Silent Herdsman;
Automatic Classification of Eating and Ruminating in Cattle using a Collar Mounted Accelerometer

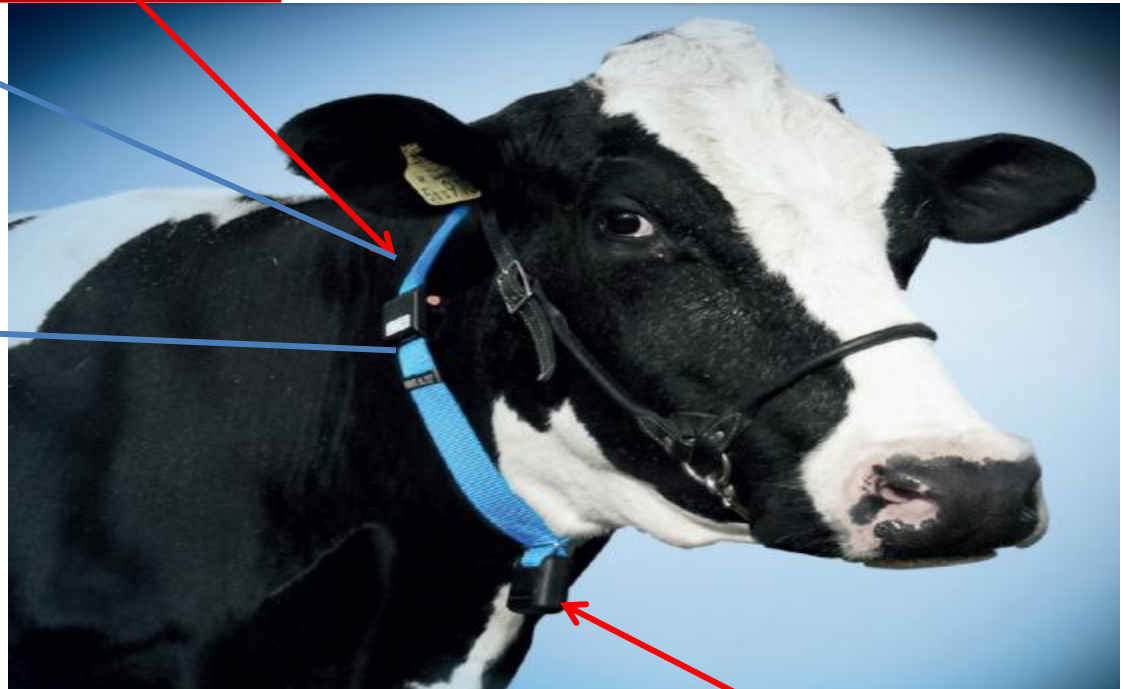**Jakub Konka[1], Craig Michie[1,2], Ivan Andonovic[1,2]**

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**[2] Silent Herdsman Ltd
Glasgow, Scotland**

Neck Mounted Collar
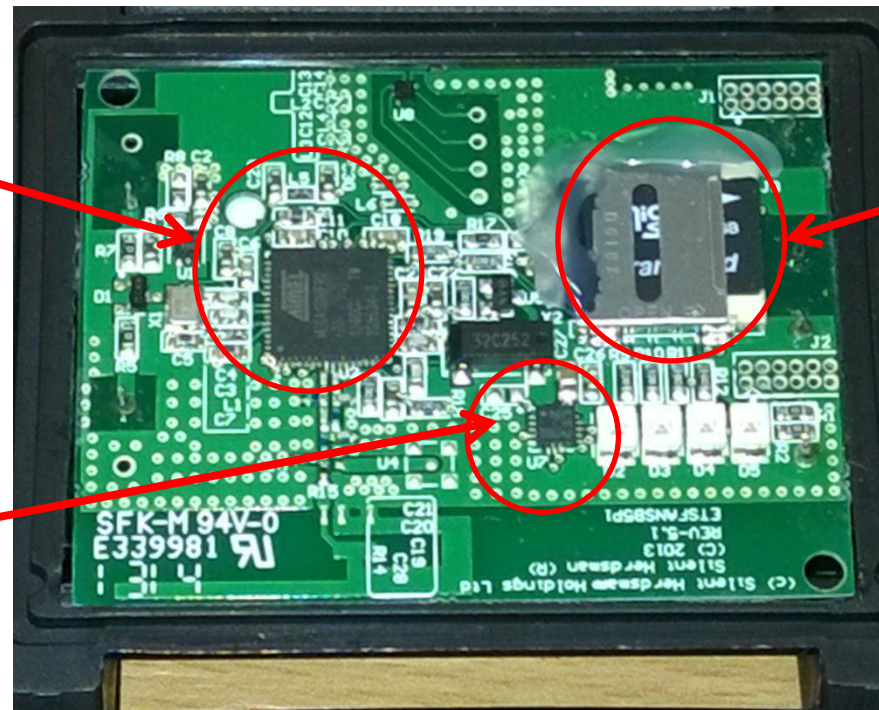
Location for collar sensor

