

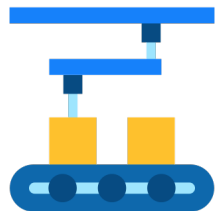


Spectroscopy enabled by Artificial Intelligence



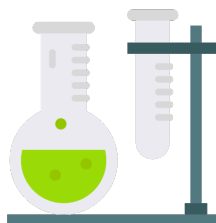


GREENTROPISM EXPERTISES



INDUSTRIAL PROCESSES

- ✓ Industry 4.0
- ✓ Quality testing (raw materials/final products)
- ✓ Textile testing



AUTOMOBILE & PETROCHEMICALS

- ✓ Fluids identification
- ✓ Oil classification
- ✓ Plastics identification
- ✓ Pollutants in vehicle



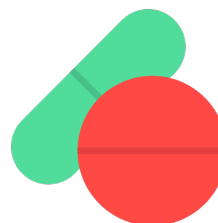
AGRICULTURE

- ✓ Soil component analysis
- ✓ Feed nutritional values
- ✓ Fat in milk



FOOD & BEVERAGE

- ✓ Identification, classification and control of food
- ✓ Quality testing in food products
- ✓ Food safety
- ✓ Level of alcohol (counterfeit products, food safety)



HEALTH & BEAUTY

- ✓ Detection of counterfeit
- ✓ Pill identification
- ✓ Active ingredient measurement
- ✓ Hair quality testing

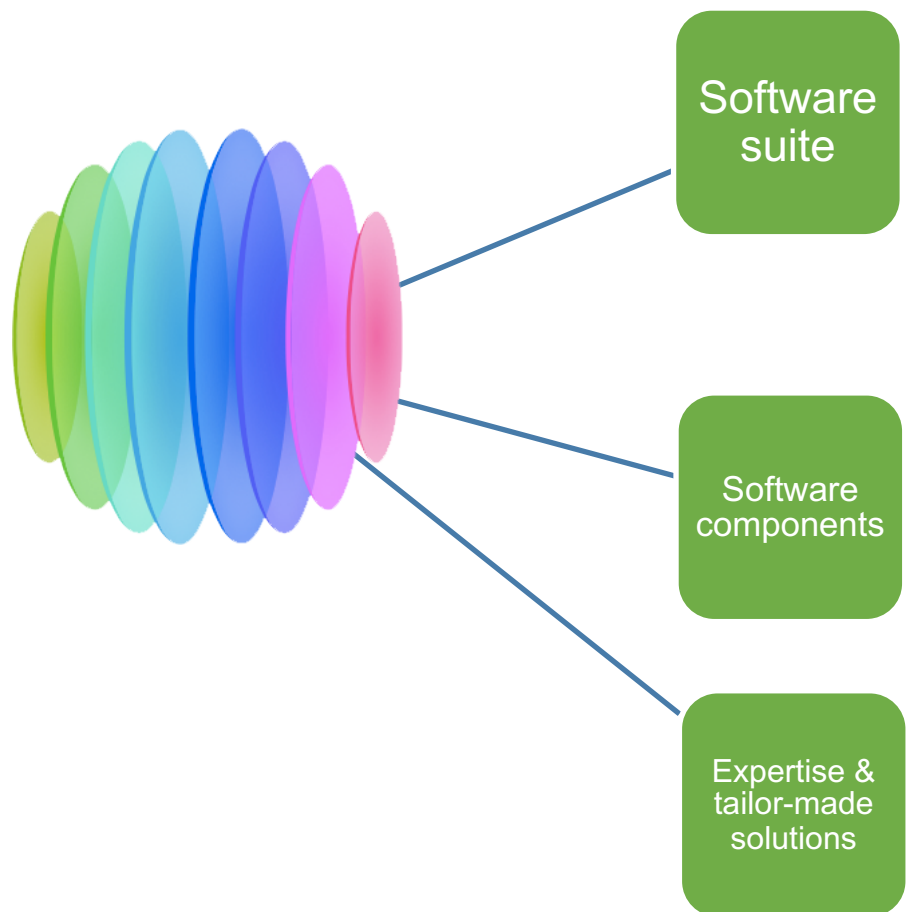


ENVIRONMENT

- ✓ Anaerobic digestion process
- ✓ Soil component analysis
- ✓ Waste repurposing
- ✓ Plastics and polymers identification and classification



