



49TH ICAR CONFERENCE 2026

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VERONA, ITALY



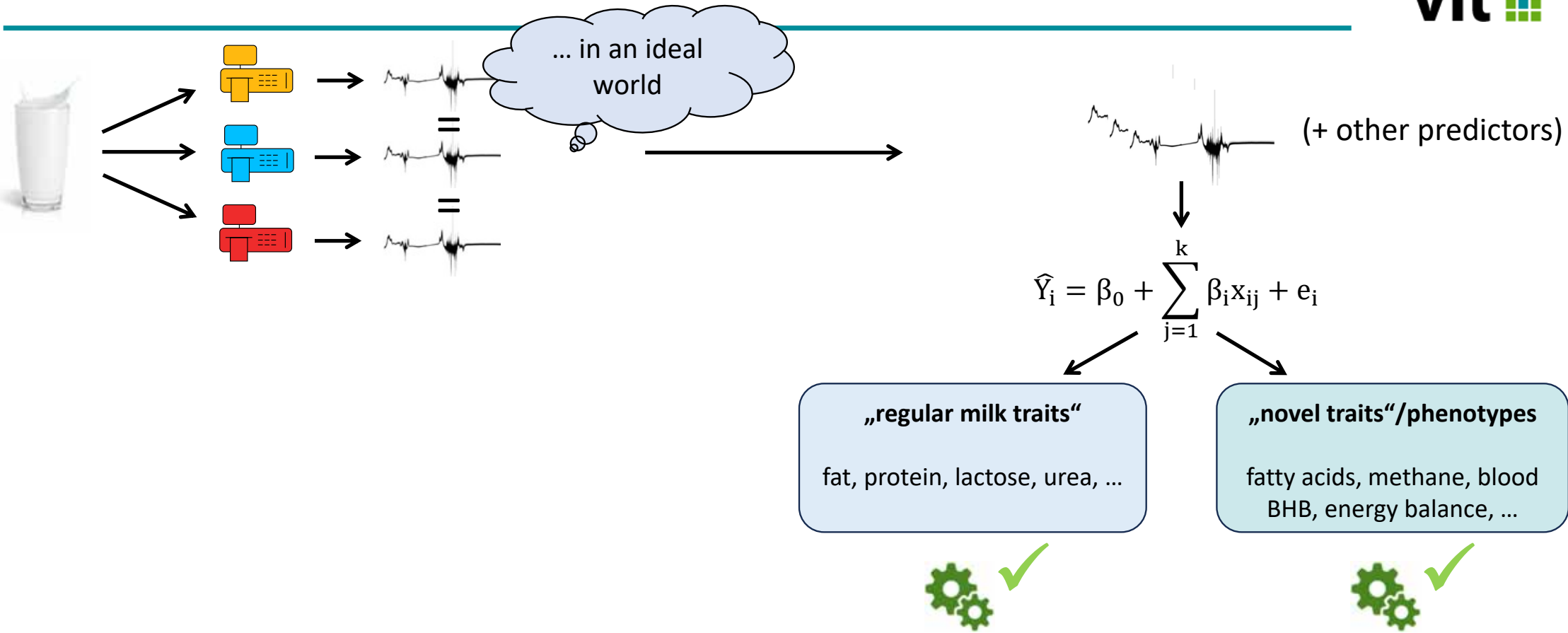
Intra- and cross-laboratory monitoring framework for MIR-integrated milk laboratory data

