From Sensor to Data Driven Operation

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Topics

- Introduction
- Lely : farming innovators
- Industry 4.0 and other buzz words
- Data, Artificial Intelligence : what, why, how ?
- Sensors and measuring systems
- Where and how to start ?
- Discussion

Lely

A family run company with farming in its DNA

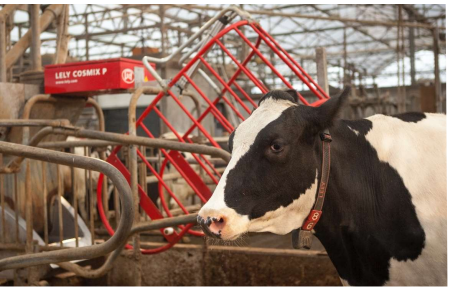
Cornelis van der Lely
Founder

Arij van der Lely
Founder

Alexander van der Lely
CEO Lely

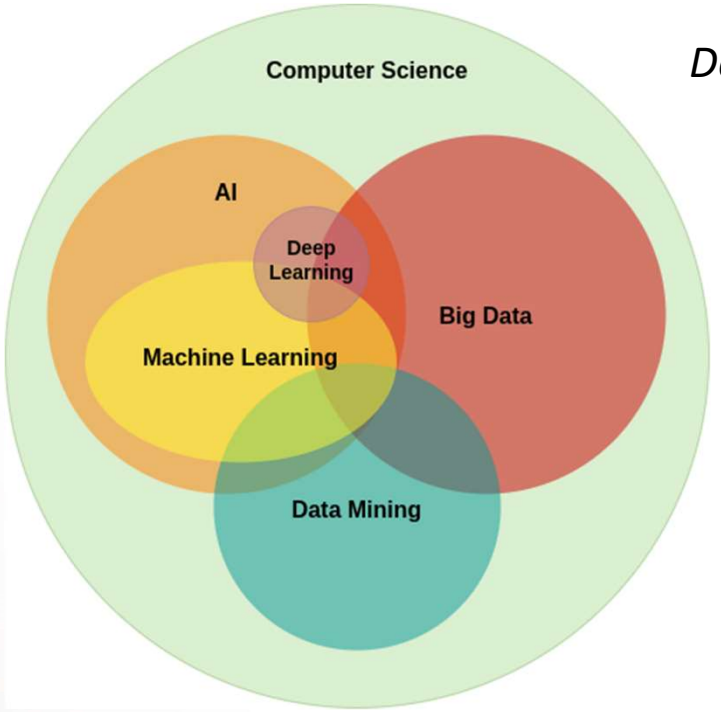
Lely today
Annual Sales
€ 400 mln
Number of employees
1.200+ fte
Investments in R&D from our product turnover
7%
Number of living patents
1.600
Number of R&D units
4
Number of production units
3
Number of markets
> 40

