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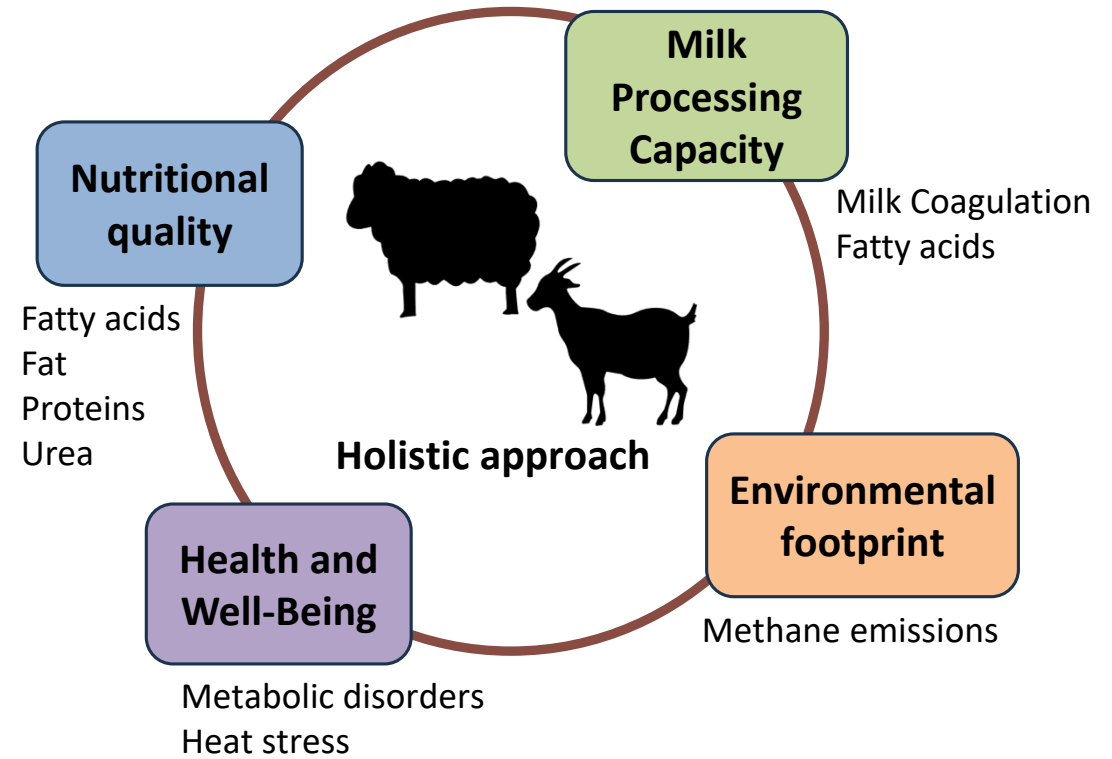
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Milk as a management tool in sheep and goat farming

E. Cabaraux, I. Alexakis, S. Franceschini, O. Christophe, C. Grelet, M. Calmels, C. Lecomte, C. Bertozzi, D. Veselko, F. Dehareng, H. Soyeurt



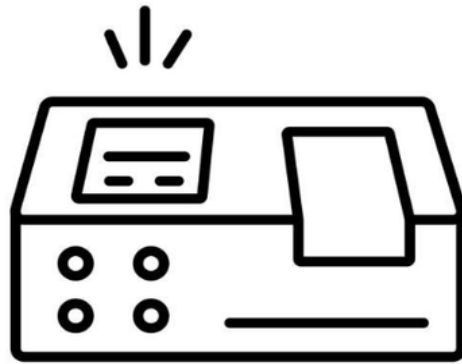
Context



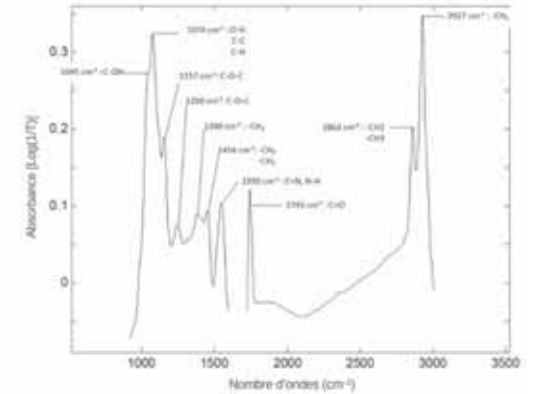
Spectrum FT-MIR



Milk sampling



Spectroscopy FT-MIR



Spectrum of analysis

(Grelet et al., 2015)

