IDENTIFYING MASTITIS EARLIER BY COMBINING TEST DAY DATA AND AMS SENSOR DATA

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Objectives

- Improvement of **detection of** potential **mastitis cows** in **AMS herds**
- Use a **combination of AMS** sensor data **and performance recording data**
- Provide different warning thresholds for improved herd management routines

⇒ **Development of a model to estimate a daily cell count status for all lactating animals in the herd**

Data description

Data set

- 113 farms / 9,859 cows
- 8,278 dual purpose Fleckvieh cows, 1,581 other breeds
- July 2020 to March 2022
- Test day records
- AMS sensor data
  - AMS somatic cell count (AMS SCC)
  - Electrical conductivity (EC)
- Training set: 93 farms / 8,244 cows
  Test set: 20 farms / 1,615 cows

Data cleaning

- At least 2 of 4 quarters with EC data
- EC > 48 "Lely units"[1]
- Milk yield > 3 kg/d, lactose > 4 %
- Days in milk > 4
- Correlation of log(SCC) from test day and AMS > 0.95

Validation data set

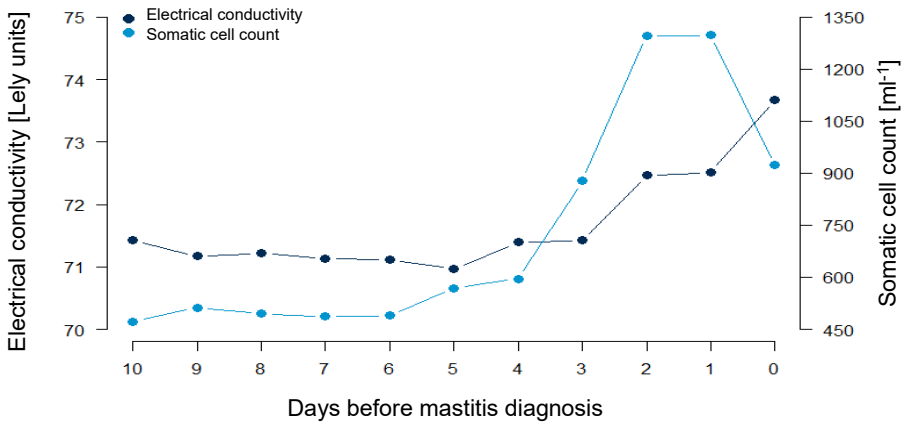
- April to August 2022
- 155 farms / 11,493 cows

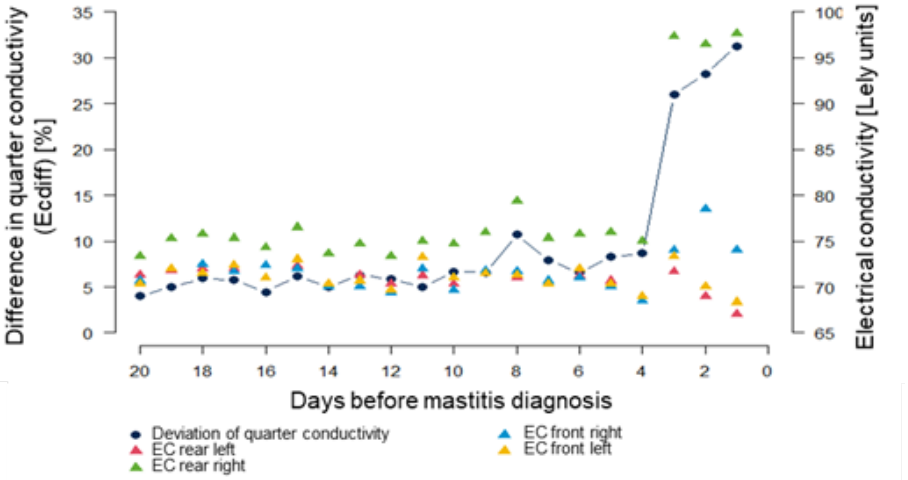
[1] 100 „Lely units" = 6 mS/cm ⇒ 70 = normal

Concept of modelling

Aim

- Develop a model combining daily AMS data and test day data to identify cows with
  - SCC ≥ 200.000 per ml
  - SCC ≥ 400.000 per ml