The cow as center point



In-house
innovation and
manufacturing

Industry 4.0 and other buzz-words

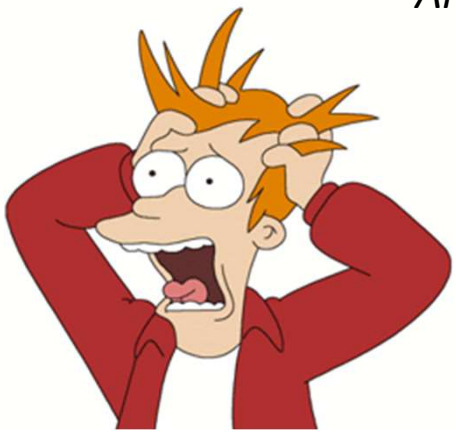


Internet of Things

Neural Networks

Deep Learning

Artificial Intelligence



Big Data Analysis

Data Governance

NoSQL Databases

Machine Learning

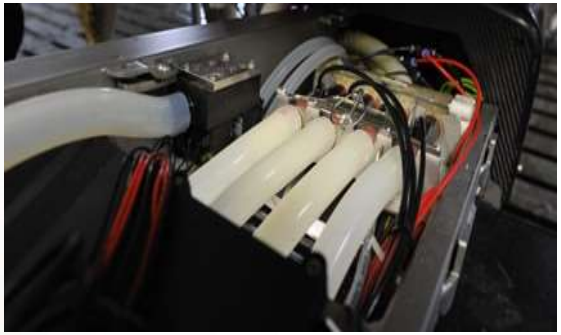
Genetic Algorithms

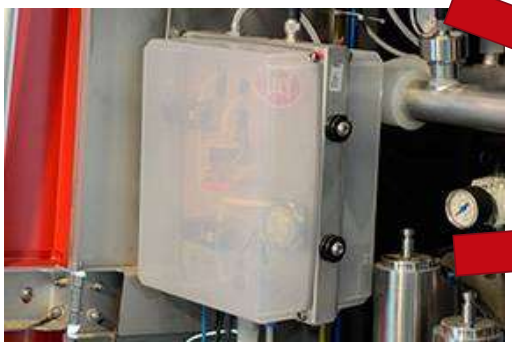
Model Based Predictive Control

Model Based Design

Cloud Computing

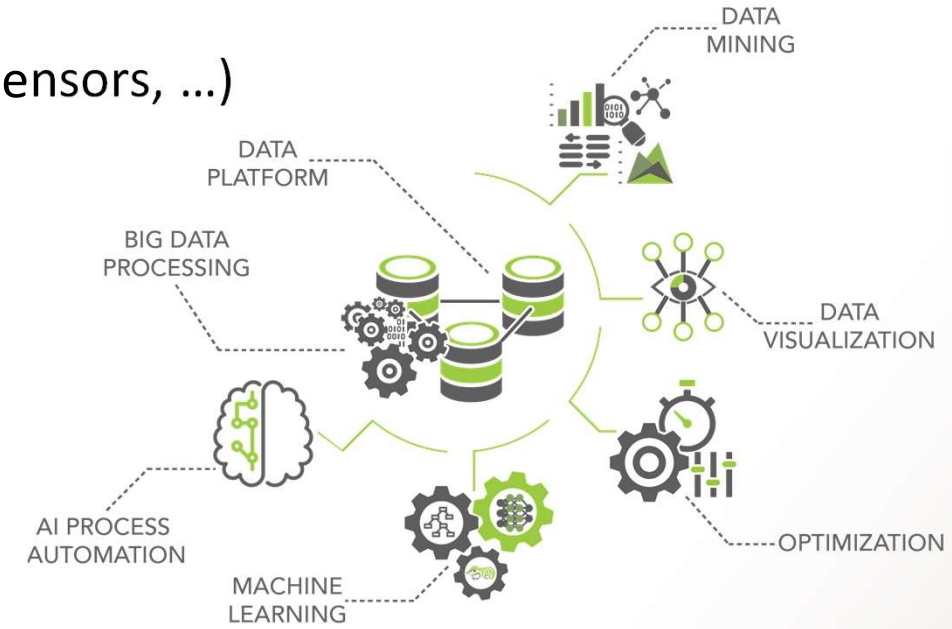
Astronaut A4 – Sensors and Farm Management





Datamole

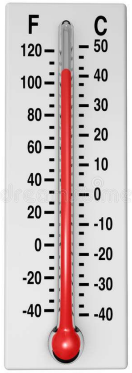
- Startup in Prague, founded in 2015 (now >20 FTE)
- Strong connection with university (CTU)
- Focus on applying AI in industry (machines, sensors, …)
- Data visualization (!)

