THE GLOBAL STANDARD FOR LIVESTOCK DATA

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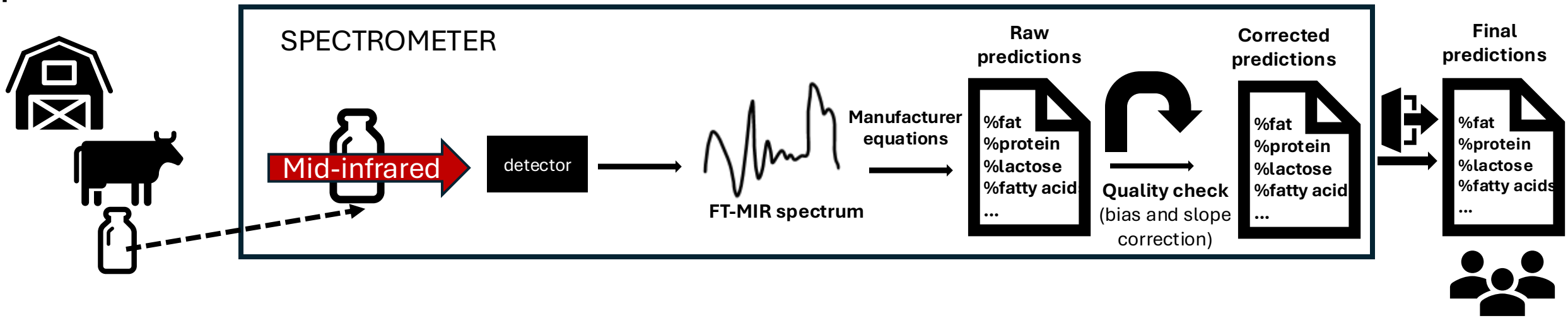
Why IDF-ICAR ExtraMIR Joint Project Plays a Crucial Role in Advancing the Global Adoption of FT-MIR-Based Methane Proxy ?

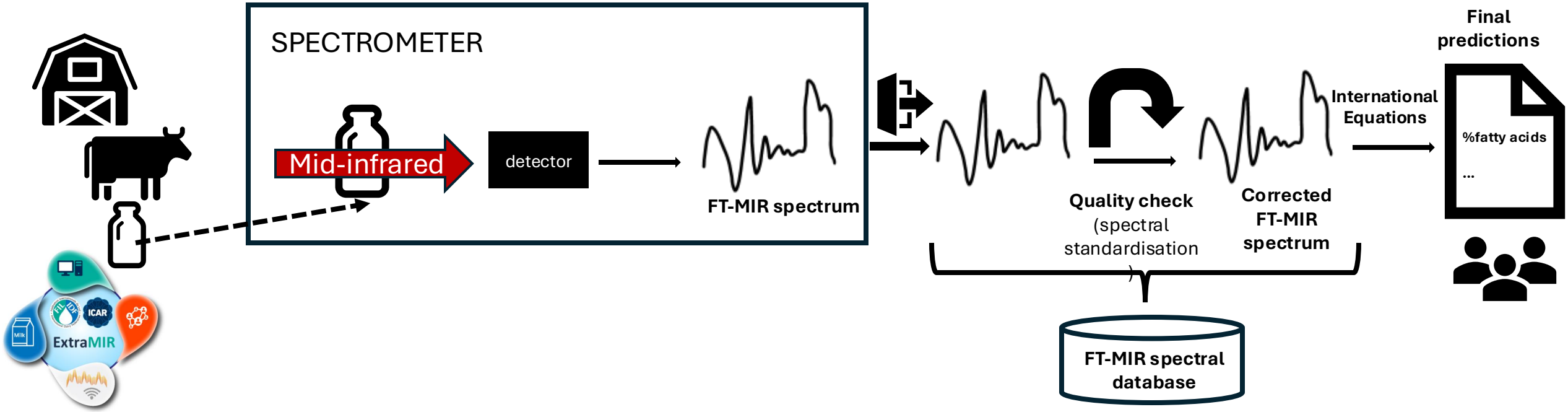
Prof. Hélène Soyeurt

Gembloux Agro-Bio Tech, University of Liège, Belgium

Existing Milk analysis process



ExtraMIR proposal



Open other possibilities

Nutritional quality

Fat, protein, lactose, fatty acids, Ca, lactoferrin,…

Technological properties

Cheese yield, yoghurt yield, butter yield, spreadability …

Animal Health

Na, lactoferrin, Energy balance, body weight, dry matter intake, acetone, BHB, citrate …