Concept of modelling

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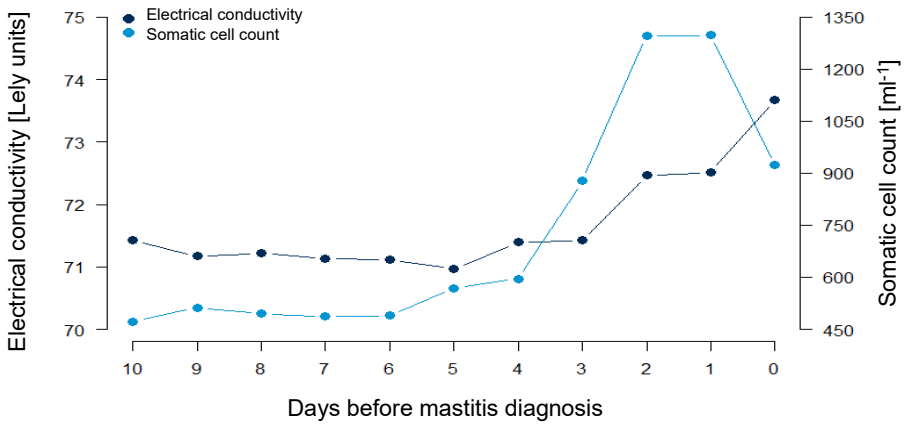
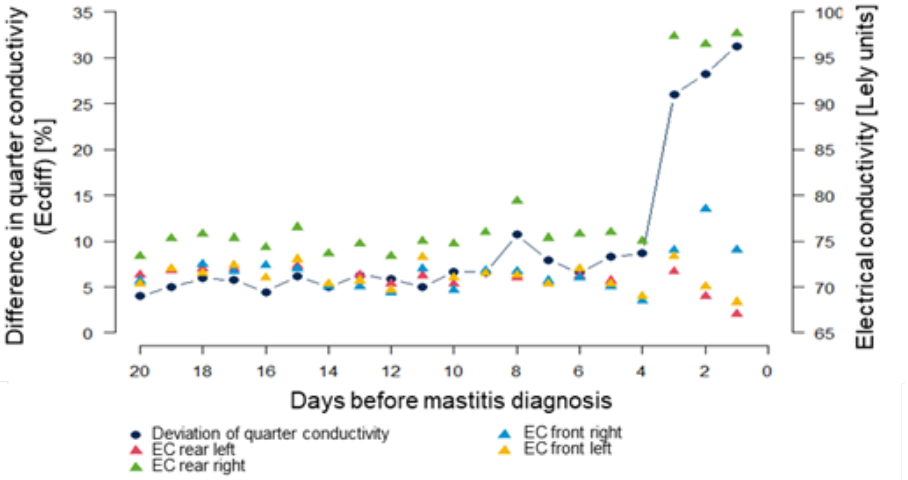
Explanatory variables used

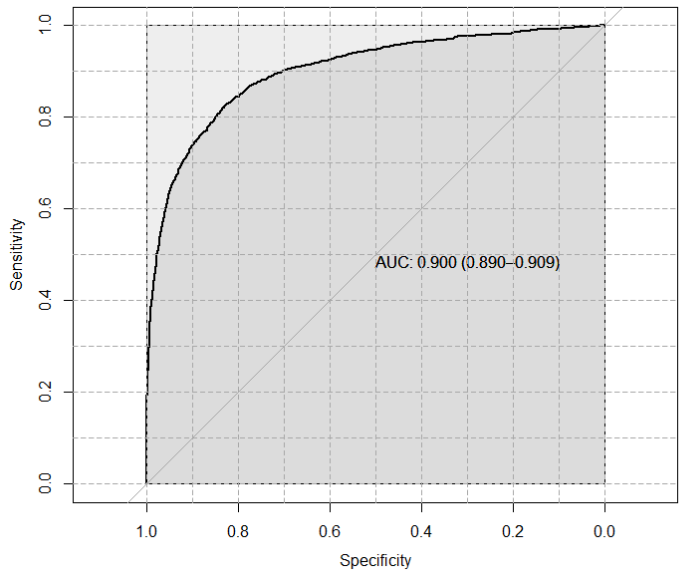
- **AMS data**
  - SCC
  - Difference in quarter conductivity (Ecdiff)
  - Daily milk yield
- **Test day data** (last test day before prediction)
  - SCC
  - Milk constituents
  - Days in milk
  - Breed
  - Lactation number

