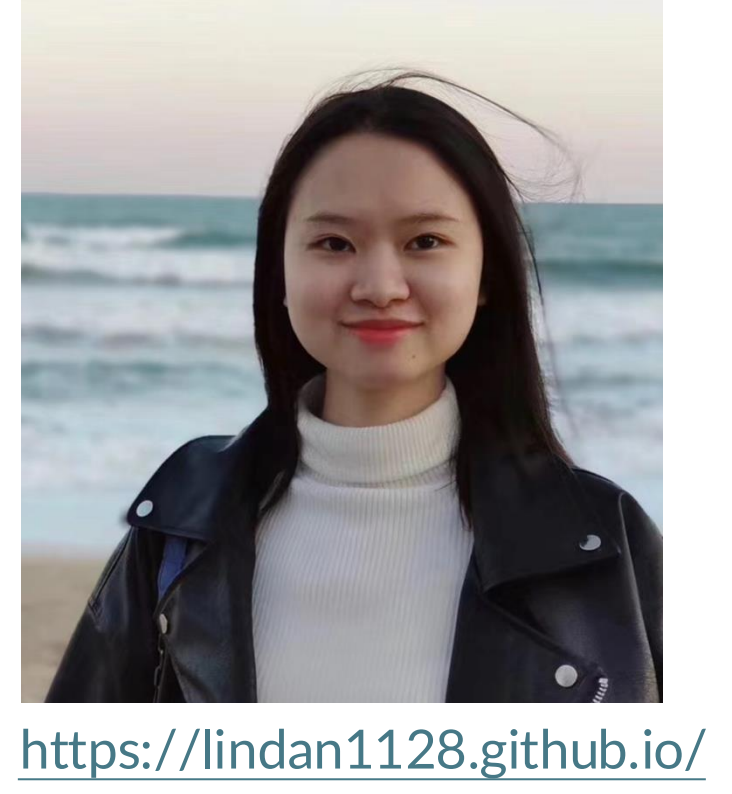


# Prediction and classification of metritis and mastitis in Holstein cows using transition milk spectra and machine learning

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<https://lindan1128.github.io/>

## Introduction

- Metritis and mastitis are the most **common early-lactation diseases** in Holstein dairy cows.
- Non-invasive monitoring based on activity or rumination sensors shows limited sensitivity, as diseases may induce minimal behavioral changes.
- Milk Fourier-transform infrared (FTIR) spectroscopy may offer an alternative **non-invasive approach**, but its potential remains unknown.

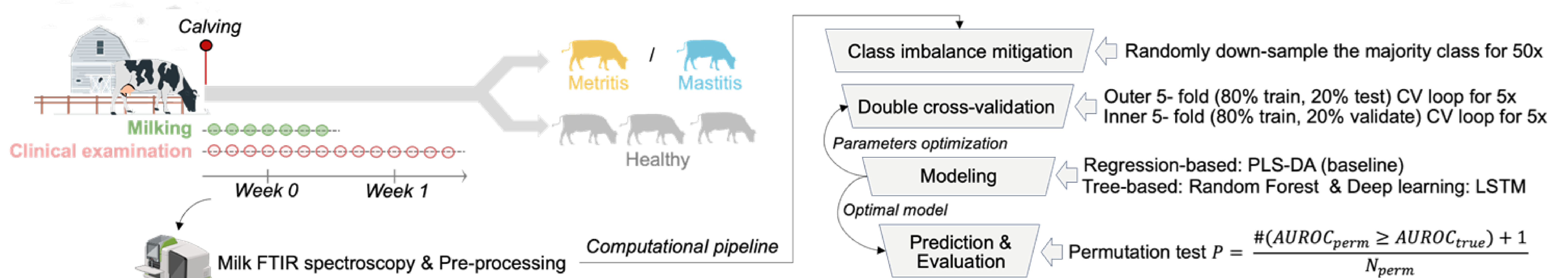
## Objectives

- To evaluate FTIR spectral variations between dairy cows with specific postpartum diseases and healthy cows at matched days in milk:
- To compare spectral patterns between healthy cows and those at risk of metritis or mastitis and assess their predictive performance
- To compare spectral differences and their associated impact on the classification performance between cows at risk for metritis and mastitis