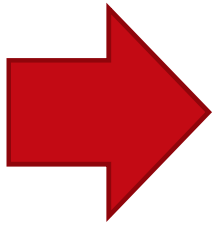


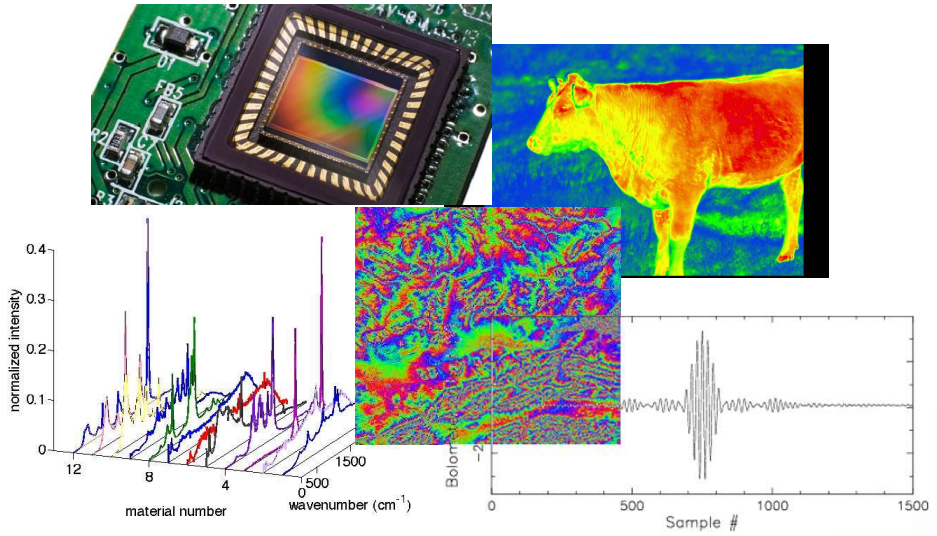
DATAMOLE

https://www.datamole.cz/

Data Driven Sensor Design







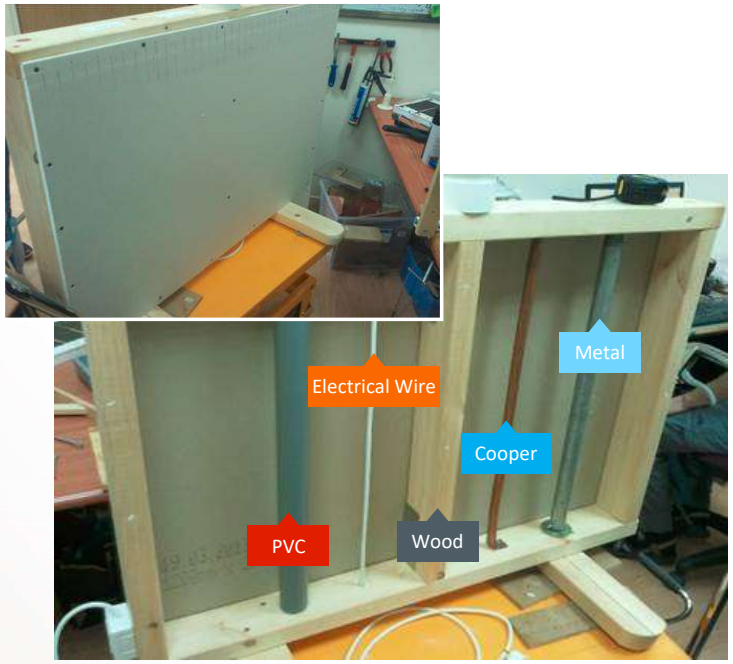
- Single parameter
- Specific
- Expensive
- Intrinsic accuracy

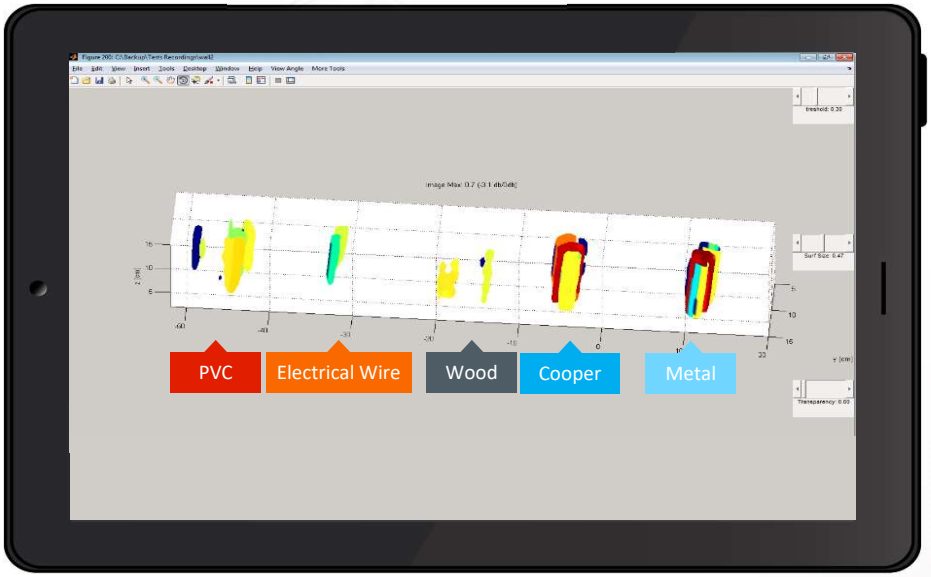
- Finger printing
- Non-Specific → unexpected information may be revealed
- Inexpensive (mass produced)
- Accuracy through machine learning

