



Electro Optical Components, Inc.

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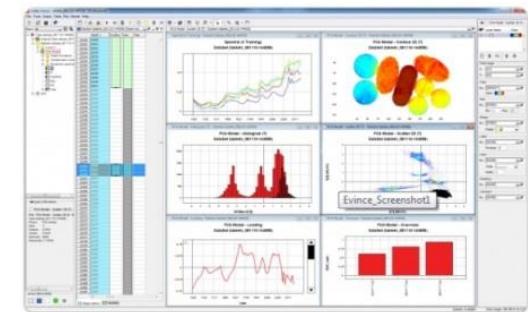
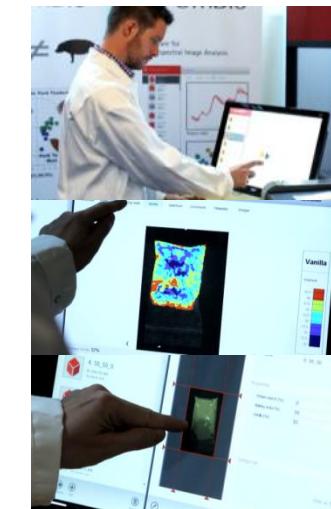
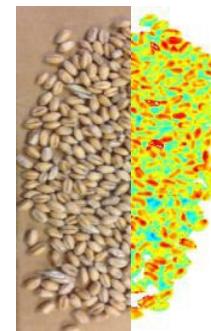
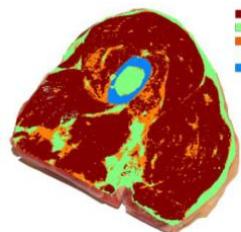
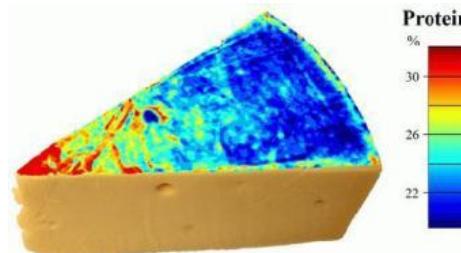
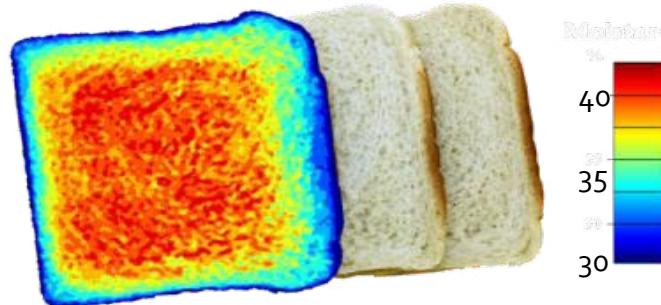
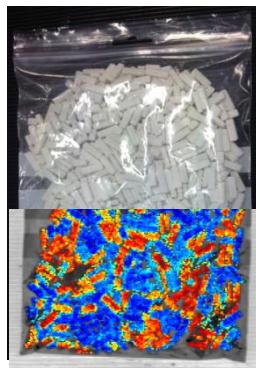
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Product Selector

Prediktera.