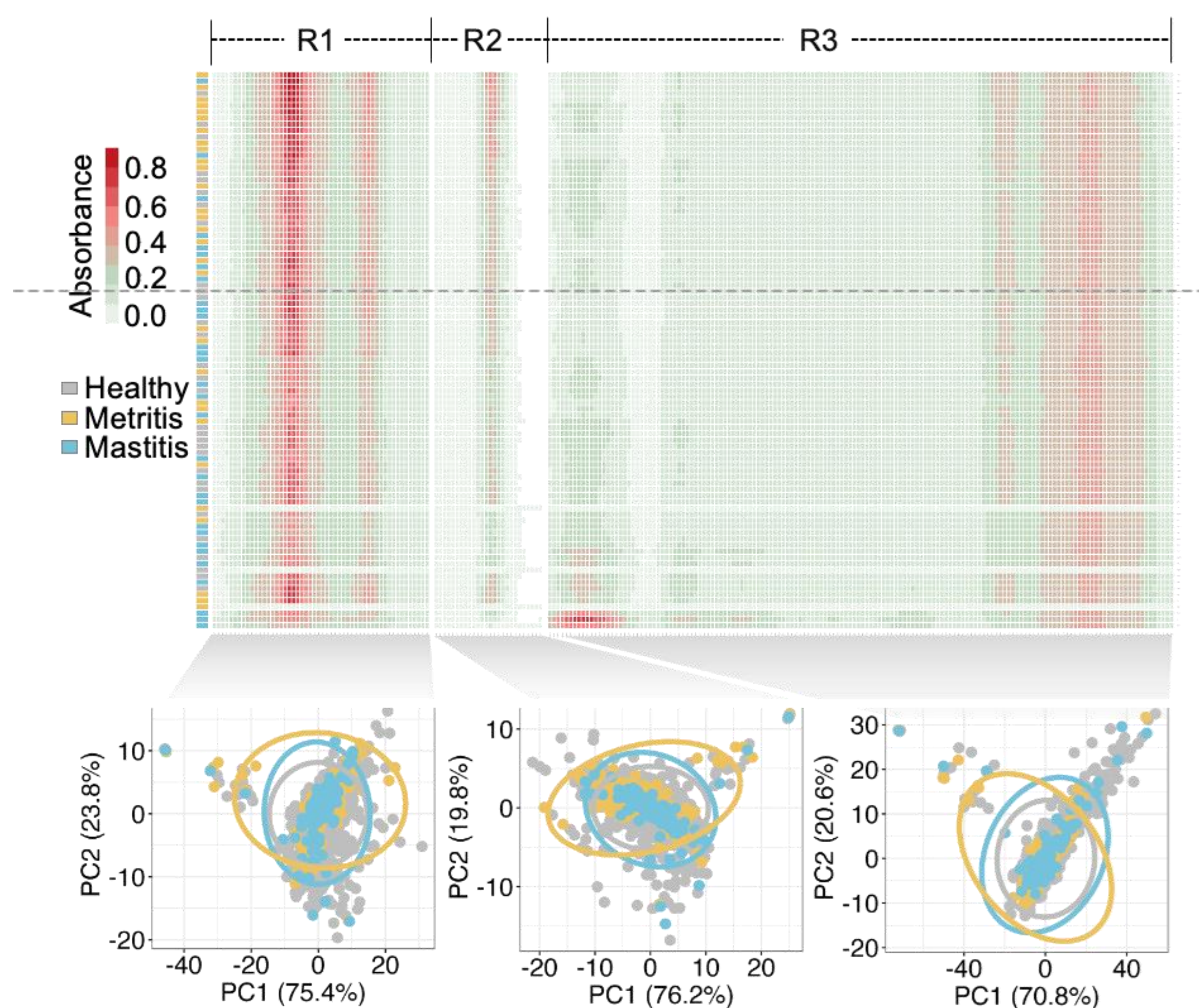
## Conclusions

- Metritis-associated spectra **diverged more** from healthy samples than mastitis, marked by higher fat and lower protein/lactose absorbance.
- These spectral differences led to **higher predictive performance** for metritis, enabling earlier differentiation from healthy cases and clear distinction from mastitis cases.
- Milk spectra can serve as a potential option for common diseases prediction.