A. Mensching, J. Braunleder, S. Schierenbeck, and R. Reents

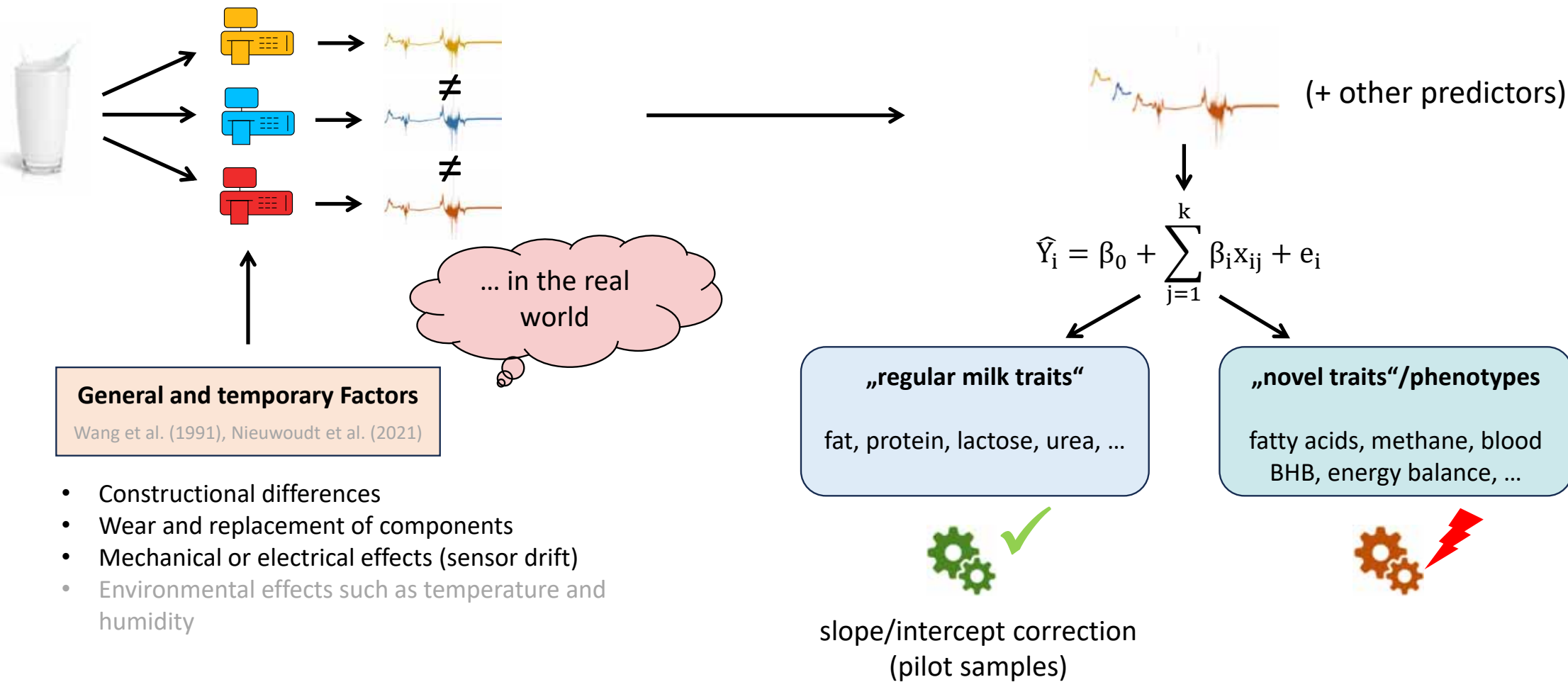
Vereinigte Informationssysteme Tierhaltung w.V. (vit)