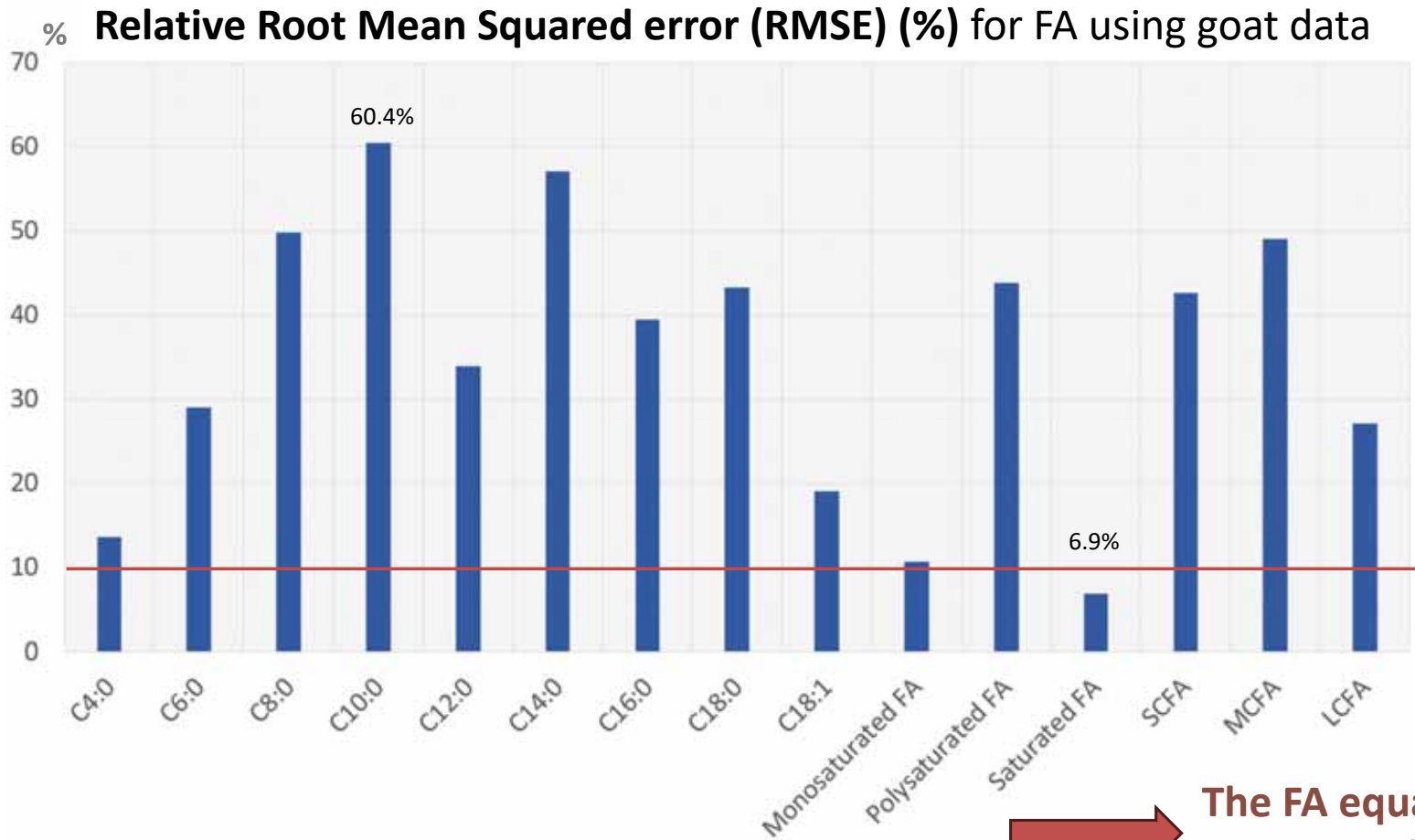


Are the equations used for cattle suitable for goat and sheep?

Example with fatty acids (FA) for goat

Bovine PLS

Are the equations used for cattle suitable for goat and sheep?



