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A Real-Time Milk Yield Prediction and Health Monitoring System for Dairy Cows

EAAP 2024 - Florence

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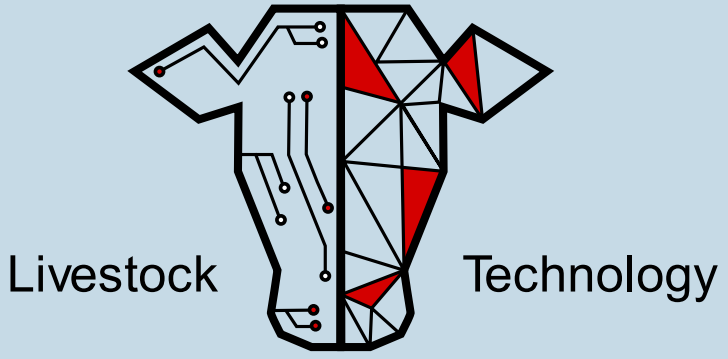

Introduction

Detecting disease in dairy cattle **early** and **reliably** is crucial for good herd management!

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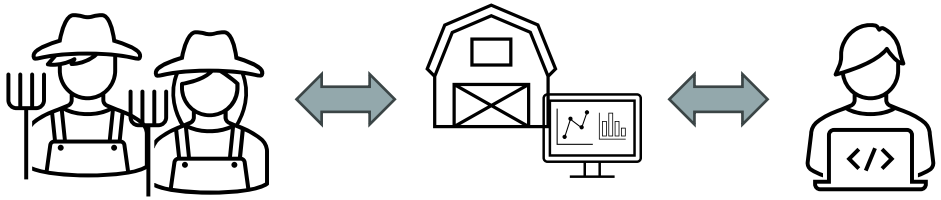
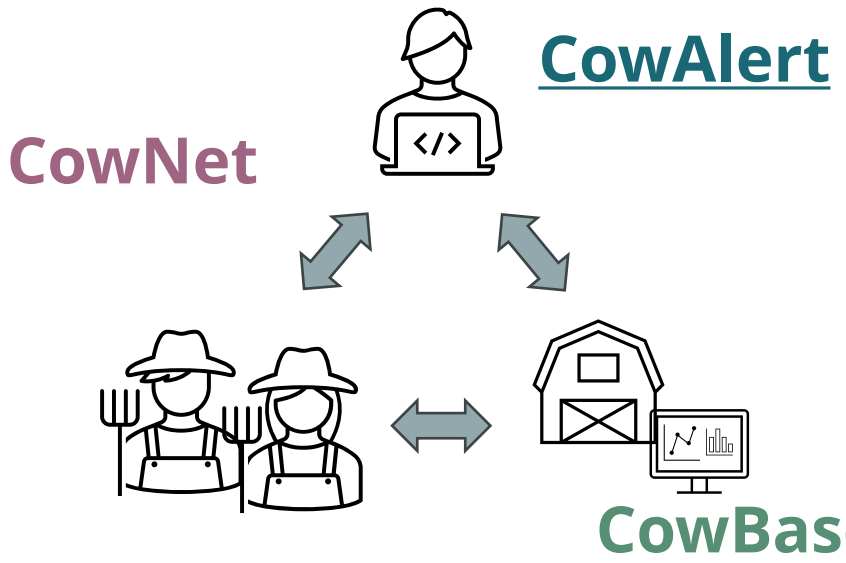


