



# Big Cheese Data

**Klavs Martin Sørensen**

Chemometrics & Analytical Technology  
Department of Food Science

KØBENHAVNS UNIVERSITET



# Say cheese !

**SayCheese** is a 3-year 4.5M DKK research project between

- KU FOOD
- ARLA Foods Taulov Dairy
- ARLA Foods Høgelund Dairy

Funded by MFF and GUDP



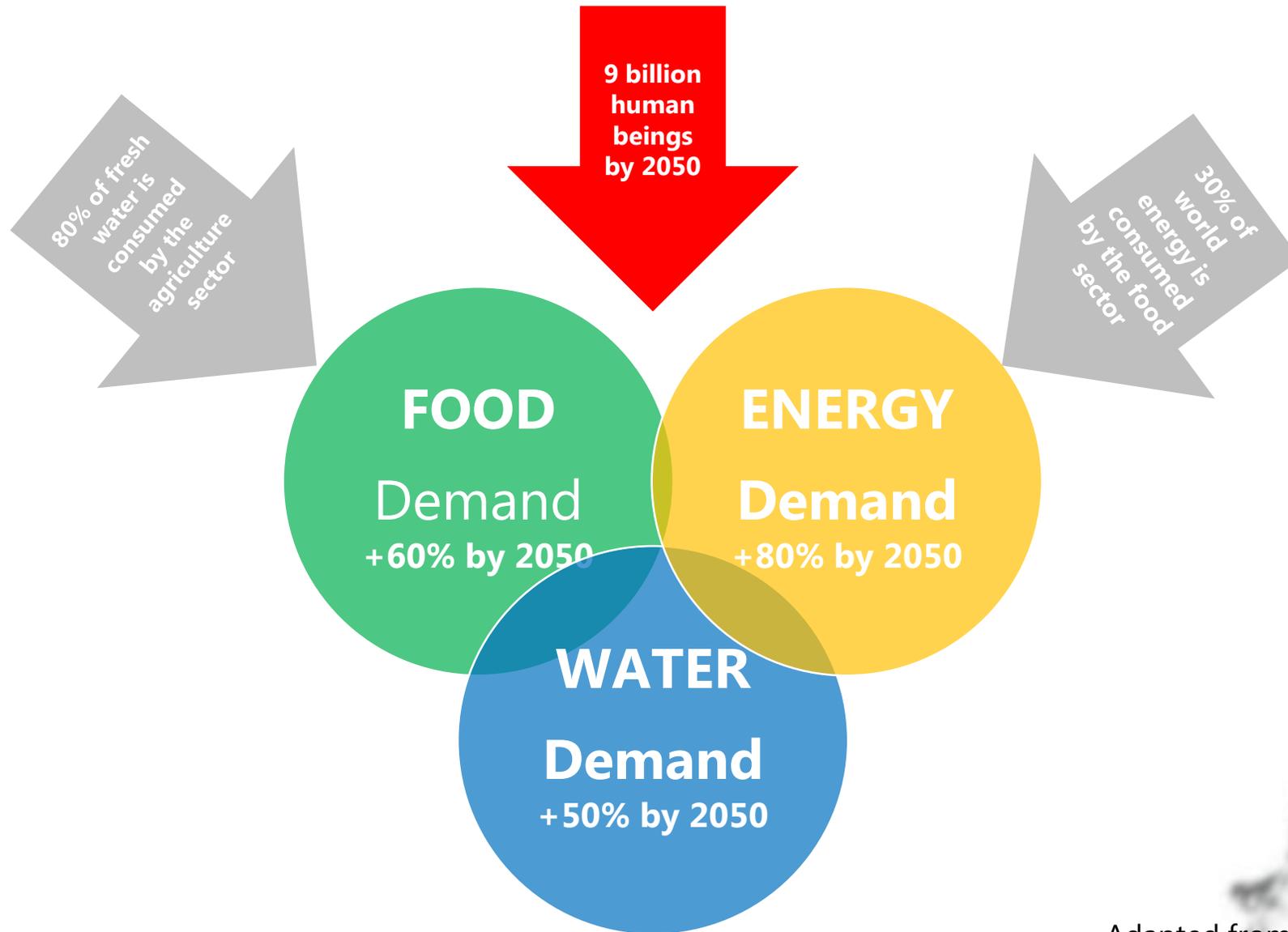
# Motivation

- 446.700 ton of cheese produced in 2017 <sup>1</sup>
- We estimate that at 1-2 m<sup>3</sup> of water can be saved per ton of cheese by reuse of water
- Obvious savings
  - procurement costs of tap water
  - disposal costs for wastewater
- Potential for valorizing side streams