Error is relatively high :
> than 10 % except for
saturated FA

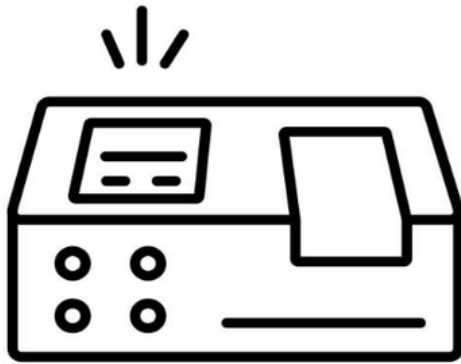


The FA equations built using cows' data
don't apply to goat's milk

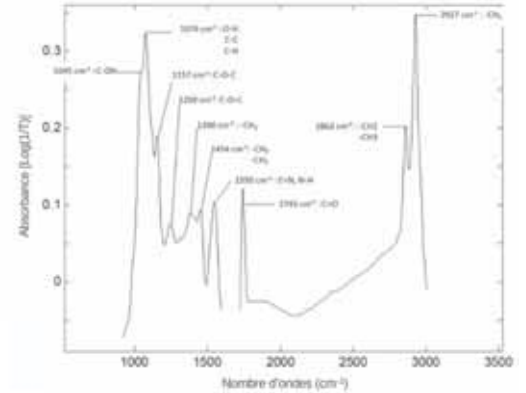
Spectrum FT-MIR



Milk sampling

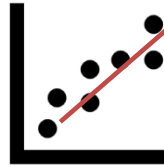


Spectroscopy FT-MIR



Spectrum of analysis

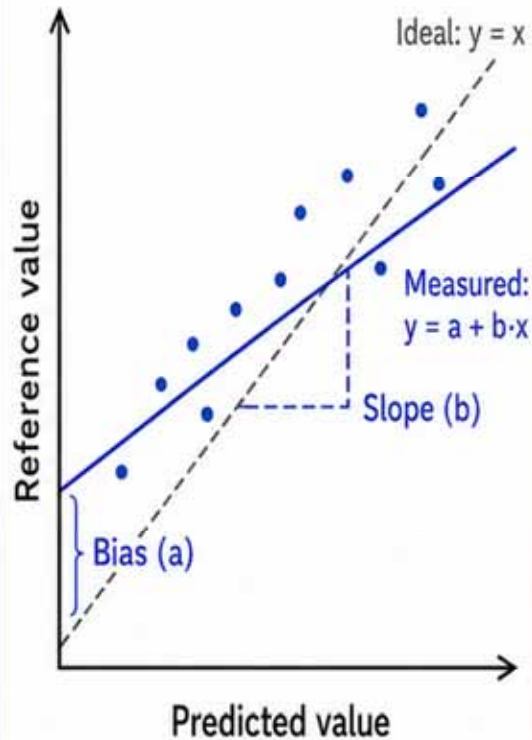
(Grelet et al., 2015)



The FA equations built using cows' data don't apply to goat's milk **BUT is it better with a slope and bias correction based on goat's milk ?**