OUR OFFER



Construction and manipulation of spectral databases



Artificial intelligence tool dedicated to the creation of chemometric models and spectral analysis

GT Lib

Real-time use of predictive spectral analysis models designed by KAÏSSA

GT-DM for Windows
KAÏSSA web service

Audit of databases and models
Building databases
AI chemometrics and algorithms



What specifies our **Software Solution** :

- Suitable for all technologies: UV-VIS, NIR, MIR, SWIR, LIBS, Raman, Camera Multi and Hyper spectral, Fluorescence,
- Compatible with all **brands of spectrometers**
- Spectral database management
- Connected technology
- Associated with an HW Solution if necessary

Return on investment:

- Save time in development
- Analysis performance and completeness
- Hardware independence

We create chemometric **models** to simplify the interpretation of your data :

- Qualitative identification models
- Quantitative correlation models
- Detection models

KAİSSA is our artificial intelligence tool dedicated to the creation of chemometric models and spectral analysis. She chooses and **combines the preprocessings and selects different modeling strategies** in order to offer the most accurate and robust predictive models.

FEATURES :

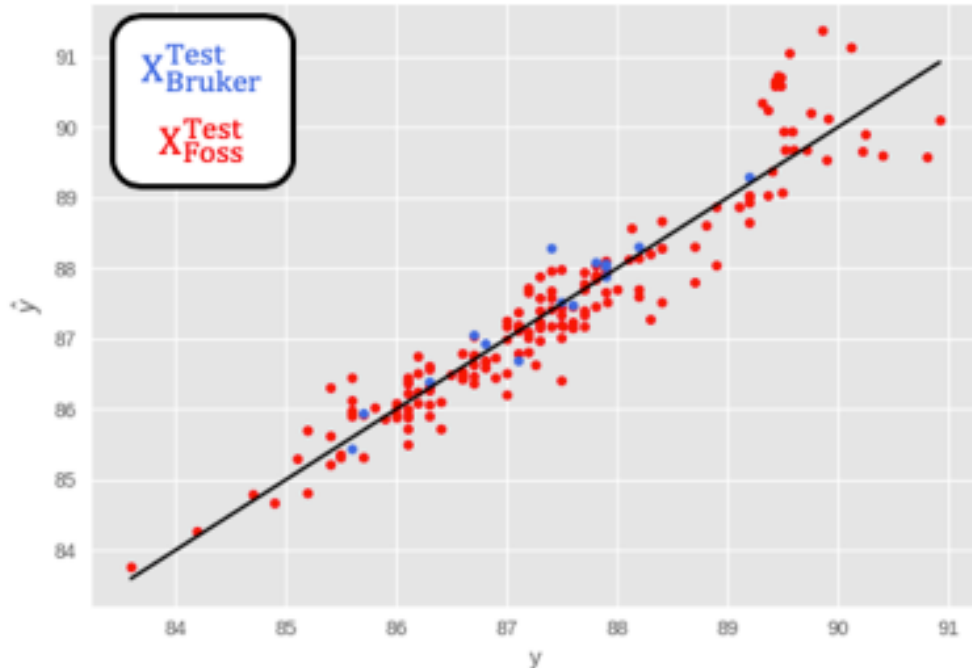
- ✓ Importing datasets
- ✓ Data visualization
- ✓ Creating models
- ✓ Retraining a model to improve its performance
- ✓ Prediction of new data
- ✓ Visualization of the created models

BENEFITS :

- ✓ Build predictive models without human intervention
- ✓ Adapts to spectrometer and spectral range
- ✓ Uses a comprehensive library of spectral data preprocessing and algorithms built by GreenTropism
- ✓ Facilitates the analysis and interpretation of modeling results
- ✓ Autonomous user in creating models



USE CASE: SIMPLIFICATION OF DATA PROCESSING FROM DIFFERENT SPECTROMETERS



Prediction results of the PLS Foss model applied to Bruker data with bias-slope correction

- **Context:** Adisseo customers are equipped with Bruker and Foss spectrometers. Their spectral data are not directly comparable due to a difference in technology. Consequently, a model specific to each type of data must be developed for each parameter and matrix studied.

Objectives: simplify the protocol by proposing a unified prediction approach; use a single model instead of two for each parameter / matrix problem by eliminating the “spectrometer” component.

