



# Automation of problem detection for rotating assets using infrequent vibration measurements

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A photograph of a Ferris wheel at night, illuminated by its lights. The image is overlaid with several bright, streaking light trails in blue, white, and yellow, suggesting motion or data flow. The text is centered over the Ferris wheel structure.  
Maintenance Analytics Summit, Stockholm  
15 May, 2018

**SKF**<sup>®</sup>



# SKF vision and mission



**A world of reliable rotation**

**The undisputed leader in the bearing business**



# SKF – a truly global company

- Established 1907
- Sales 2016 SEK 72,761 million
- Employees 48,593
- Production sites around 115 in 29 countries
- SKF presence in over 130 countries
- Distributors/dealers 17,000 locations
- Global certificates ISO 14001  
OHSAS 18001 certification  
ISO 50001





# Two value propositions in focus

## 1. Rotating equipment performance



## 2. Product



### Customer need:

*"I want your products and my assets to reach technical end of life with trouble-free operation"*

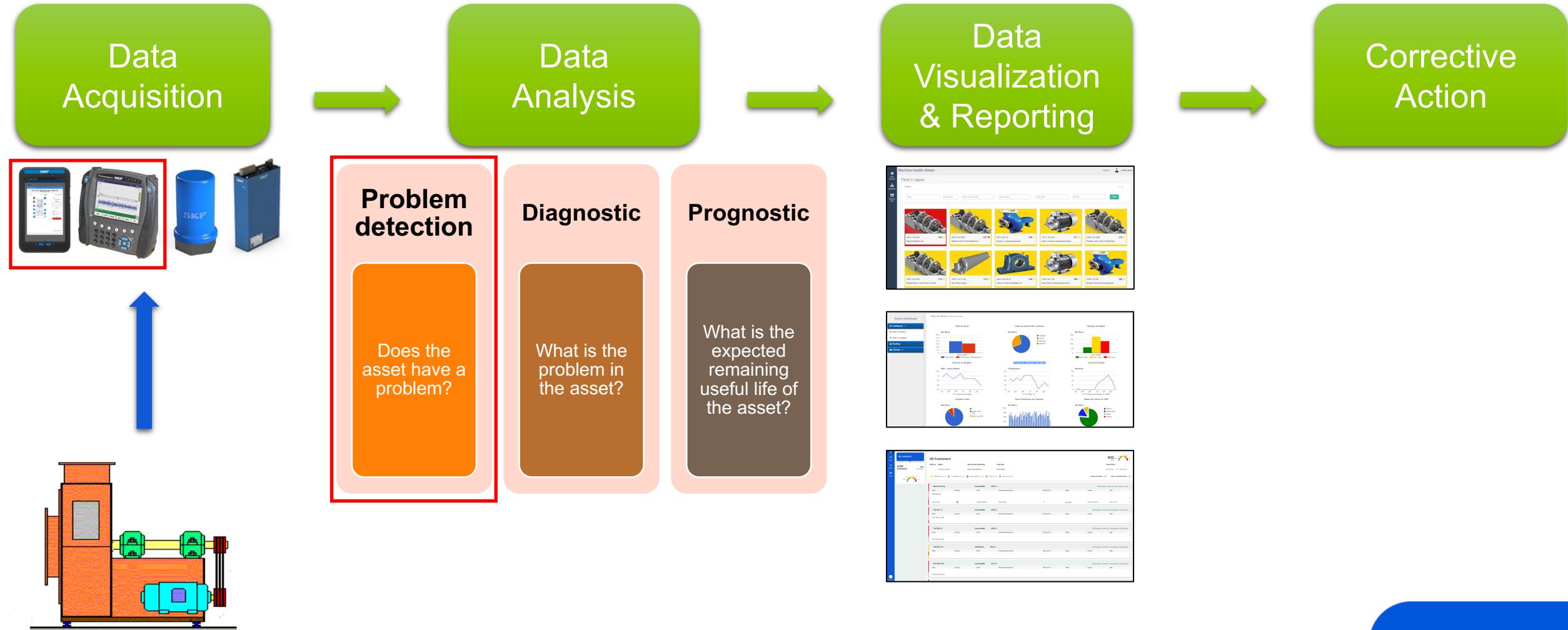
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### Customer need:

*"I want on-time delivery, quality and field performance, flawless launches of new products, technology and price"*