Environmental fingerprint

Methane, P, urea …

Sustainability

Consumption index, nitrogen efficiency …

Abnormal milk samples, color …

Soyeurt, 2023

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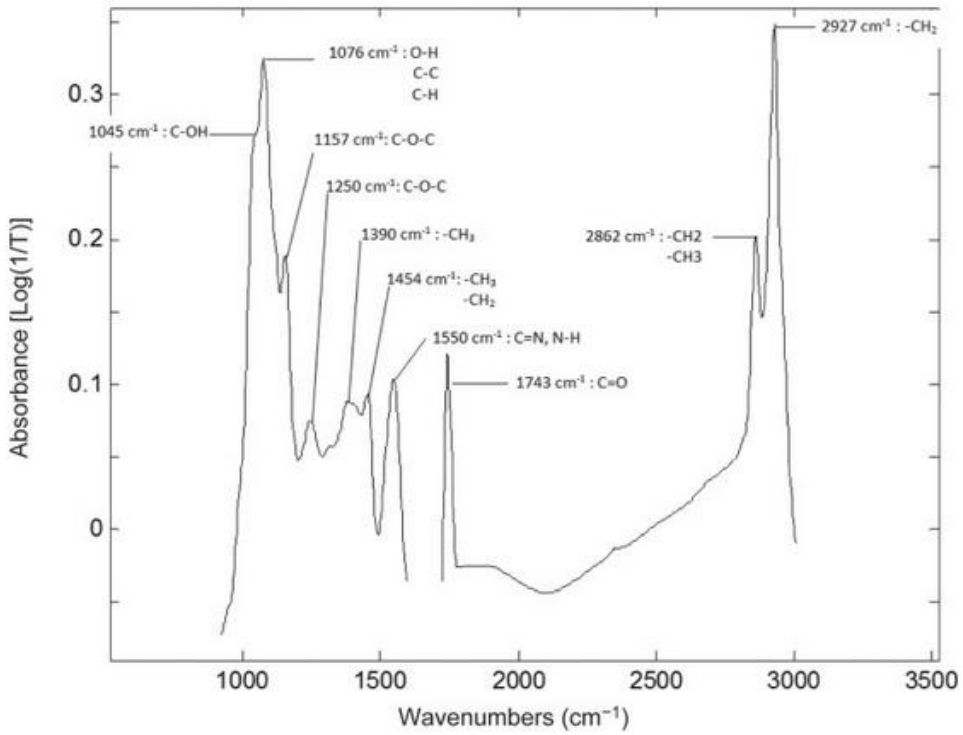
Soyeurt, 2023

Go back first to the basics to understand the crucial rule of ExtraMIR for the MIR methane prediction

MIR Prediction



2 components :

