

VLAIO TETRA

Machine Vision for Quality Control

(MV4QC)

Case 5
Bepalen van het vetgehalte in donuts na frituren

Case 5 - Bepalen van het vetgehalte in donuts na frituren



Doughmix	Extrusion en cutting	Proofing	Frying	Cooling
Flour, water, sugar, yeast, fat and donut mix and rework		Water ↑ Flour ↑	Fat ↑ Water ↓	Fat distribution uniformity ↓

$$\text{Fat absorption (FA)} = \frac{F - P}{F} \times 100 \%$$

Met:

P Proofed dough weight

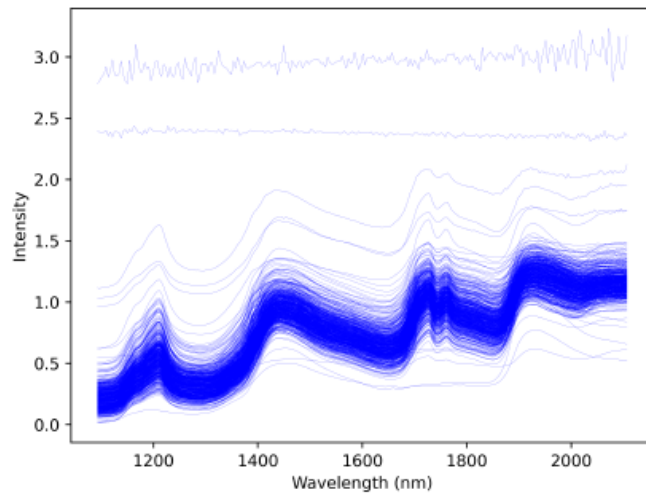
F Fried donut weight

Case 5 - Data capture

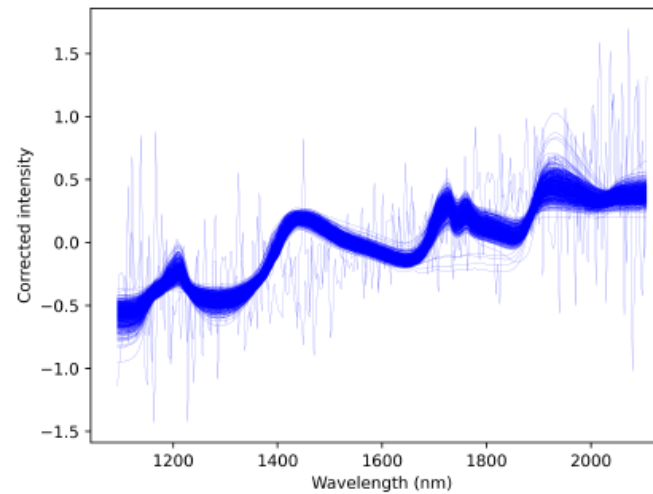
- 10 Februari 2023
- **Covicon** voorziet de PAS-H-B01 probe met bijhorende NIR proces spectrometer.
- Opmeten van invloed van proofing, frying and cooling in meerdere stappen bij Vandemoortele R&D
- Vandemoortele bepaald referentie waarden via een chemische analyse



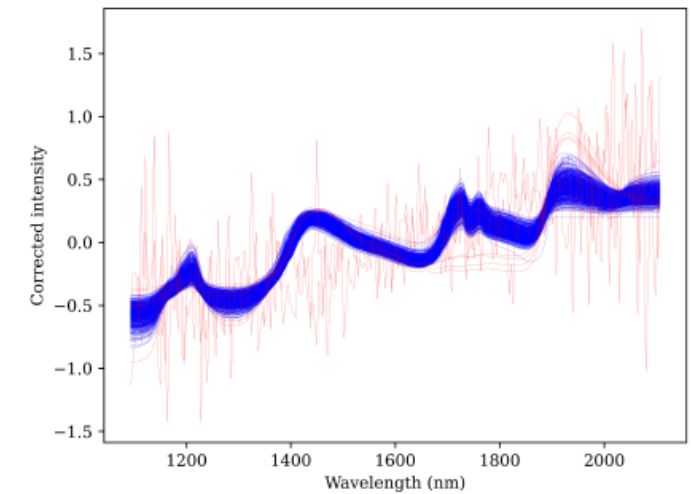
Case 5 – Data pre-processing



(a)



(b)



(c)

Fig. 1: The raw data (1a) is preprocessed by MSC-correction (1b) and outlier (red) filtering (1c)

Case 5 - Fat & Moisture prediction

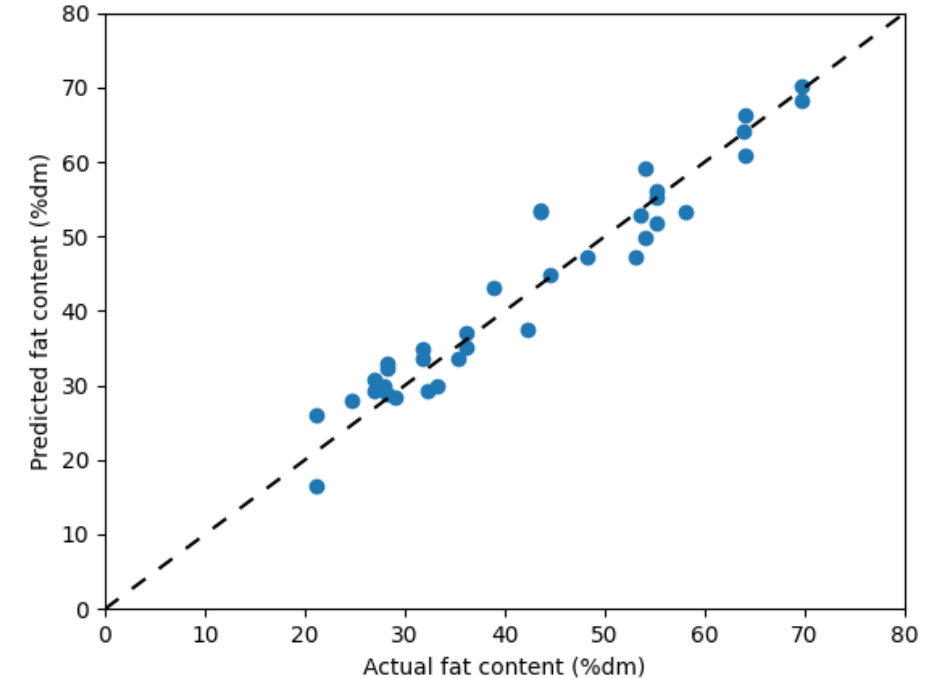
Huidige methode (Weibull-Stoldt)