Sensor Startups - Vayyar

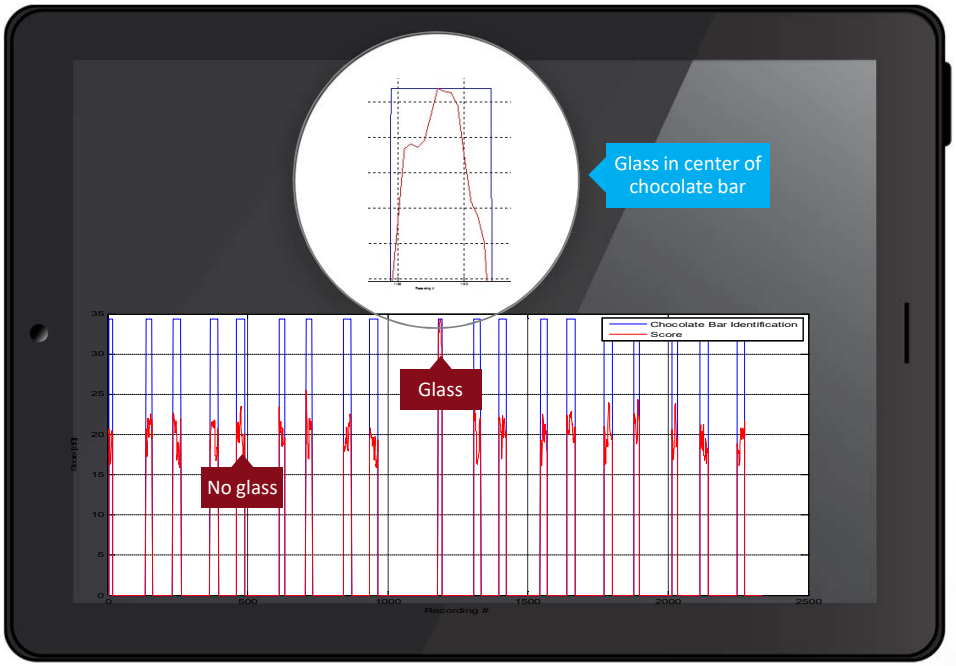
RF Imaging (dielectric spectroscopy)

vayyar





Sensor Startups - Vayyar

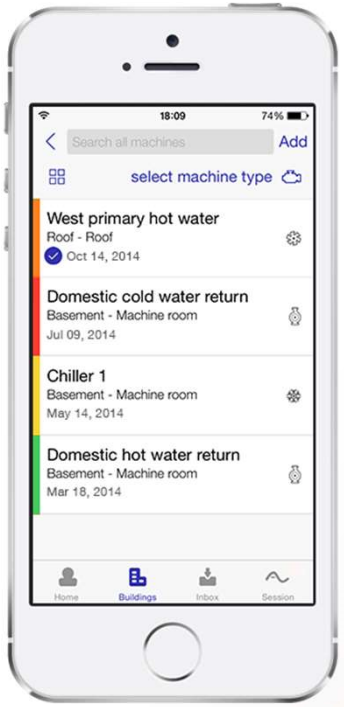


vayyar https://vayyar.com/

Sensor Startups - Augury

Predictive Maintenance using Sound Profiles

Augury's diagnostic technology is built around a simple principle. Every mechanical system can be characterized by the sound that it makes – machines "talk" and we understand their language. We use vibration and ultrasonic sensors, which are the gold standard in the Predictive Maintenance space, to measure these sounds.