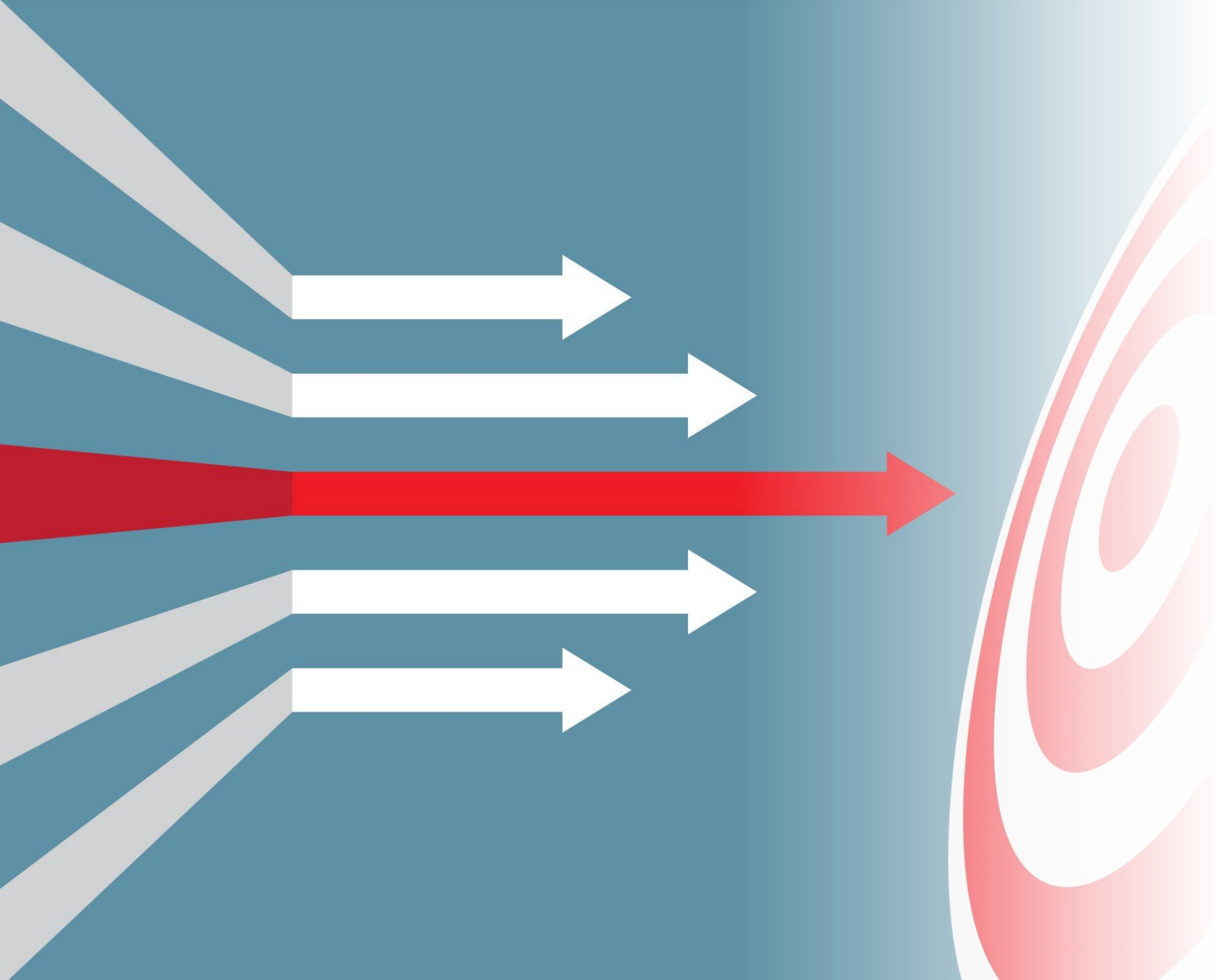
Spectrum

$spec_1$
$spec_2$
$spec_3$
$spec_4$
$spec_5$
$spec_6$
$spec_7$
.
.
.
.
.
.
.
.
.
.
.
.
$spec_n$

Equation

$coeff_1$
$coeff_2$
$coeff_3$
$coeff_4$
$coeff_5$
$coeff_6$
$coeff_7$
.
.
.
.
.
.
.
.
.
.
.
.
$coeff_n$

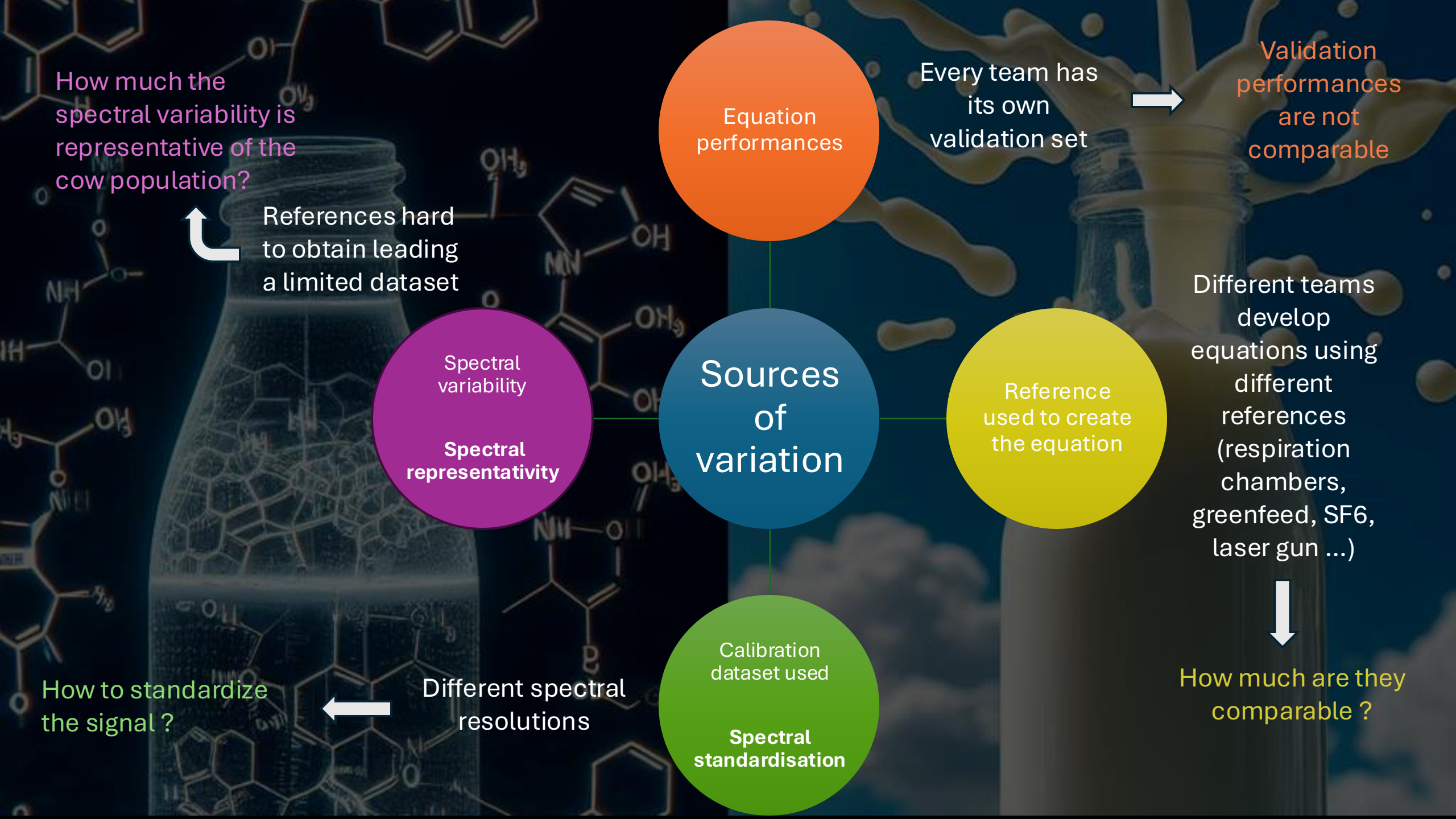
Prediction = intercept + sum(spec*coeff)



