - November 2018

- Refrigerant Charge Added
  - April 2019

- Post Validation Thoughts
  - Trip 2: Poor Health
  - Trip 3: Reduced Charge Sufficient To Higher Setpoint?
  - Trip 4: Struggled to Maintain Temperature At Lower Setpoint

Historical Health
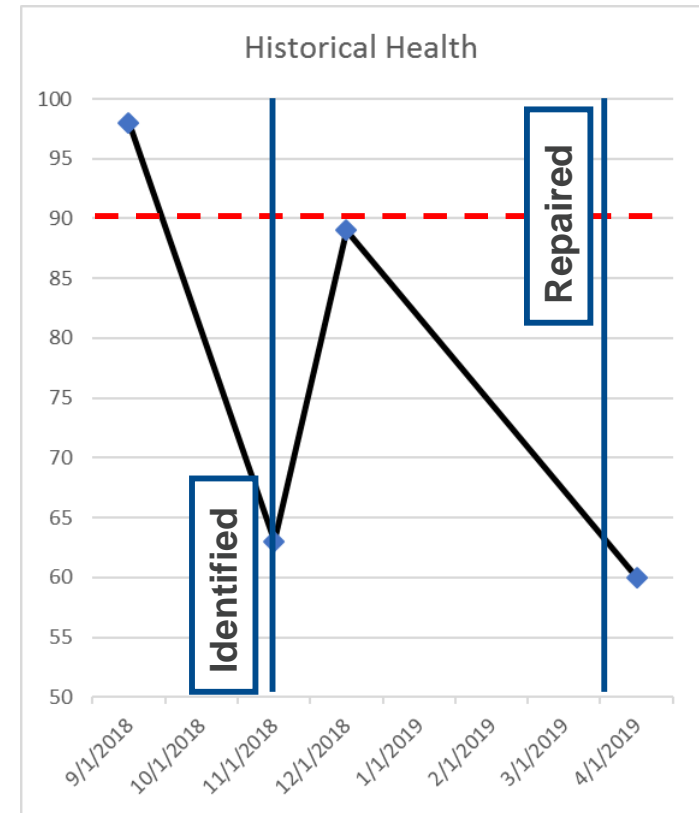
Trip Start	Trip End	Setpoint	Health	Comment
8/29/2018	9/19/2018	-1.5	98	NA
10/17/2018	11/3/2018	1	63	Poor Power Health
11/5/2018	12/13/2018	10	89	Poor Power Health
3/12/2019	4/15/2019	-18	60	Poor Supply and Return Health

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Pulldown Analysis Use Case

- Problem Identified Within Initial Days of Trip

- Projecting Pulldown Time

- <u>Validation</u> That Repair Is Sufficient To Maintain Product Temp

Previous Health :: 100%
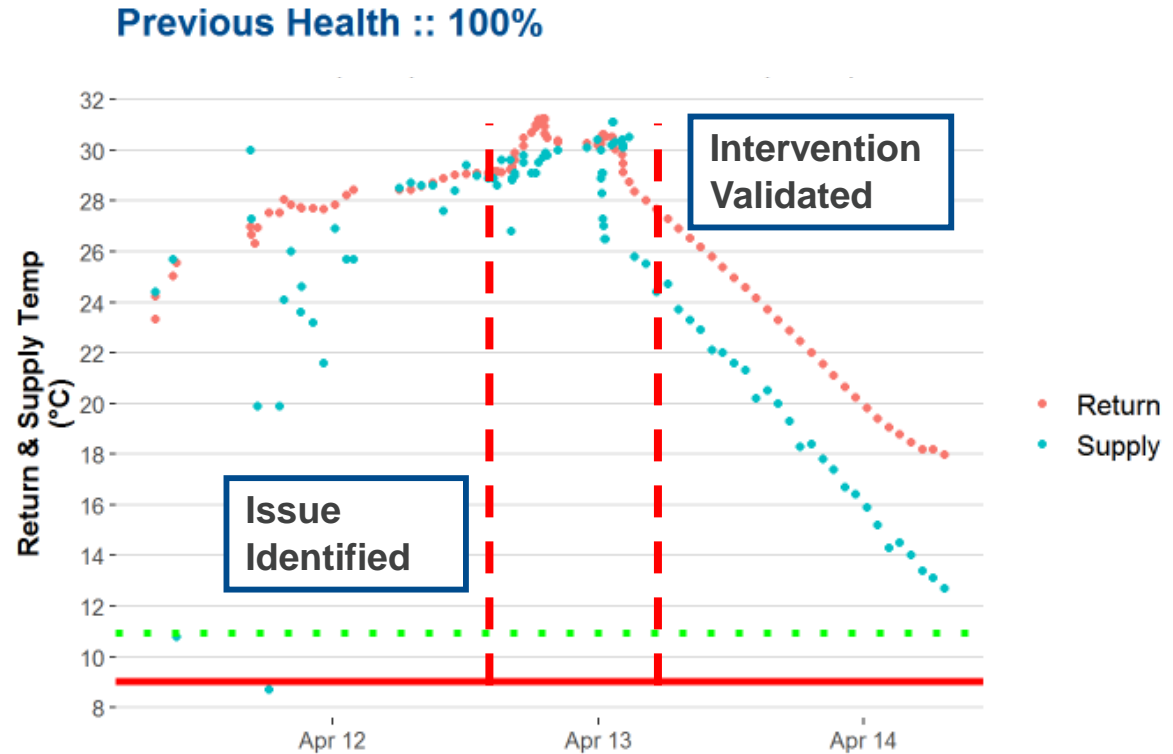
| Elapsed Time	Trip Start	Setpoint	Projected Total Pulldown Time	Priority
36 Hours	4/12/2019	9	Inf	1
48 Hours	4/12/2019	9	110 Hours	0

In Process of Incorporating Pulldown Analysis With Health Check

What About A Fleet Of Different Units?

