Intelligent Asset Management

Physics based Digital Twins

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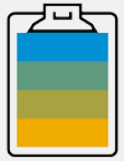
Strong Momentum for Intelligent Asset Management

Digital readiness surveys show that companies clearly see the need to leverage the digital capabilities to optimize their asset management:

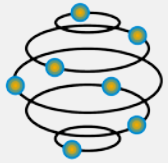
76%

of organizations consider it important to **predict potential failures** by leveraging data models



21%

Only 21% of organizations employ **predictive and preventive maintenance** effectively



83%

of organizations consider it important to run **real-time asset management processes**

13%

Only 13% of organizations are able to drive asset performance based on **analysis of real-time sensor data, along with historical maintenance data**

Source: Business Performance Benchmarking by SAP 2017

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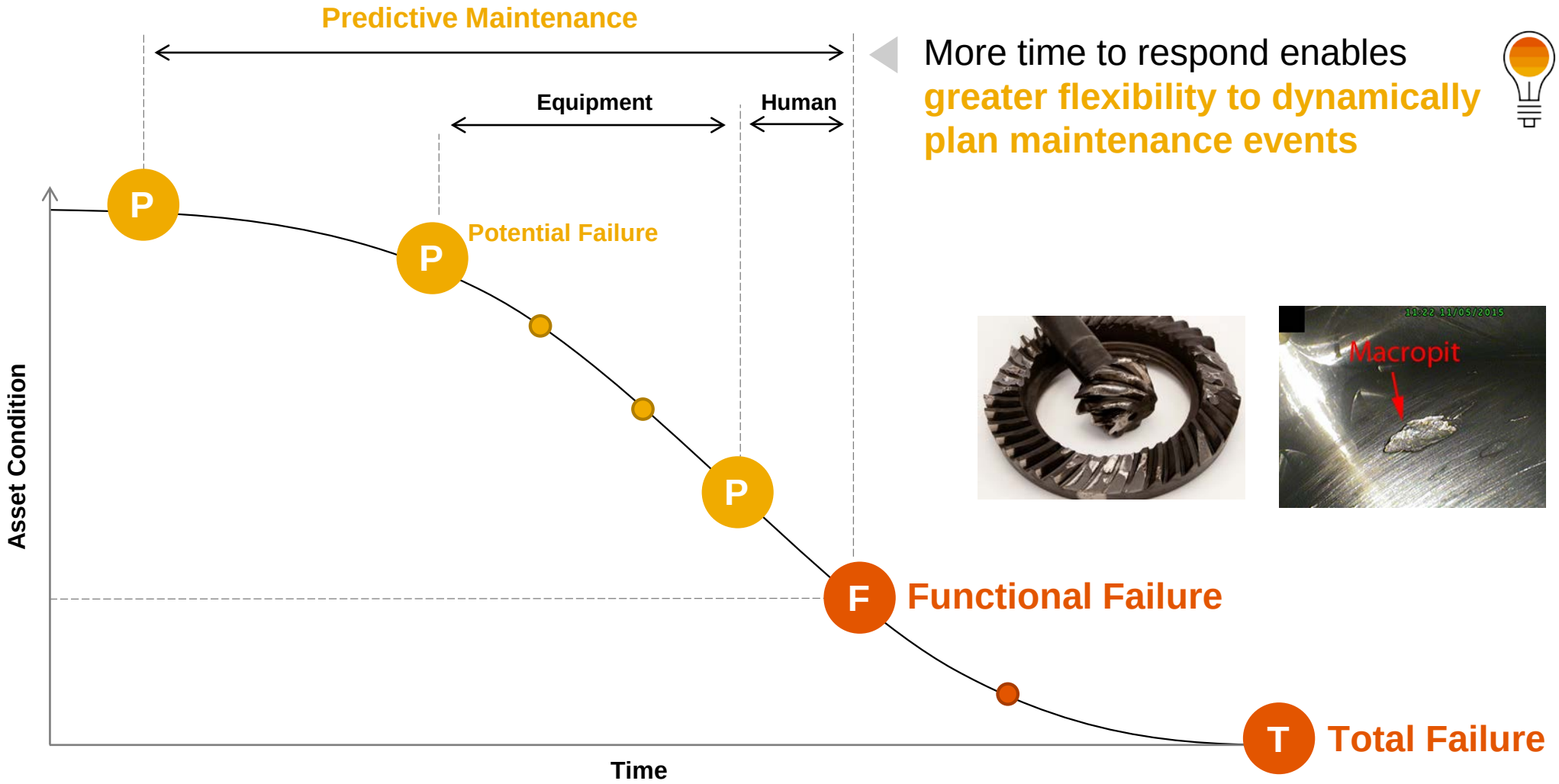
Motivation – Intelligent Asset Management



More time to respond enables **greater flexibility to dynamically plan maintenance events**

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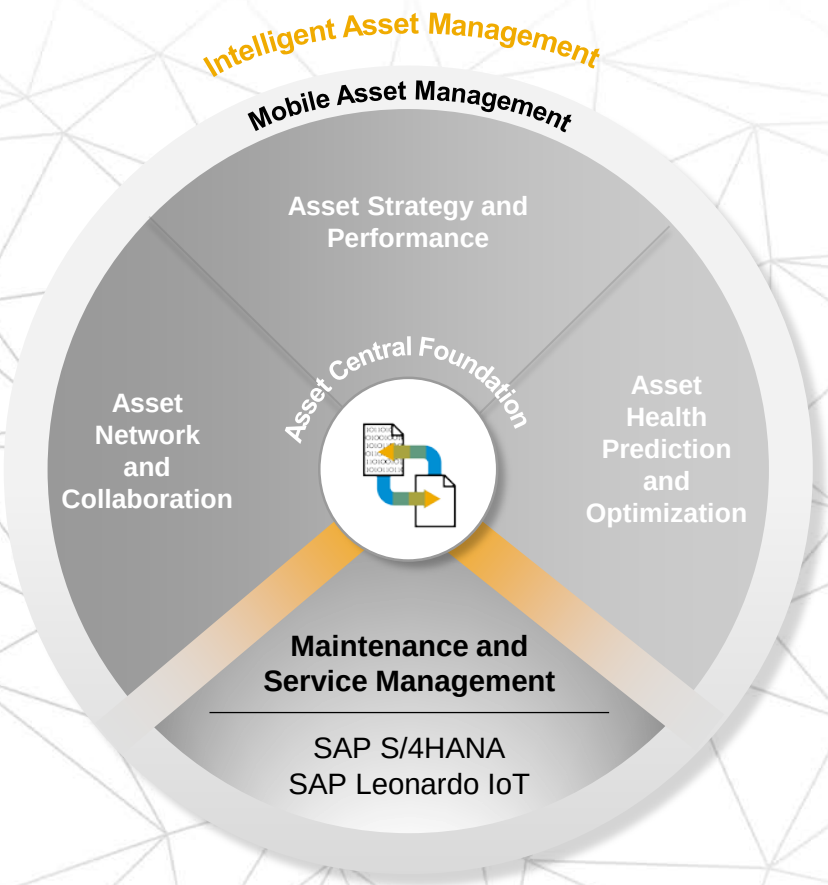
SAP Enterprise Asset Management