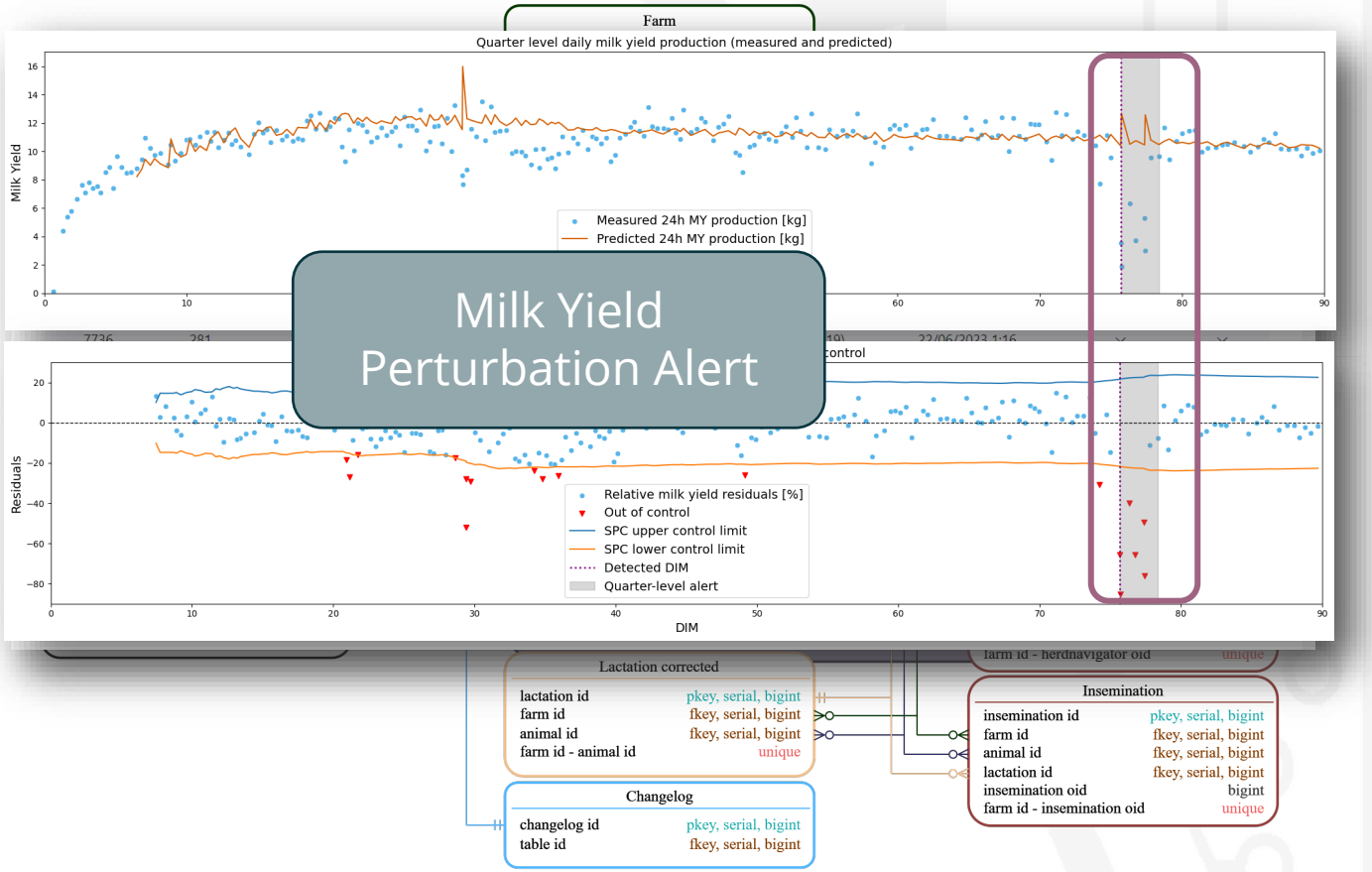
Post-hoc analysis

Introduction

Detecting disease in dairy cattle **early** and **reliably** is crucial for good herd management!



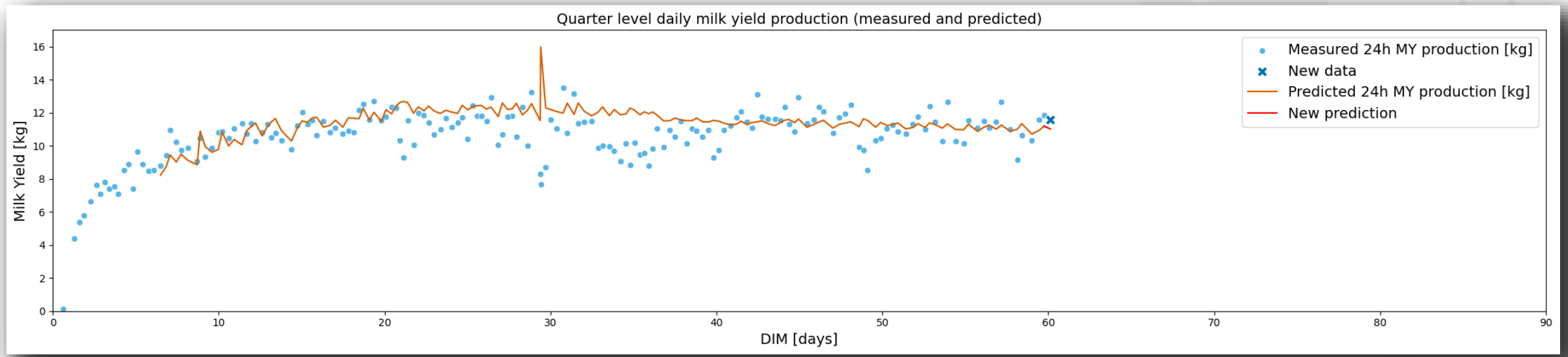
Including farmers in a “semi-real-time” setup



