

PhD position : Automatic detection of circadian anomalies of dairy cows using wavelets and fuzzy logic

Location :

- LIMOS (UCA - Aubière) <http://www.limos.fr>
- UMRH (INRAE - Theix) <https://umrhbioinfo.clermont.inrae.fr/Intranet/web/UMRH>

Supervisors :

- Violaine Antoine (LIMOS) Violaine.Antoine@uca.fr
- Jonas Koko (LIMOS) Jonas.Koko@uca.fr
- Isabelle Veissier (UMRH) Isabelle.Veissier@inrae.fr
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Research work

The PhD thesis is part of a project which aims to develop methods for early detection of health problems or stress through the behavior of an animal recorded by sensors. Ultimately, these methods can be implemented in precision breeding tools. A first machine learning method, to detect anomalies in activity rhythm, was designed using a Fourier transform (Wagner et al., 2020b). The candidate will have to continue this work to improve the reliability and accuracy of detection. He / she will be able to explore the following approaches:

- Use unsupervised learning algorithms to see if certain health or stress problems induce similar behaviors.
- Use artificial neural networks to detect not only anomalies in the rhythm of activity (considered as a time series) but also their nature (lameness, oestrus, mastitis, etc).
- Explore wavelet transforms and/or topographic classification to better account for signal asymmetry between day and night
- Use fuzzy logic to take into account the onset and progressive disappearance of disorders (promising results have been obtained (Wagner et al., 2020a)).

These developments will be tested on data sets acquired by the laboratory (dairy cow activity level).

Training and skills

- Master's degree
- Strong backgrounds in Data Science or/and in Applied Mathematics
- Knowledge of some programming languages (C/C++, MATLAB, Python)

Remuneration : 1500€/month

Application : Deadline June 20. Application must include a CV, an application letter, copies of Master diploma or grades. To be sent to the supervisors.

References

Wagner, N., V. Antoine, J. Koko, and R. Lardy. 2020a. Fuzzy k-NN Based Classifiers for Time Series with Soft Labels. Pages 578-589. Springer International Publishing, Cham.

Wagner, N., Antoine, J. Koko, M. Mialon, R. Lardy, and I. Veissier. 2020b. Comparison of Machine Learning methods to detect anomalies in the activity of dairy cows. Pages 342-351 in Proc. IFoundations of Intelligent Systems. ISMIS 2020. Springer, Cham.