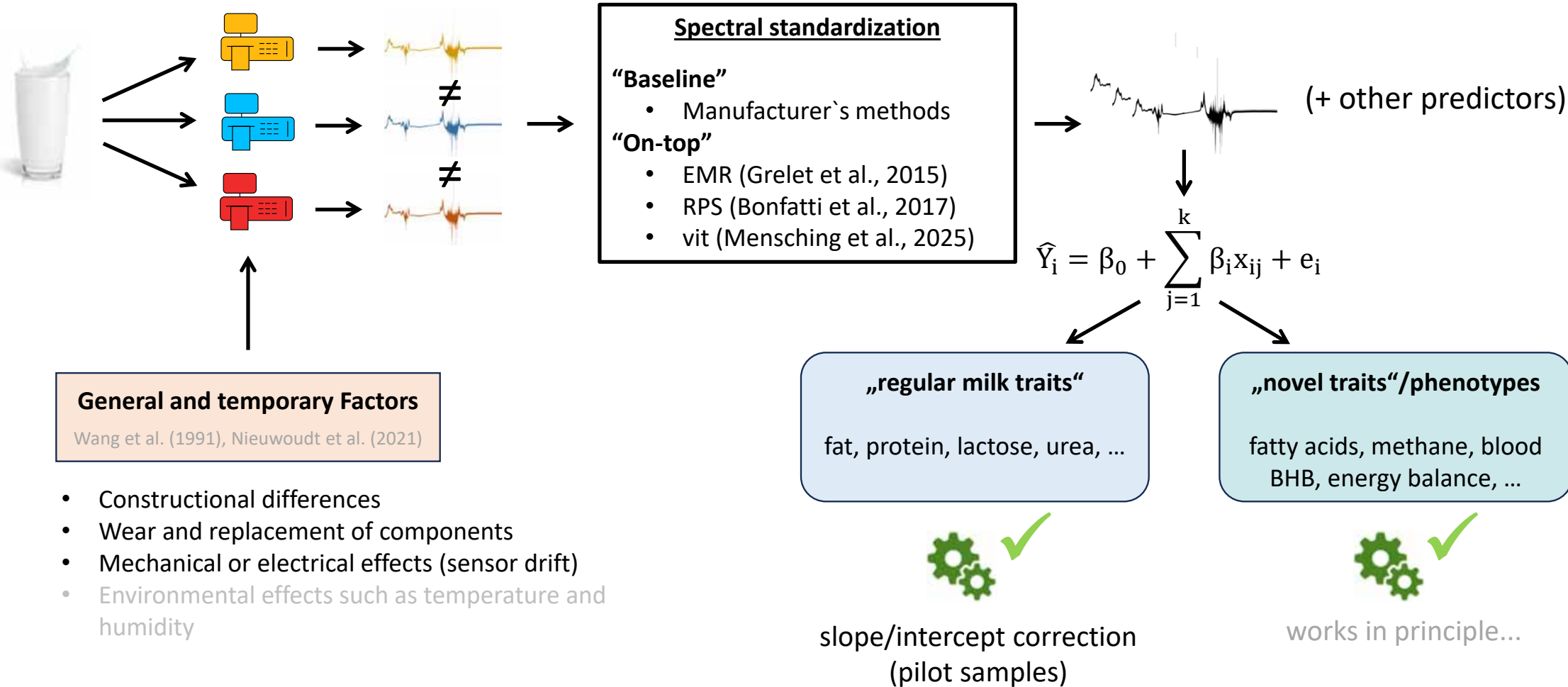
MIR spectrometry and underlying challenges



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A real-world example: DHI data of one farm (01/2022 to 06/2022)

(n ≈ 200 cows, n = 795 DHI samples)

*each analyzed on 3 instruments

Predictions using “raw” MIR spectra

Instrument
 A
 B
 C

- Large general and temporary instrument-specific effects
- A major issue for DHI applications requiring rapid feedback to farmers
- Probably less critical for genetic evaluation due to corrections (e.g. test-day effects, HYS, ...)

Predictions using **standardized** MIR spectra

- Substantially higher comparability between instruments
- More stable results over time



Should we take a closer look at this?



- How stable are predictions over time?
- What about other instruments in other laboratories?
- Is the standardization process also reliable?

We have to take a closer look!