See the invisible

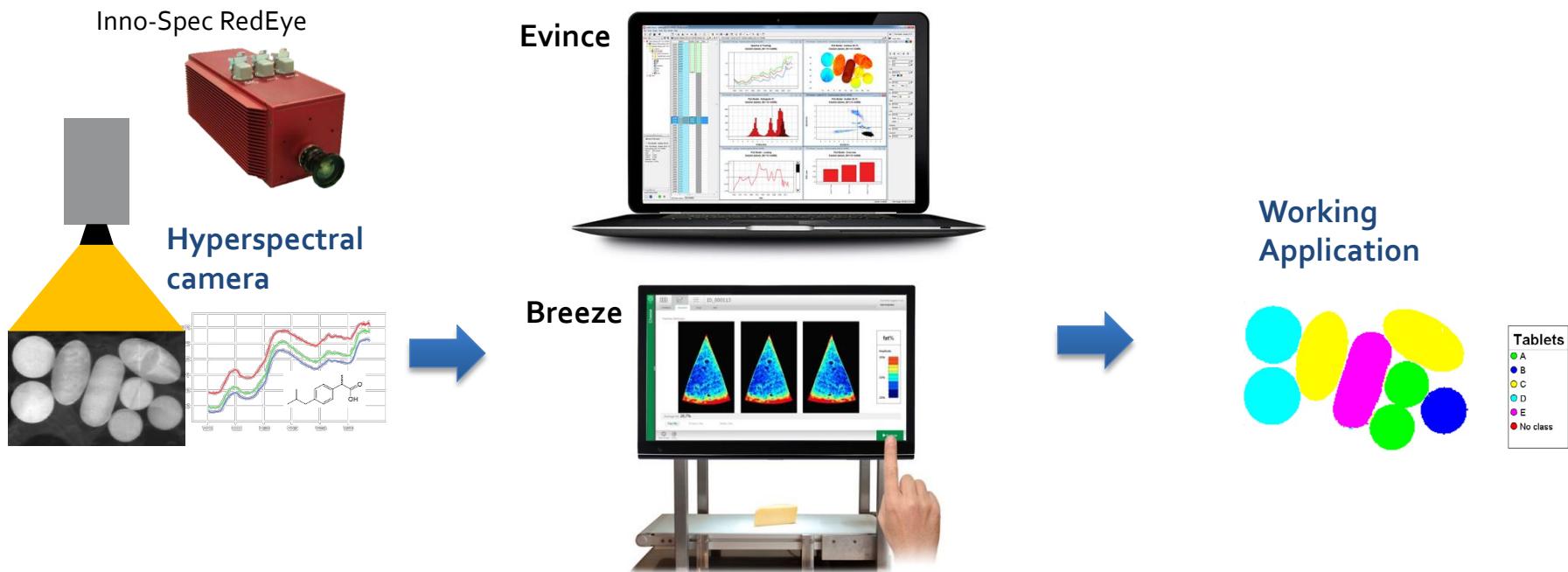
Example applications



Software for hyperspectral imaging analysis

Prediktera.

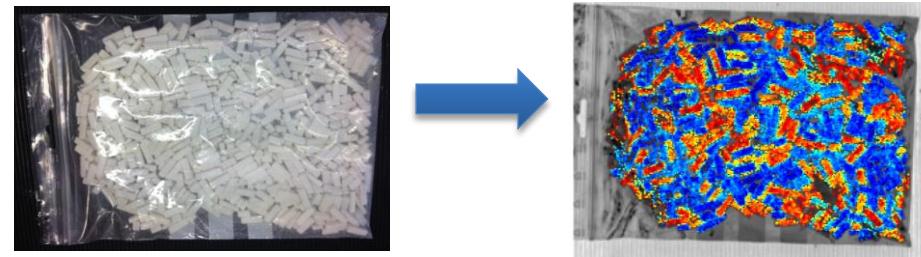
Develop applications and solutions based on hyperspectral imaging