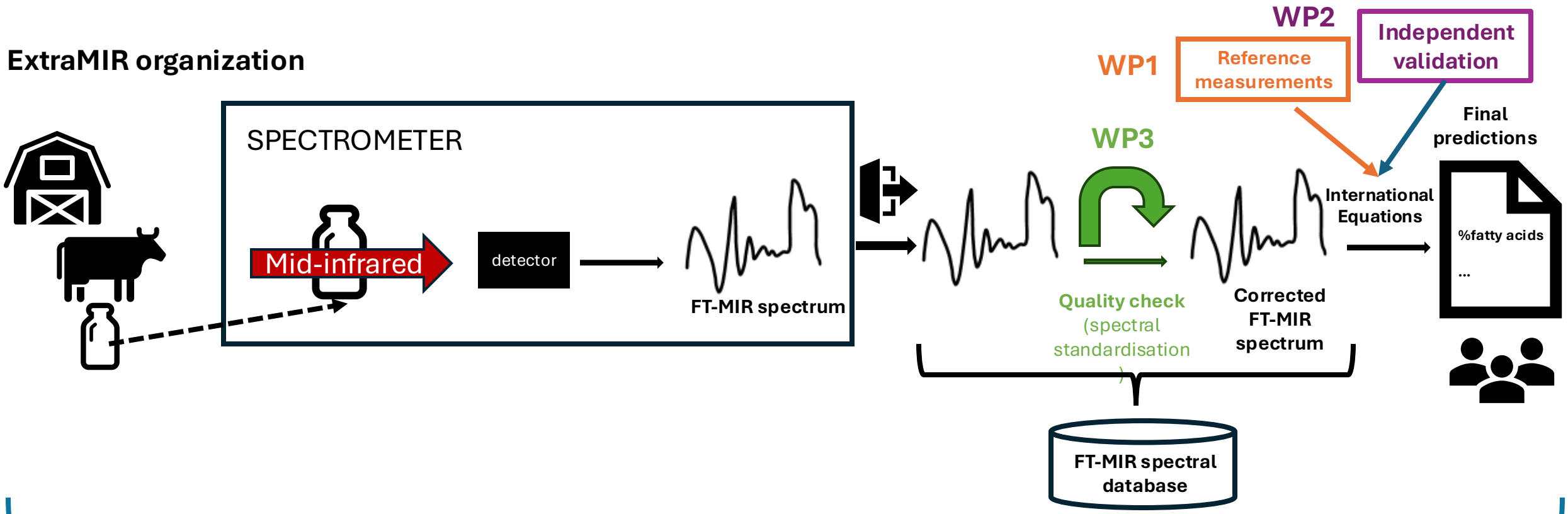
Ultimate Goal

Having the same prediction for the same spectrum

Not so simple …


How much the spectral variability is representative of the cow population?
References hard to obtain leading a limited dataset
Equation performances
Every team has its own validation set
Validation performances are not comparable
Spectral variability
Spectral representativity
Sources of variation
Reference used to create the equation
Different teams develop equations using different references (respiration chambers, greenfeed, SF6, laser gun ...)
How much are they comparable ?
Calibration dataset used
Spectral standardisation
Different spectral resolutions
How to standardize the signal ?