Intelligent Asset Management



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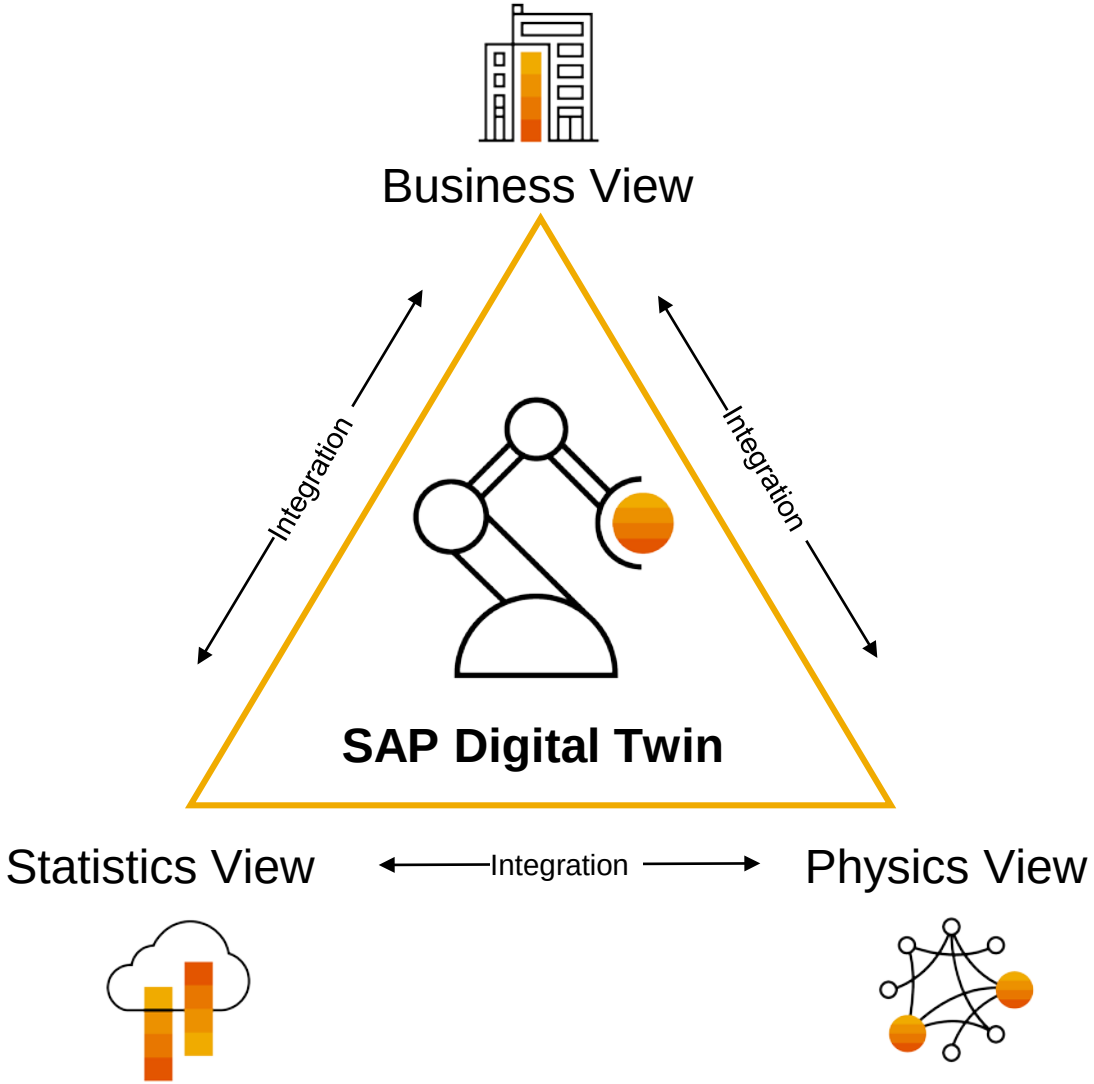
SAP Intelligent Asset Management