Poster 14.15 @ EAAP 2024

CowAlert – Linear Mixed Model (LMM)*

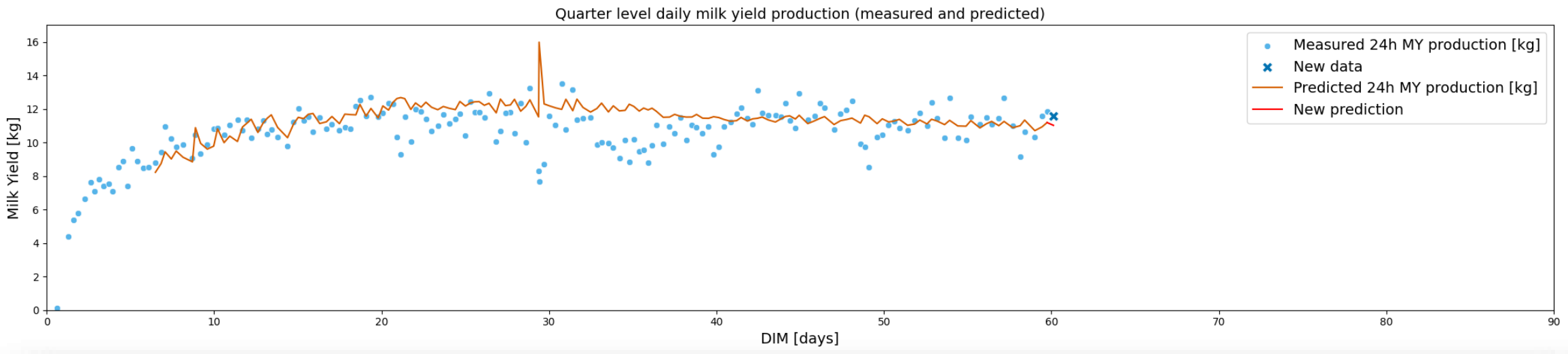
Quarter-level

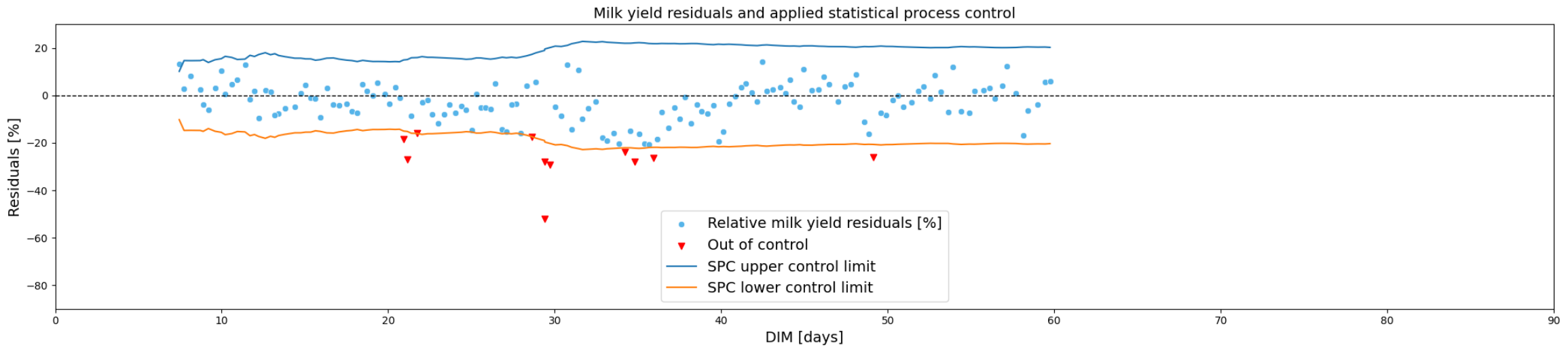


*based on Adriaens et al. 2018

CowAlert – LMM + Statistical Process Control (SPC)