<sup>1</sup> Landbrug & Fødevarer, Mejeristatistik 2017

# Motivation





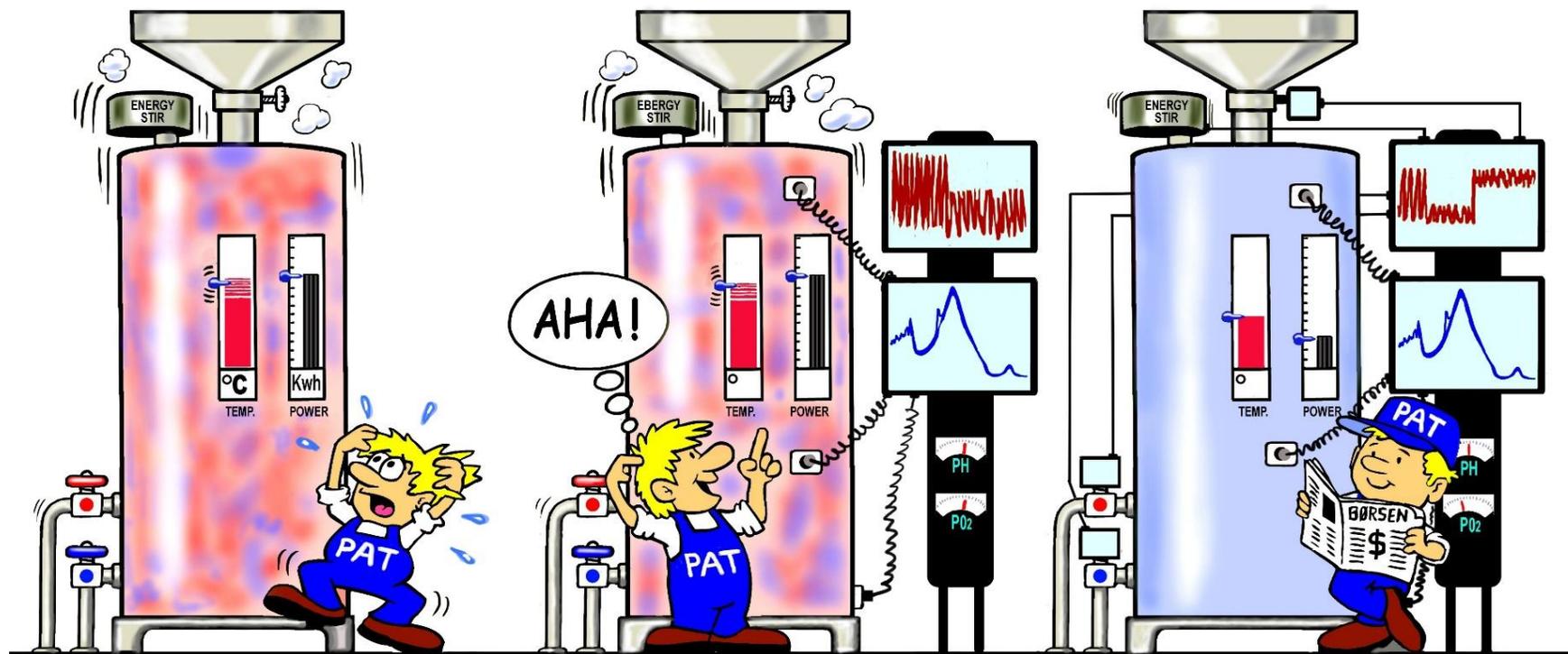
The enabler for process water reuse :  
To never compromise  
**Product Quality or Safety**

*“Measurement is the first step that leads to control and eventually to improvement. If you can’t measure something, you can’t understand it. If you can’t understand it, you can’t control it. If you can’t control it, you can’t improve it.”*