Bias and Slope Correction

1 Raw conversion



2 Correction

Residue =
Reference value - Predicted value

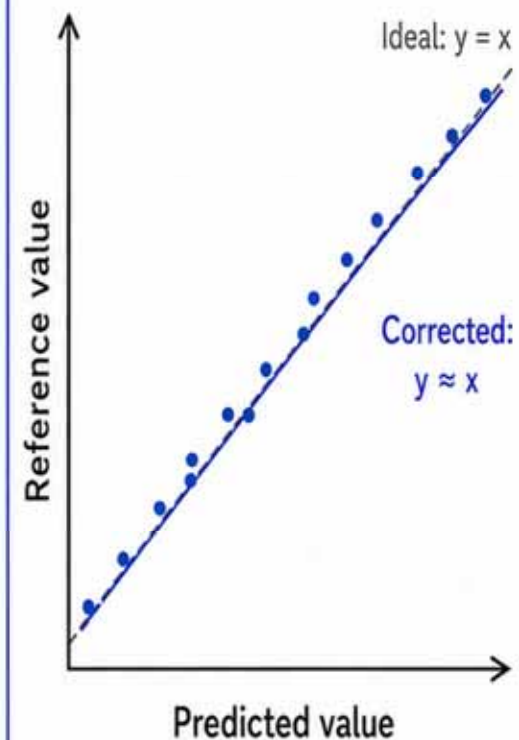
$$y = a + b \cdot x$$

Bias (a): intercept error

Slope (b): proportional error

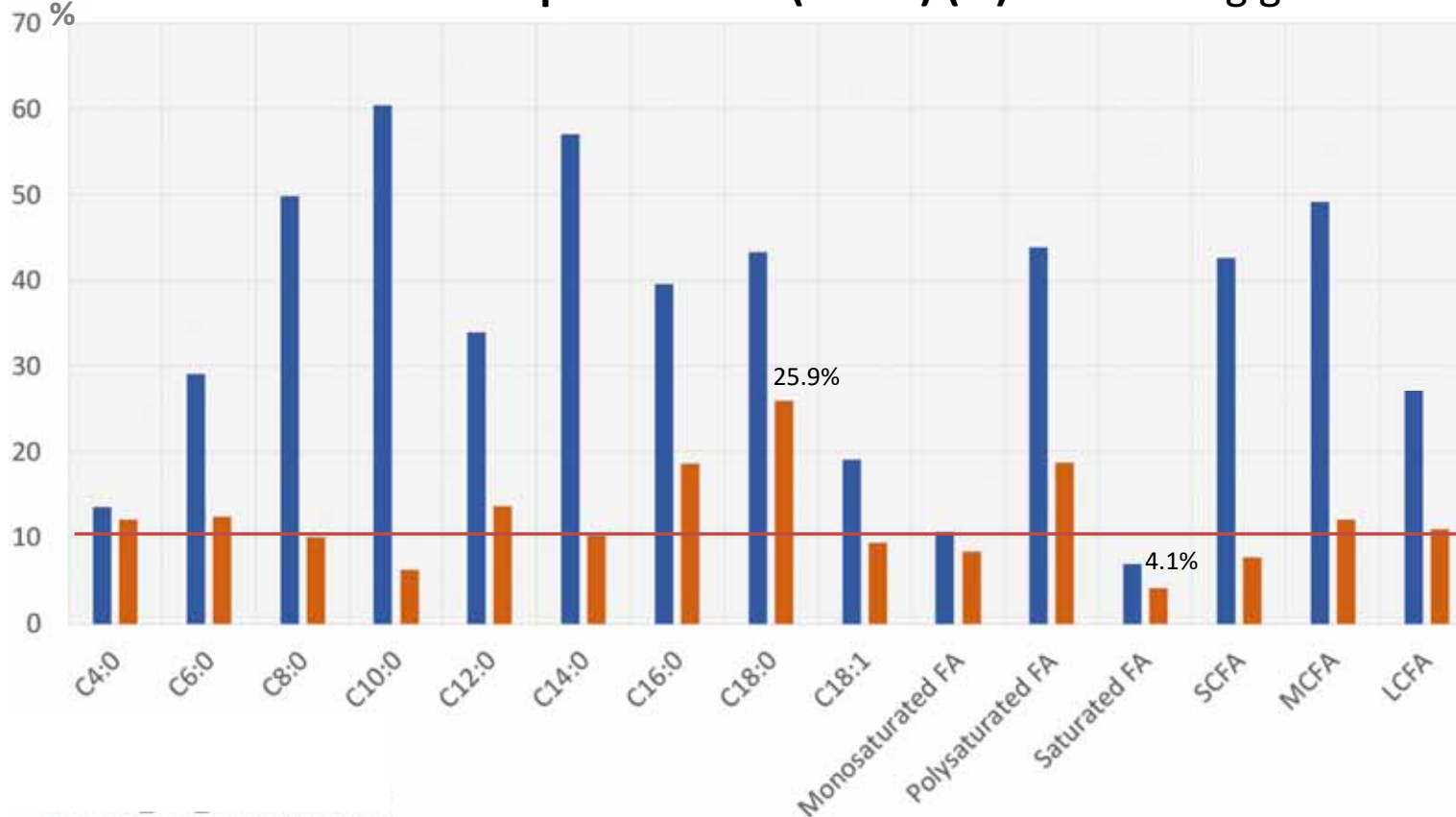


3 After correction



Bias and Slope Correction

Relative Root Mean Squared error (RMSE) (%) for FA using goat data



The correction significantly reduces the error

Error range decreases

Error lower than 10% for SFA, MUFA, SCFA, C8:0, C18:1



Could it be better to create models with goat's data to improve all FA ?

Objective

→ Development of specific equations for dairy goat based on **Transfer Learning**