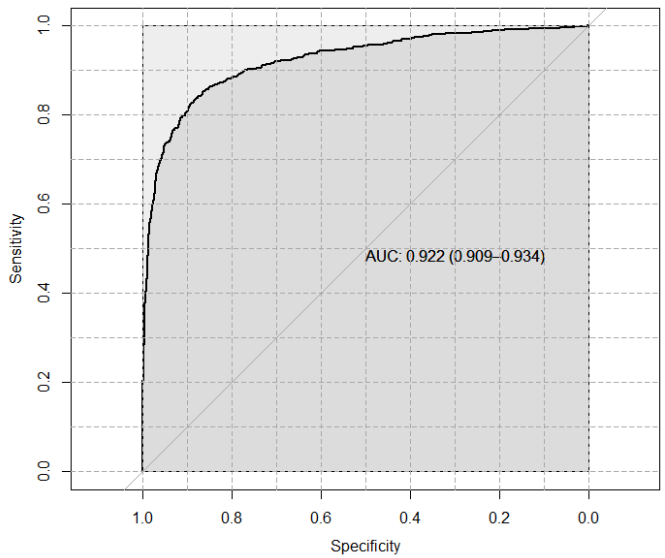




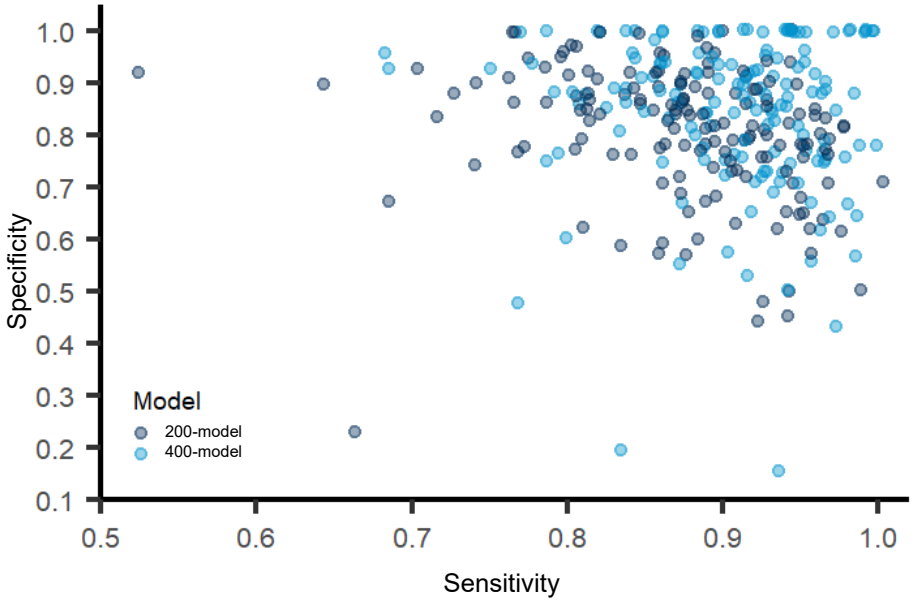
Generalised linear model

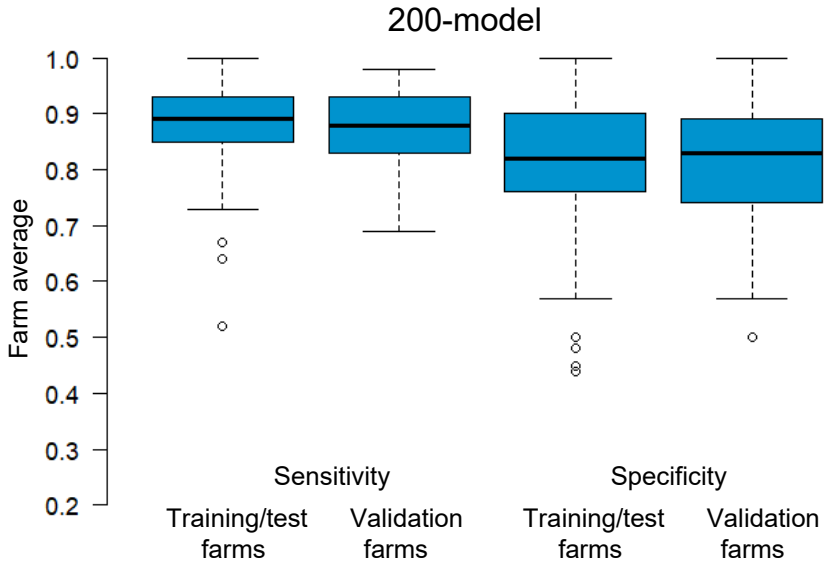
	200-model	400-model
Dependent variable	0: SCC < 200 — 1: SCC ≥ 200	0: SCC < 400 — 1: SCC ≥ 400
Explanatory variables	SCC AMS; SCC test day; ECdiff; lactose-%; milk-kg; DIM	SCC AMS; SCC test day; ECdiff; lactose-%; milk-kg; DIM
Variables not used	Lactation number; fat-%; protein-%; breed	
Sensitivity	**0,83**	**0,88**
Specificity	**0,83**	**0,83**