AUGURY

https://www.augury.com

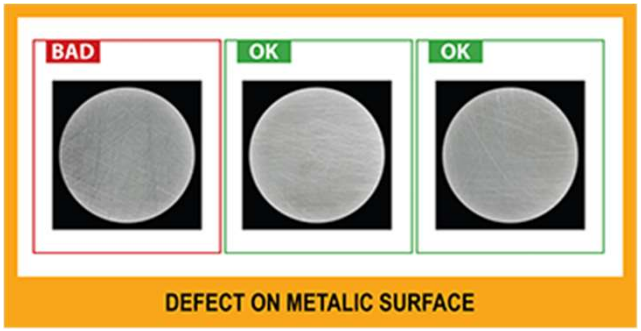
Sensor Startups - Cainthus

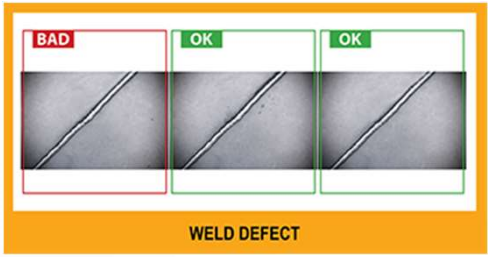
Cow Identification and behavioral analysis through Machine Vision

https://www.cainthus.com

Sensor Startups - Sanezoo

Artificial Intelligence inside Cameras





SANEZOO https://www.sanezoo.com/

Modelling

White box (deterministic) models

Based on our understanding of a system
(the best option if no, or limited amount of data)

Black box (AI/machine learning) models

Based on an internal structure which is unknown,
we are happy as long as it describes our observations well enough
(much data and many CPU's required)

Grey box

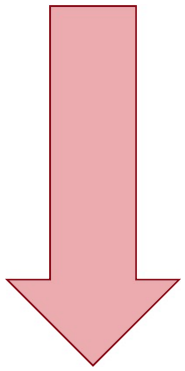
Combination of the above
(no gain if enough data and CPU power)

AI in 2018 – Black Box Modelling

- AI is the new **electricity**, it will transform every major industry
- Most AI Startups are in about the same stage as internet companies in the 90s
- > 99% of all AI applications are still of the A->B type (supervised learning)

Supervised learning
labeled data
Transfer learning
apply learning from one domain to another
Unsupervised learning
learn from unlabeled data
Reinforcement learning
video games, Alpha Go
robots (simulator)