Asset Health Prediction and Optimization



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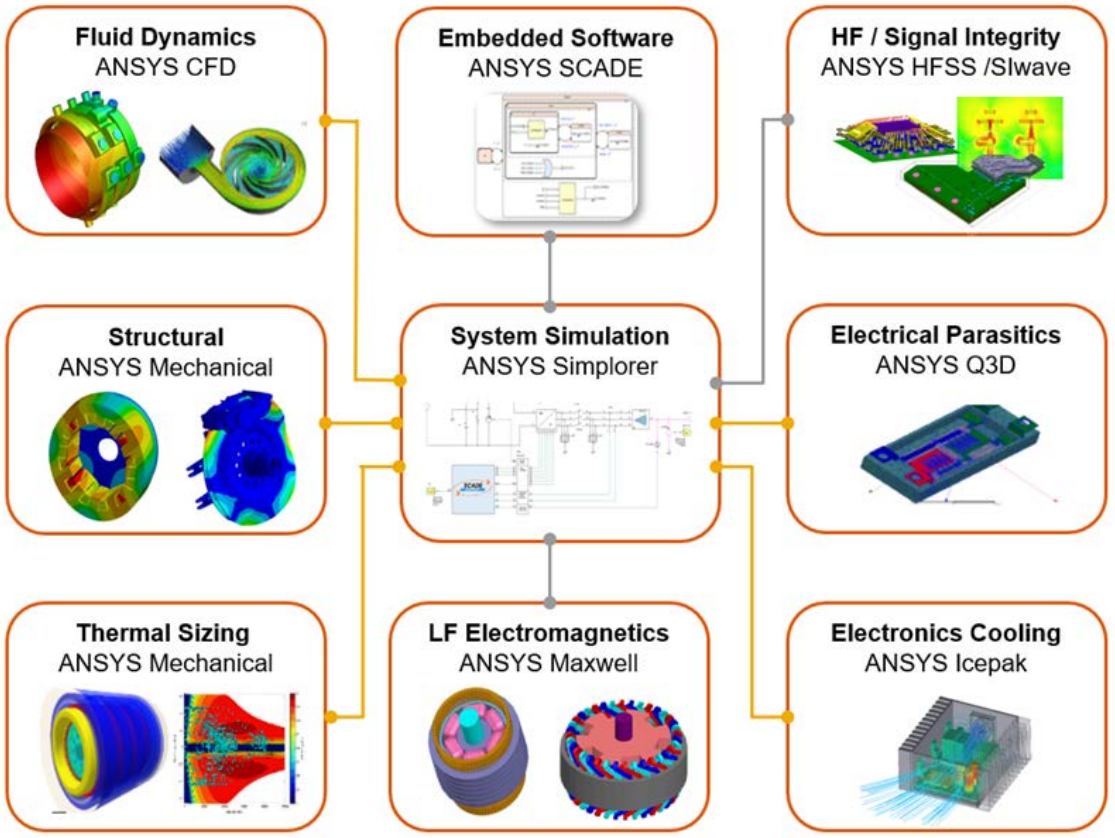
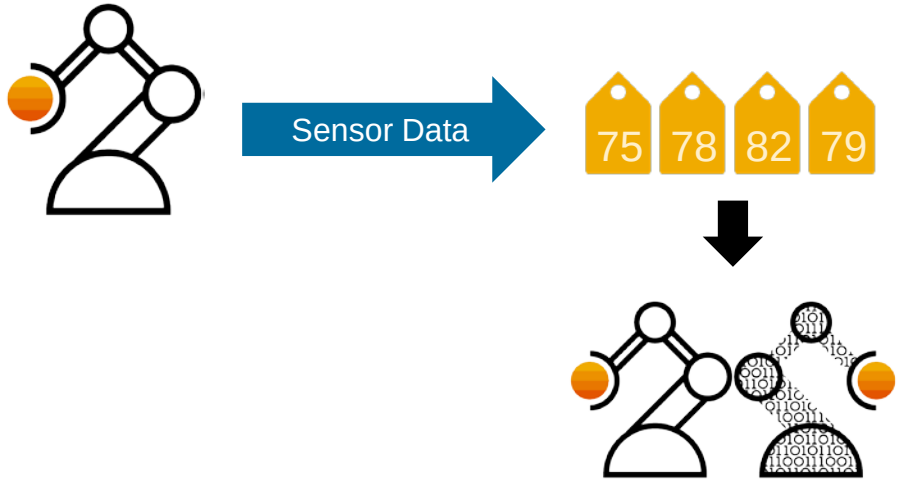
SAP Intelligent Asset Management

Asset Health Prediction and Optimization





Simulation-based Digital Twins

Leverage IoT enabled **engineering simulation models** for asset health prediction and optimization based on multi-physics simulations

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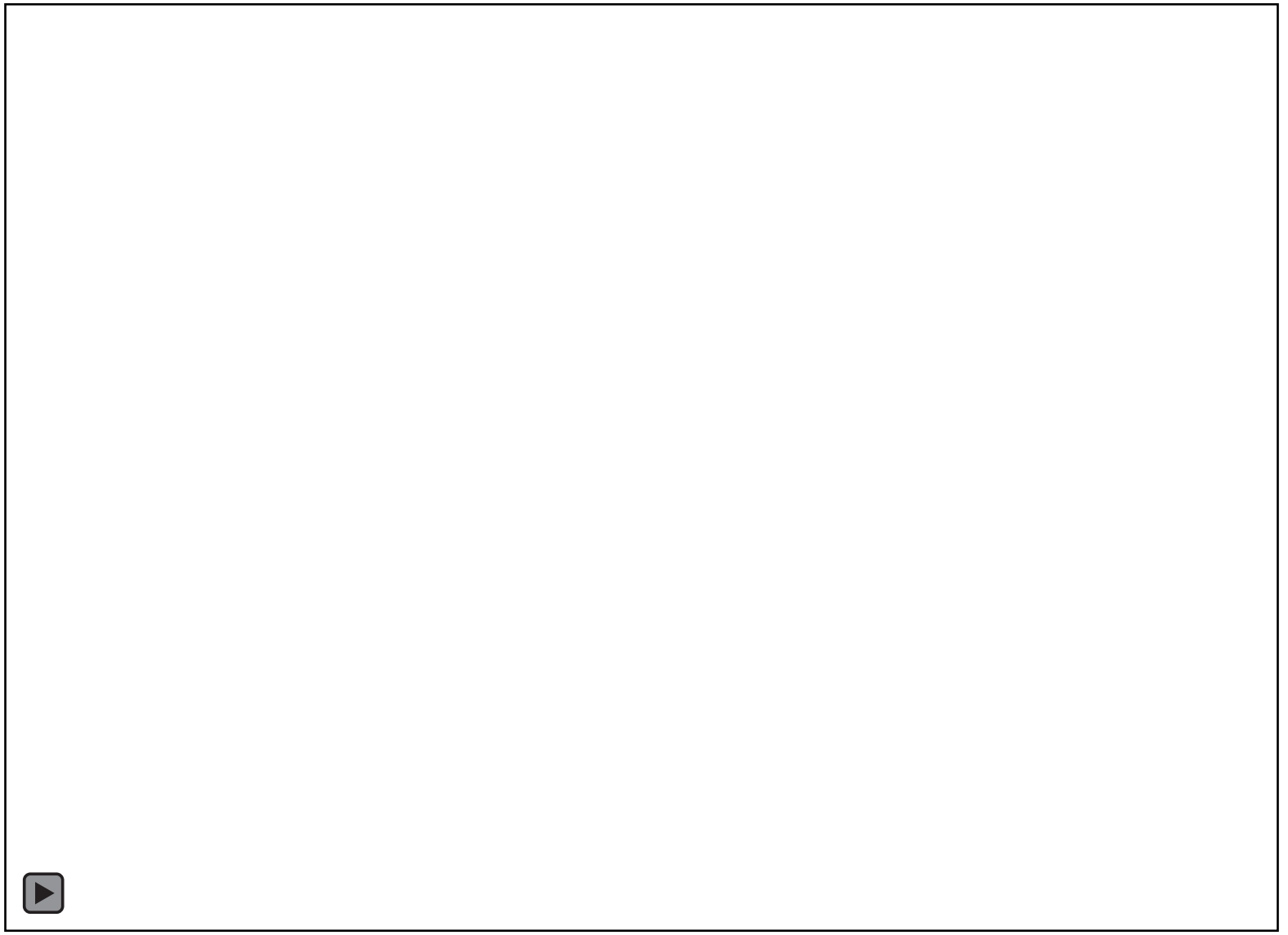
Digital Twin for Structural Dynamics