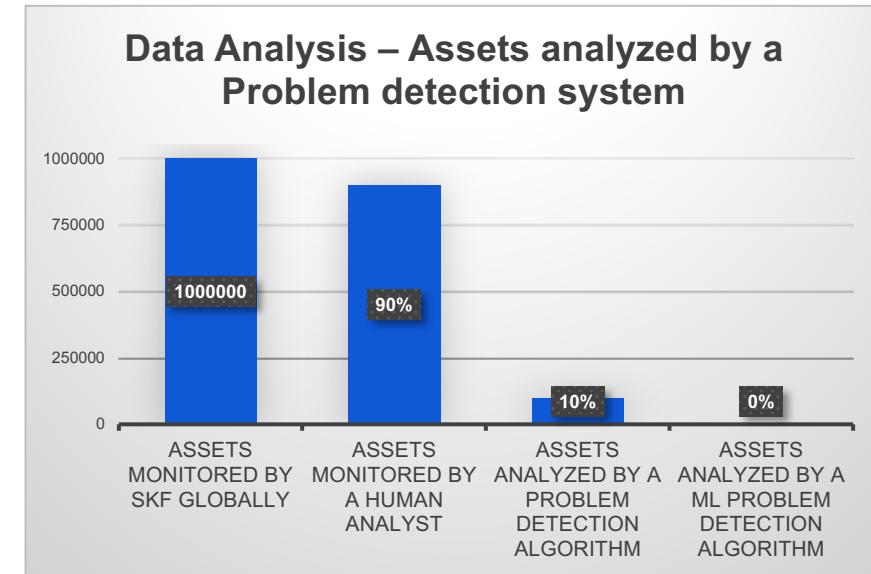
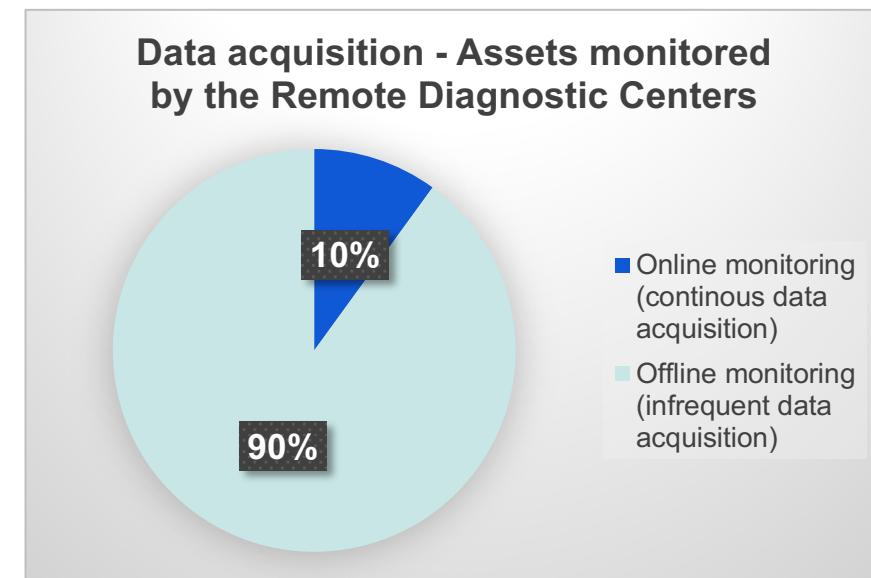
# Asset health monitoring: an essential part of REP





# Data Analysis

- SKF monitors around **1.000.000 assets** globally
- Only **10%** of these assets are monitored by using online systems – all the rest is monitored by using handheld devices (offline monitoring)
- There's **no problem detection algorithm** that uses Machine learning in place to support the analysis.





# COMBIENT

A unique collaboration network of **non-competing** Swedish and Finnish enterprises

*Vision:* bringing digitalized industrial innovation to the industry



Owners and associated partners



# Project goal

Is it feasible to automate the problem detection from infrequent vibration measurements?