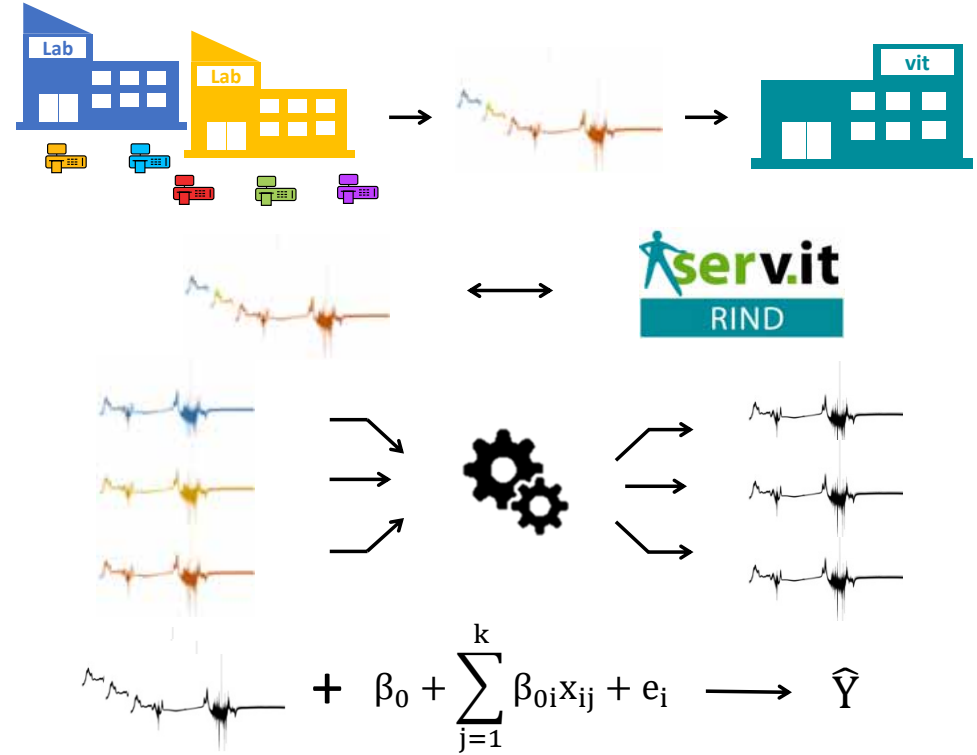
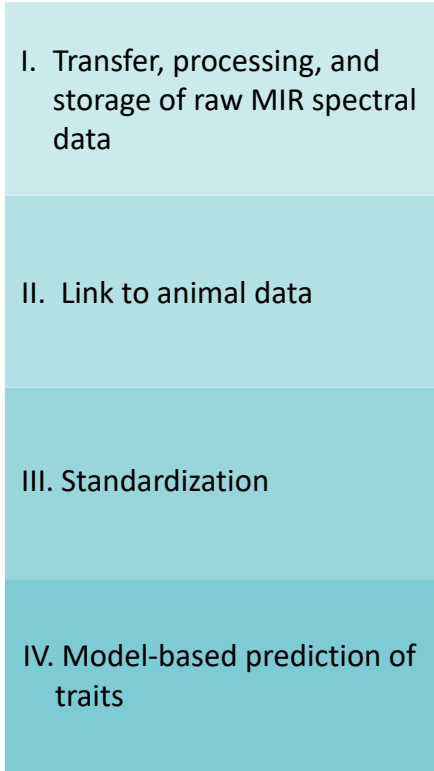
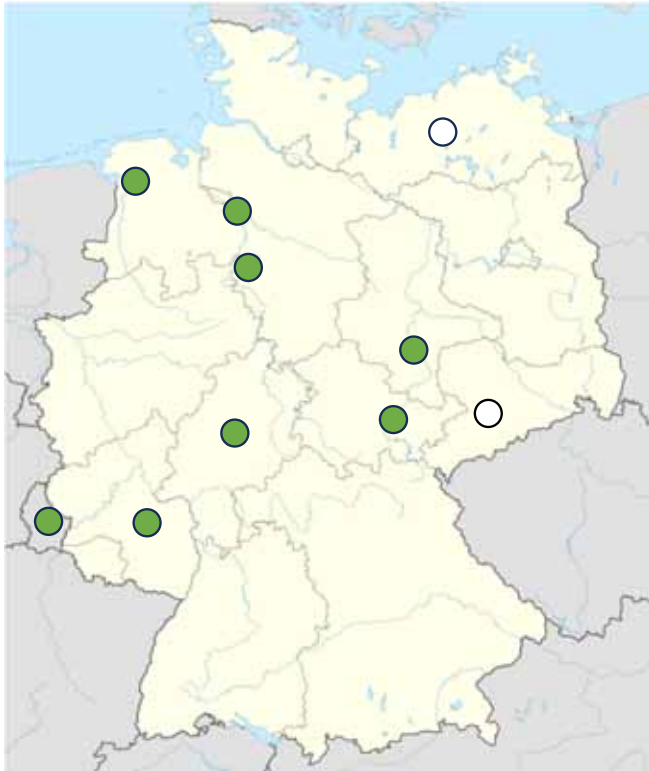
But how???