RMSECV = 1.44

Hyperspectrale analyse

RMSECV = 4.2

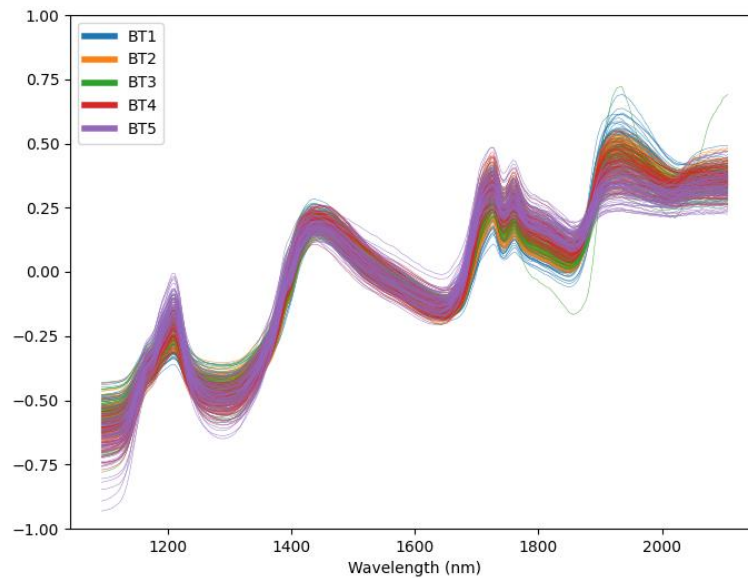
Label	Model (preprocessing)	Number of features	Cross-validation		Prediction	
			Rc^2	RMSECV(%)	Rc^2	RMSEP(%)
Fat	PLSR (SNV + SD)	81	0.89	4.20	0.92	3.8
	LS-SVM (SNV)	79	0.68	7.32	0.75	7.14
Moisture	PLSR (SNV + SD)	60	0.88	1.83	0.92	1.61
	LS-SVM (SNV)	63	0.68	2.96	0.83	2.39



Case 5 – Next steps

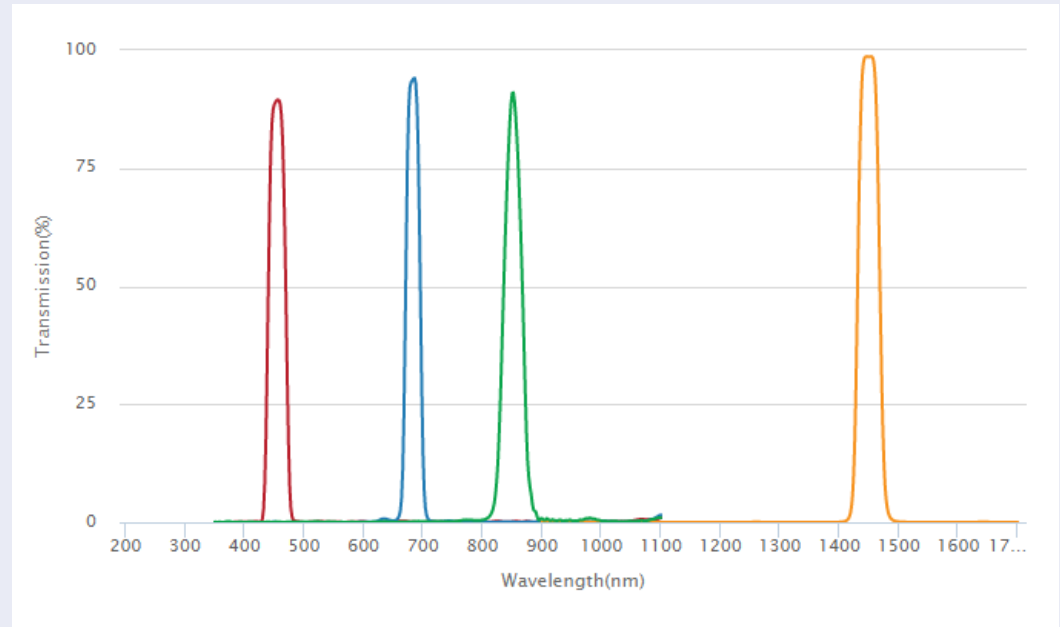
Hyperspectraal

81 Banden van 8 nm



Multispectraal

Meerdere commercieel beschikbare filters



Case 5 – Next steps

- Valideren van resultaten voor potentiële implementatie
- Mogelijkheden overleggen met **integratoren** voor opstellen van testopstelling + kostenschatting