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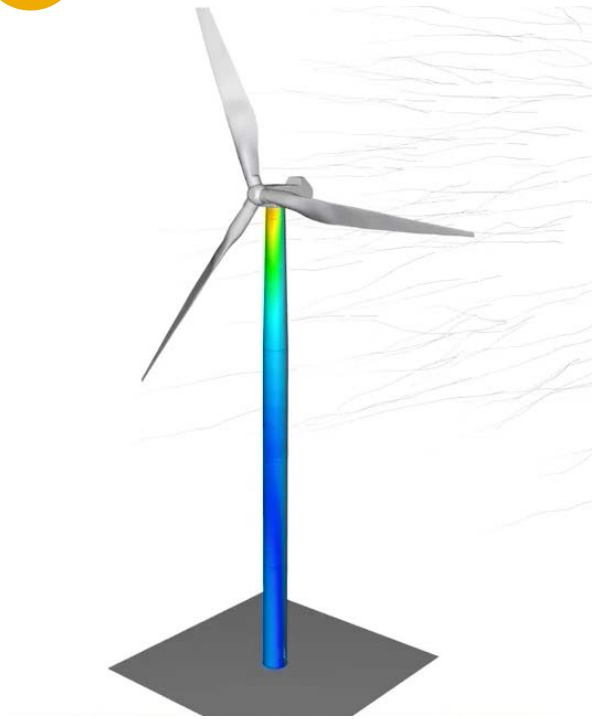
Asset Health Prediction and Optimization

Examples

1 **Wind turbines**



2 Bridges

3 Vibrating equipment

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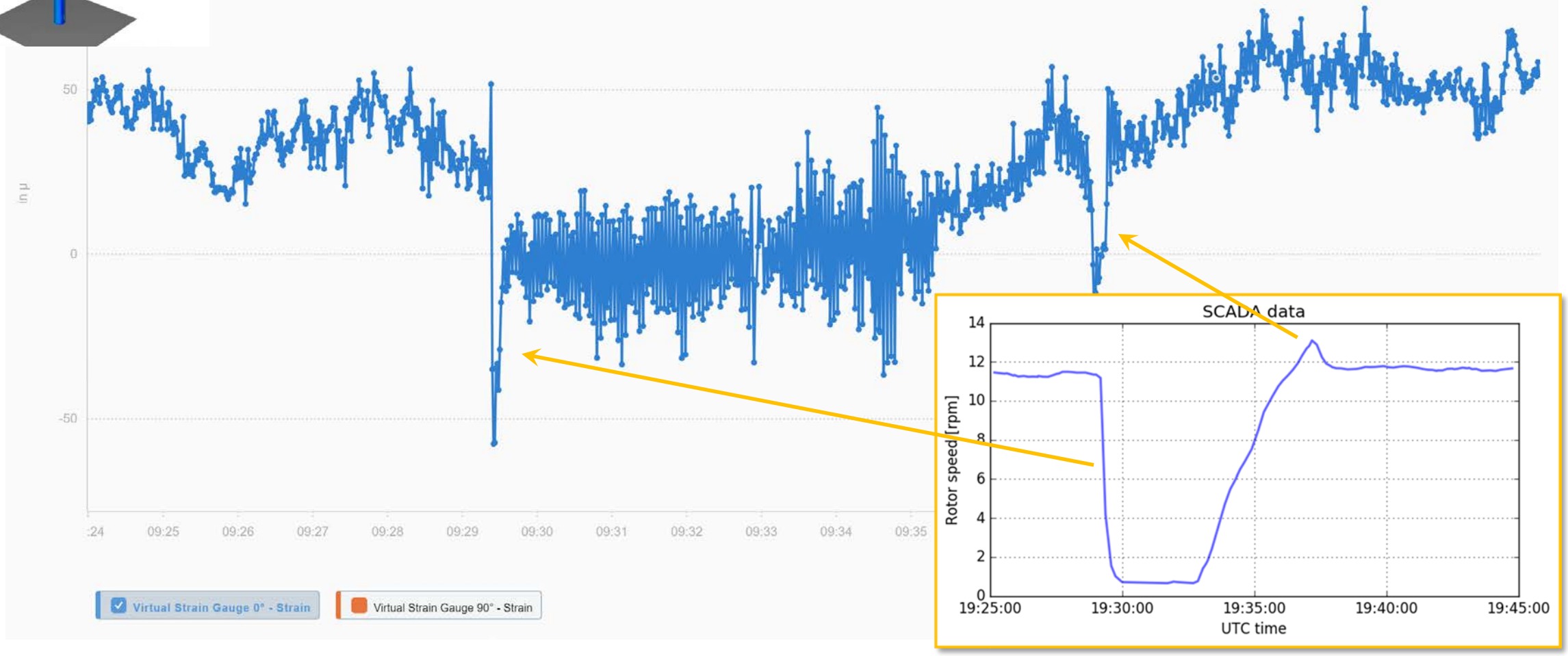
1