— H. James Harrington



# PAT – Process Analytical Technology



**RECIPE  
BASED**



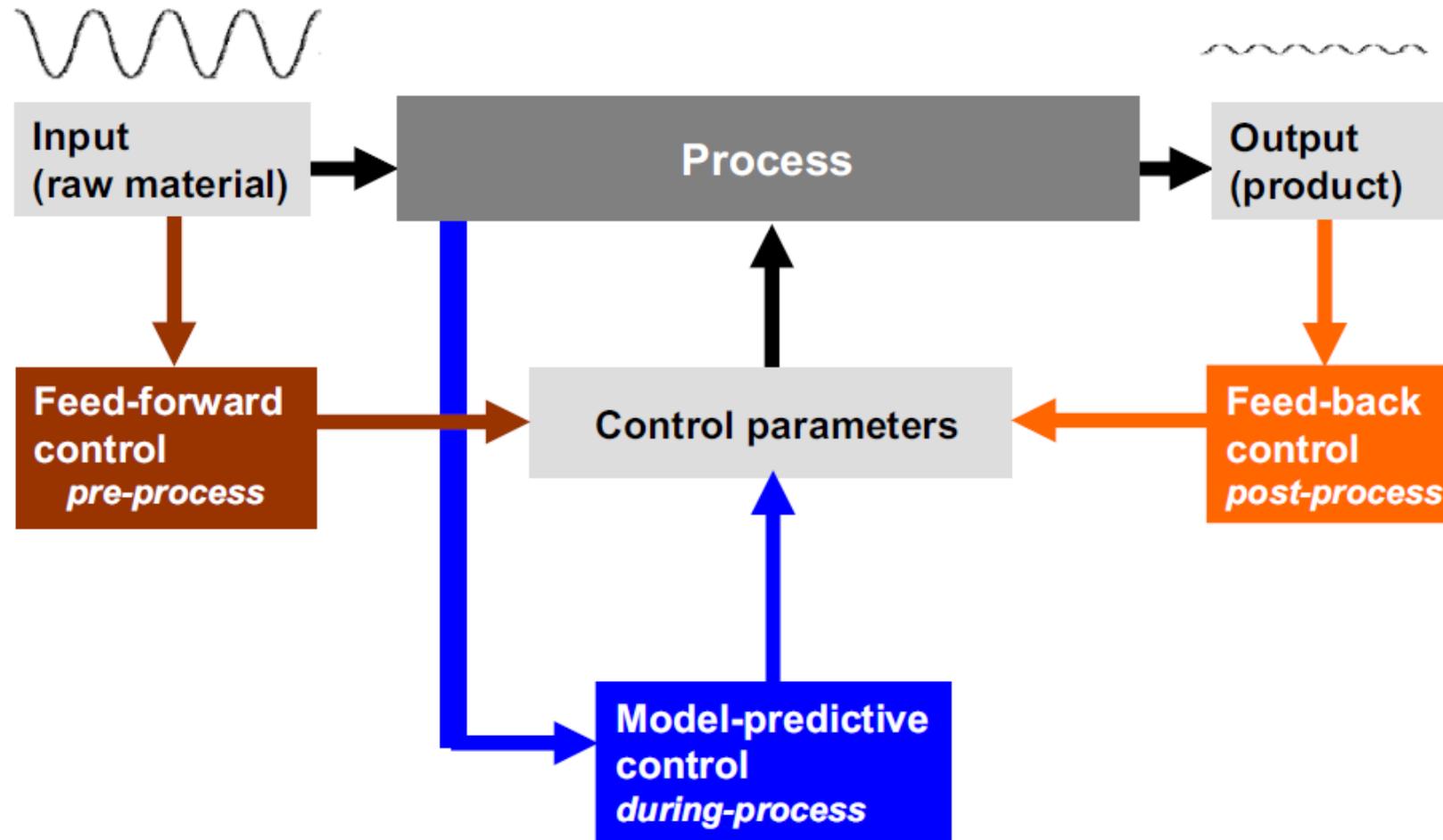
**MONITORED  
RECIPE BASED**



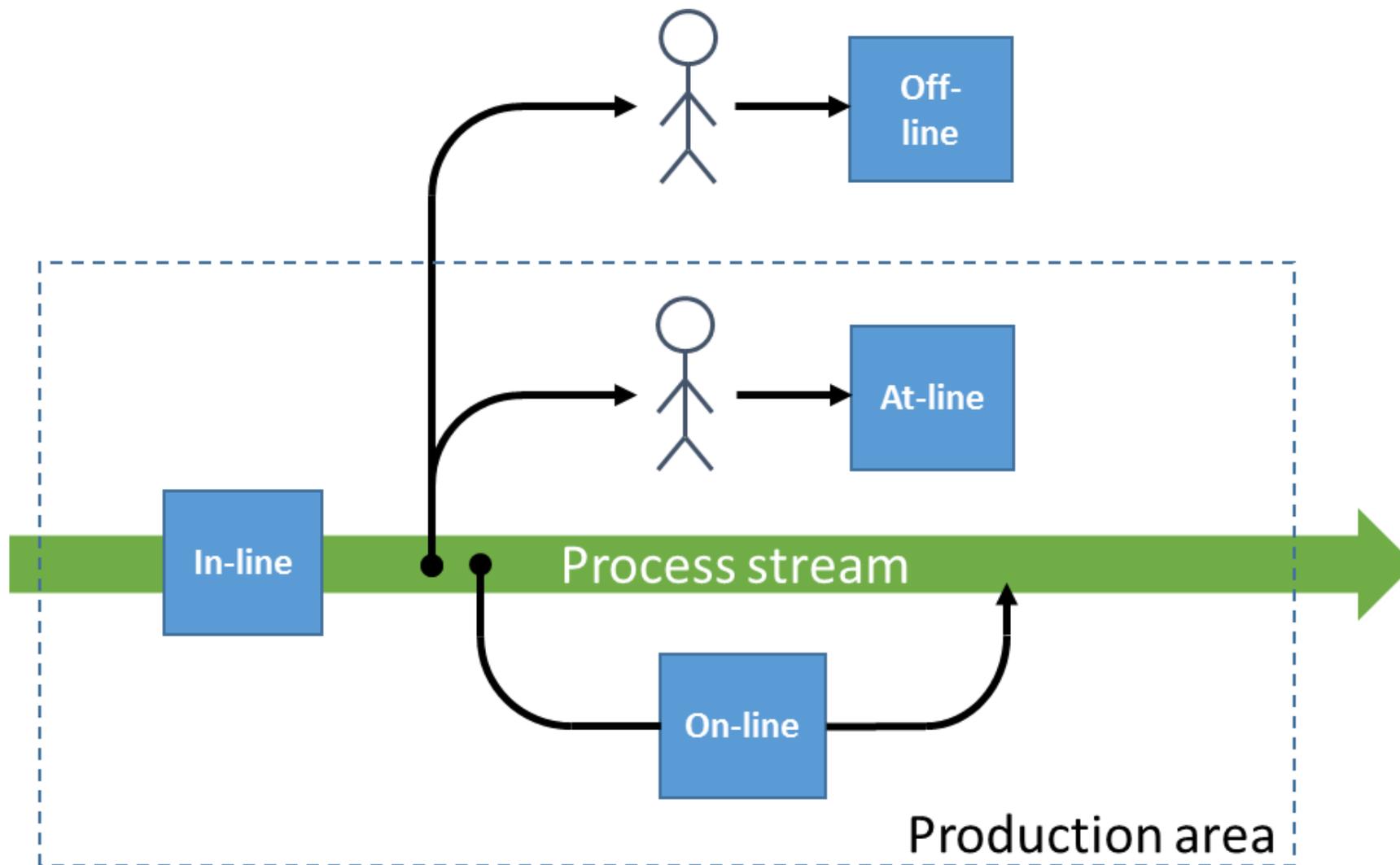
**MONITORED  
& CONTROLLED**



# PAT – Process Analytical Technology



# PAT – Process Analytical Technology



# Near-infrared