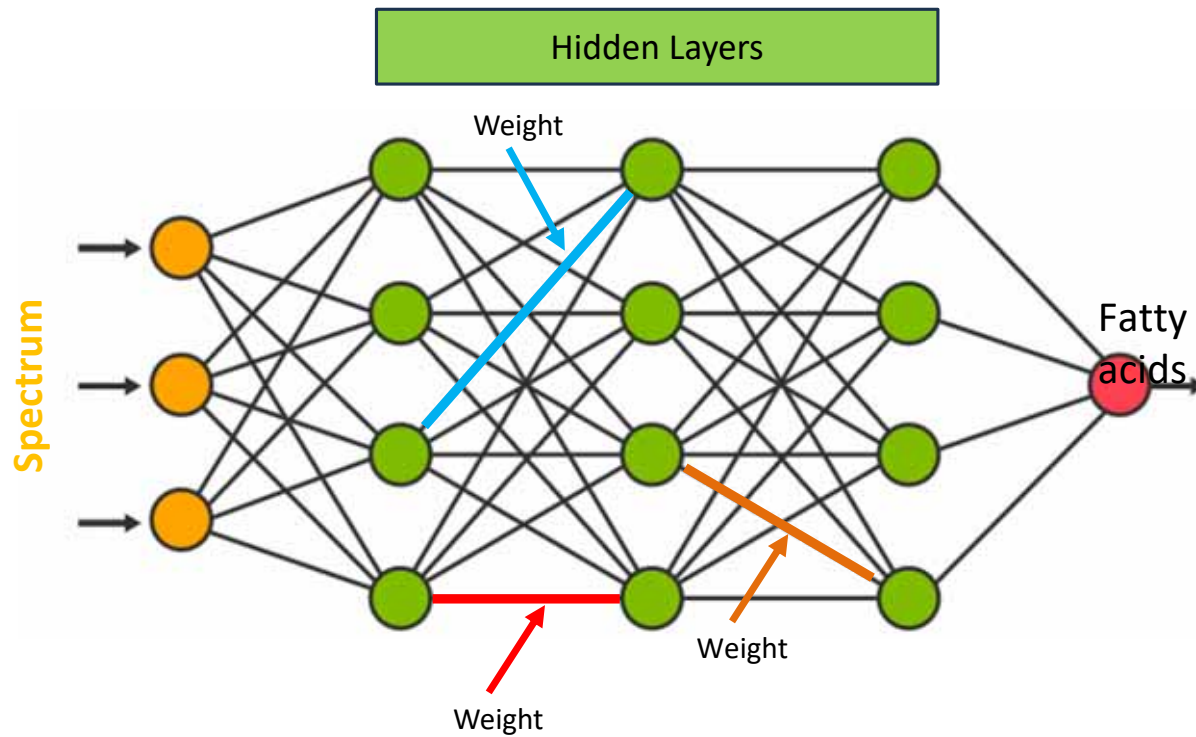
Cost of a reference database

INNOVATION



Transfer learning

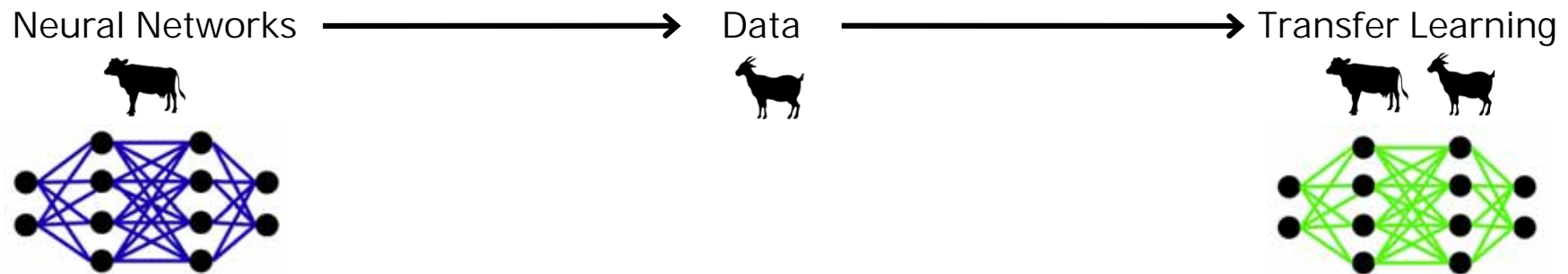
Artificial Neural Network (ANN)



Transfer Learning (TL)

Transfer Learning

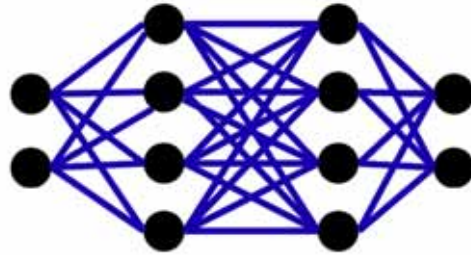
Method that uses previously trained models to apply knowledge learned in previous tasks to new tasks.