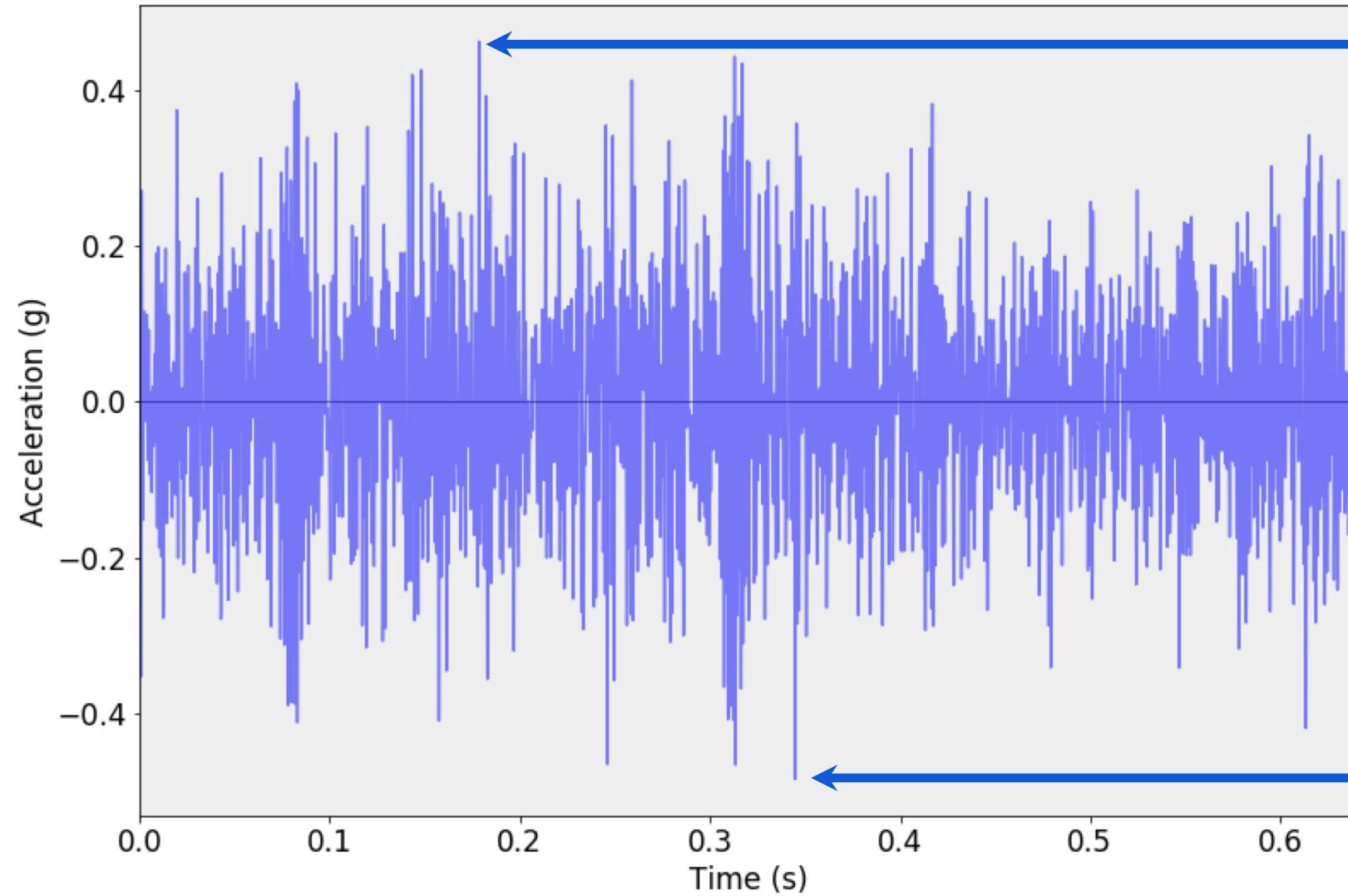
Doing this...