spectroscopic analysis equipment

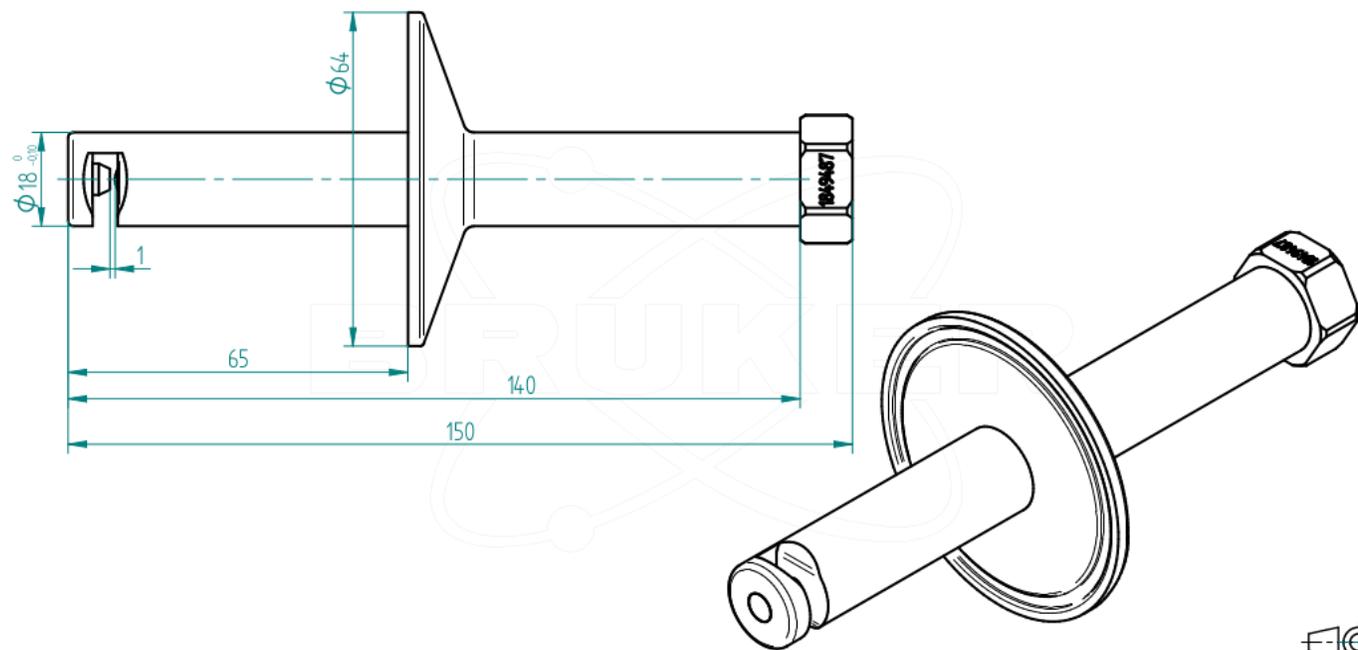


# Near-infrared spectroscopic analysis equipment - online



NIR transfection probe IN271F-02 modif.  
1849487

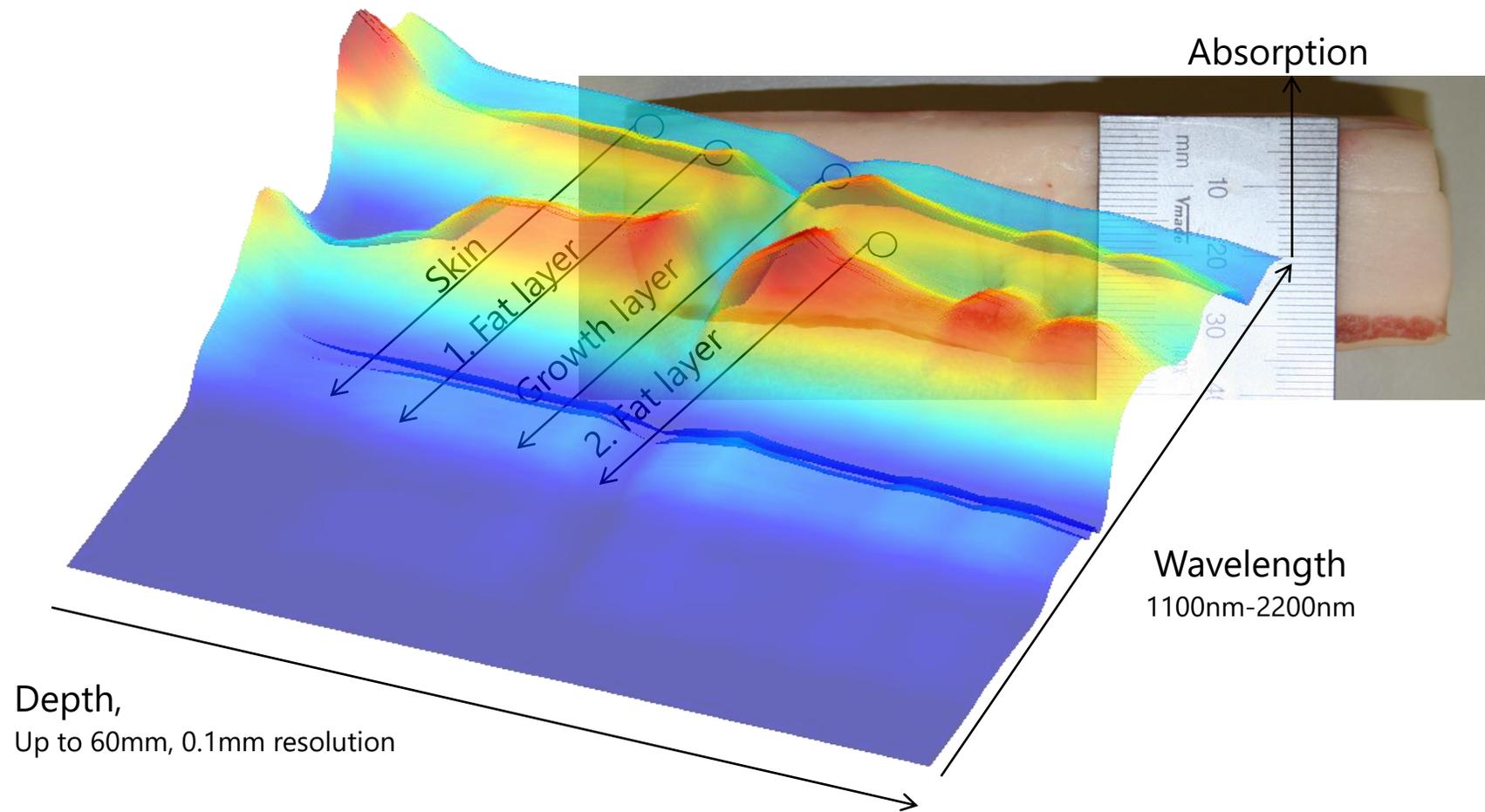
Bruker Optik



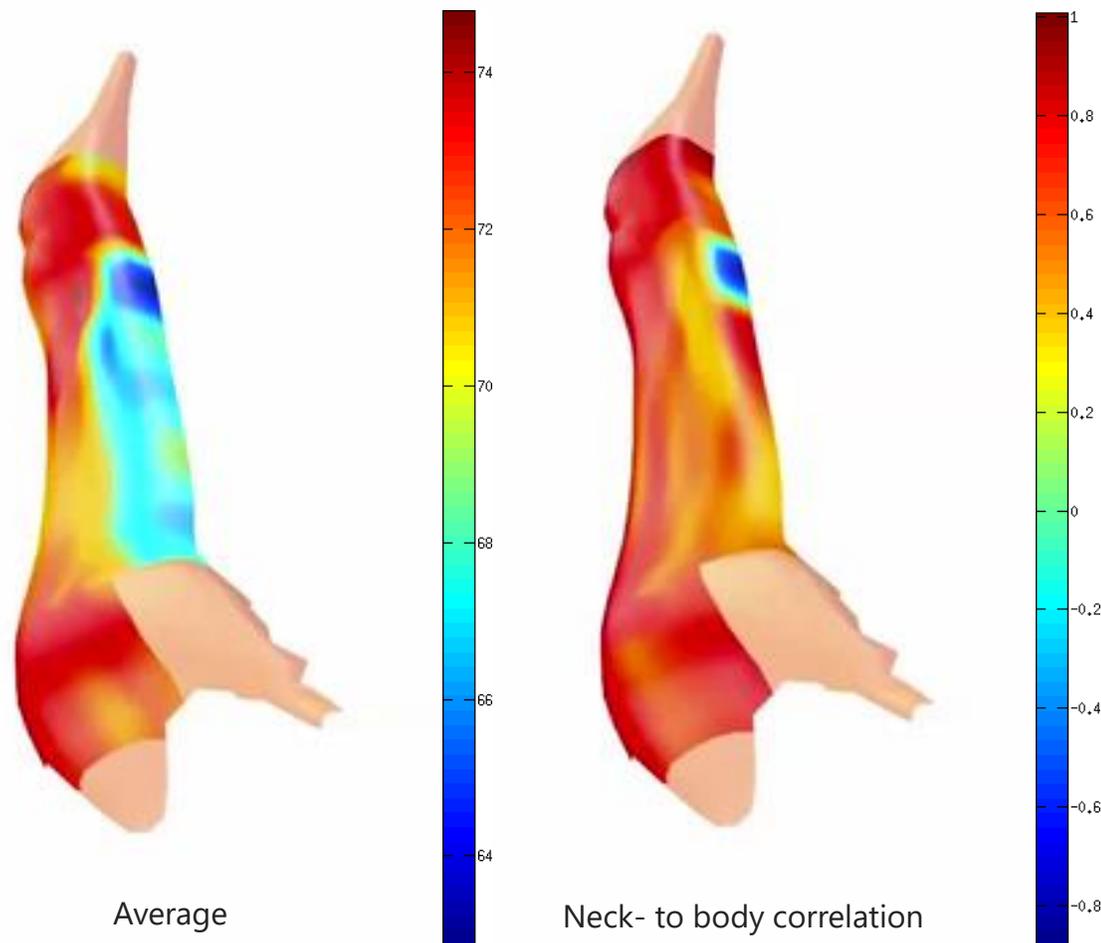
# Measuring non-trivial products on-line