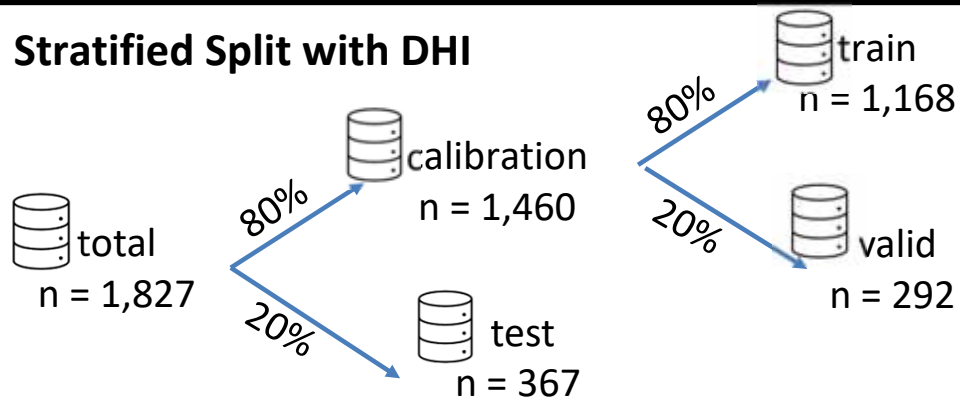
Creation of ANN



PLS Model



Stratified Split with DHI

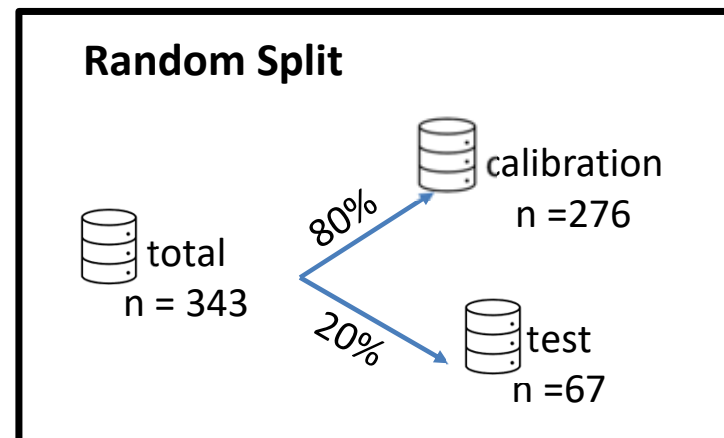
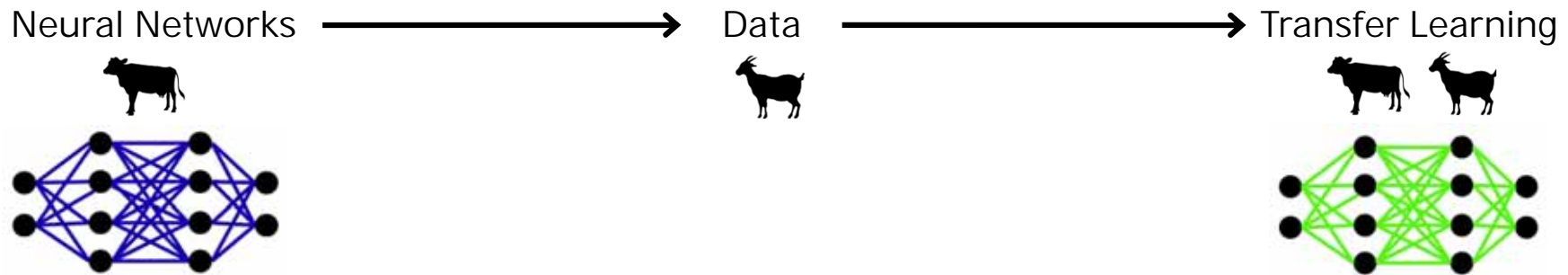


FA
Observations
C4:0
C6:0
C8:0
C10:0
C12:0
C14:0
C16:0
C18:0
tot C18:1
Saturated FA
Monosaturated FA
Polysaturated FA
SCFA
MCFA
LCFA