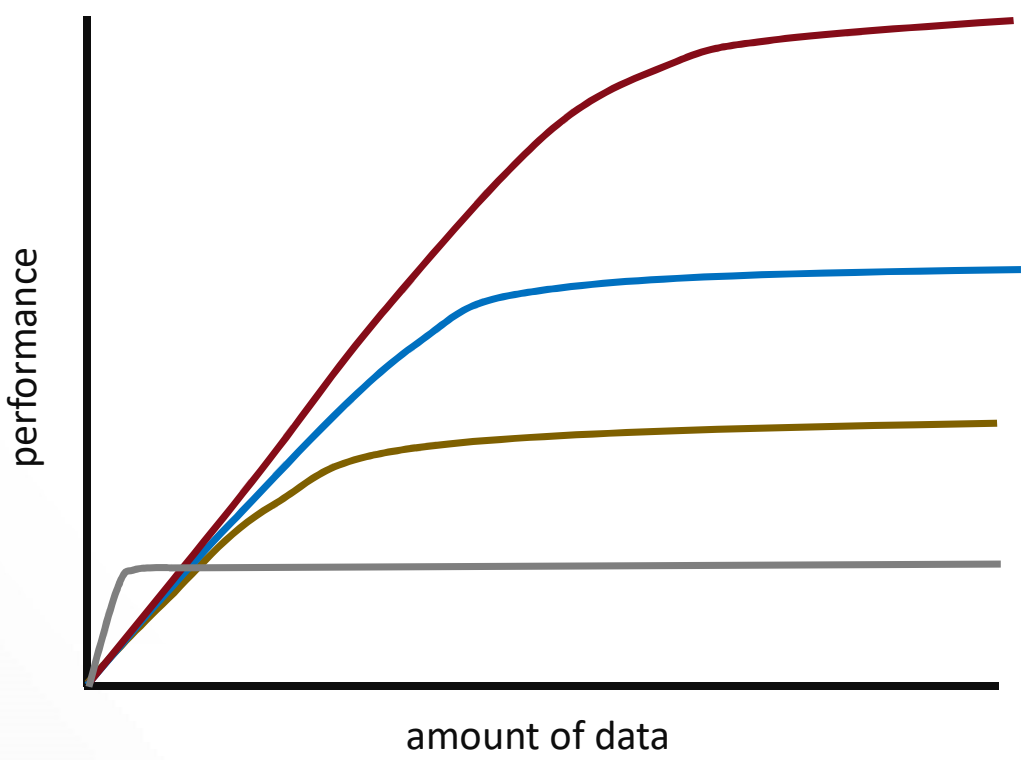
More data required



Data beats algorithms!

(Andrew Ng, Stanford, former chief scientist Baidu)

Deep Learning – Neural Networks



Large Neural Networks

Medium Neural Networks

Small Neural Networks

Traditional "AI"

Multi variate analysis (PCA/PLS/…)
Support vector machines / classification
…

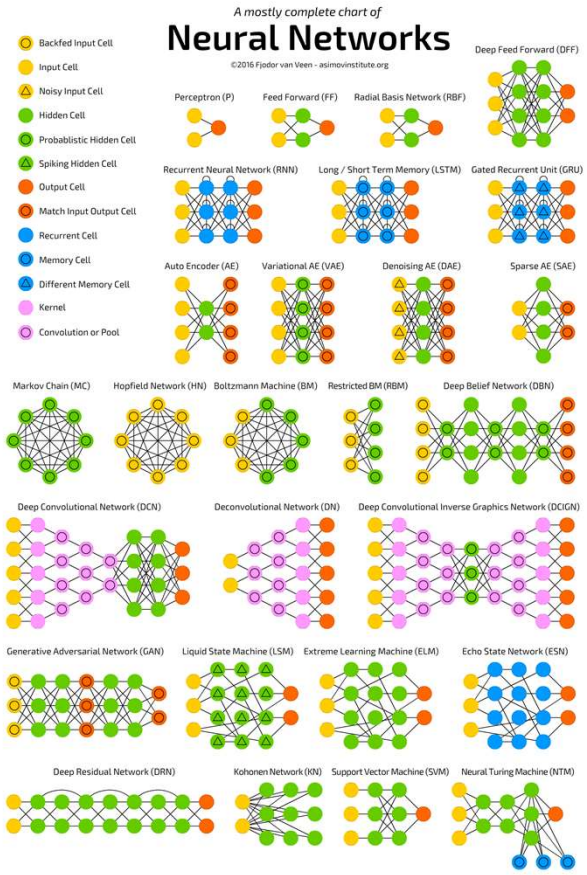
Google

Massive computational power and data required!!

(Andrew Ng, Stanford, former chief scientist Baidu)

Neural Networks - Work for Experts !

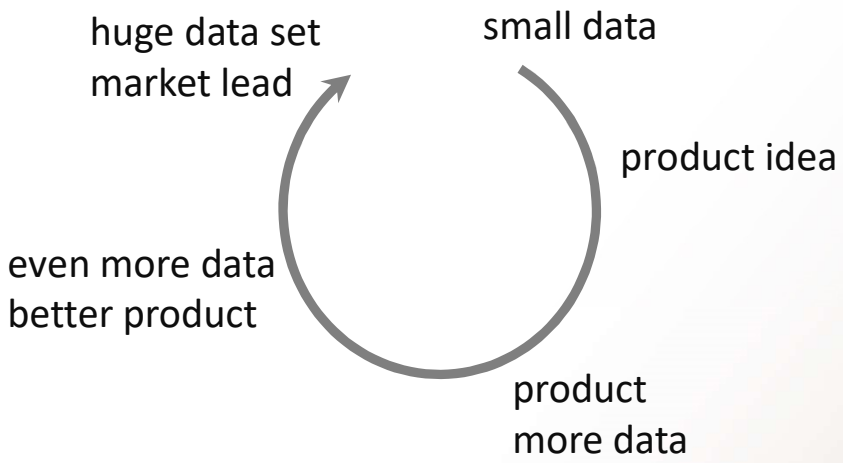
http://www.asimovinstitute.org/neural-network-zoo/