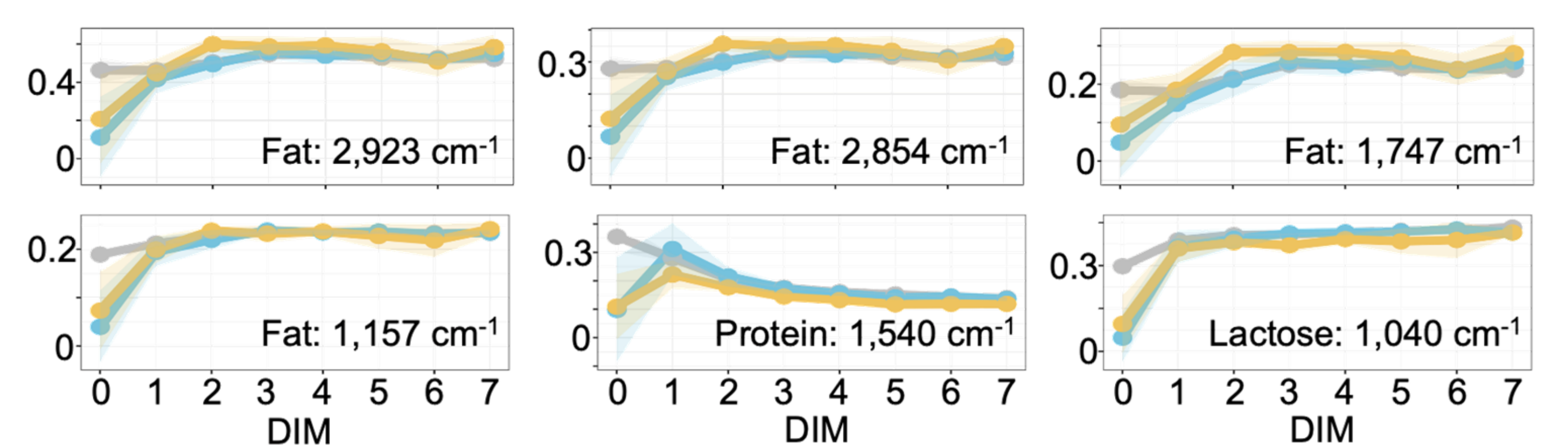
## Methods



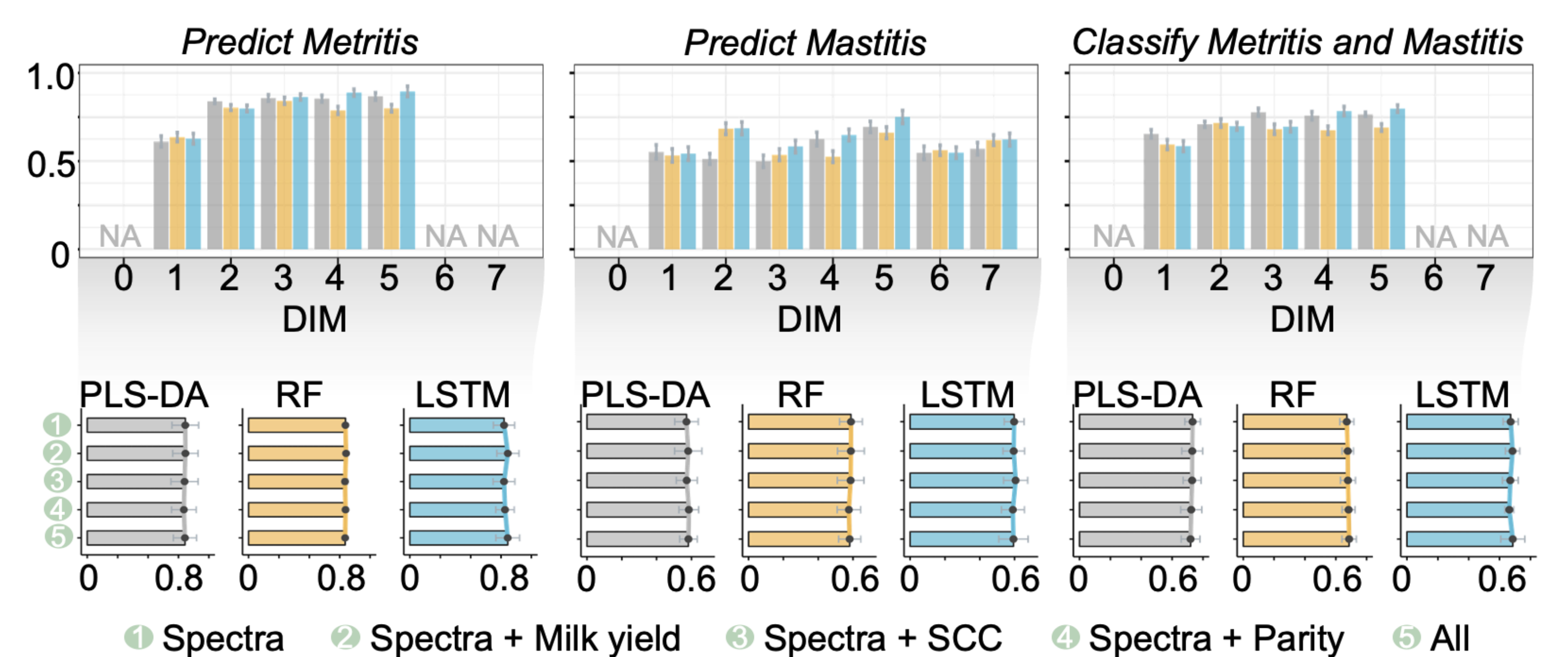
## Results



**Figure 1.** Similarity of milk FTIR spectra among the three groups based on 30 randomly selected samples per group collected within the first 7 DIM.



**Figure 2.** Absorbance of fat, protein, and lactose at six most indicative wavenumbers in FTIR Spectra of milk samples collected from three groups during the first 7 DIM.



**Figure 3.** Predictive performance (average AUROCs) of various models (PLS-DA, Random Forest, and LSTM) using milk FTIR spectra and various feature combinations



This work was supported by the USDA National Institute of Food and Agriculture Hatch project. The authors would like to thank the participating dairy farm, Dave Barbano and Chassidy Coon (Cornell University, Ithaca, NY, USA) for their assistance in milk analysis, and Jackson Seminara, Katie Callero, Ian Frost, Regina Martinez, Hannah McCray, and Abigail Reed (Cornell University, Ithaca, NY, USA) for their kind help with collection of all the milk samples.

## Acknowledgements