Examples

Extreme loads from rapid changes in state
Production > stop > production



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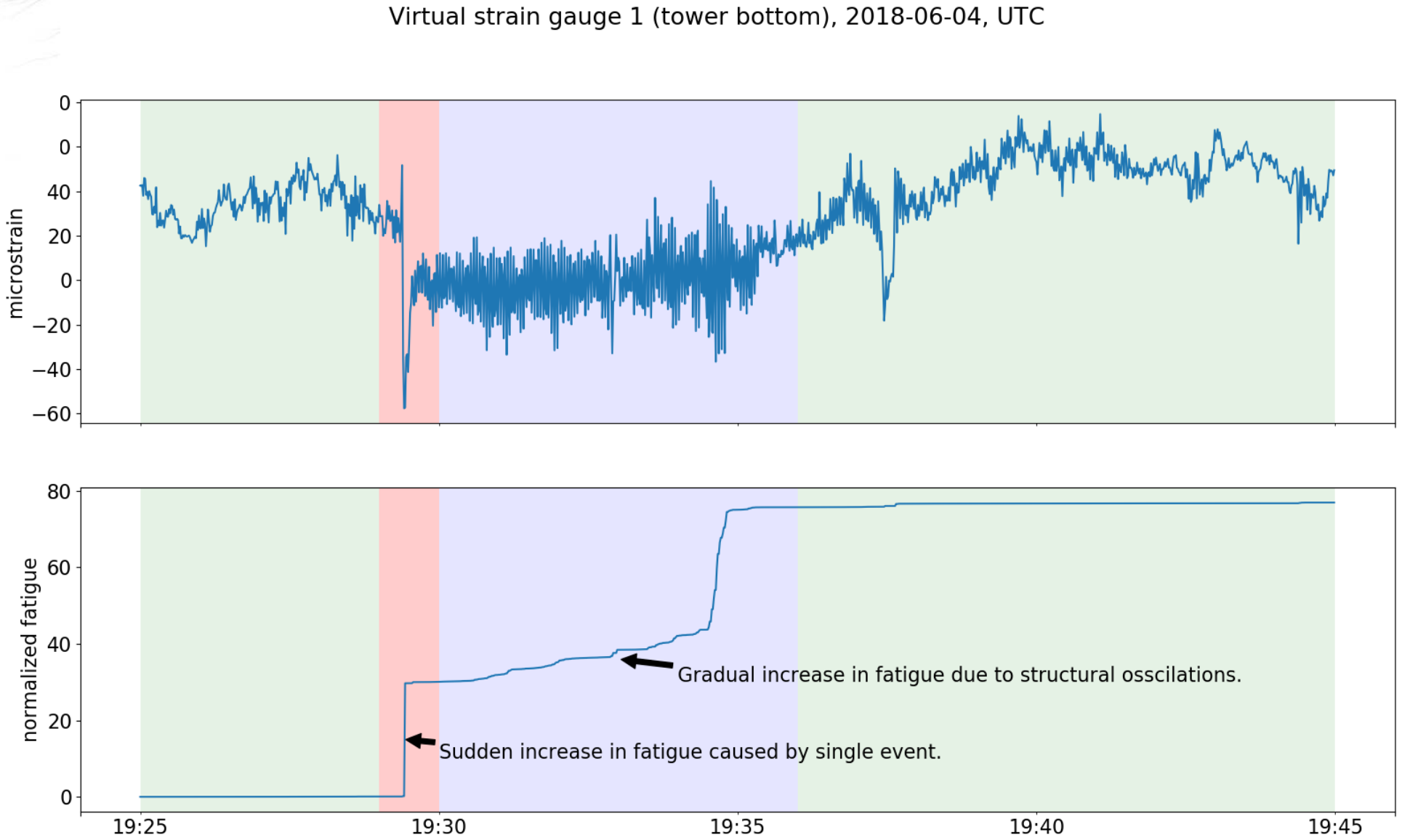
1 Examples

One radical happening “eats” 4 days normal life



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Asset Health Prediction and Optimization