Sensitivity and specificity on farm level

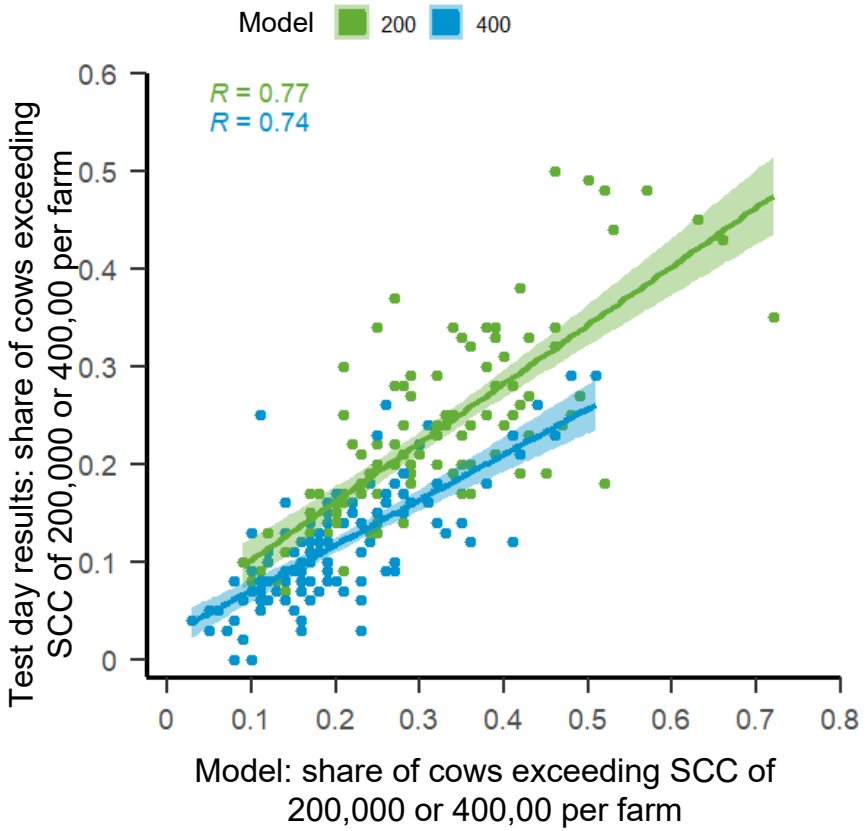


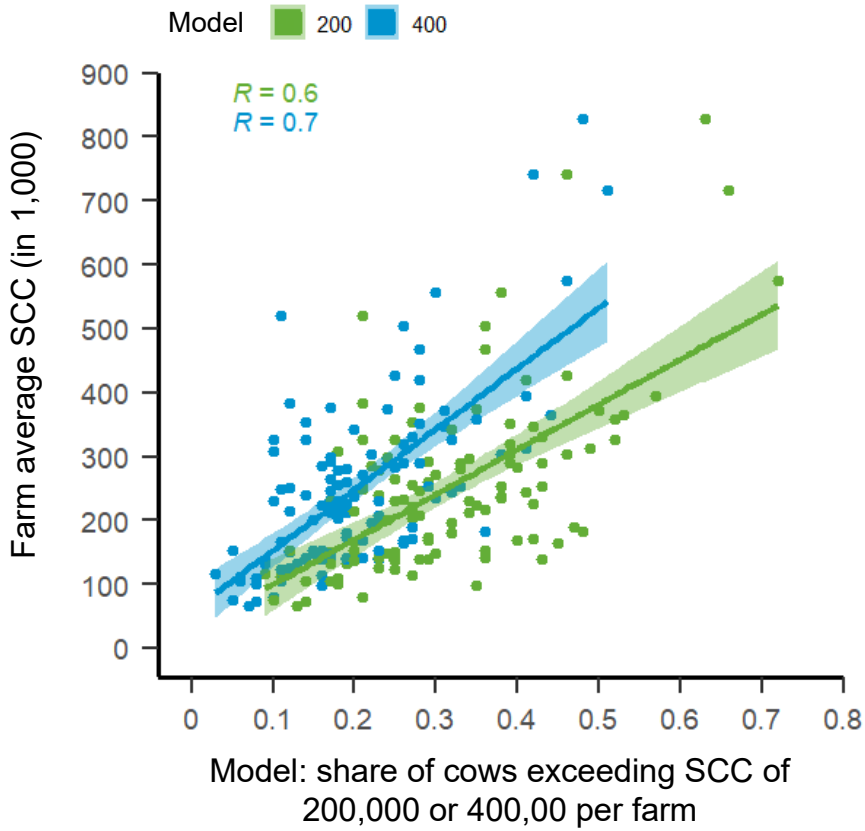


⇒ Model performs well on most farms

⇒ Model can be used for farms that were not in the training set

Classification of farms





⇒ Mastitis problems can be detected

Evaluation phase

- Weekly e-mail report for farms
- Daily individual cow status combining both models
  - Status 0: predicted SCC status <200.000 cells/ml
    Status 1: predicted SCC status ≥200.000 and <400.000 cells/ml
    Status 2: predicted SCC status ≥400.000 cells/ml

Stallnr.	Name	LOM	Zellzahl-Status am							Datum Beobachtung	Beobachtung
			25.06.	24.06.	23.06.	22.06.	21.06.	20.06.	19.06.		
499	Susi	DE 09 123 45603	2	2	2	1	2	1	0	24.06.	BU positiv
528	Bella	DE 09 123 45606	2	1	1	0	0	0	0		
530	Alma	DE 09 123 45607	1	2	2	2	2	2	2	20.06.	BU positiv
624	Heidi	DE 09 123 45601	1	1	0	1	0	0	0		
609	Berta	DE 09 123 45605	0	0	1	1	2	2	2		
616	Paula	DE 09 123 45602			0	1	1	1	1		
621	Emma	DE 09 123 45604	0	0	0	0	0	0	0	17.06.	CMT negativ

By-product: Evaluation of AMS SCC measurement

- 200- and 400-models were also implemented without using AMS SCC data
- Model performance was still satisfying