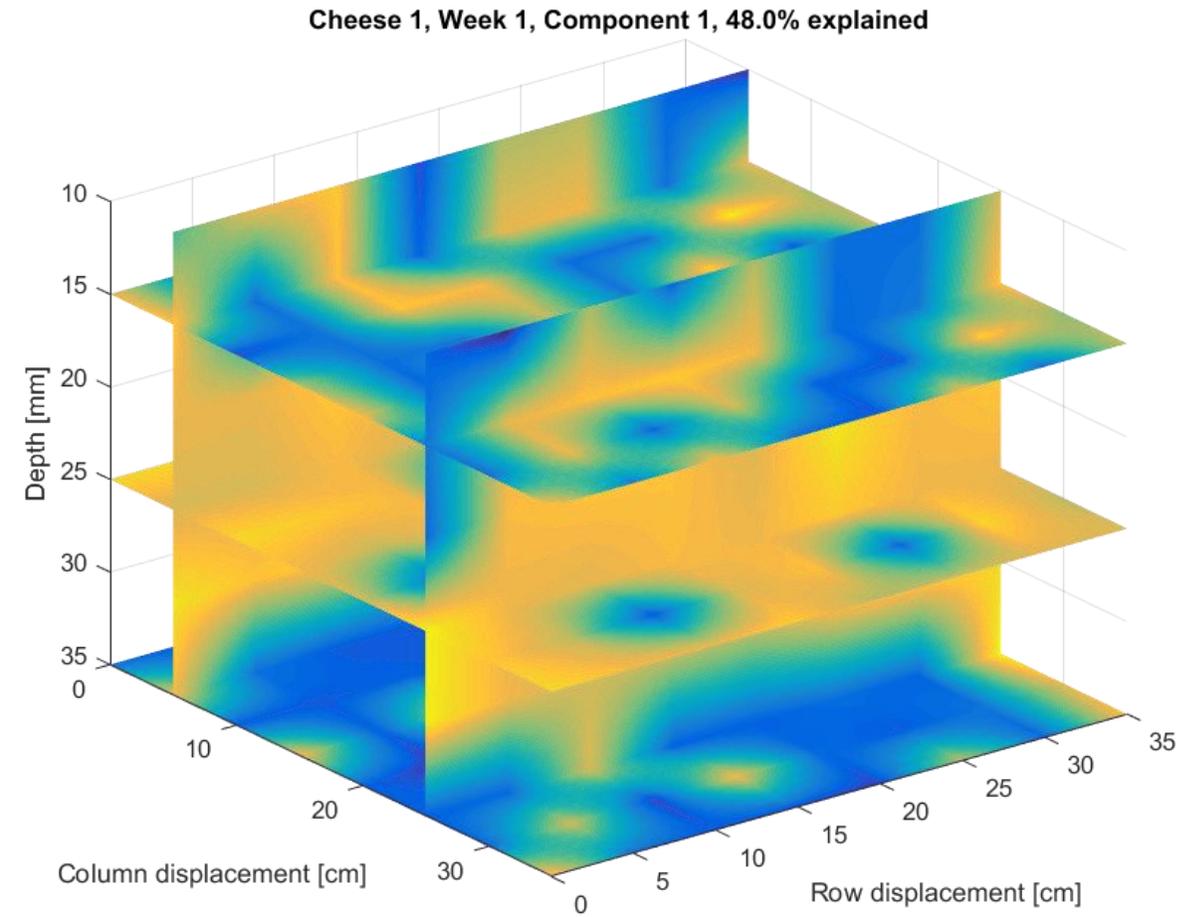
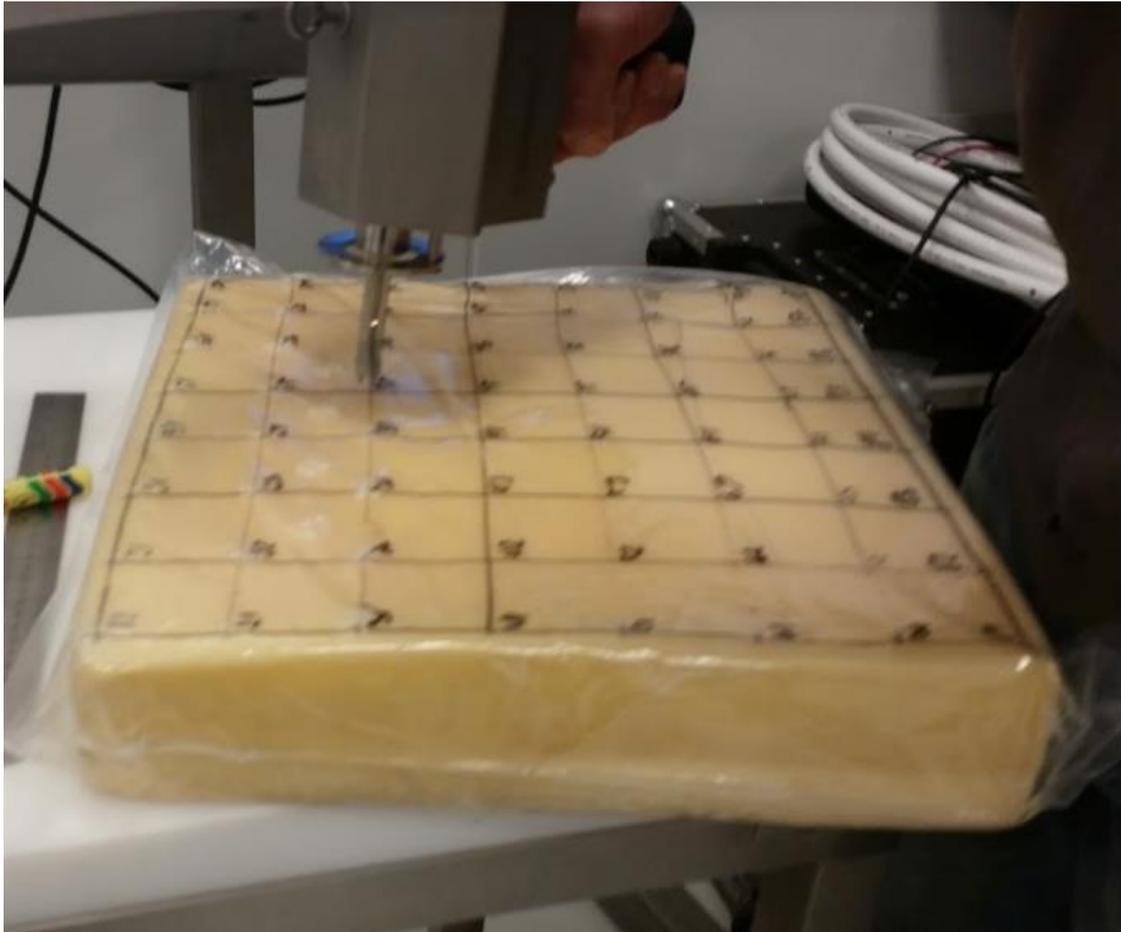
# Spatially resolved NIR measurements