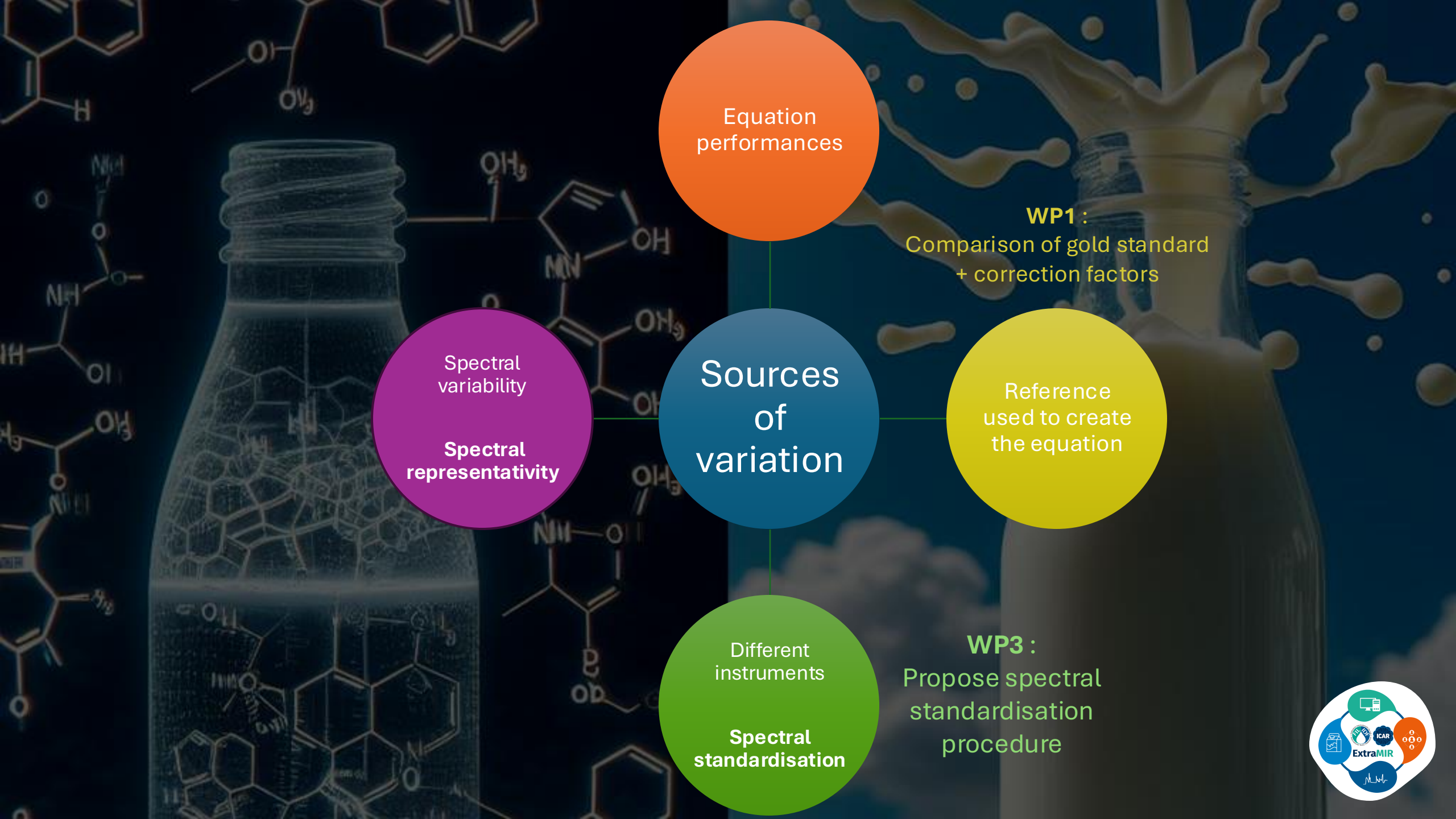
ExtraMIR organization



Communication with all stakeholders

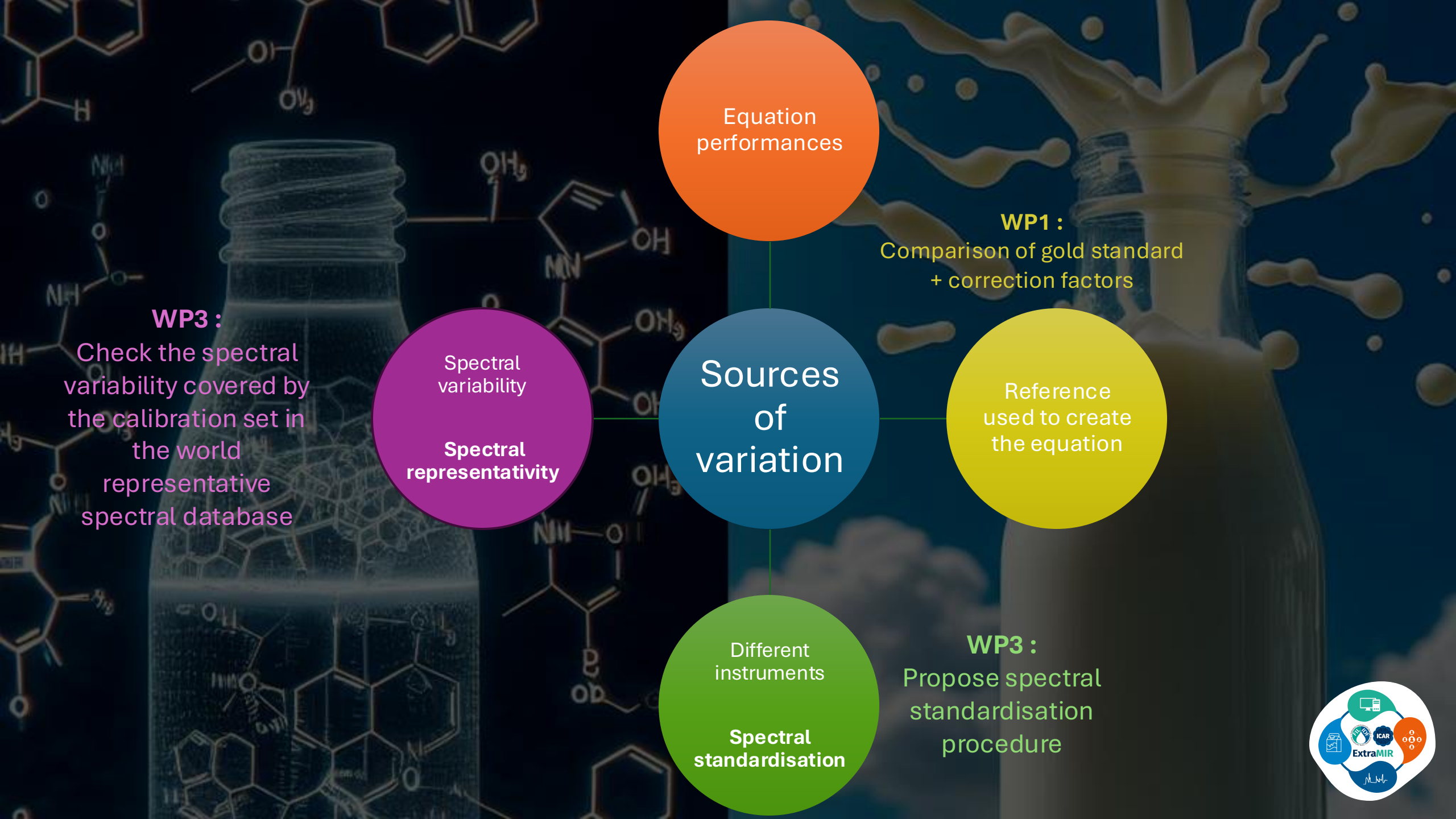
WP4

Focussing on Fatty Acids this year but many achievements are interesting for the MIR-based prediction of methane


Equation performances
WP1 :
Comparison of gold standard + correction factors
Spectral variability
Spectral representativity
Sources of variation
Reference used to create the equation
Different instruments
Spectral standardisation
WP3 :
Propose spectral standardisation procedure
ICAR
ExtraMIR

WP3 : Propose spectral standardisation procedure

- A group is formed to compare different spectral standardization using samples sent with the ICAR proficiency test
- Results will be communicated soon