Weight

Data Gathering Collar

Radio Microprocessor

SD Card

Accelerometer

Detecting Illness

- Activity
  - sick cows tend to be less active
- Eating
  - sick cows tend to eat less
- Rumination
  - sick cows tend to ruminate less
  - they also eat less

Feed Intake versus Time

Truthing Data

- *Hoko* Feeder
  - time stamps only give indication that cows head is in the feeder
- Video analysis is good but open to interpretation and very labour intensive
- Need another sensor that give alignment with collar…..

'Rumiwatch' Halter

Commercial in Confidence

Raw 3-axis Accelerometer Output
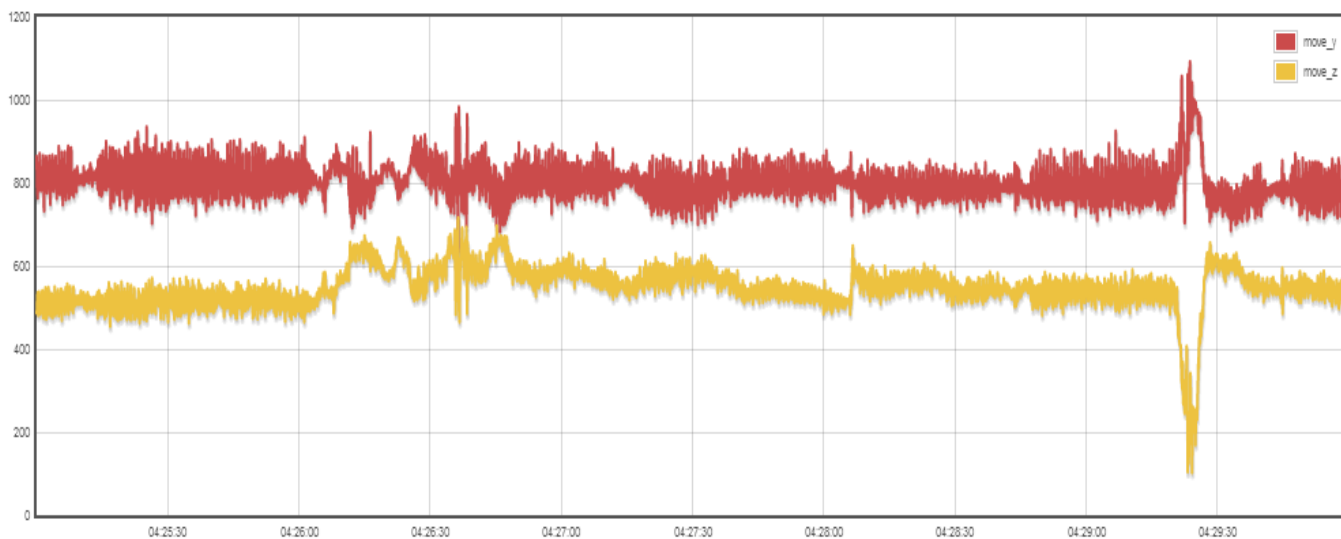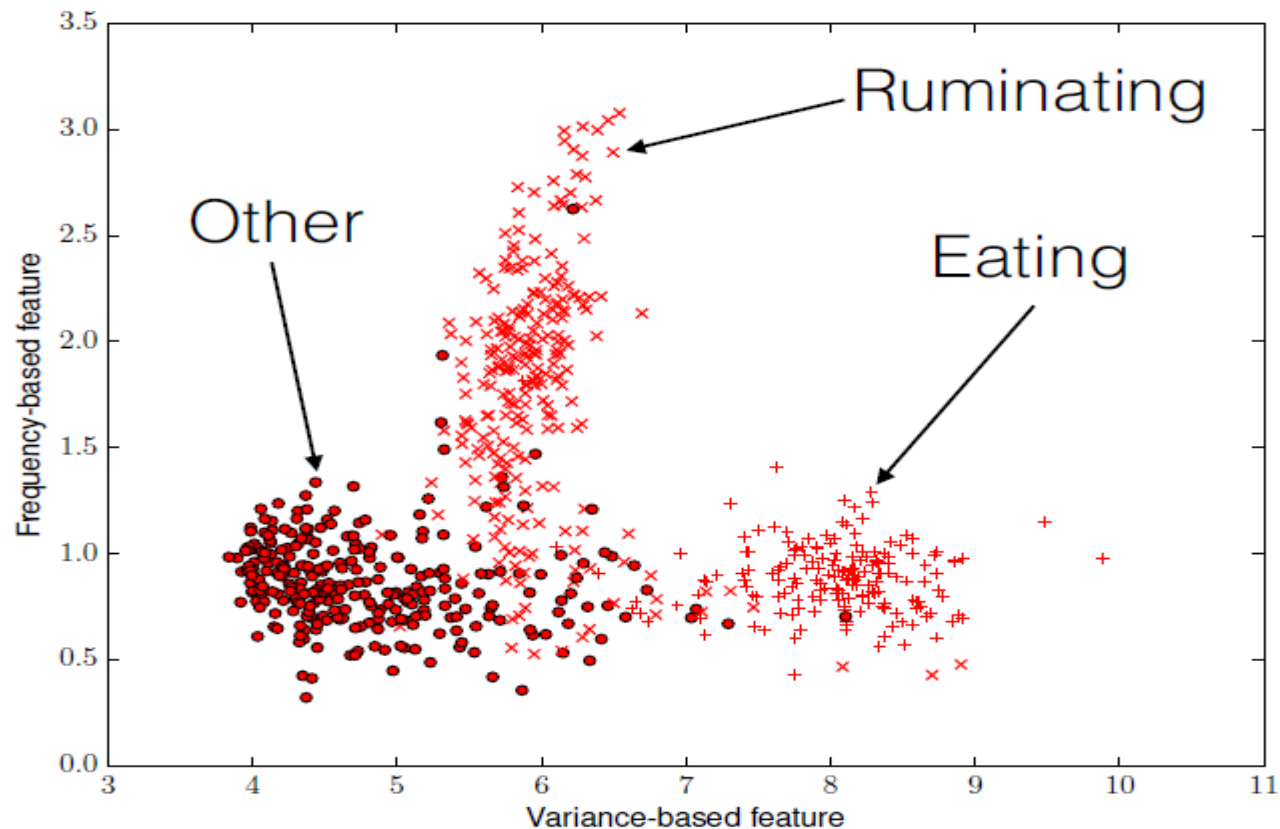
Feature Extraction