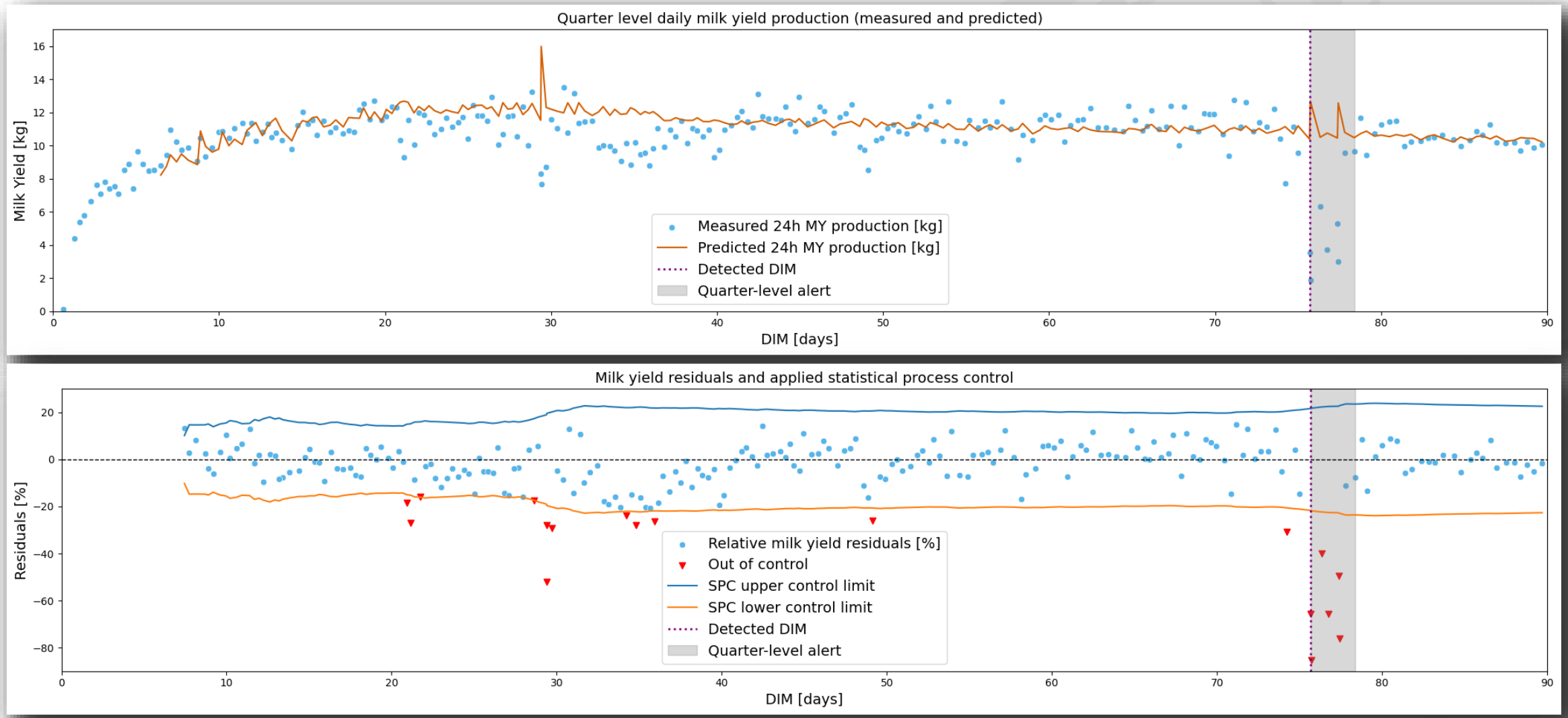
Quarter-level





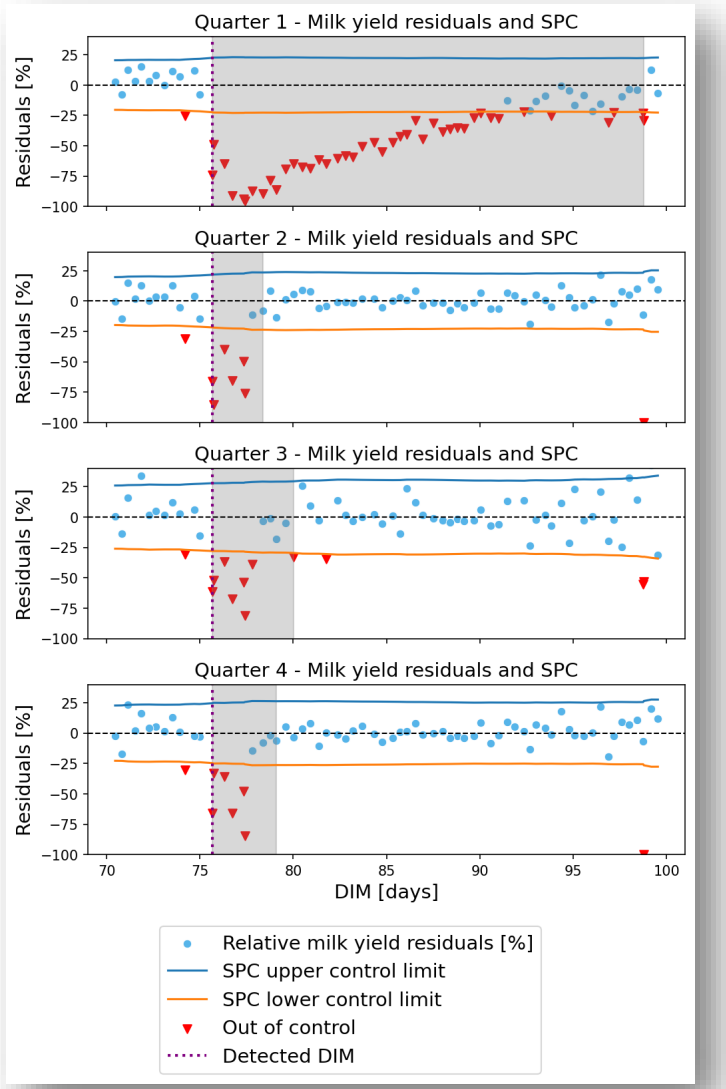
CowAlert – LMM + SPC + Alert rules*

Quarter-level

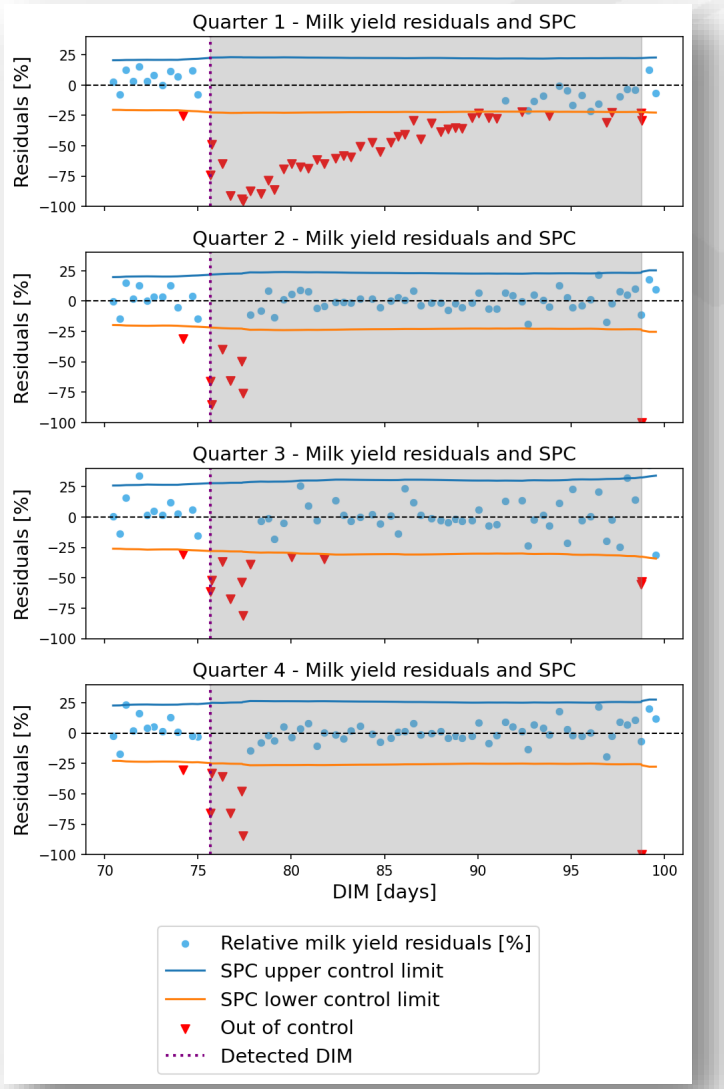


*Alert rules were defined on a moving window of **4 milking events**

CowAlert – LMM + SPC + Alert rules



Quarter-level Alert

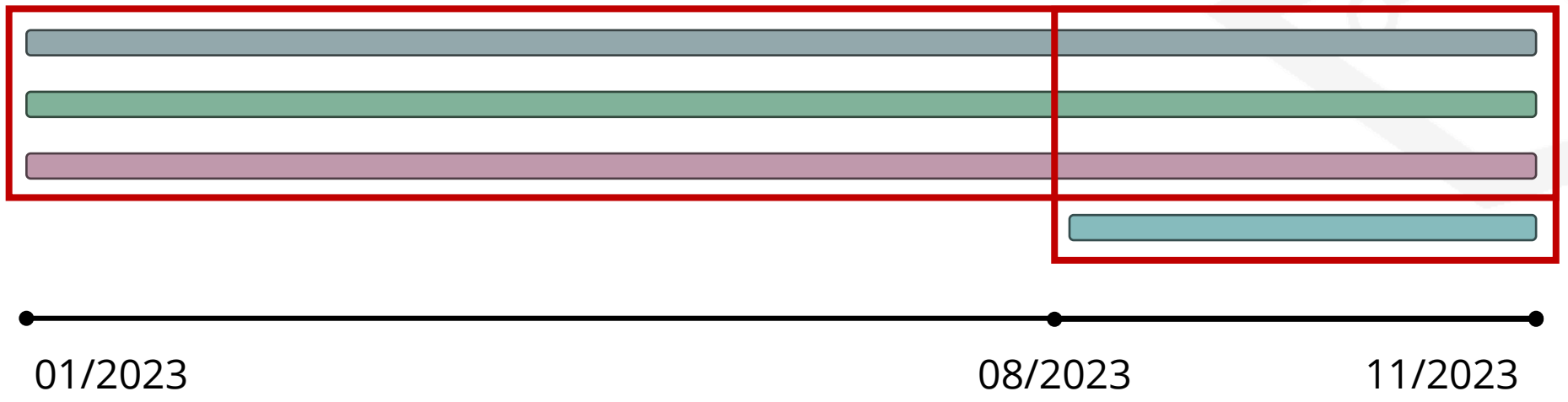


Cow-level Alert

Ask for **farmers' feedback**:

- Are there **clinical signs**?
- What underlying **disease**?

First trial phase – Data selection



CowAlerts

AMS alert

Treatment register

Farmers' feedback (2 farms)