Equation performances
WP1 :
Comparison of gold standard + correction factors
WP3 :
Check the spectral variability covered by the calibration set in the world representative spectral database
Spectral variability
Spectral representativity
Sources of variation
Reference used to create the equation
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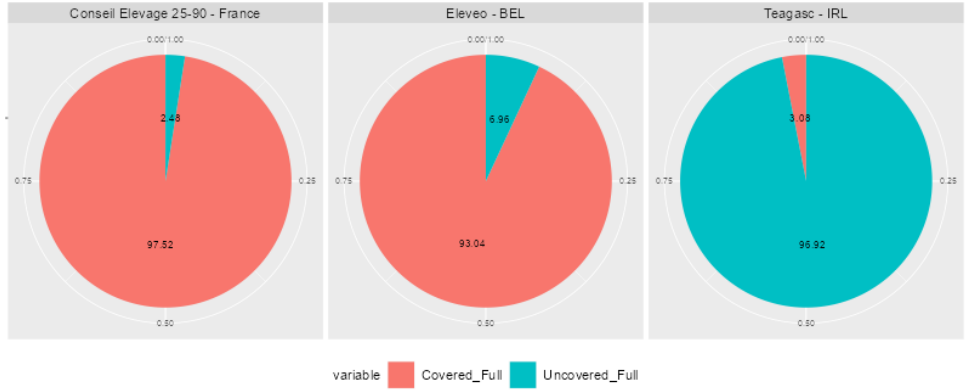
WP3 :
Check the spectral variability covered by the calibration set in the World Representative Spectral Database (WRSD)