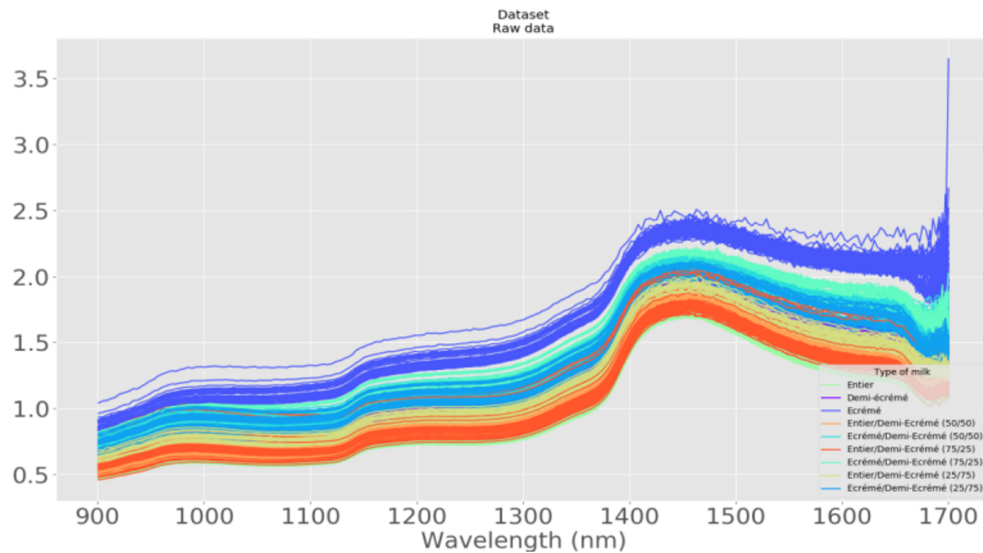
Results: validation of transferability; improvement of performance and simplification of model maintenance management.



USE CASE: FAT IN MILK QUANTIFICATION

Agriculture

Customer
under NdA



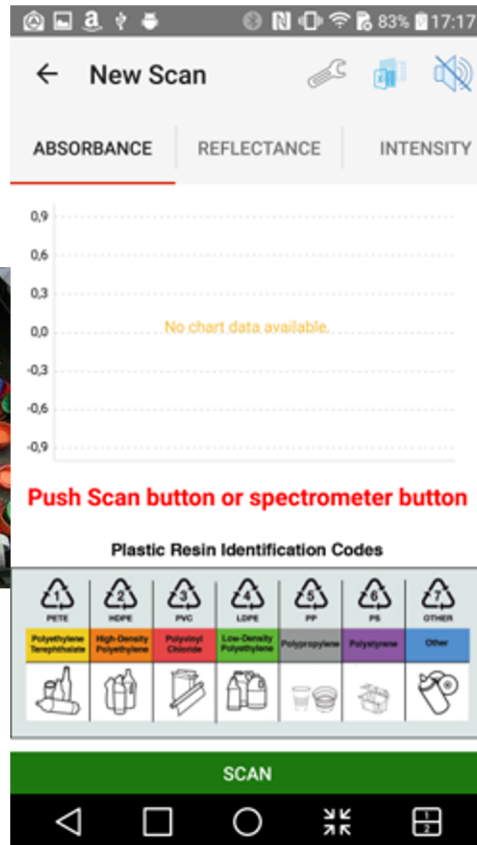
- **Context:** fat in milk is used as an indicator to invoice buyers and to optimize industrial processes
- **Objectives:** use miniaturized spectrometers to measure fat in milk, with taking into account the temperature of the samples and the bias of measurements
- **Results:** after training (600 measurements), the model has been tested in real conditions. New milk samples have been sampled and we have been able to predict their fat content with an average error of 1,2%, demonstrating the reliability of the model that has been developed.



USE CASE: PLASTIC ANALYSIS

Automotive
& Petro-
chemical

Customer
under
NdA



- **Context:** deployment of AI on miniaturized spectrometers for mobile analysis of plastic waste deposit before valorization
- **Objectives:** 5 polymers to identify, to perform immediate buy-or-not decision
- **Main challenges:** molecular similarity of the polymers, long-term calibration management
- **Achievement:** 99% accuracy; unit-to-unit normalization; no network; hardware working in external condition; limited database available
- **Perspectives:** upgrade models to analyze 12 polymers



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