10-month period (3-month trial)

Question 1: Where and how can we **improve the LMM + alert rules** further?

Data period: *3 months* Number of animals: *106 + 119 (2 farms)* CowAlerts: *175*

Question 2: Can milk loss characteristics help **distinguish between diseases**?

Data period: *10 months* Number of animals: *106 (1 farm)* CowAlerts : *586*

First trial phase – CowAlert classification

		Data Set 1	Data Set 2
Group 1	CowAlerts with **reported clinical signs/treatment** (Mastitis, Ketosis, Other)	***24***	***72 (38,23,11)***
Group 2	CowAlerts w/o reported clinical signs/treatment but an **AMS alert** (mastitis/ketosis)	***20***	***105***
Group 3	CowAlerts that relate to **dry-off**/end of lactation	***43***	***87***
Group 4	CowAlerts - **Natural fluctuations**/no-disease	***88***	***322***
	total	***175***	***586***

Q1: Can milk loss characteristics help **distinguish between diseases**?

Q2: Where and how can we **improve the LMM-alert** further?

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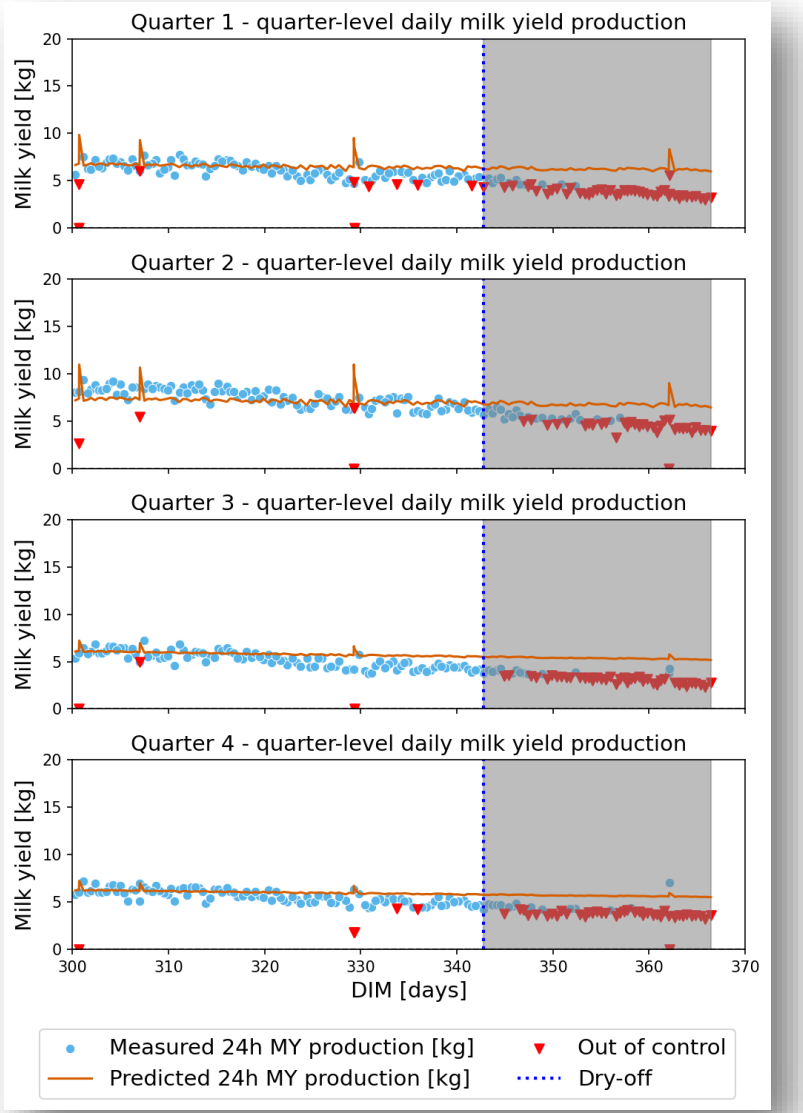
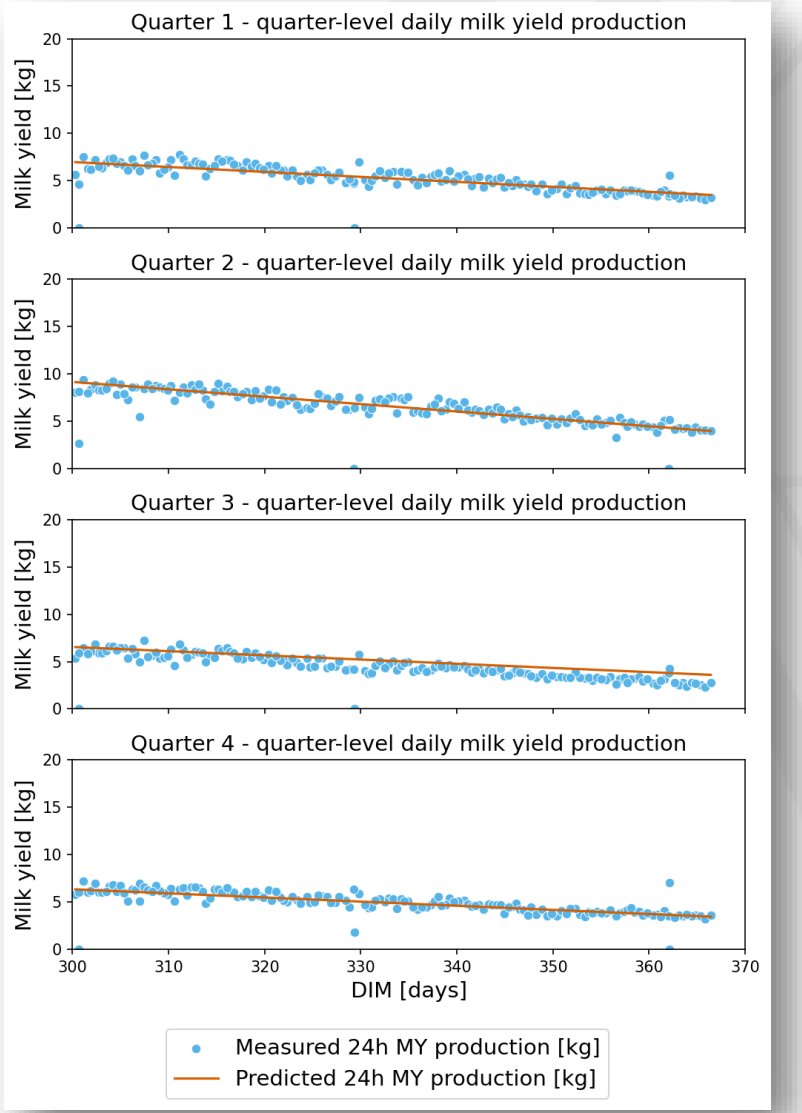
CowAlerts related to dry-off