Intra- and cross-laboratory monitoring framework using an interactive dashboard for visualization



MIR data processing pipeline at the vit



≈ 90 million MIR spectra [State of 05/29/2026]

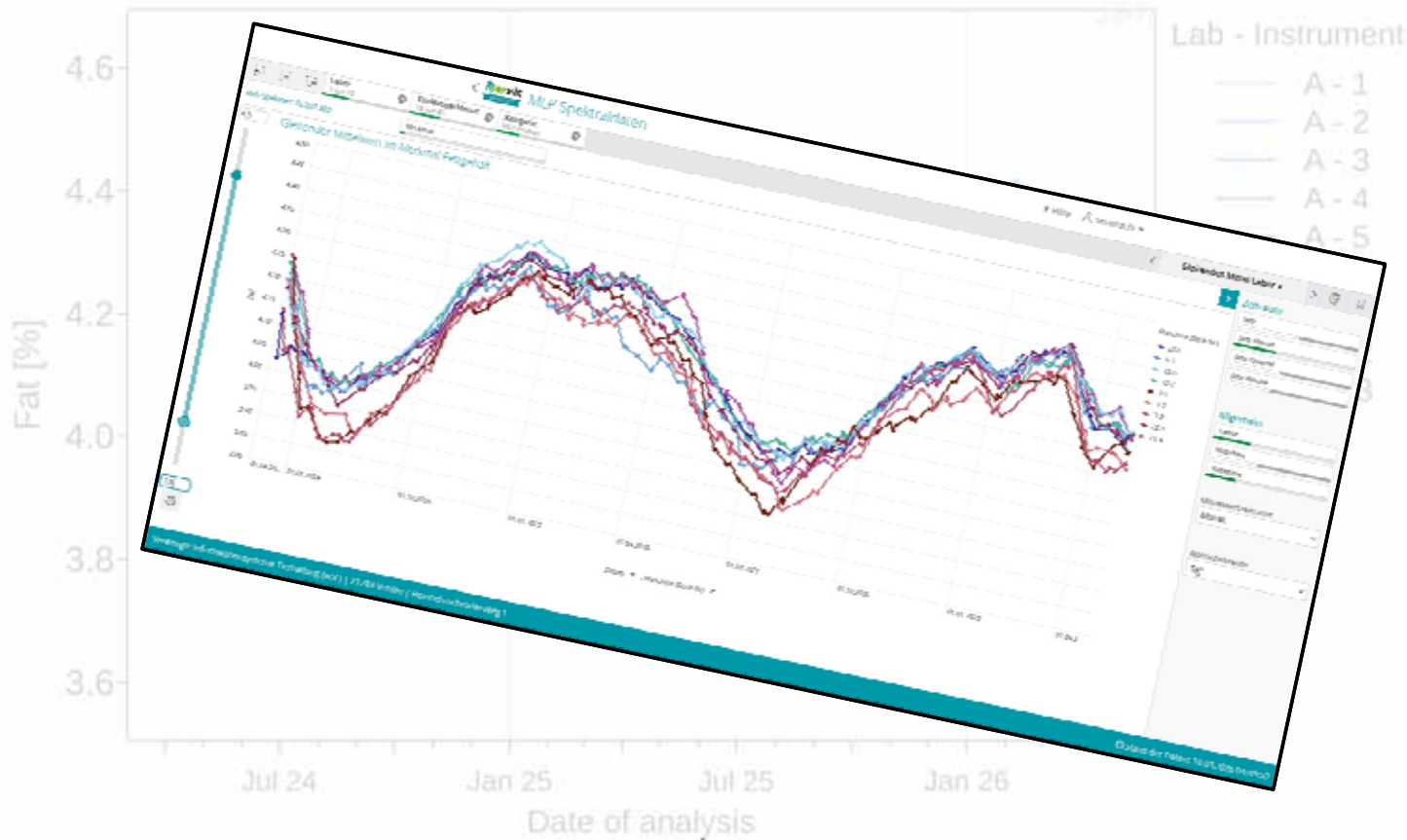
- Oldest MIR spectra from 2012
- Processing of up to 90,000 spectra per day