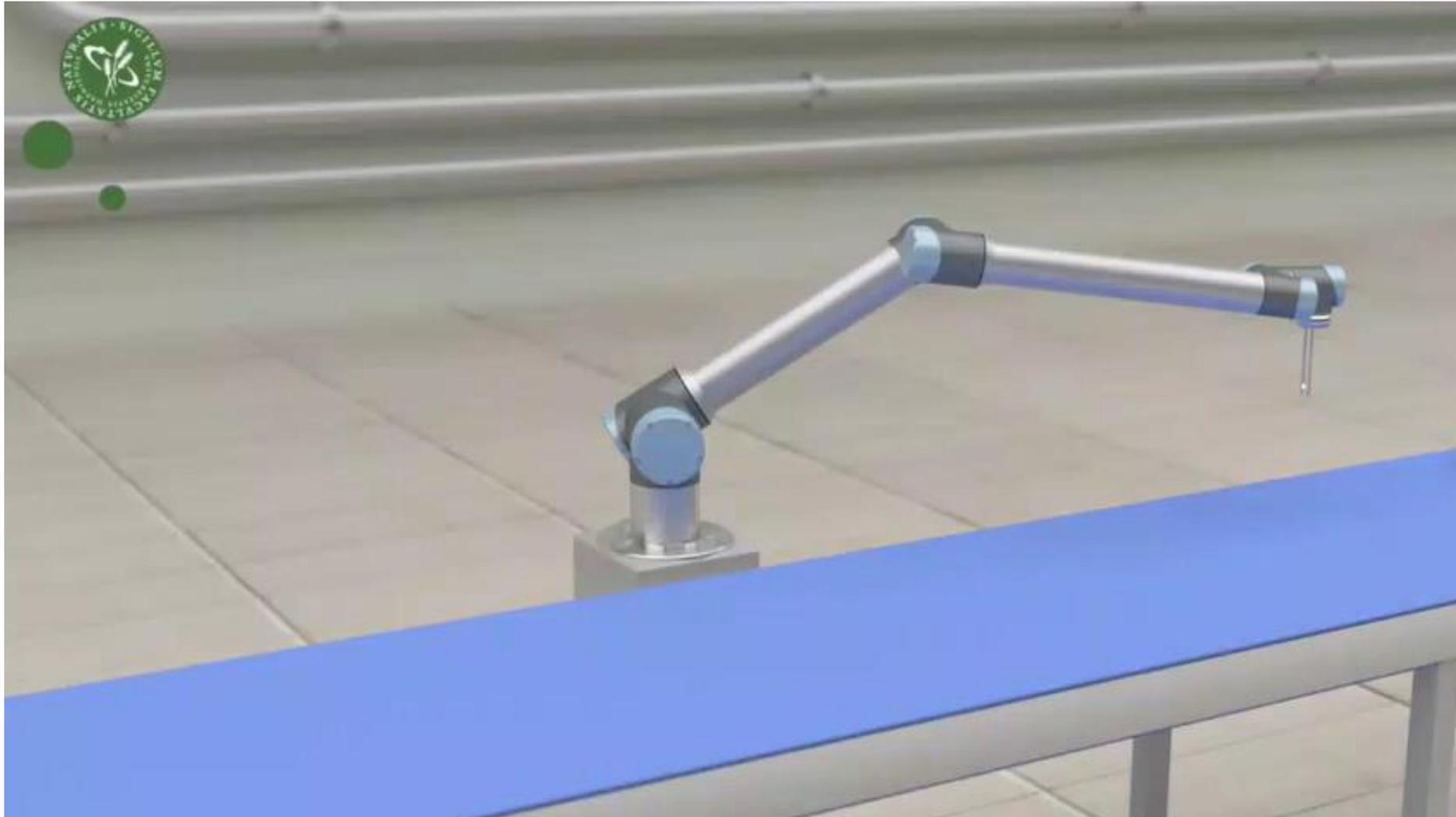
# Topological mapping of quality in slaughter pigs