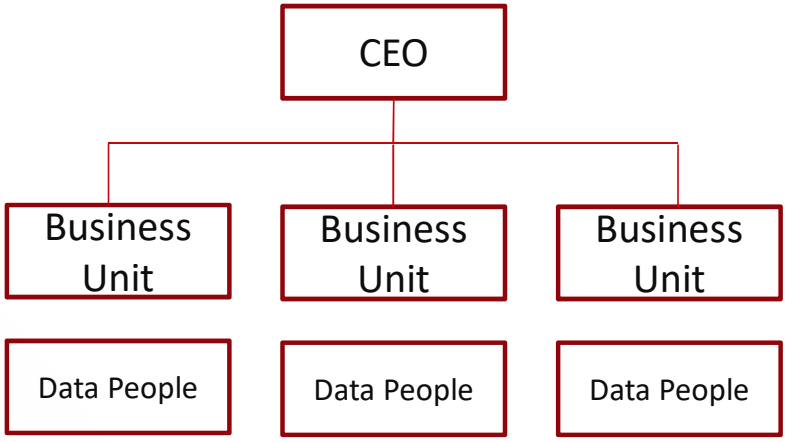
Data as a Commodity – Work for You !

- Data beats algorithms
- Algorithms are difficult to protect (open source)
- Data access is key (competitors advantage)
- Strategic data acquisition

  - Follow product during entire life cycle !
  - Not only in traditional product column …
    … but consider entire chain (cradle to cradle)
  - Product quality, storage, usage
  - Recycling



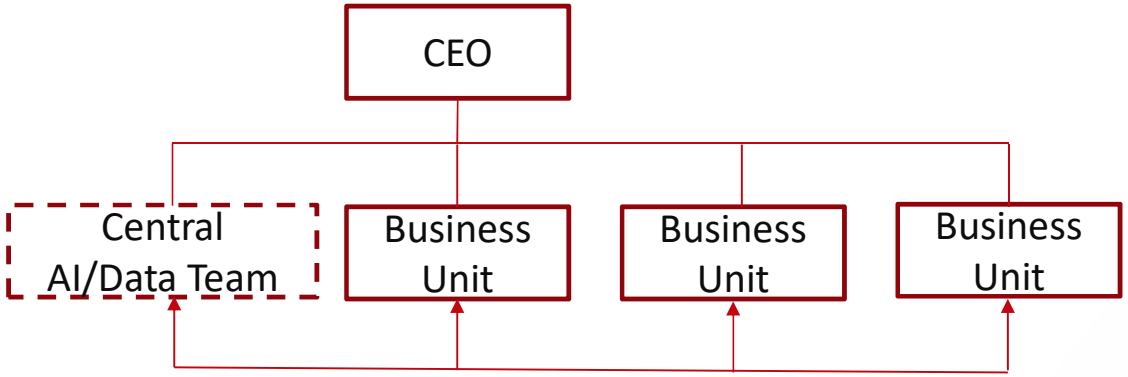
How to Implement AI



For now, recipe for disaster

… but in the future the best option again if :

- shared platforms
- shared data warehouse
- shared tools
- democratization of data



For now, a good start !

→ New job descriptions
→ More complex world → decision making push down !

Questions - Discussion

- laat je niet intimideren door alle "hypes" en "buzzwords" ... ga aan de slag!
- richt je op het strategisch verzamelen van data ... "data beats algorithms"
- volg je product en verzamel gegevens gedurende de gehele levenscyclus ("cradle to cradle")
- formeer een toegewijd team van "data scientists" (intern of extern)

Thank You!

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