Examples

1 Wind turbines

2 **Bridges**

3 Vibrating equipment

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2

Example bridges

Global structural deterioration

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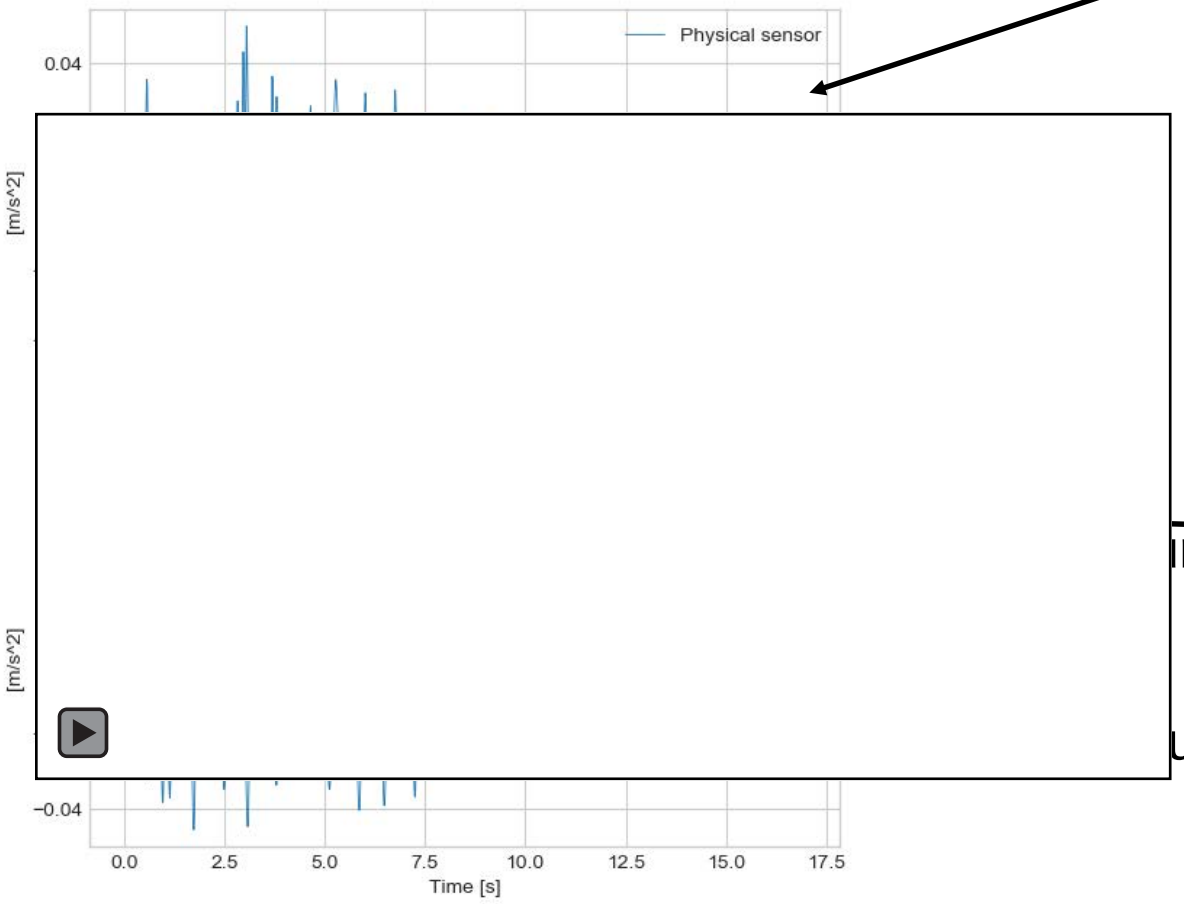
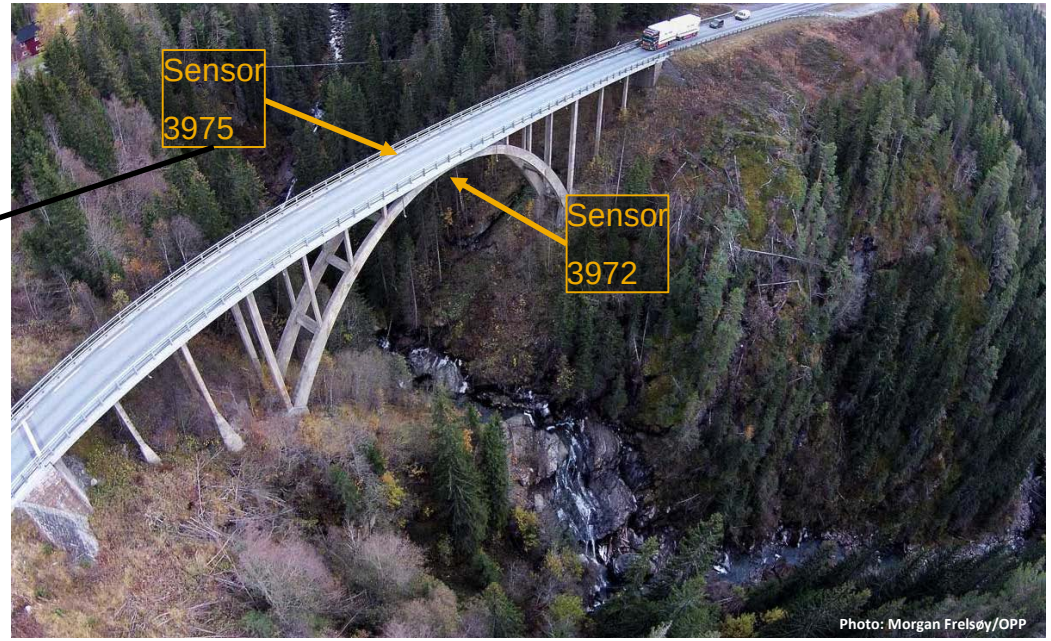
2

Example bridges

Global structural deterioration





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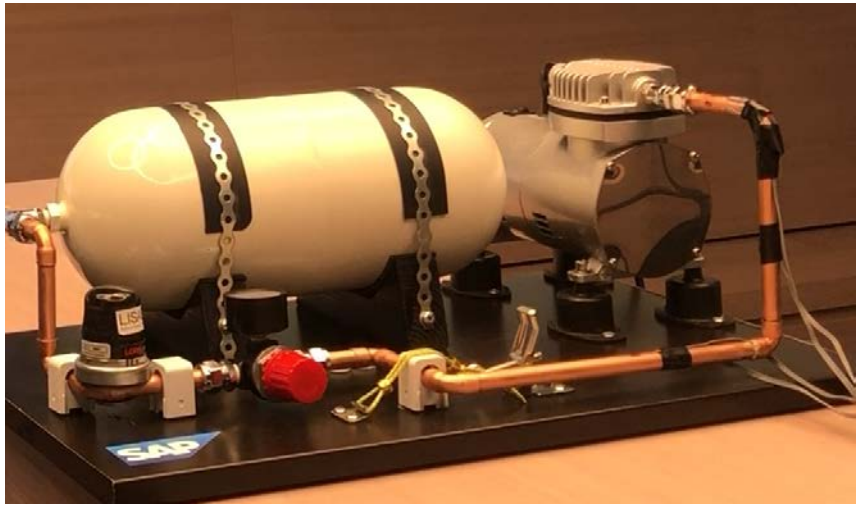
Asset Health Prediction and Optimization

Examples

1 Wind turbines

2 Bridges

3 **Vibrating equipment**



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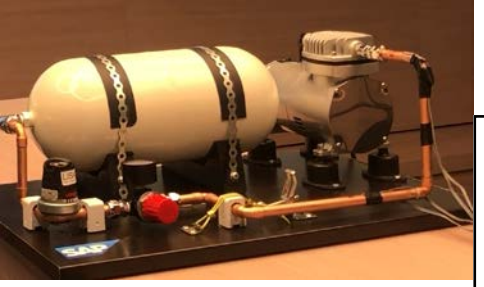

3 Example Vibrating Equipment

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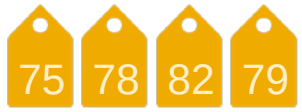
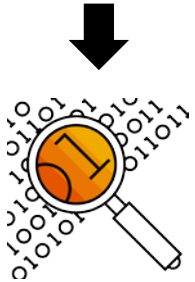
SAP Intelligent Asset Management

Asset Health Prediction and Optimization





Data Science

Use **machine learning** to provide advanced notice of a failure to reduce the number of unplanned downtime maintenance

Simulation-based Digital Twins

Leverage IoT enabled **engineering simulation models** for asset health prediction and optimization based on multi-physics simulations