...can prevent this





# What is the “data”?



Use e.g. peak-to-peak  
to quantify vibration  
energy



# Historical labeled data

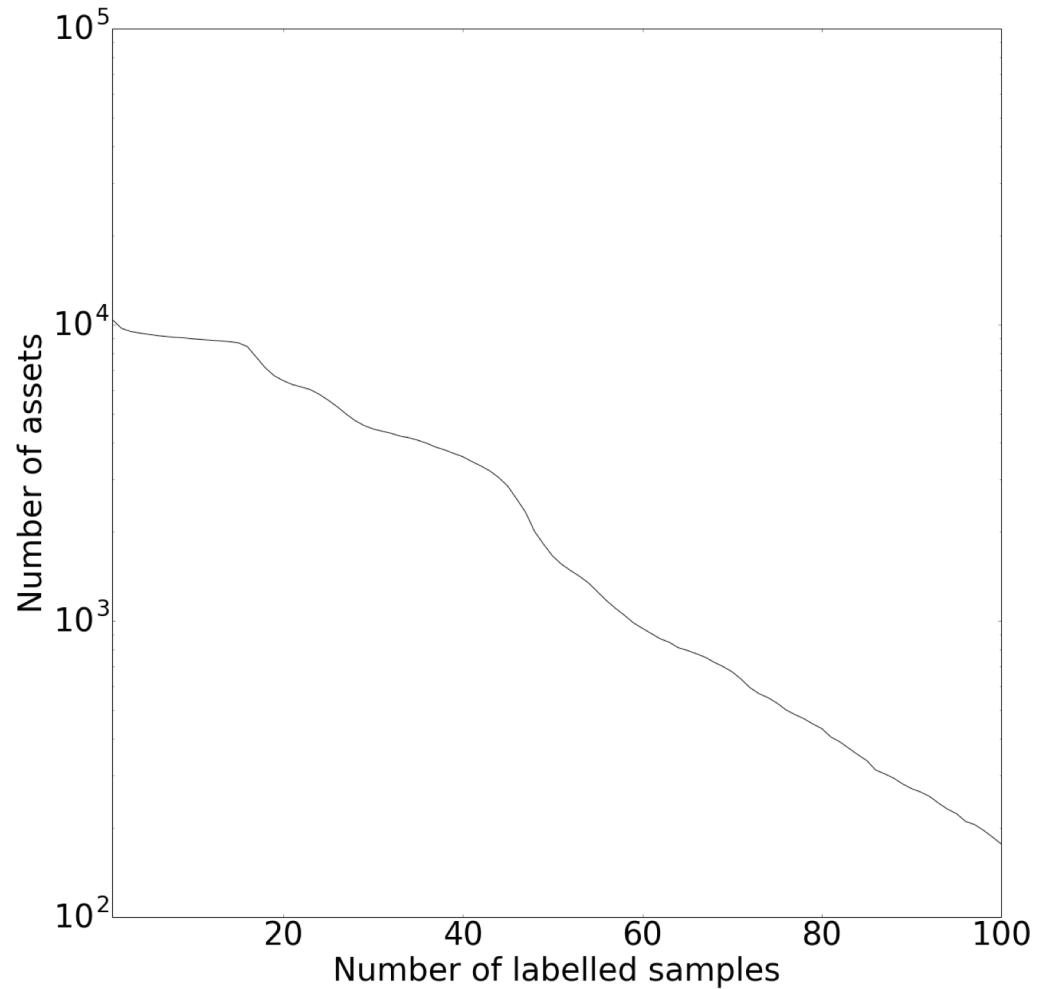
Vibration data from 29,318 machines (or assets) in **four factories** collected for 16 years (~1TB)

Manual entries about asset condition by SKF analysts; used as labels

Data series are **not** continuous

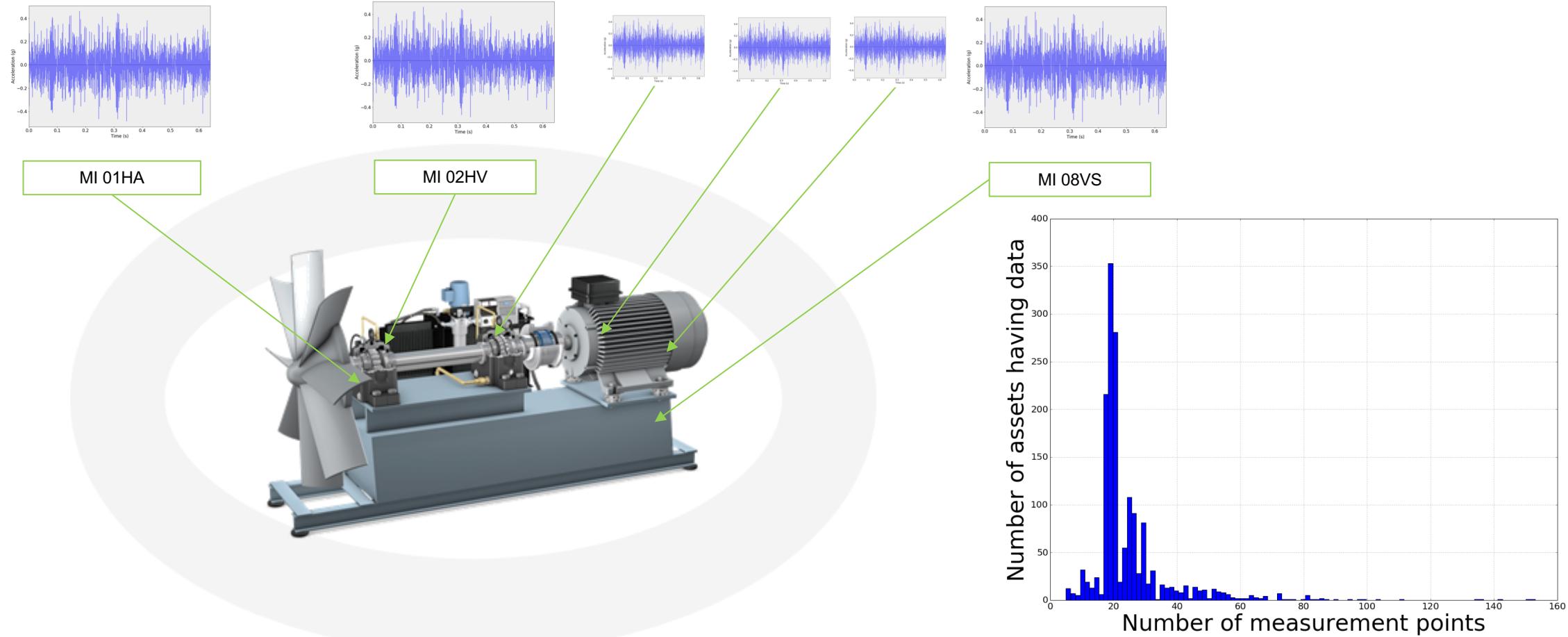
Only ~1500 assets had one or more points with >50 **labeled** measurements