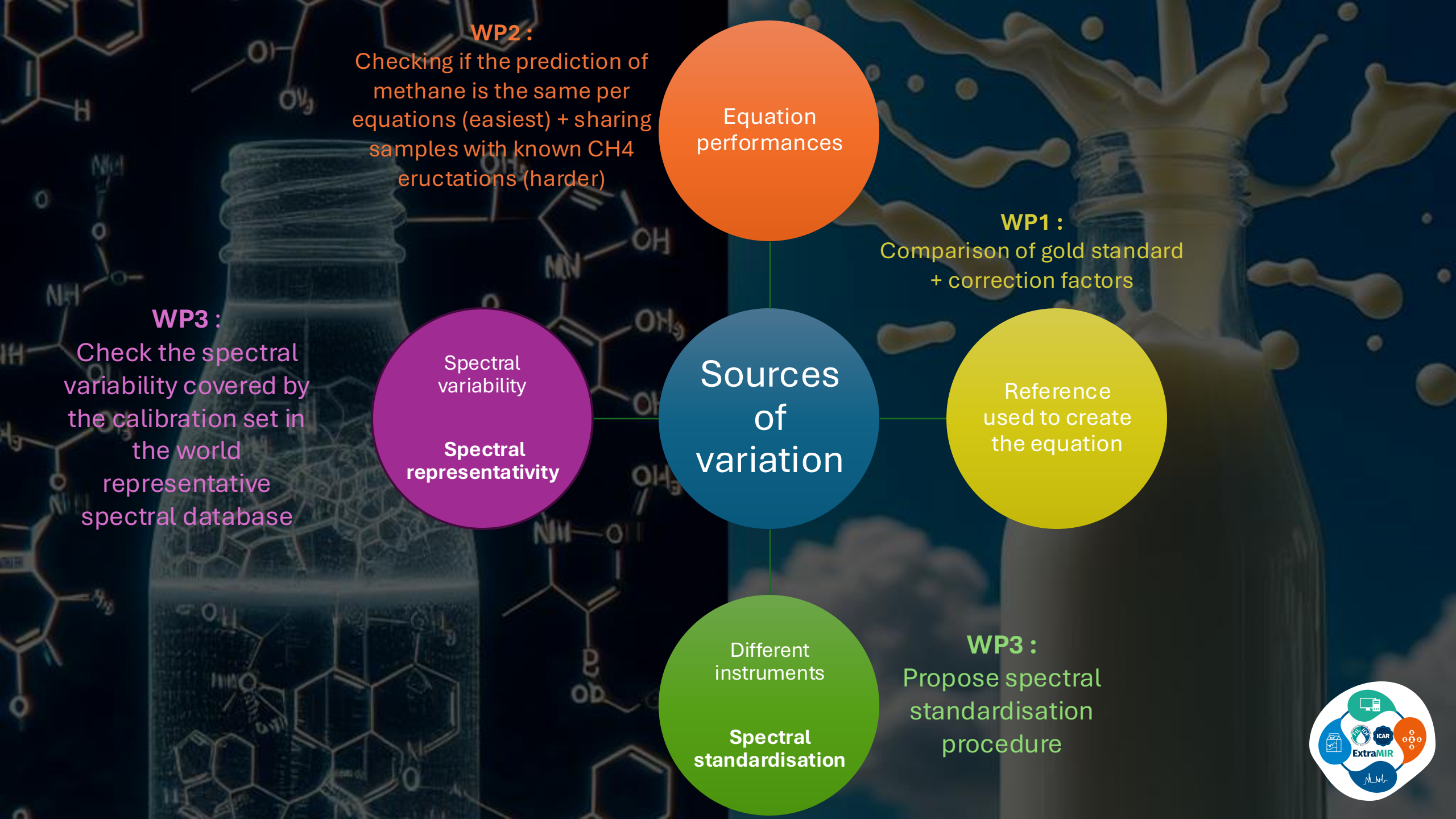
Spectral variability

Spectral representativity

Global-H distance per partners - visual view



- A web application will be available soon
- The idea is to compare the spectral variability of a calibration set with the spectral variability existing in WRSD


WP2 :
Checking if the prediction of methane is the same per equations (easiest) + sharing samples with known CH4 eructations (harder)
Equation performances
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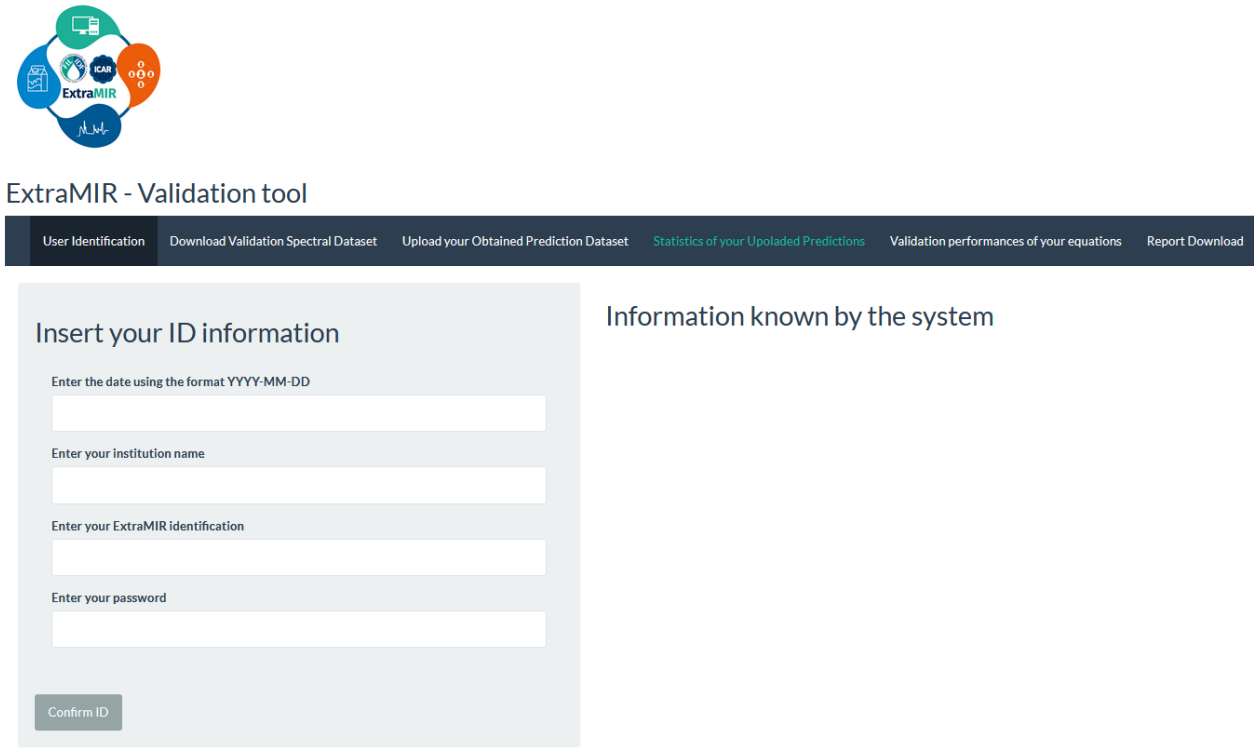
Equation performances



- A web application developed in RShiny for Fatty Acids will be available soon.
- We can derive a tool for Methane which compare the predictions performances of equations

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Outputs from ExtraMIR can help to ensure high quality MIR-based prediction of methane

Next chapter for ExtraMIR ?

Fédération Internationale du Lait • International Dairy Federation

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ICAR

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