	200-model	400-model
Sensitivity	**0,79**	**0,75**
Specificity	**0,82**	**0,83**

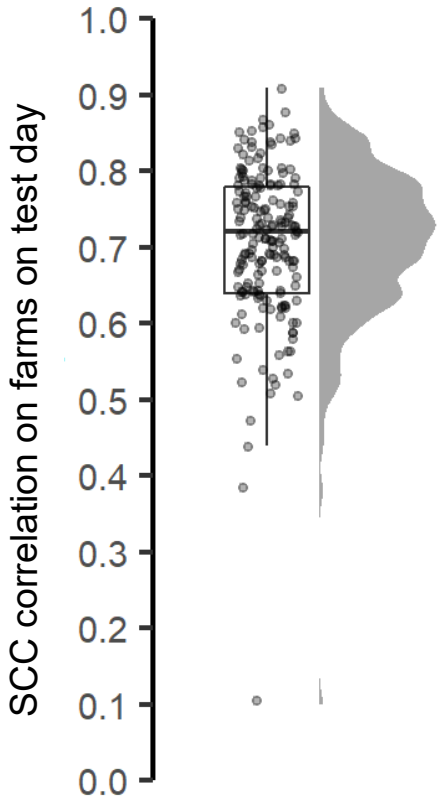
⇒ SCC prediction is also available for farms without inline SCC measurement system

By-product: Evaluation of AMS SCC measurement

- 144 farms with at least 5 test days were analysed: Correlation lab SCC - AMS SCC > 0.7
  - on all test days: 19 farms
  - on more than half of test days: 99 farms
  - frequently fluctuating correlations: 26 farms

⇒ For farms with inline SCC measurement, congruence between AMS and lab SCC on test days determines which model is applied

⇒ Together with cow report, farms receive information about SCC correlation between AMS measurements and lab results



Summary and Outlook

- Classification for cell count thresholds works well
- Classification is also possible for farms without inline cell count measurement
- Model can be extended to new farms

- What's next:
  - Collect feedback from pilot farms
  - Implementation in herd management software for daily calculation and notification
  - Extend model to other AMS brands/models (?)

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Contact us!

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