**Key Challenge 1:** limited amount of labelled data per individual asset





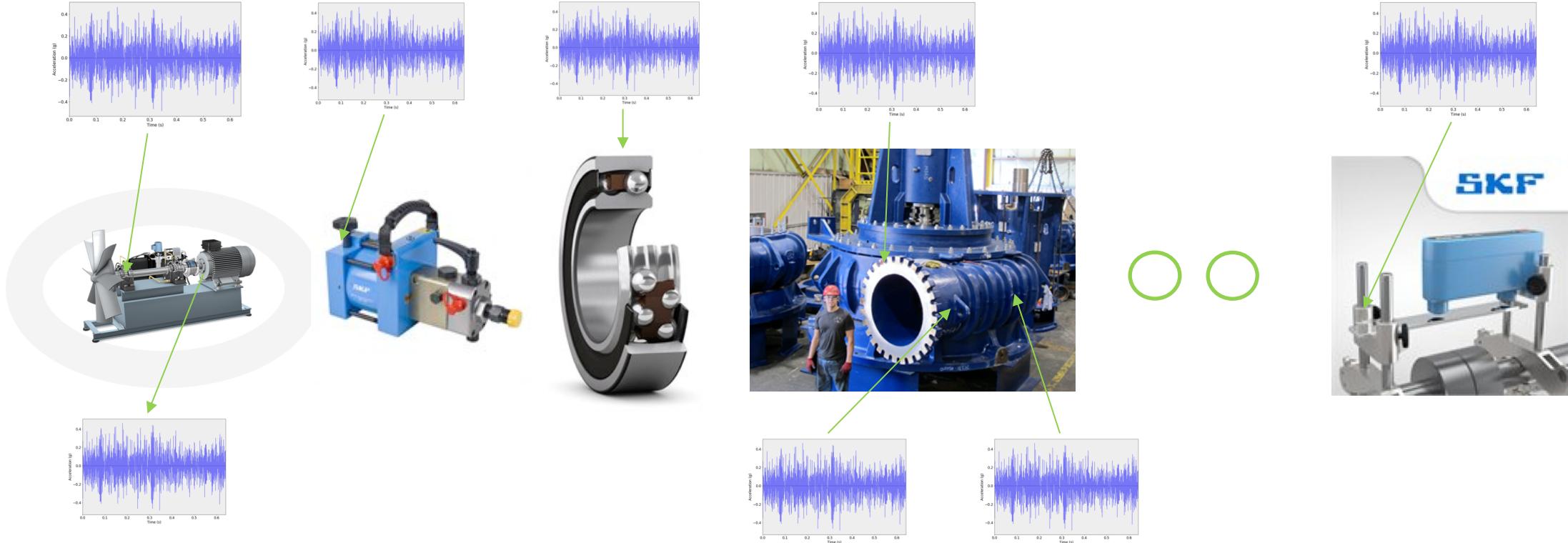
# Multiple measurement points



**Key Challenges 2:** Data is collected at multiple points, but not always in the same points  
Not known what point the label is based on