Data Set 1



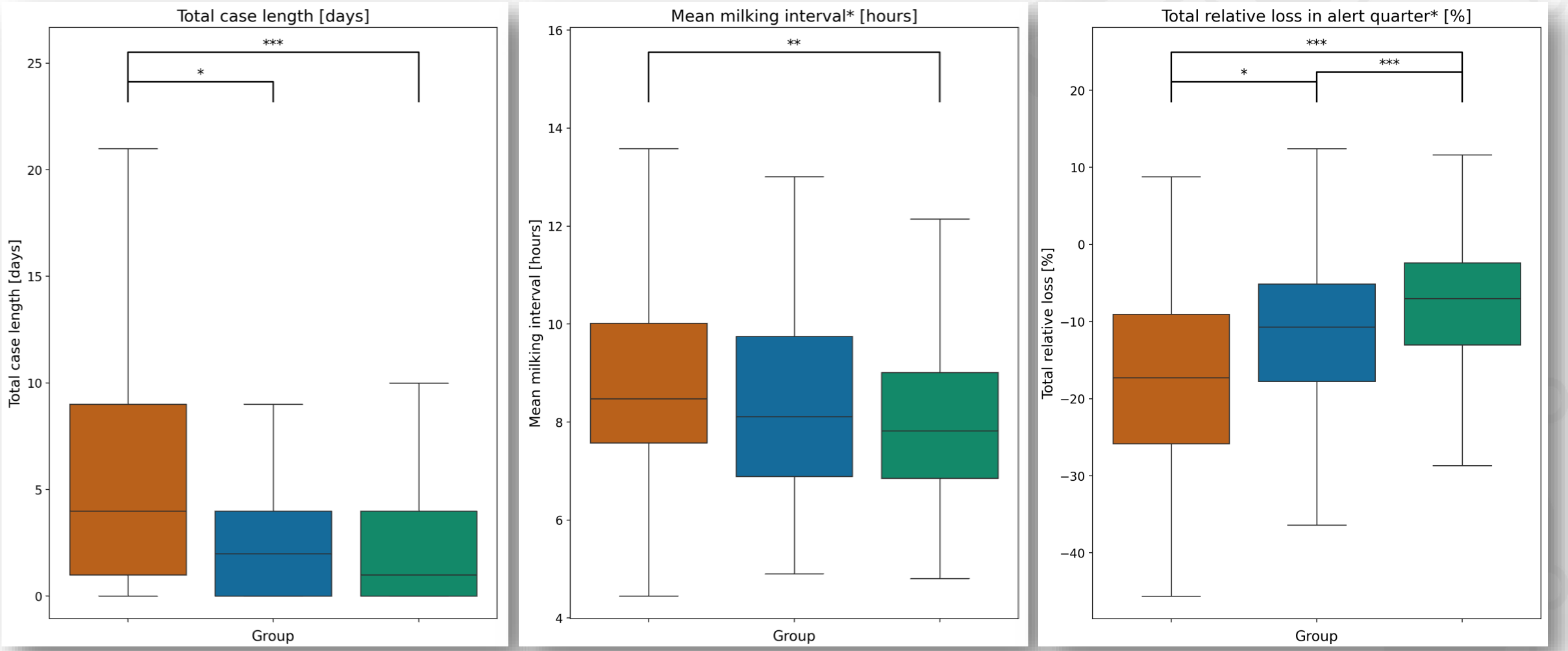


Current model

Update model

CowAlerts related to natural fluctuation

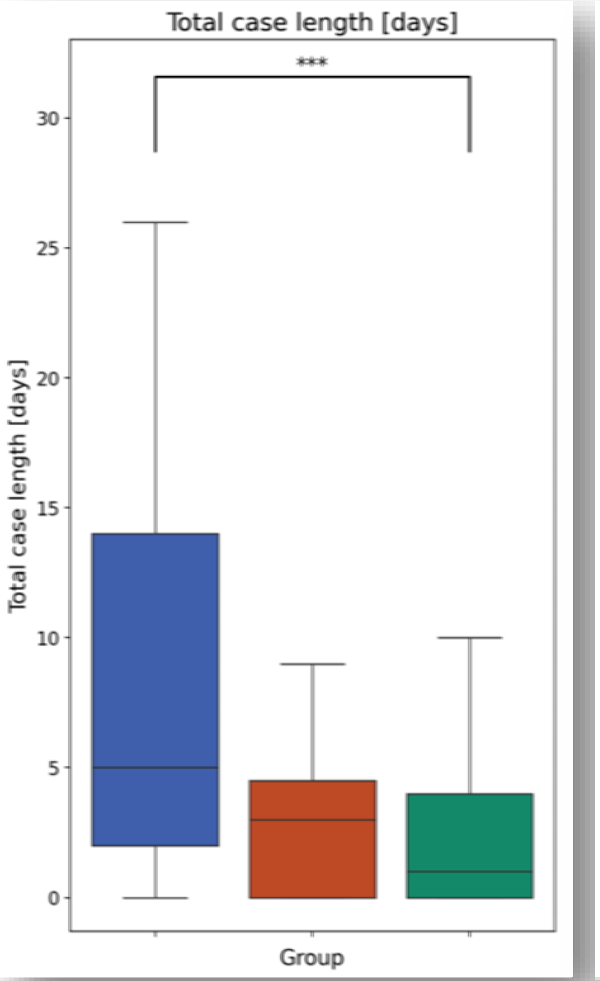
Data Set 1

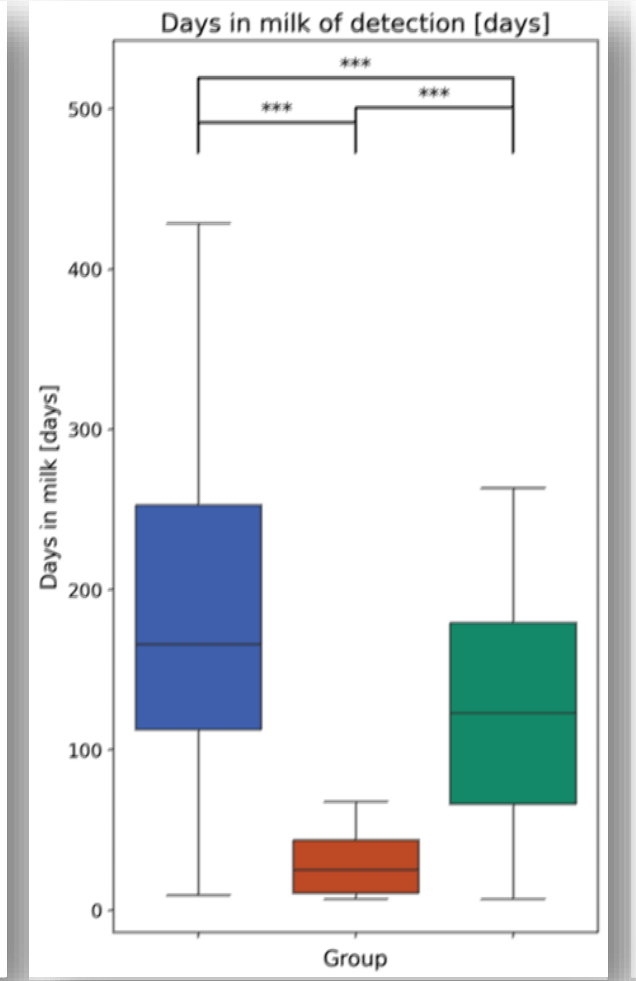


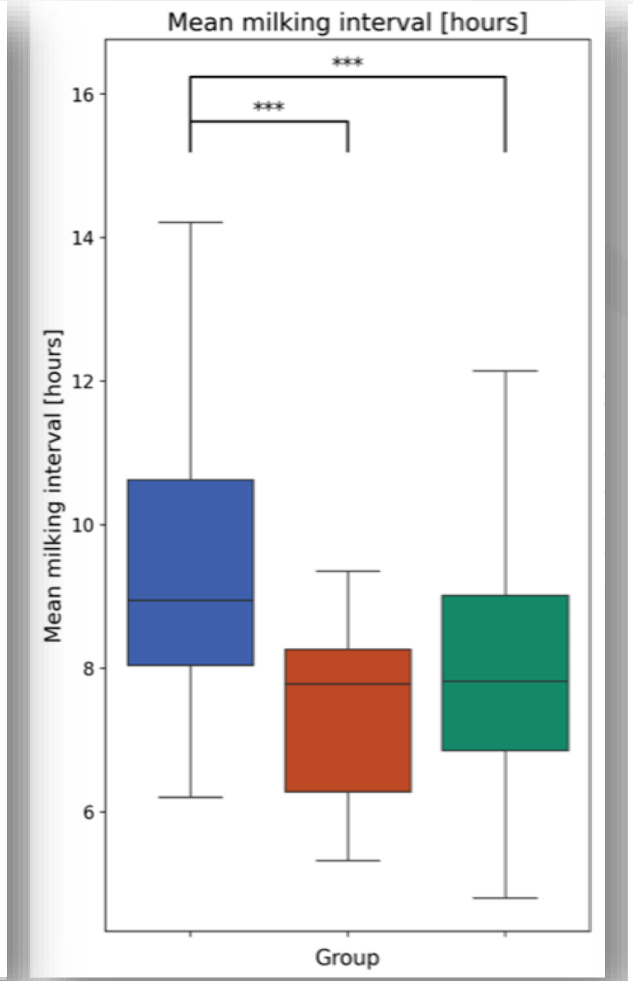
*Features are calculated on a window of -1 to 3 days around a detected alerts

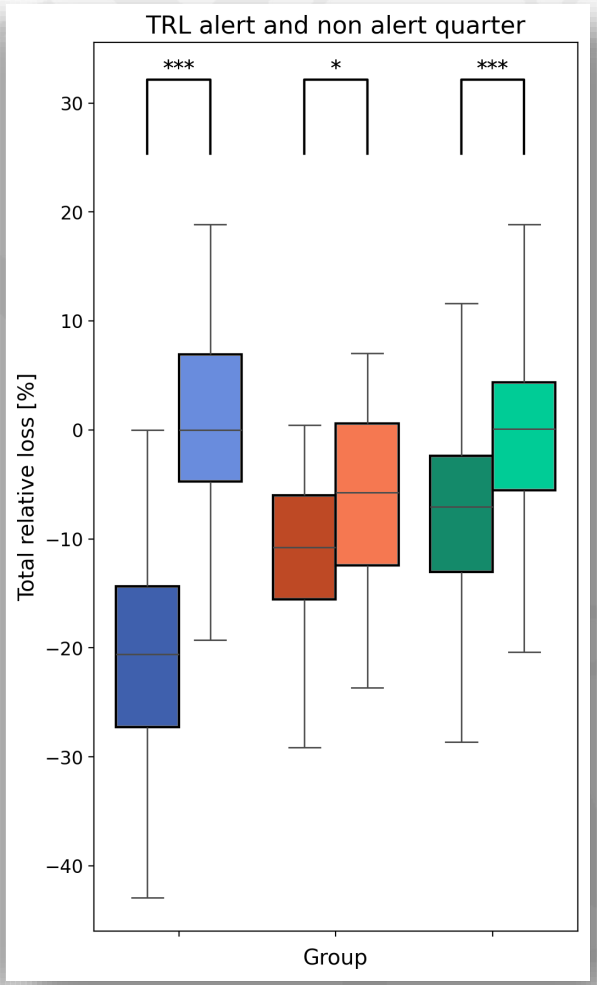
Mastitis vs Ketosis vs Natural fluctuation

Data Set 2







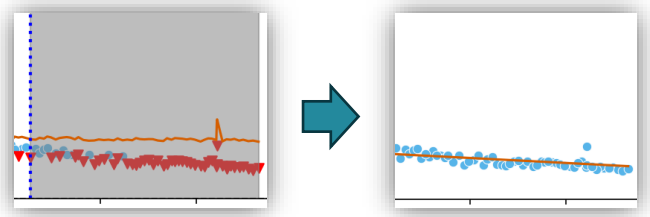


CowAlerts - Treated mastitis
CowAlerts - Treated ketosis
CowAlerts - Natural fluctuations
Total loss alert quarter
Total loss non alert quarter