Legend

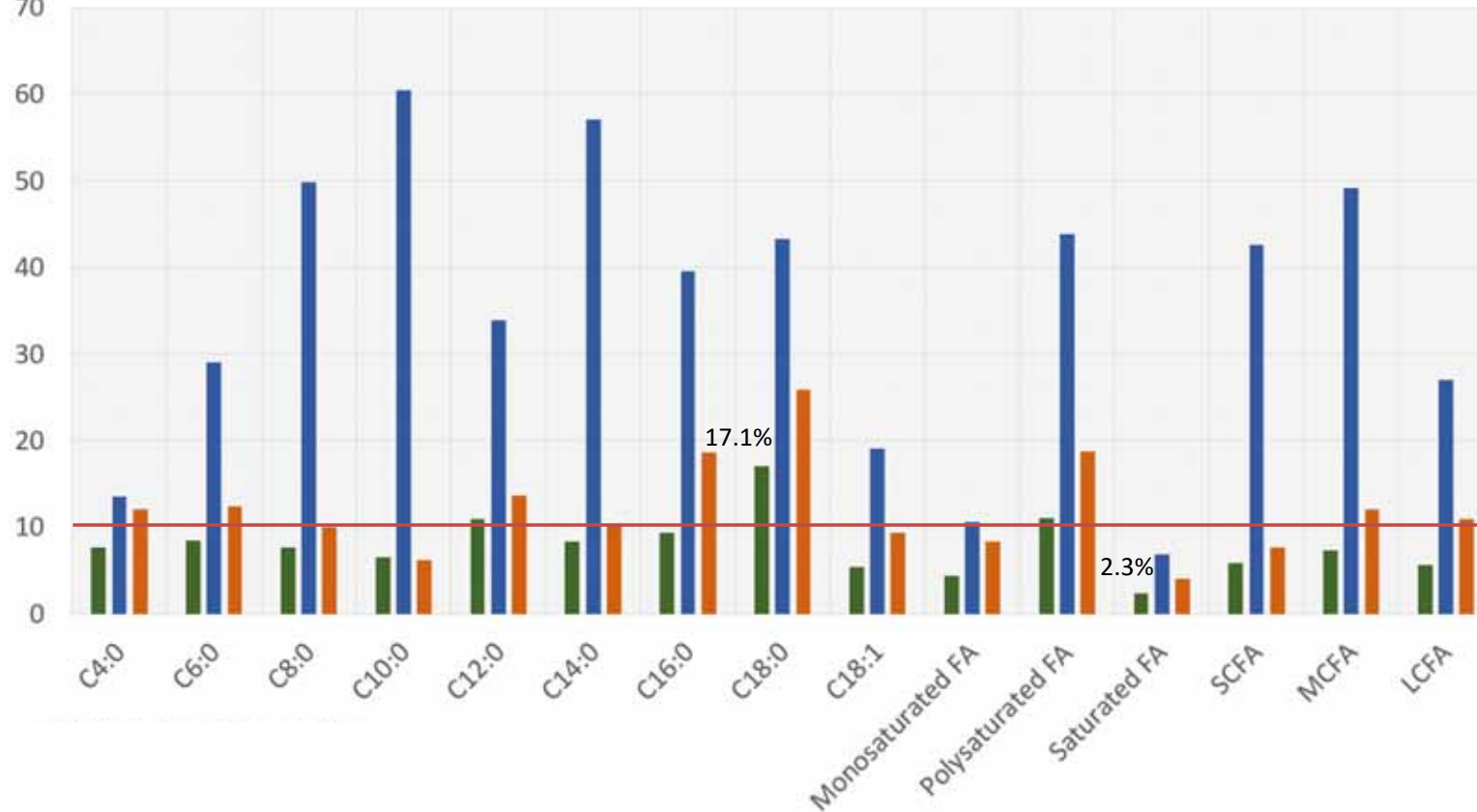
80% < R^2 < 85%	
85% < R^2 < 90%	
90% < R^2 < 95%	
95% < R^2	

Transfer Learning (TL)



