

Title: Software optimization and parallel computing of social network construction in dairy cows

Company/Institution: SLU in collaboration with RISE Institute.

Supervisor: Lars Rönnegård, SLU

Background: In our research project, data from dairy cattle in free-stall barns have been collected since the beginning of 2020 using an ultra-wide band location system where each individual cow's position in the barn is updated every second. We collect data from two herds, one in Sweden and one in The Netherlands with around 250 dairy cows on each farm. The activities (sleeping, eating, walking, standing) of all cows are registered continuously.

The overall aims of the research project are:

- To develop tools for summarizing animal movement and social interactions in dairy farms.
- To develop decision-support tools for minimizing disease transmission within dairy farms based on knowledge gained from animal movement and social interactions.
- To develop methodology for breeding on indirect genetic effects, ie inherited social effects.

The research project will run from 2020 to 2022 and is a collaboration between SLU in Uppsala, RISE, Växa Sverige and University of Copenhagen. Seven senior researchers, four postdocs and two PhD students are currently involved in the project. For more information see

<https://www.slu.se/en/faculties/vh/research/forskningsprojekt/not/precision-livestock-breeding/>

Goals: A modern farm usually is the home for around 250 cows. These cows make around 4 million contacts every day. Your task is to investigate how to calculate cow social contact using position data efficiently. The task may also involve using parallel computing in UPPMAX. This is important for understanding cow-to-cow interactions. There is Matlab code available to guide you.