# Variety of asset types



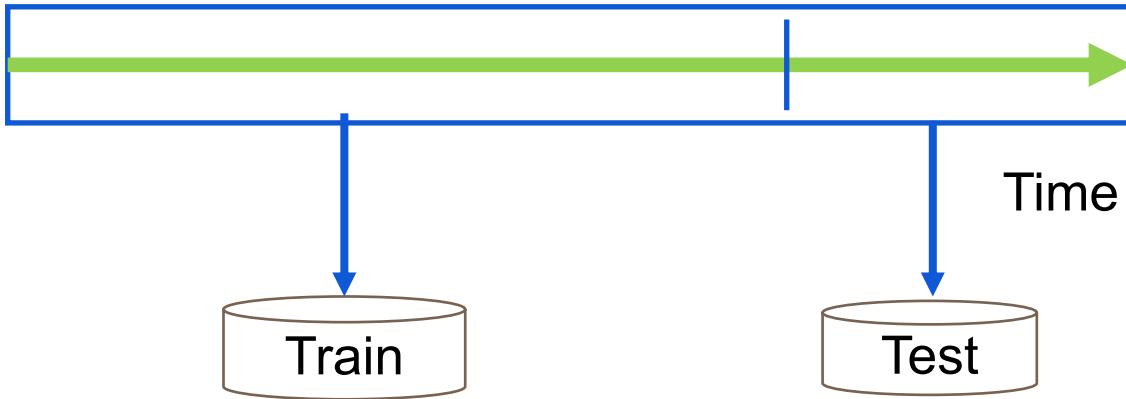
**Key Challenges 3:** Large variety types of assets, each has their own vibration signature  
Limited information about the asset type



# Modelling Approach

## Single-asset model

Training and testing on the same asset

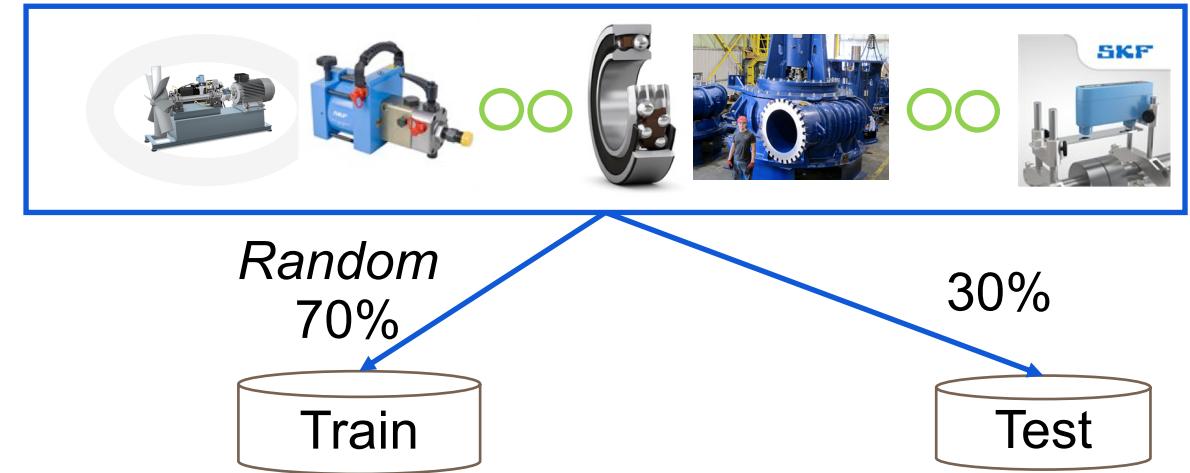


Disadvantages:

- Limited amount of data
- Need training period for which asset's health can not be predicted