- Features relate to energy expended by cow in carrying out different functions
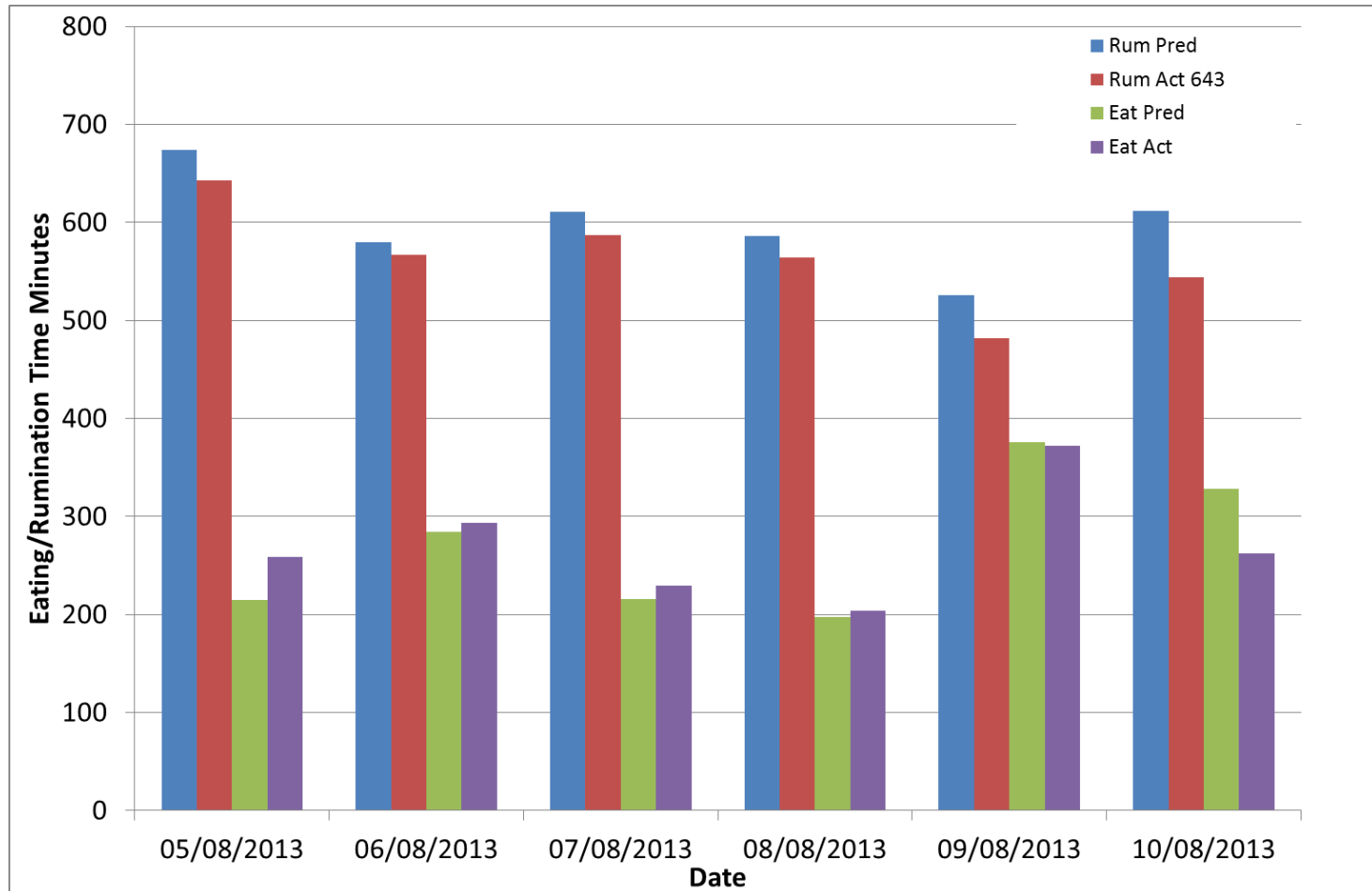- Signals are small but recoverable