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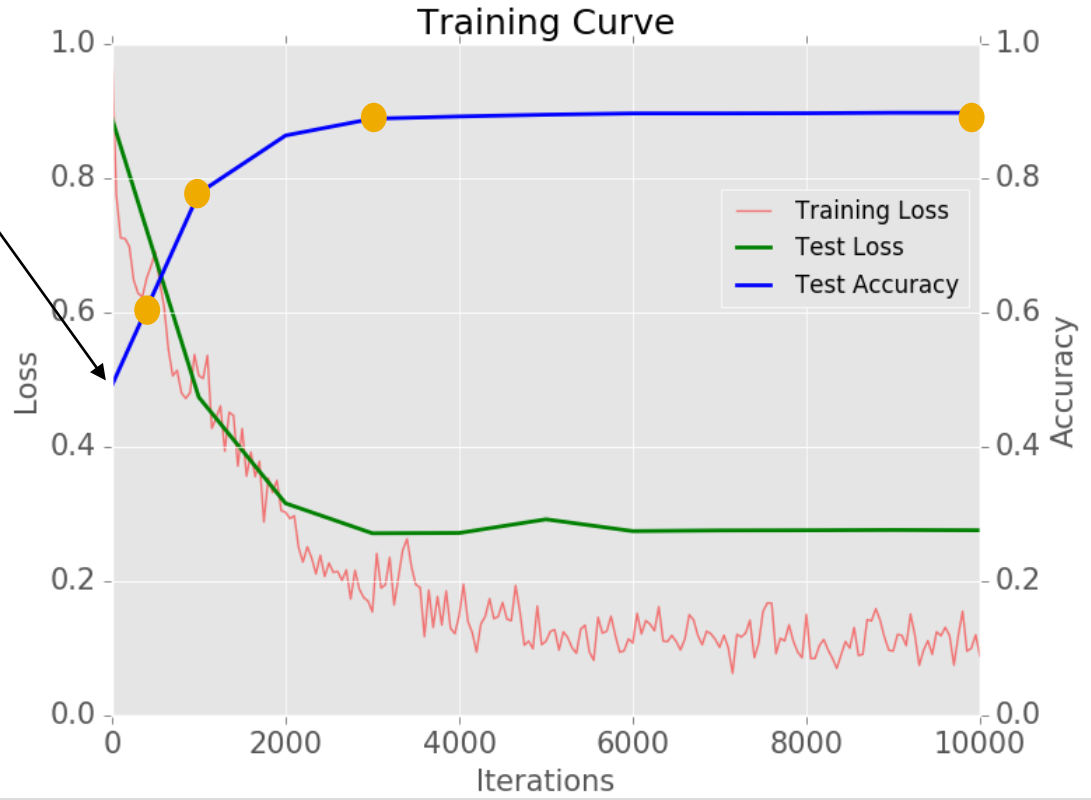
Machine Learning/Teaching

Starting point: 50/50

Sample of cats & dogs images from Kaggle Dataset



http://adilmoujahid.com/posts/2016/06/introduction-deep-learning-python-caffe/

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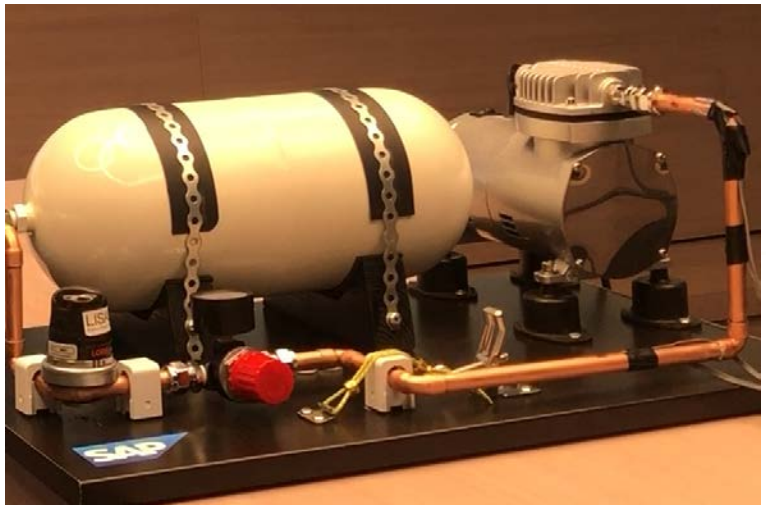
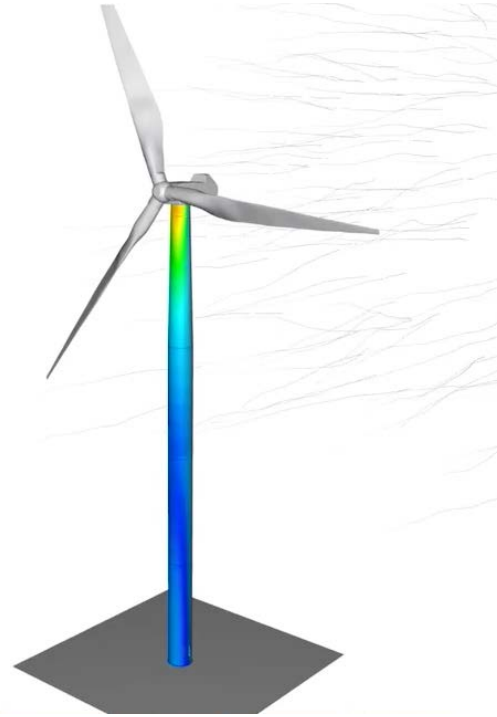
SAP Digital Twin and Machine Learning

Machine Learning in industrial application is used to determine «normal vs irregular»

WHAT IS NORMAL?

- The laws of physics are constant (=Normal?!)





