



**HAL**  
open science

## Prediction of daily nutritional requirements of gestating sows based on their behaviour and machine learning methods

Maëva Durand, Christine Largouët, Louis Bonneau de Beaufort, Jean-Yves Dourmad, Charlotte Gaillard

### ► To cite this version:

Maëva Durand, Christine Largouët, Louis Bonneau de Beaufort, Jean-Yves Dourmad, Charlotte Gaillard. Prediction of daily nutritional requirements of gestating sows based on their behaviour and machine learning methods. ESPHM - 14th European symposium of porcine health management, May 2023, Thessalokini, Greece. pp.1-1, 2023. hal-04119697

**HAL Id: hal-04119697**

**<https://hal.inrae.fr/hal-04119697>**

Submitted on 6 Jun 2023

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License



maeva.durand@inrae.fr

# Prediction of daily nutritional requirements of gestating sows based on their behaviour and machine learning methods

M. DURAND, C. LARGOUËT, L. BONNEAU, J.Y. DOURMAD, C. GAILLARD

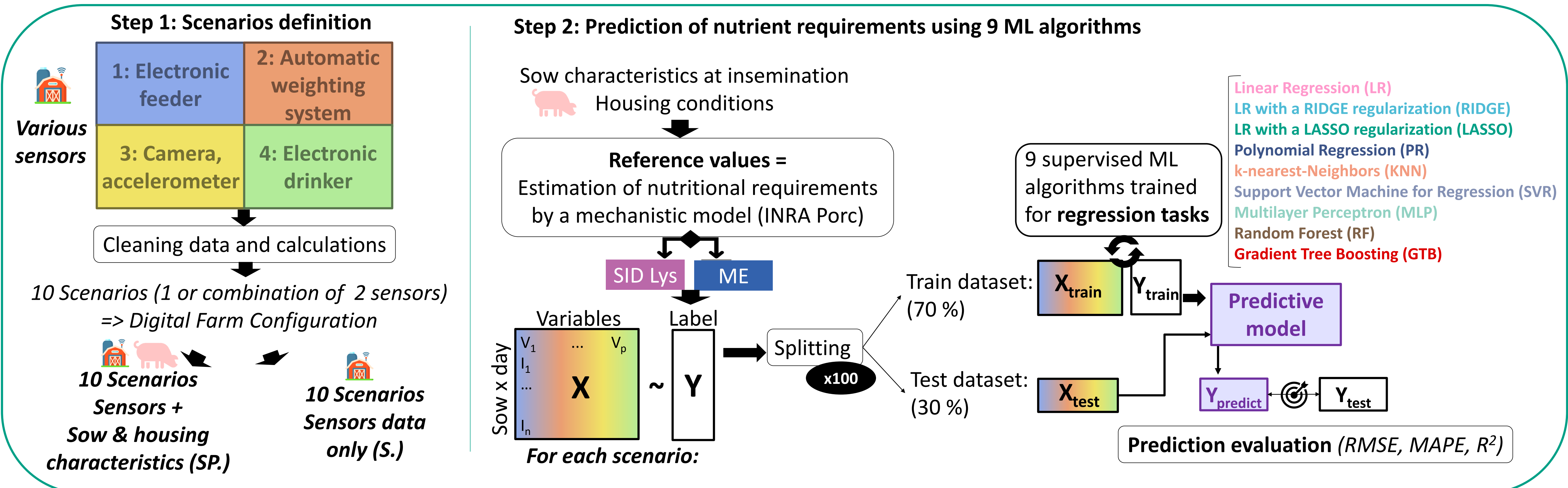
## BACKGROUND & OBJECTIVE

- Precision Feeding** aims to define the right feeding strategy according to **individual's nutrient requirements**, to reduce feed cost and environmental losses.
- Usually, the nutrient requirements of gestating sows are calculated by a **mechanistic nutritional model** requiring input data such as sows and herd characteristics.
- Aim of this study: Prediction of nutritional requirements using machine learning methods and sensor data.**

## CONCLUSION

- Machine learning methods using sensor data and behavioural data can accurately predict** the sows daily requirements (error under 7 % for energy and 12% for lysine) which could **simplify the application** of precision feeding on farms.
- Sow's activity, feeding behaviour, and body weight** are the best predictors. **Adding sow and housing characteristics** significantly improves the results.
- Gradient Tree Boosting** is the most accurate ML algorithm.