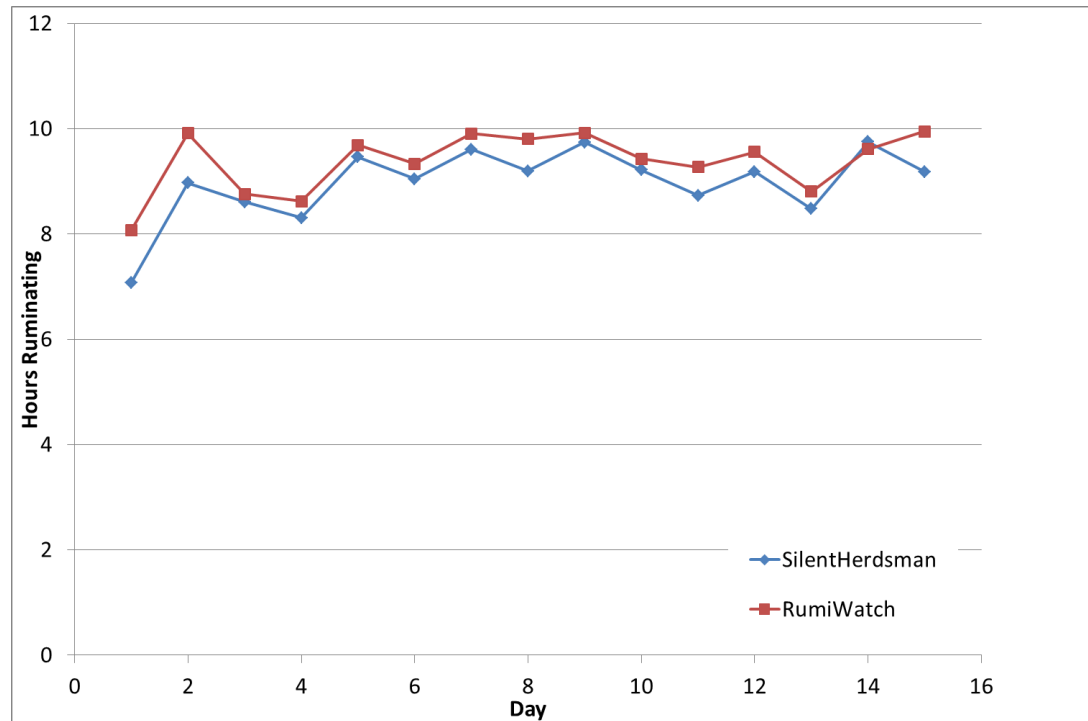# Halter and Accelerometer