Variety of Systems

- Different Sensor Sets
- Different Compressors
- Fixed and Variable Speed
- Different Coils
- Different System Ages
- Different Operating Conditions
- Different Product

One Emerson Health Prediction
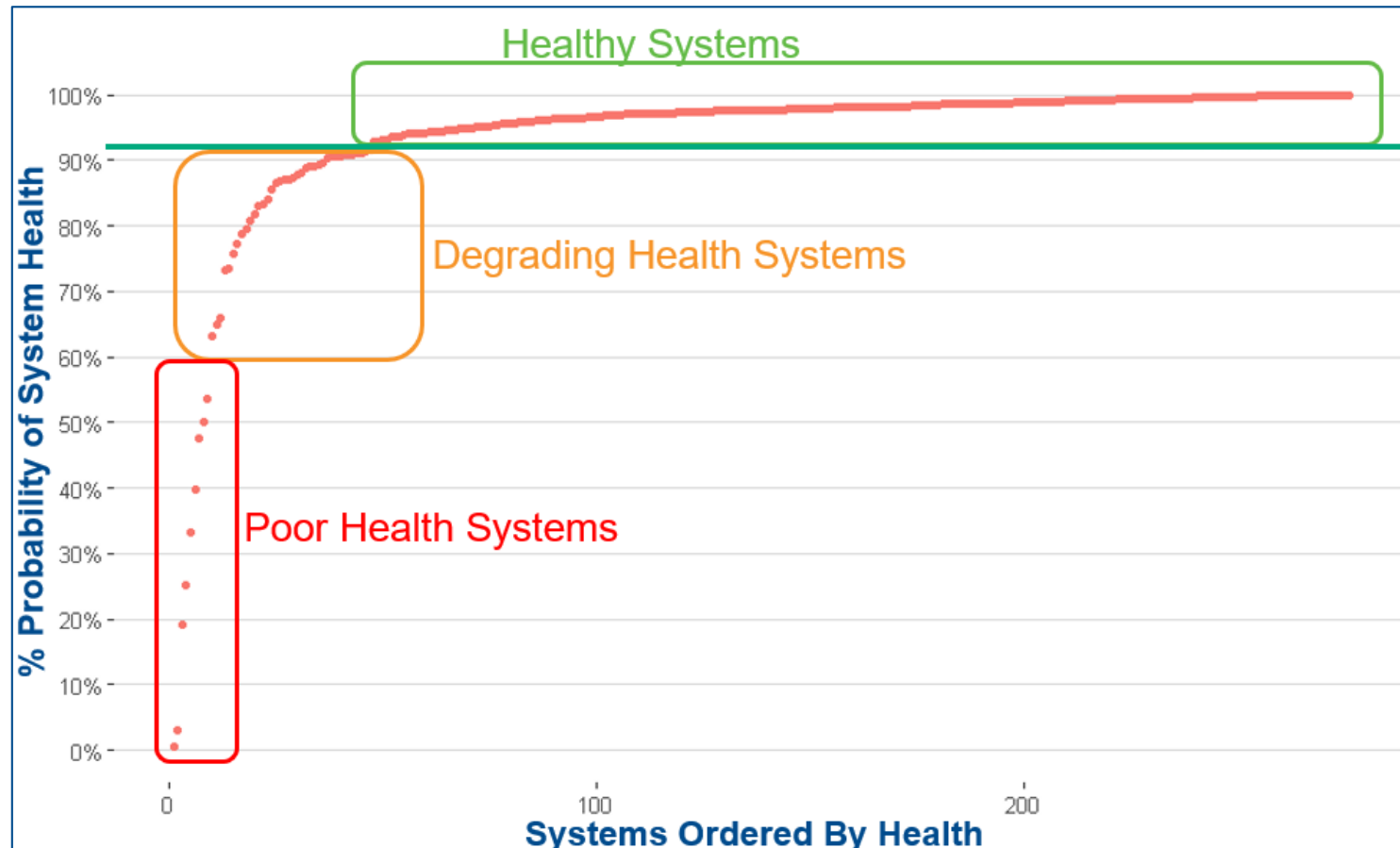
Ability to Identify Systems With Poor Health Profiles At A Glance

Key Learnings

Field **Validation** is pivotal on all fronts, not just for verification of each algorithms technical competency but equally important, the customer specialist expertise.

Analytics Applications will **not be a PTI alternative** for the forseeable future.

Business Processes are complex, and solutions need to be **evolutionary and integrative** to reduce the risk of introducing new inefficiencies.

Start small and learn big.

More Information?

For more detailed insight, please come talk with us:

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Thank you.

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