Routine phenotype monitoring

Example: Laboratory fat values (S/I corrected)

(n = 16.7M DHI samples, moving means, window length =



- Expected seasonal variation confirmed (e.g. Heck et al., 2009)
- High instrument agreement within laboratories
- Minor differences between laboratories (expected due to shared regional milk supply)

→ **Already online available for spectra providing laboratories!**



Assessment of drift and spectral standardization

Cross-laboratory drift assessment

(n = 249.3k identical weekly changed pilot samples, moving means, window length = 7d)



- Routine laboratory values remained stable
(effective S/I correction)
- Raw spectra revealed substantial instrument-individual drift
(despite identical weekly exchanged pilot samples!)
- Daily vit-standardization restored cross-instrument comparability

→ **Already online available for spectra providing laboratories!**



Assessment of drift and spectral standardization

Detection of technical anomalies

(n = 21.7k pilot samples, daily means)



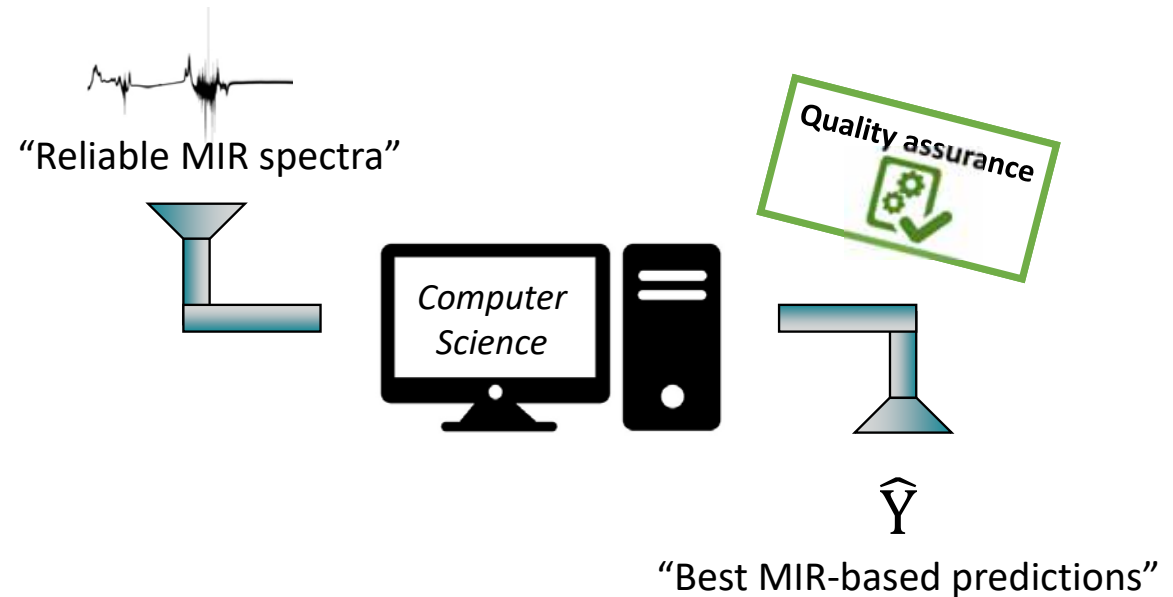
- Documented **cuvette defects** clearly visible in monitoring data
- Raw spectra showed pronounced bias excursions
- Bias of standardized spectra remained stable and close to zero

→ Already online available for spectra providing laboratories!



Summary and conclusion

- Phenotype monitoring supports plausibility assessment of routine MIR-derived data
- Routine operation revealed substantial temporary instrument-specific drift
- Standardization markedly improved longitudinal comparability
- Continuous monitoring enables drift detection and anomaly traceability



→ **Dashboard-based quality assurance supports reliable MIR applications**



- Interactive and modular dashboard architecture
- Flexible integration of new traits and monitoring statistics
- Provides a basis for benchmarking and comparison of alternative methods



Thank you for your attention!