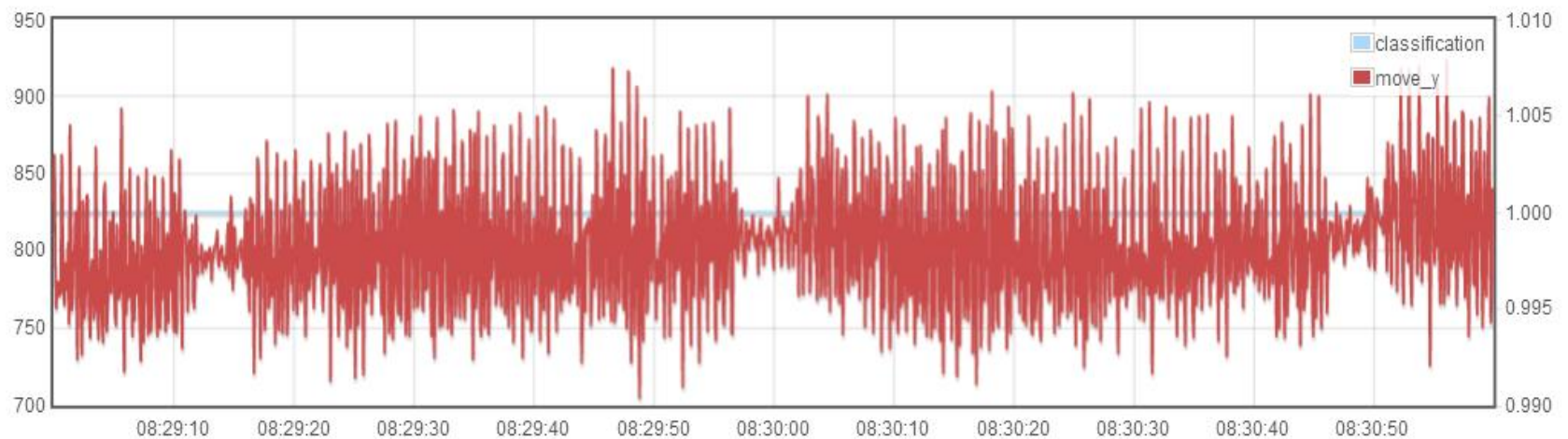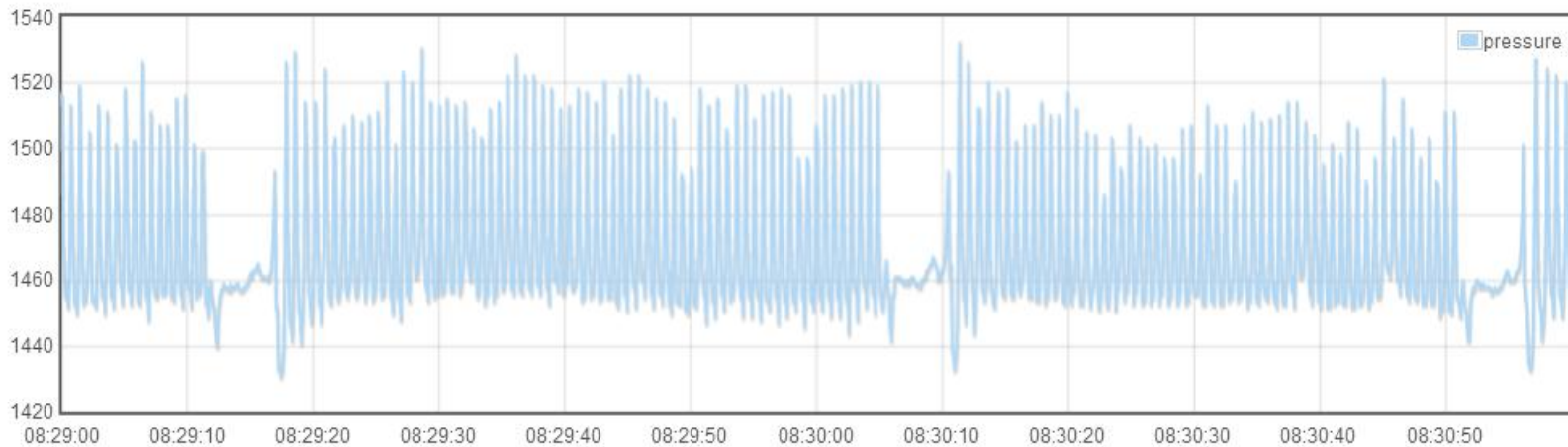
Clustering Procedure

