



Analyzing Synchronized Behavior in Dairy farms

Project aim

To create support tools for analysing synchronized behaviour in dairy farms, including a summary of dairy herd movement, social interactions and behaviour.

Background & Task

Signs of non-synchronized behavior in a cow may indicate a problem. An application for the tools developed in this project is detecting signs of bad health in cows – keeping the farmer updated on the state of the cow herd. We got a set of csv files containing information about how the cows spend their day. Using Python, we then improved the given data and developed tools for analyzing cows.

Data pre-processing

- Inactive tags were removed by setting a minimum threshold of total distance travelled.
- A time threshold for changing activities to remove rapid changes, i.e., eating-walking-eating patterns.
- For some methods combine standing & walking activities.
- Cows change tags sporadically, to keep the information for each cow consistent, we matched which tag corresponds to which cow at which time.

How cows spend their days

Here we see how many hours per day an example cow spend on each activity. As can be seen not all days are the same.

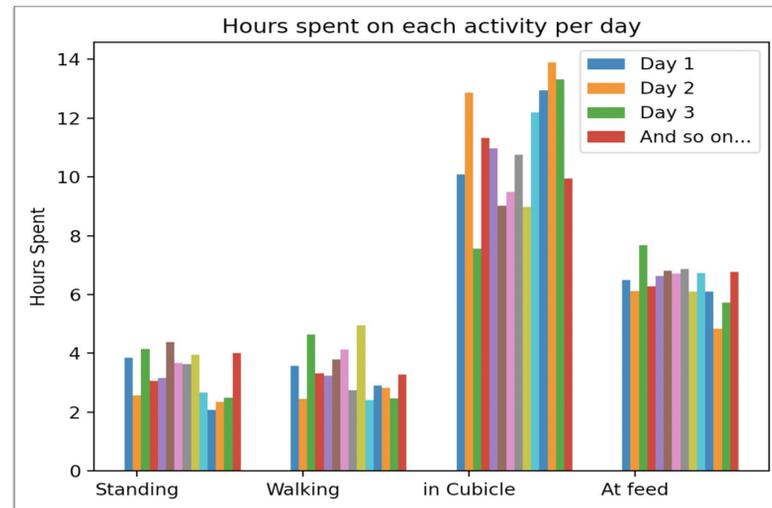


Figure 1: How many hours a cow spend each day on each of the 4 activities. Here we are using 14 days of data.

Deviation from average

Here we took the average time spent on the 4 activities. Once knowing the average for each activity this tool then plotted the deviation from that average for each day. This can be useful in spotting abnormal behavior which may be indicative of something going wrong.

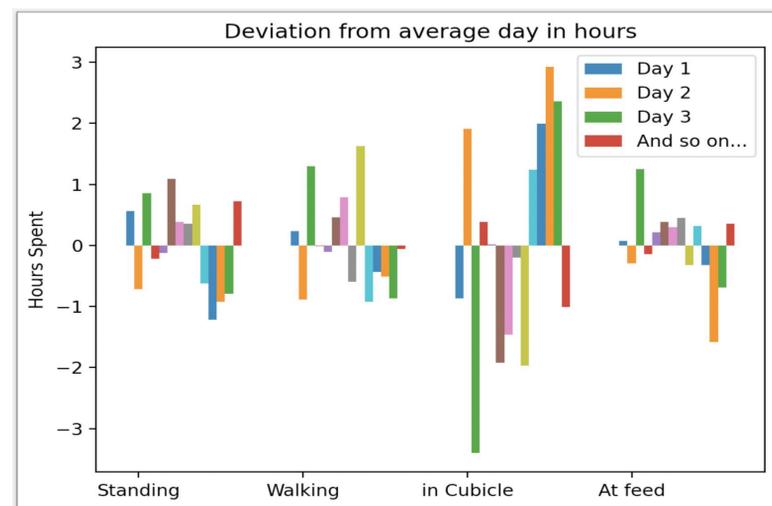


Figure 2: Deviation from daily average time spent performing an activity.

Pairwise synchrony

By calculating the synchrony between each pair of cows and then performing cluster analysis, we can detect communities of cows that display a more synchronized behaviour. Synchrony here is defined as the time spent on the same activity for both cows, divided by the time spent on said activity for either of the cows.

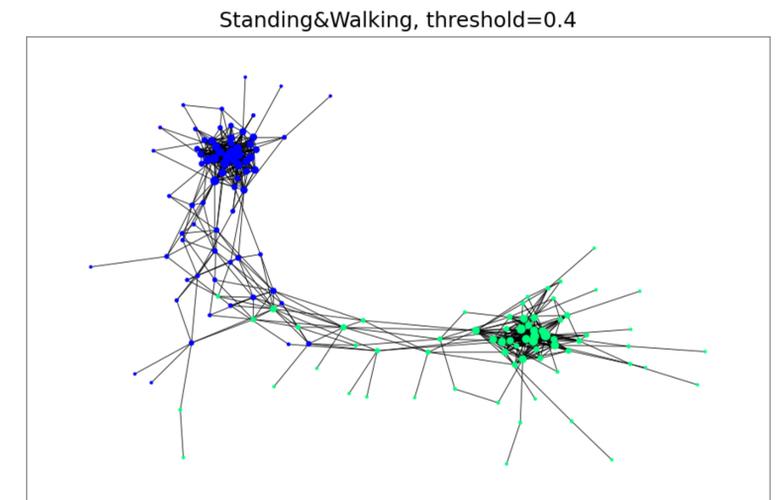


Figure 3: Each dot represents a cow, the colour represents which side of the barn (left or right), and each line represents a synchrony value above 40%. The activity here is standing and/or walking.

Conclusion & further research

The cows display a somewhat synchronized behaviour. This is hard to detect, one reason being their frequent deviation from their average routine. Further analysis would be needed for a longer time span. Further research is recommended to analyse the cows in real time to visually find social bonds to help further analysis.

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