Change point detection for precision agriculture

Phd project summary

Weight monitoring is a conventional tool used for the careful tracking of livestock. It is an automated and non-invasive method that helps to assess the health status of animals. In this context, the LIMOS laboratory studies data collected from an outdoor automatic lamb-weighing system called Wow [1]. The lambs were initially weighed and divided into three groups according to their weight (low, medium, high) in order to remove outliers collected by the automatic weighing system. These outliers are caused by several animals simultaneously stepping onto the scale, variations in crossing speed, accumulation of excrement on the scale, etc. In the end, 61% of the collected data is discarded.

The objective of the PhD is the unsupervised change point detection [2] of Wow data in order to alert farmers to potential problems affecting a particular lamb.

The different stages of the PhD are as follows:

1. Analysis of Wow data in order to identify its structural characteristics.
2. Literature review on change point detection, with a focus on algorithms that best match the characteristics of Wow data and the adjustments required to theoretically achieve better performance.
3. Development of algorithms and their validation using synthetic datasets with controlled characteristics, in order to assess the strengths and weaknesses of the algorithms.
4. Application of the developed methods to Wow data and validation of the results by domain experts.

Particular attention will be given to clustering-based change point detection techniques, uncertainty management using fuzzy set theory or belief functions, and cost-function-based approaches.

Application deadline: 30/06/2026

Required profile and skills:
Master’s degree or Engineering degree in Applied Mathematics or Computer Science, with strong foundations in statistics, data mining, and machine learning, as well as programming skills (Python and/or MATLAB).

Location :
The PhD will take place at LIMOS, in Clermont-Ferrand. LIMOS is a Unité Mixte de Recherche CNRS of Clermont Auvergne University, and is specialized in Computer Science.

Extra information :
- Desired starting date : October 2026
- Salairy: 2300 euros gross per month
- LIMOS contacts:
  - Violaine Antoine violaine.antoine@uca.fr
  - Jonas Koko jonas.koko@uca.fr

[1] E. Leroux, I. Llach, G. Besche, J.-D. Guyonneau, D. Montier, P.-M. Bouquet, I. Sanchez, E. González-García. Evaluating a Walk-over-Weighing system for the automatic monitoring of growth in postweaned Mérinos d'Arles ewe lambs under Mediterranean grazing conditions. *Animal-Open Space*, *2*, 100032, 2023.
[2] S. Aminikhanghahi, D.J. Cook. A survey of methods for time series change point detection. *Knowledge and information systems*, *51*(2), 339-367, 2017.