## Multiple-assets model

Training on one subset of assets and testing on a different subset of assets

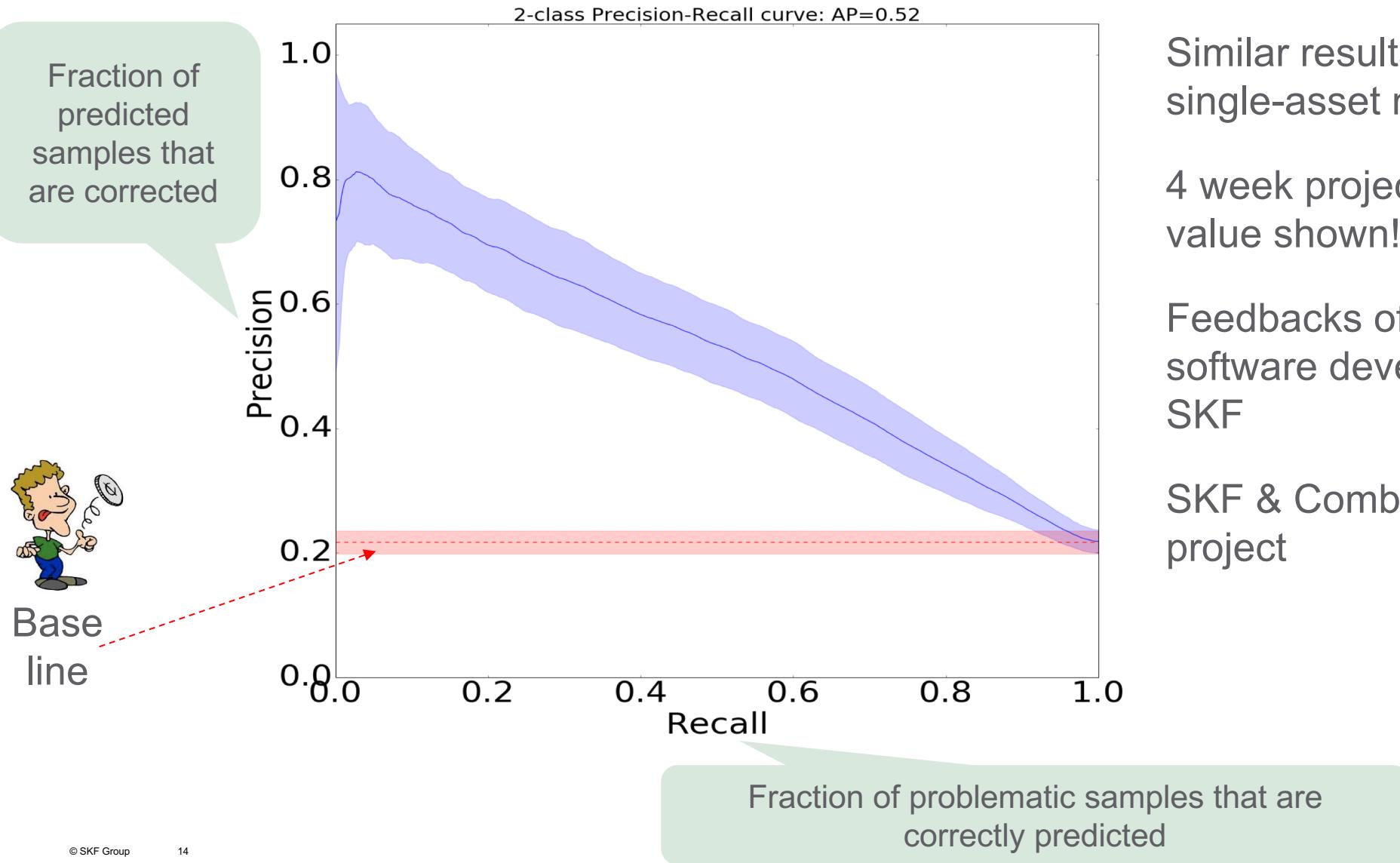


Disadvantages :

