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

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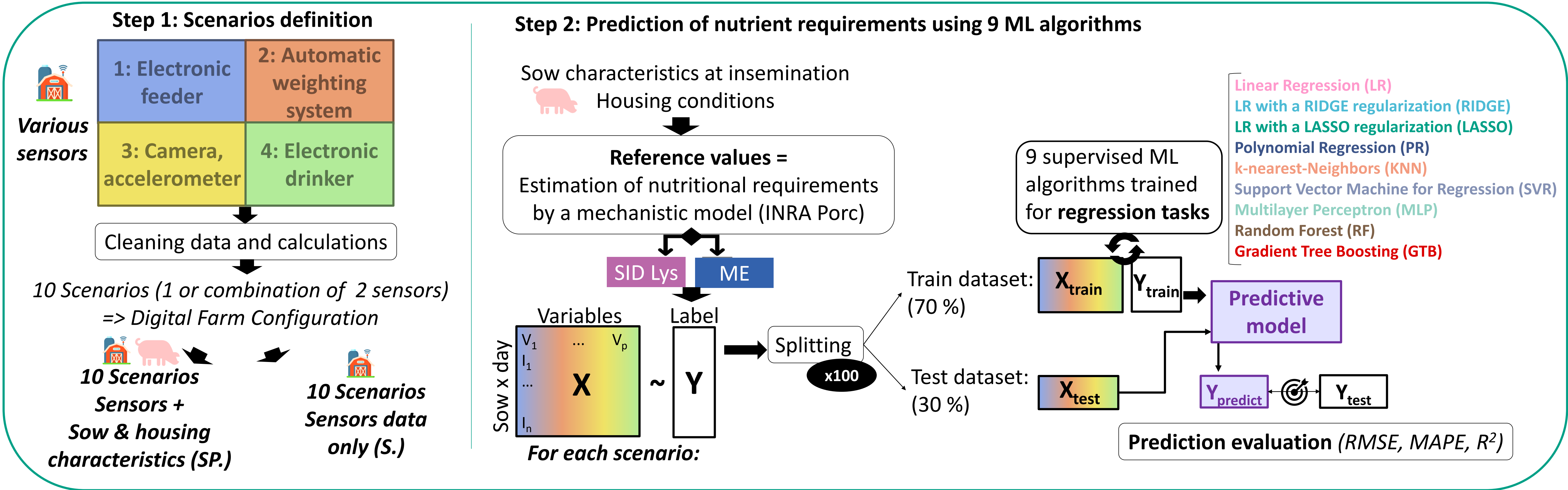
BACKGROUND & OBJECTIVE

- 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.

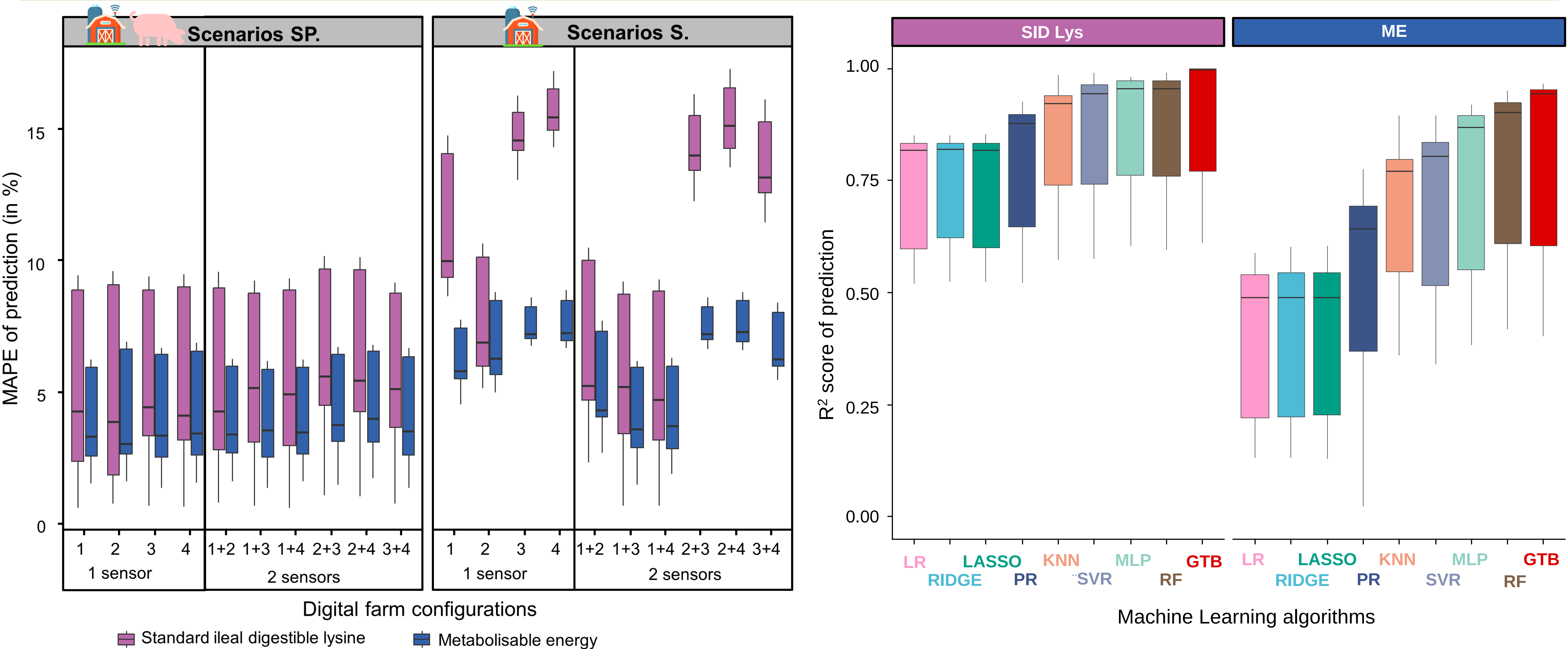
MATERIAL AND METHODS



SID Lys: Standard ileal digestible lysine; ME: Metabolisable energy; RMSE: Root Mean Square Error ; MAPE: Mean Absolute Percentage Error; R2: 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^2 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).