# Topological mapping of a cheese

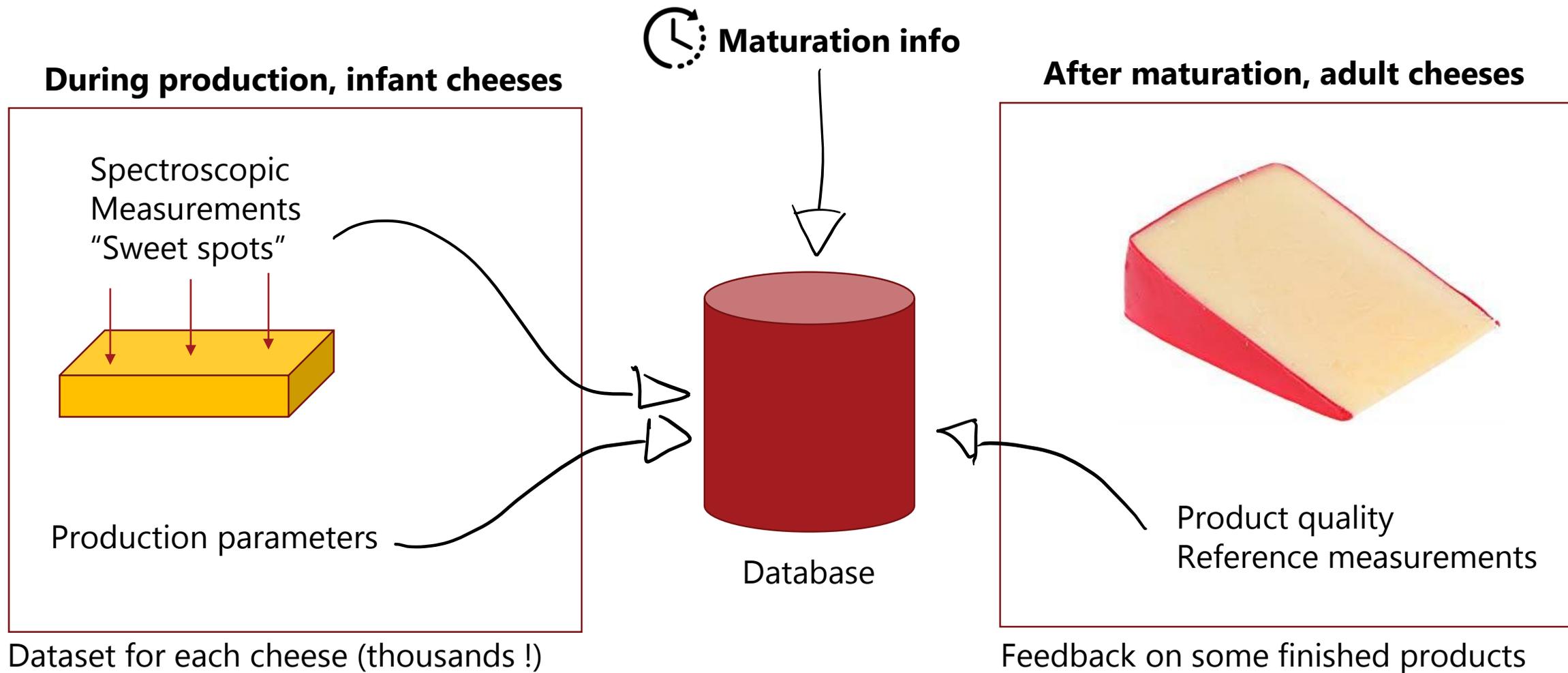


# SayCheese: Automated on-line measurement of cheese

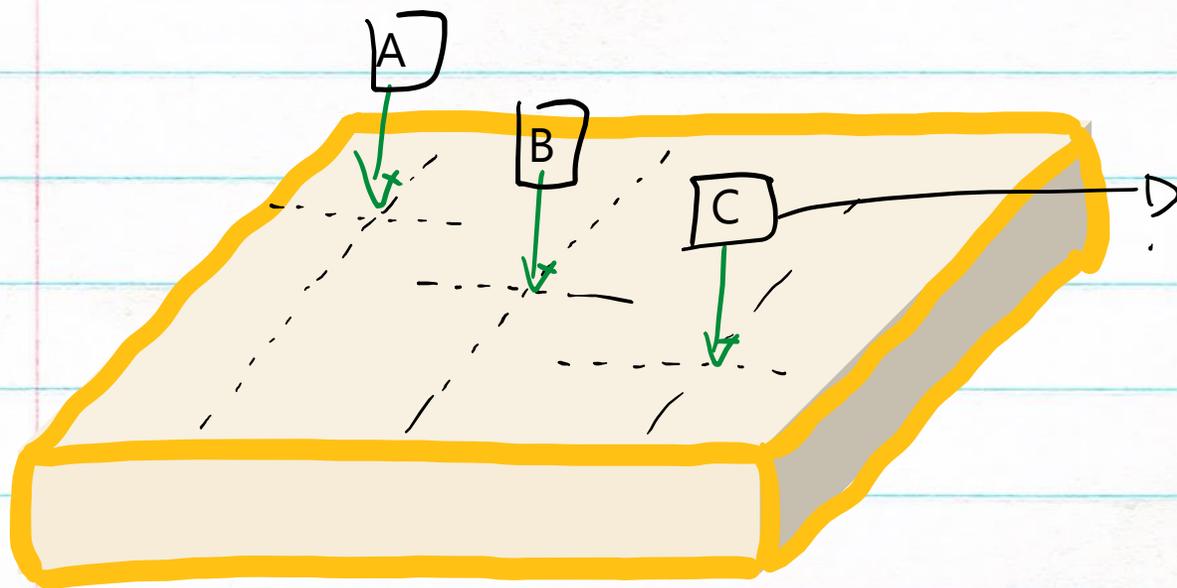




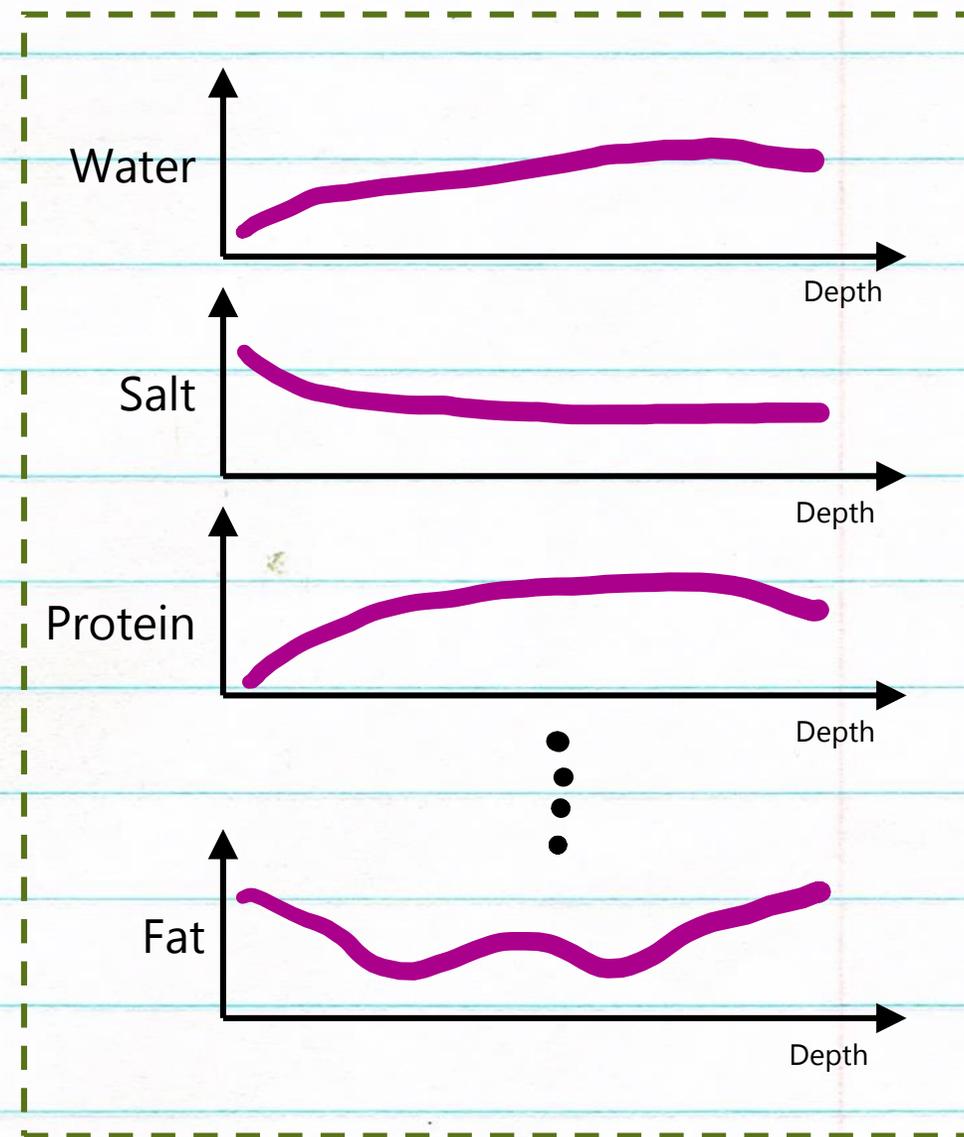
# SayCheese - Building Big Data



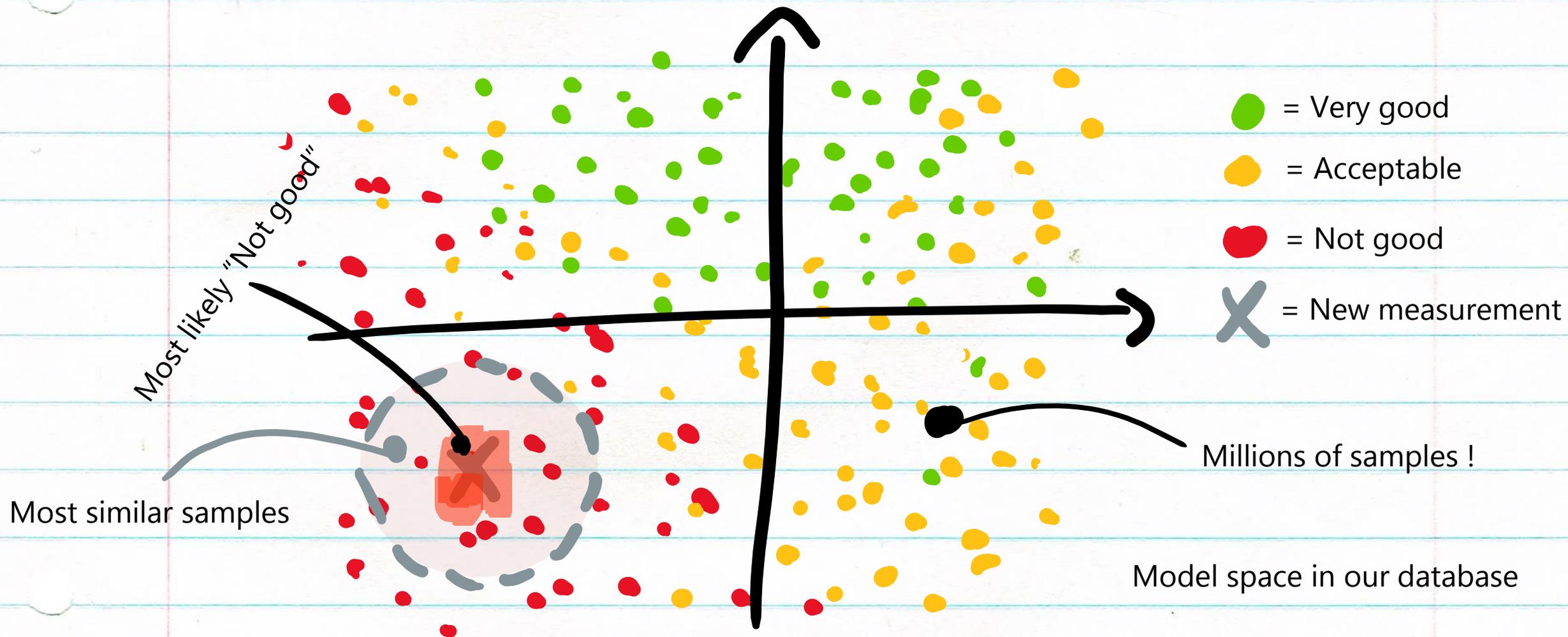
# Topological cheese description



"Production fingerprint"



# SayCheese – predicting matured cheese quality



# Thank for your attention !

Please contact me for further info, or if you have comments or suggestions !

**Klavs Martin Sørensen**

**kms@food.ku.dk**