Results of Transfer Learning

Relative Root Mean Squared error (RMSE) (%) for FA using goat data



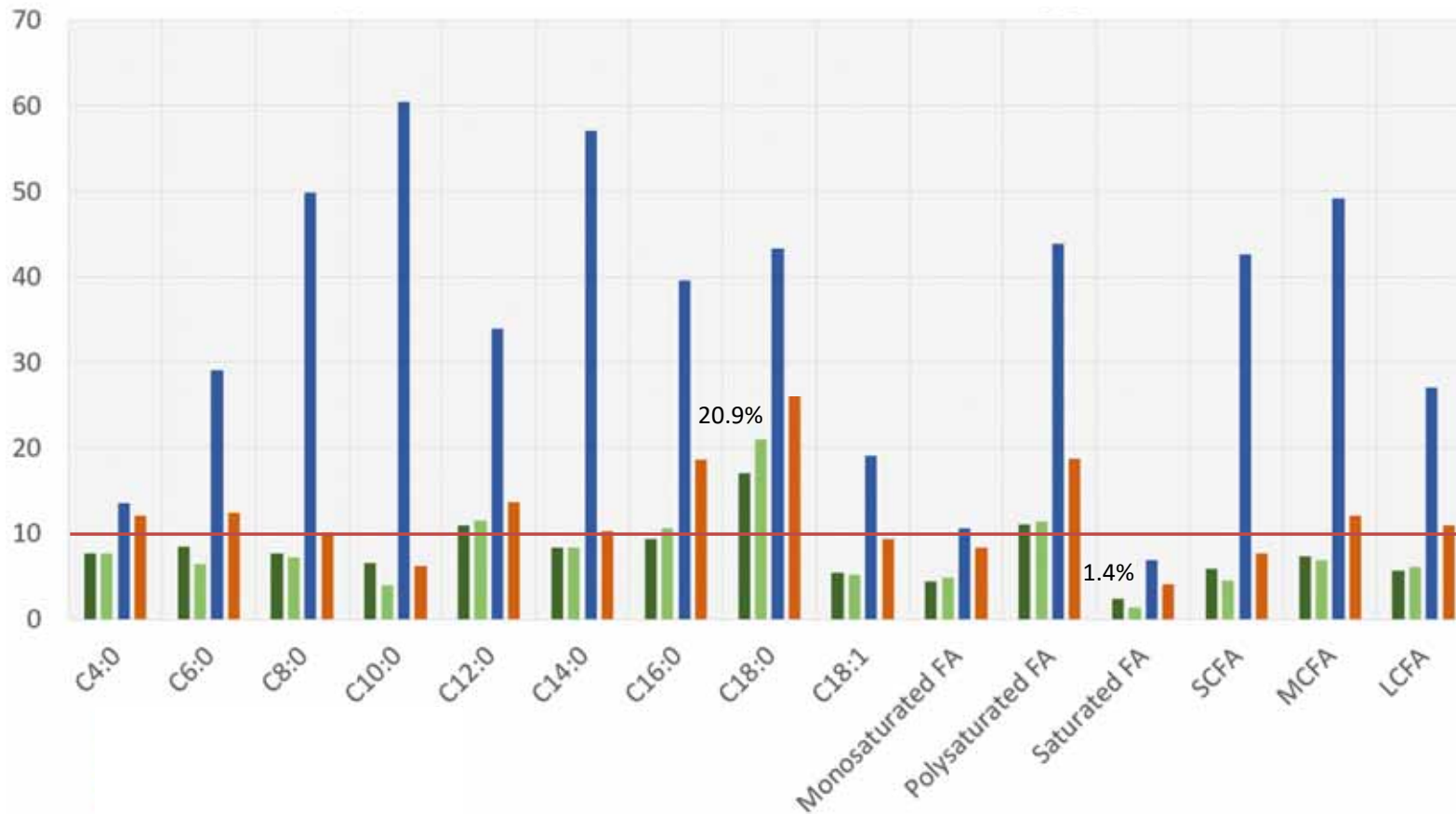
Transfer learning helps to reduce the prediction error compared to other models

Error lower than 10% for all FA except C12:0, C18:0 and PUFA

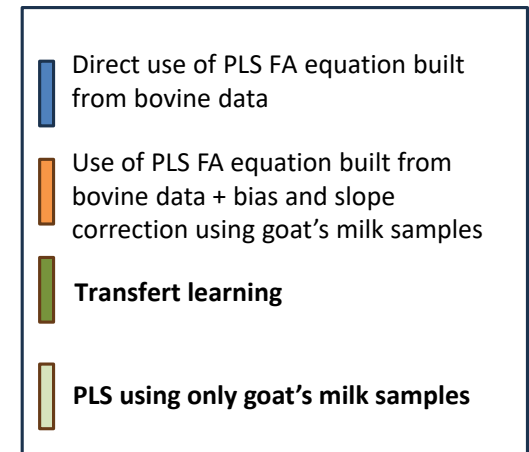
- Direct use of PLS FA equation built from bovine data
- Use of PLS FA equation built from bovine data + bias and slope correction using goat's milk samples
- Transfer learning

Results of goat-specific PLS model

% Relative Root Mean Squared error (RMSE) (%) for FA using goat data



TL and PLS goat are the best model



Error lower than 10% for all FA except C12:0, C18:0 and PUFA

Conclusion

Take-home message

- A simple application of equations build from cow's data don't apply to goat's milk
→ Minimum Slope and Biais correction
- Models train with goat data are better
→ Necessary to have goat's dataset to create specific models
- TL can outperform goat-specific PLS models for some FA
→ Choice of the best model

Contact

If you would like to:

- Take part in the project
- Share data or your experience
- Collaborate with us

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Various topics to study