Performance

- Rumination
  - Sensitivity >85%
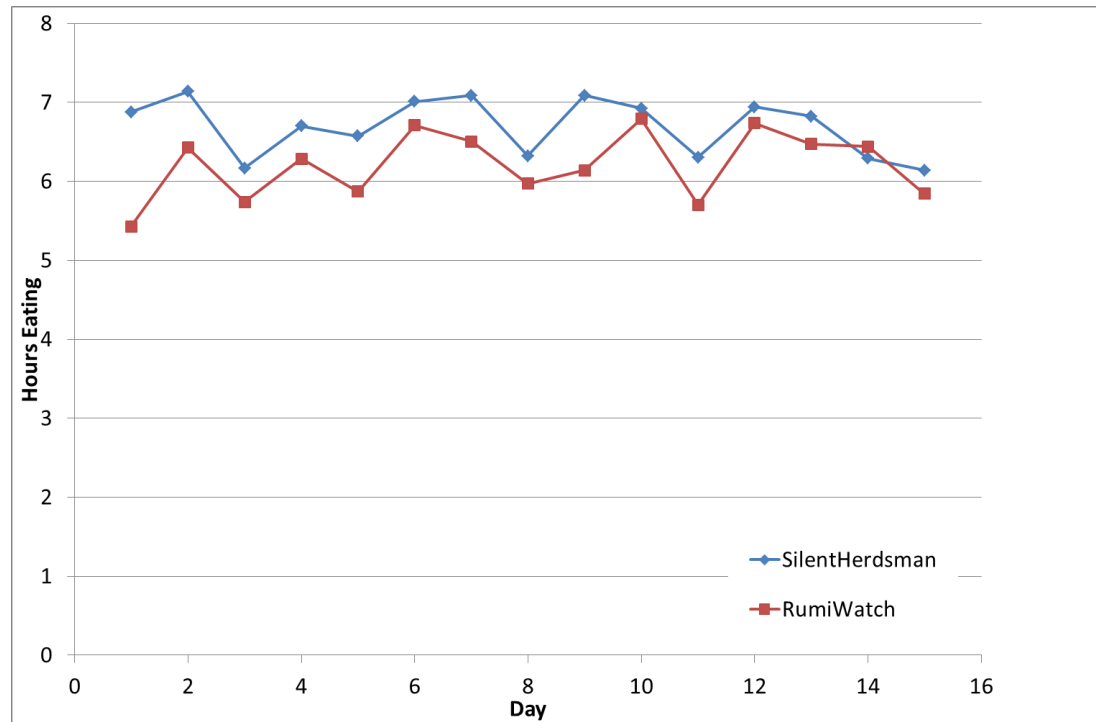 - PPV   >95%
- Eating
  - Sensitivity >85%
  - PPV   >85%
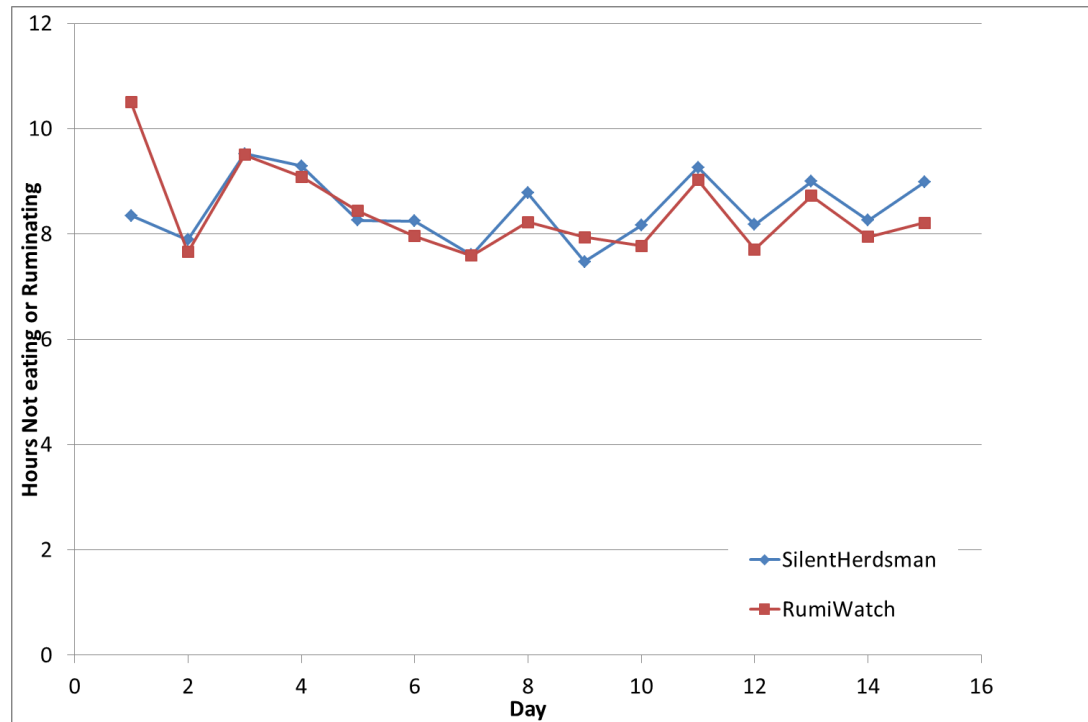
Performance
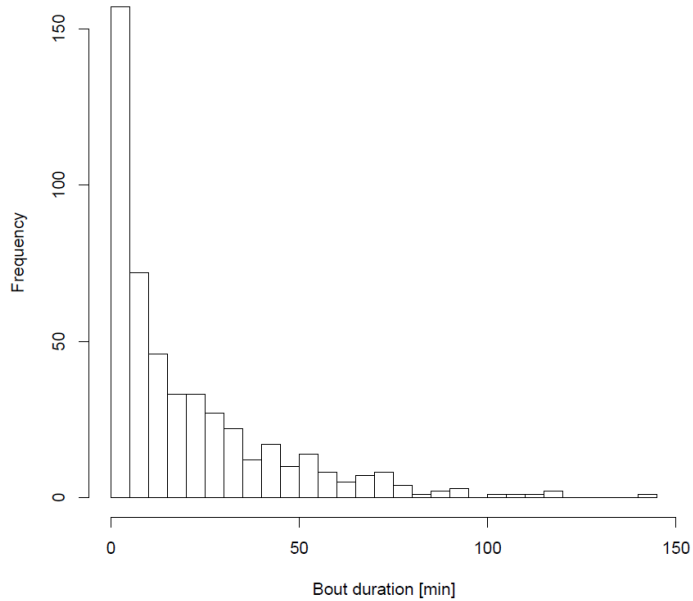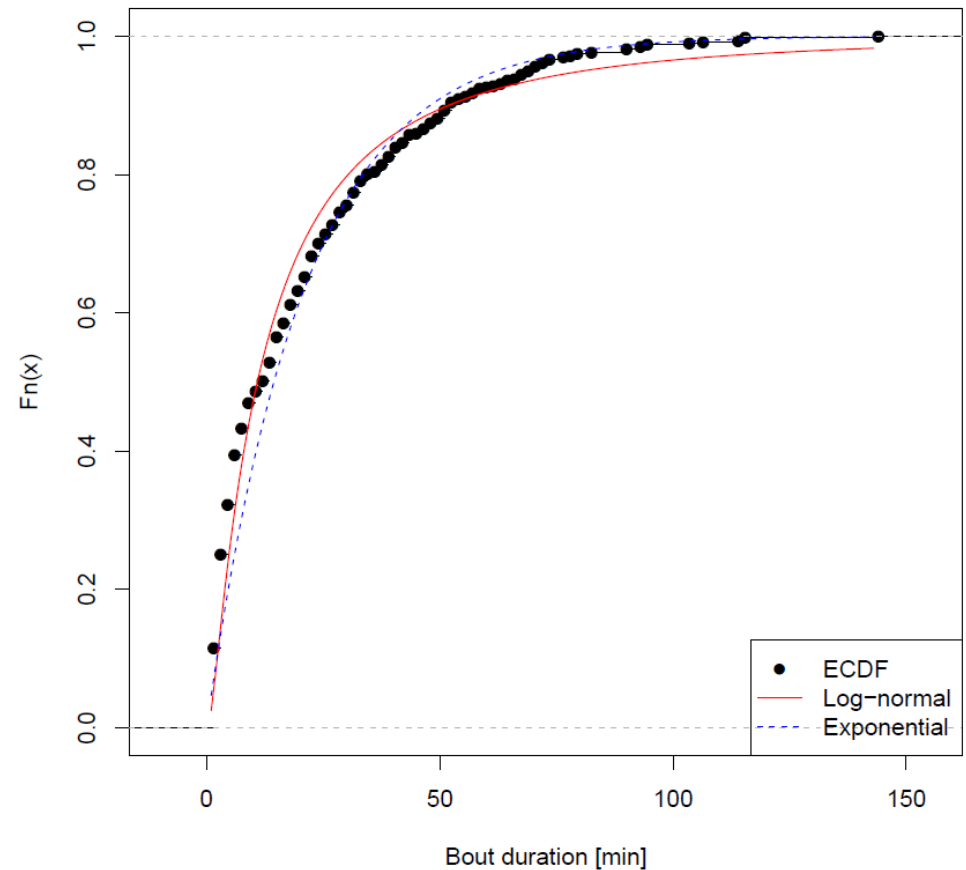
Ruminating

Eating

Other

Conclusions

- Multiple behavioural states of individual animals can be derived from the raw data captured by a neck mounted 3-axis accelerometer
    - Heat detection
    - Eating times
    - Rumination times…..other?
- improved classification performance includes temporal behaviour

What next - eating

Q–Q plot for feeding