- mixing different asset types that have different vibration signatures



# Results for the multiple-asset model



Similar results are obtained for the single-asset model

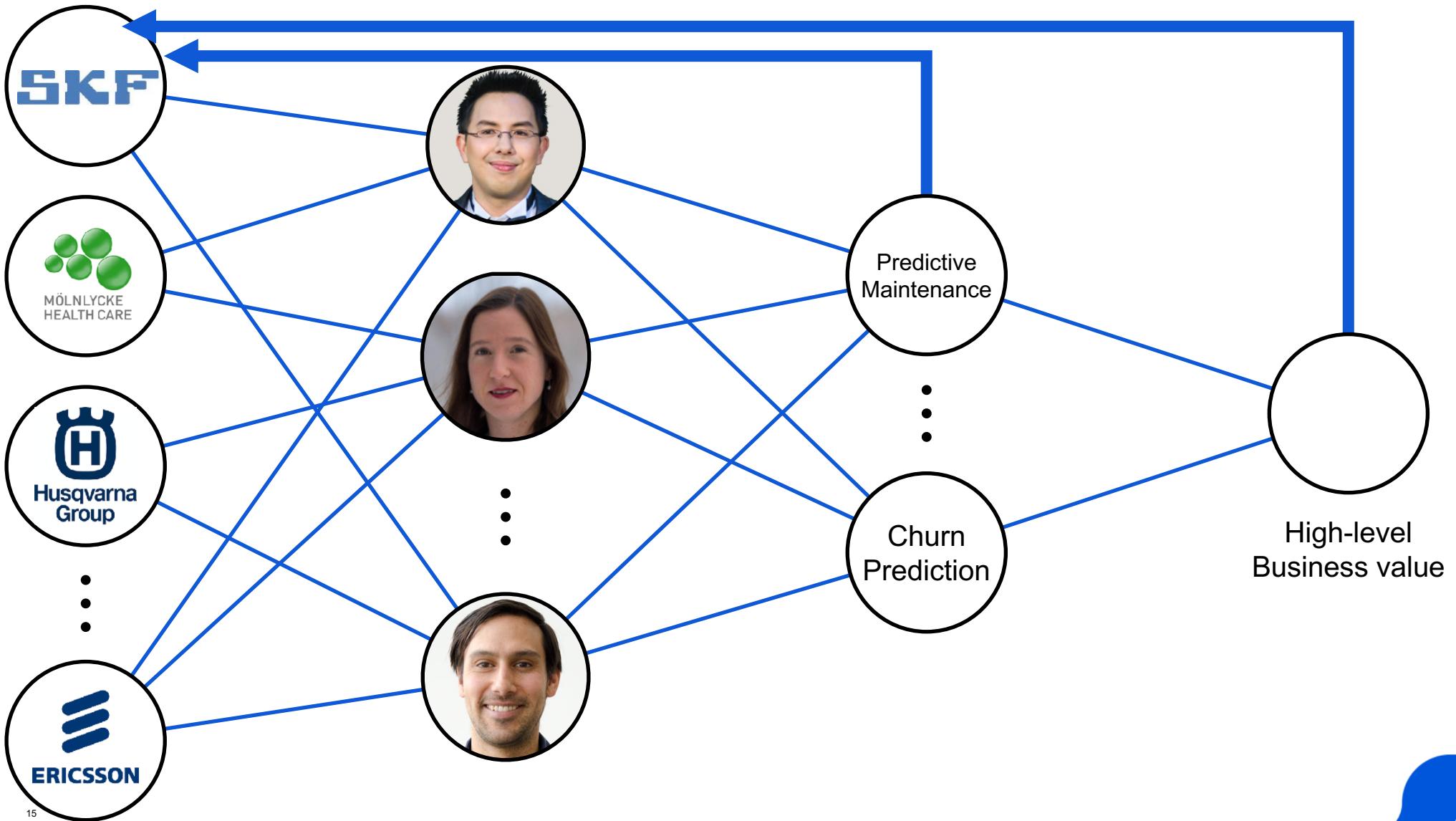
4 week project completed - proof of value shown!

Feedbacks of the results to software development process in SKF

SKF & Combient will continue the project



# Model for the AI and Analytics team





## Combient is looking for Data Scientists

Combient · Stockholm, Sweden

Posted 1 day ago · 62 views

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Off



### Job description

We are looking for **Data Scientists** to join our team and help build a data-driven ecosystem in the Combient sphere. Our mission to be the number one enablers of Machine Learning and Data Science for over 24 companies in our family.

We work with some of the largest companies in Sweden & Finland that span a wide range of industries, you will be able to apply your experience, skills, and creativity on a broad scale. You will have the opportunity to study and analyse a wide range of problems from the Internet of Things (IoT). You will be able to use your skills to build predictive models to take our group further. You will also have a chance to help the companies in our group to foster a data-driven culture and organisation.

#### What you will do:

- Build machine learning to statistical models to enable better prediction or advance efficiency.
- Help realise new business model through Data and Analytics.
- Research, implement and build solutions for some the most complex problems out there.
- Work with a set of problems in areas such as Image Processing, Natural Language Processing, Cyber Security and Predictive Maintenance.
- Help our companies realise and scale your solutions to become data-driven at scale

**Seniority Level**  
Mid-Senior level

**Industry**  
Information Technology and Services,  
Industrial Automation,  
Management Consulting

**Employment Type**  
Full-time

**Job Functions**  
Analyst, Research, Science

### Similar jobs



Combient is looking for  
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Combient  
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work here

2 weeks ago



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looking for **Digital Marketing Consultant...**  
Accenture  
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160 alumni work here

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