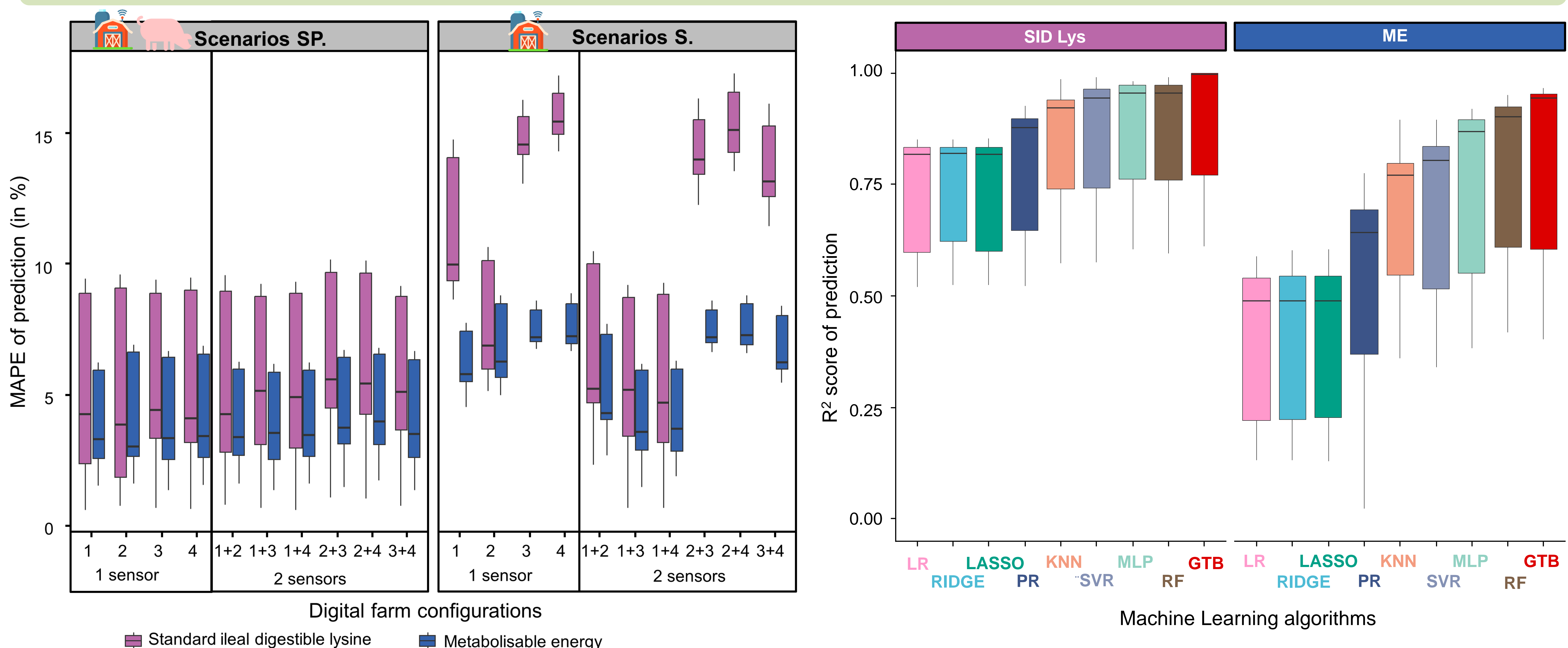
## MATERIAL AND METHODS



SID Lys: Standard ileal digestible lysine; ME: Metabolisable energy; RMSE: Root Mean Square Error ; MAPE: Mean Absolute Percentage Error; R<sup>2</sup>: coefficient of determination

## RESULTS

Integration of sow and housing characteristics (scenarios SP.) reduced the RMSE by 20% for energy and 35% for lysine.



Lower MAPE obtained using scenarios SP with **automatic weighting system + feeder** for lysine (5.31%) and with **feeder + activity sensors** for energy (3.88%).

R<sup>2</sup> values were higher with **Gradient Tree Boosting** (0.95 for energy and 0.99 for lysine) compared to those obtained with **linear regression** (0.52 and 0.83).