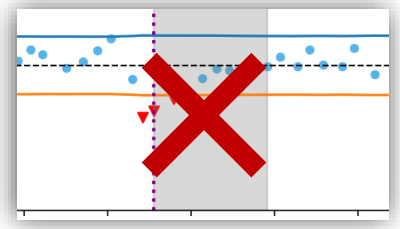
*Features are calculated on a window of -1 to 3 days around a detected alerts

Conclusion – Next steps

Q1: Where and how can we further **improve the LMM + alert rules**?

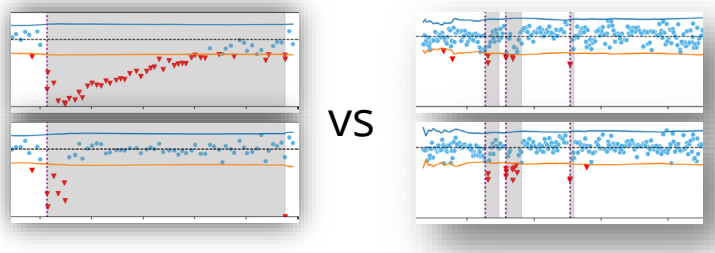


Update CowAlert model

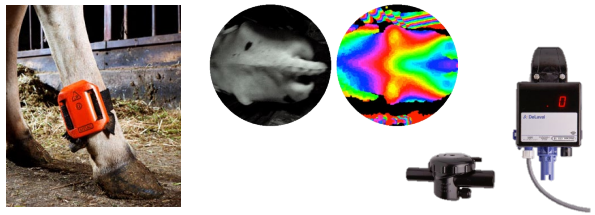


Set up adaptive alert rules

Q2: Can milk loss characteristics help **distinguish between diseases**?



Different patterns between diseases



Include additional sensor data

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Supervised by: Prof. Dr. Ben Aernouts, Dr. Ines Adriaens
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