SAP Digital Twin can be used to train the Machine Learning Algorithms

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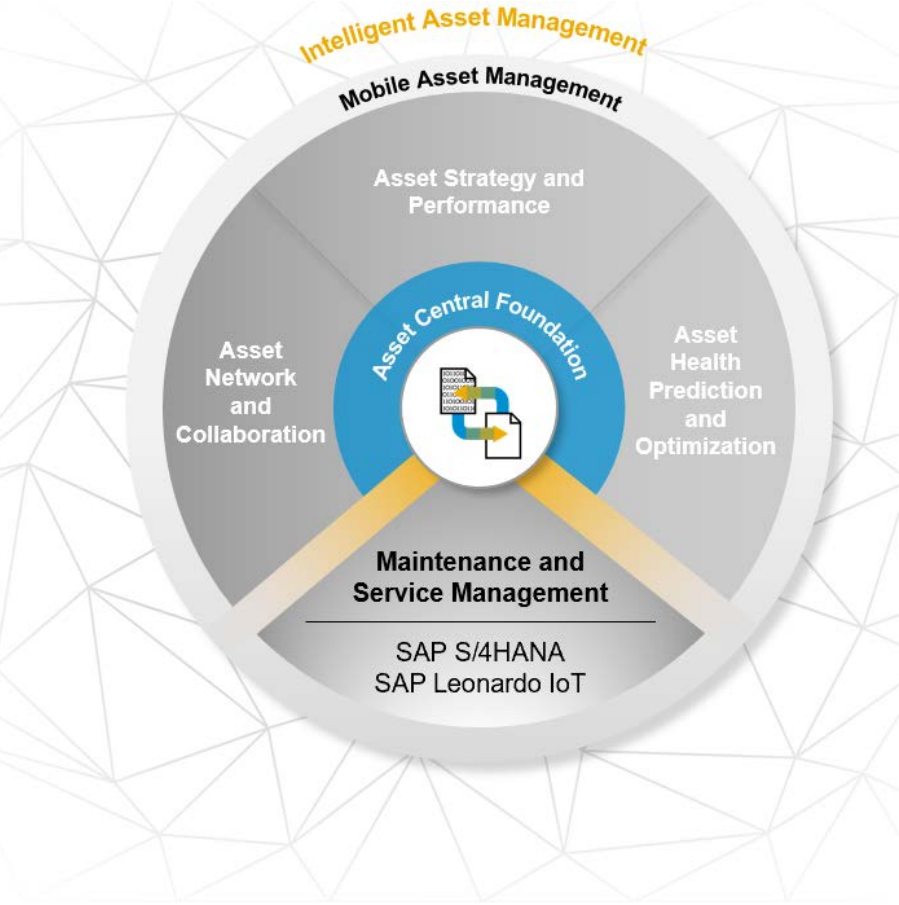
Intelligent Asset Management

Advantages

- **Continuous** versus campagne
- Integrated platform in one core SAP system. No stand-alone measuring system
- **Real time** asset behaviour
- **Integrate maintainance, inspection, risk matrix** and geographical overlay
- Based on the need for prediction; simulations using **sensor data** or the **Digital Twin models can predict global behaviour**



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Thank you.

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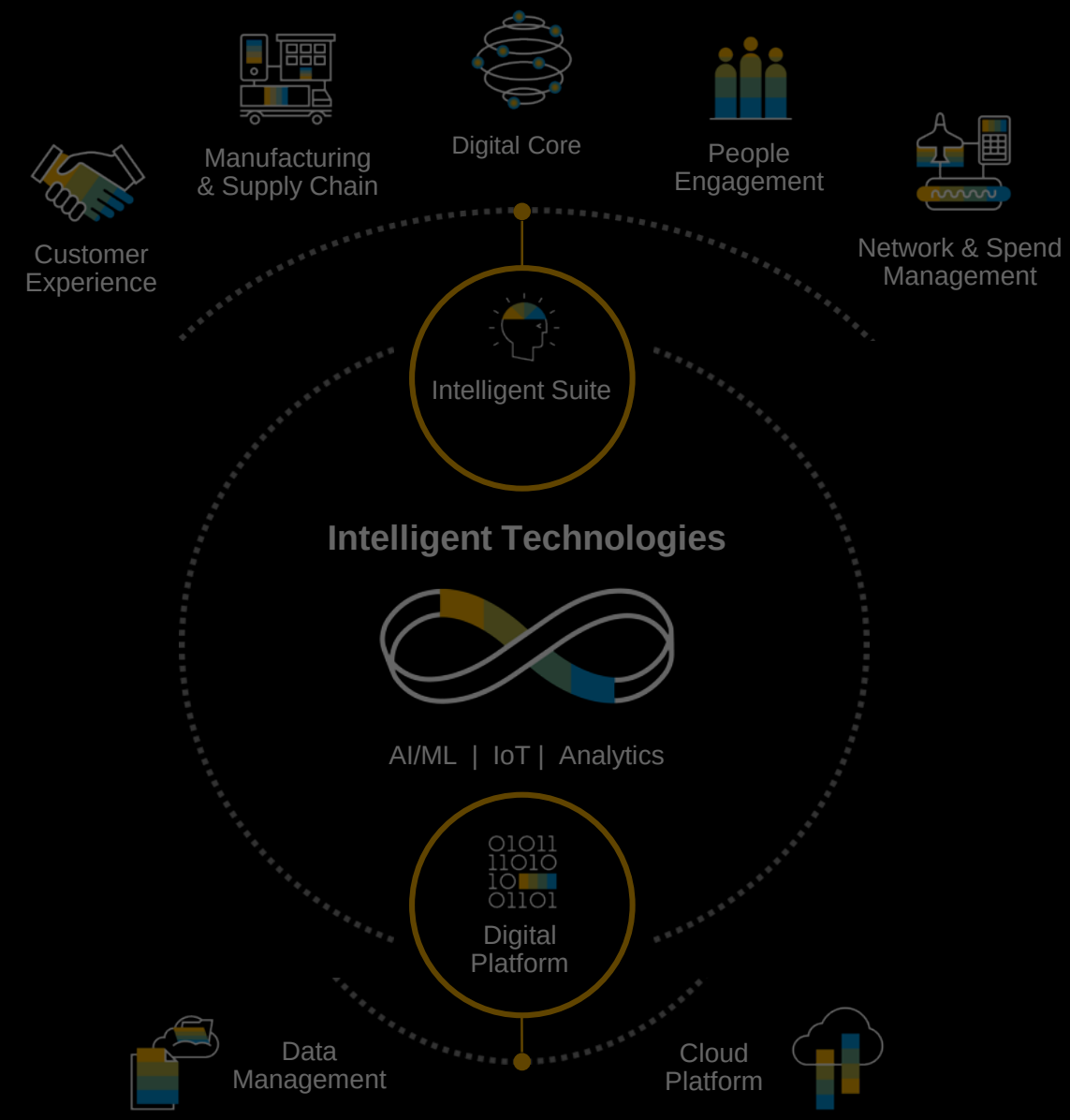

Run Simple