Typical types of applications

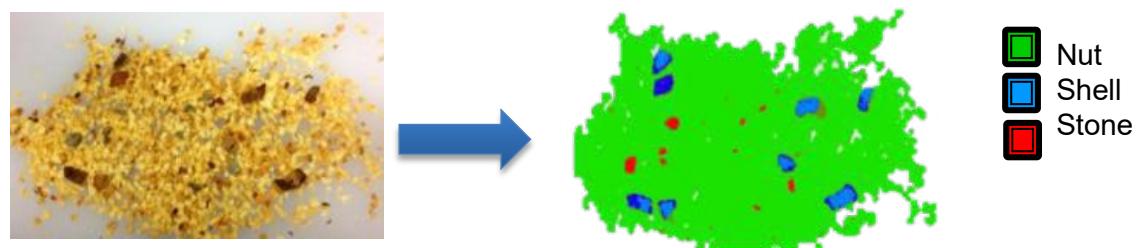
Example: Screening of confiscated drugs

Chemical variation

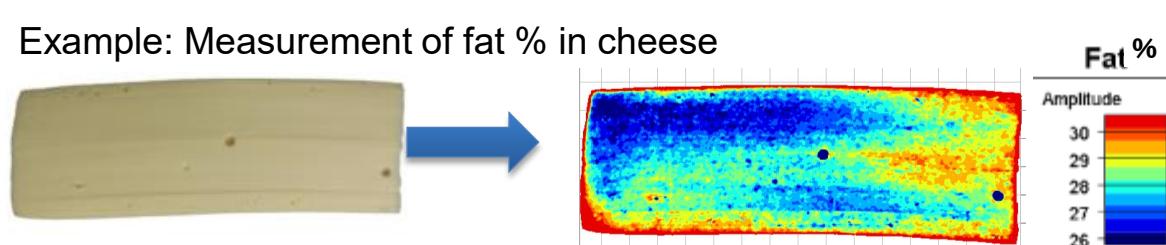


Example: Detection of stones and shell

Classification



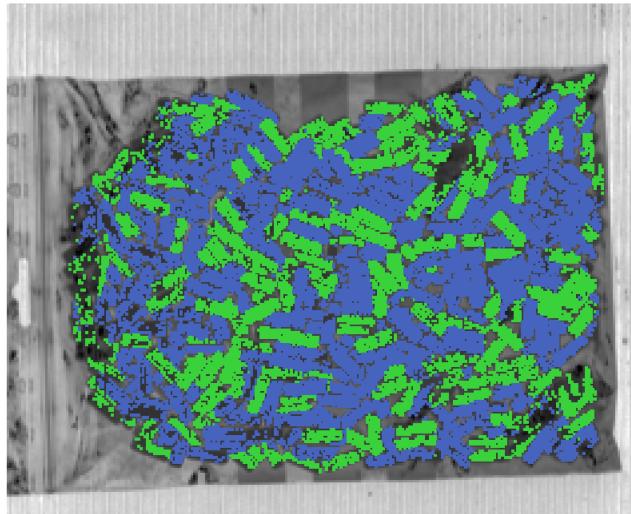
Quantification



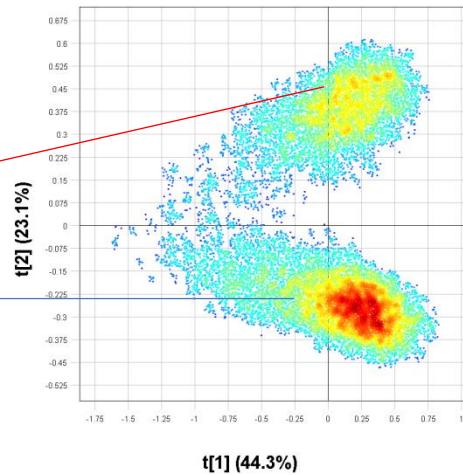
Chemical variation: Screening of confiscated illegal drugs

Prediktera.

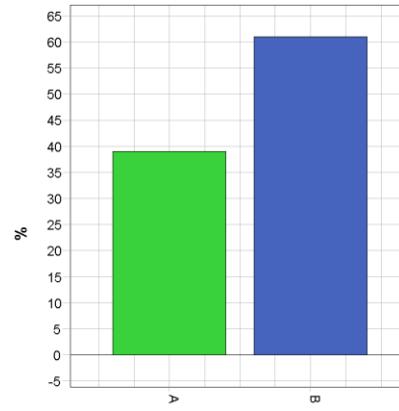
Alprazolam (Benzodiazepine) tablets



PCA scatter plot



% of type A och B

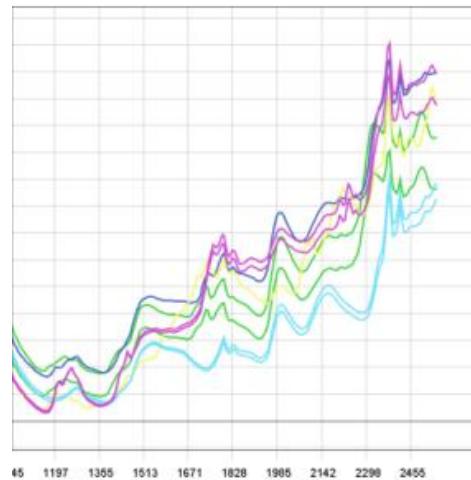


Classification of tablets

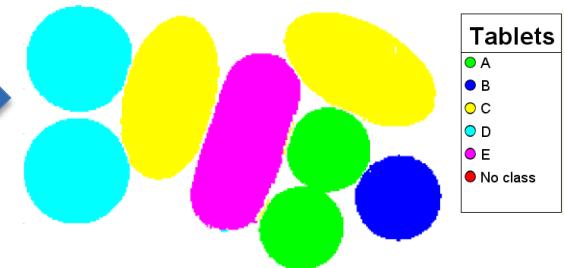
Prediktera.



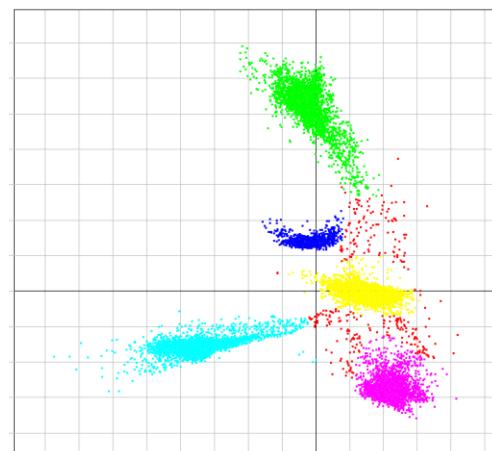
Average spectral profile for each object



PLS-DA



Scatter plot for pixels



Classification example: Mould infected barley seeds

Prediktera.

Infected



Healthy

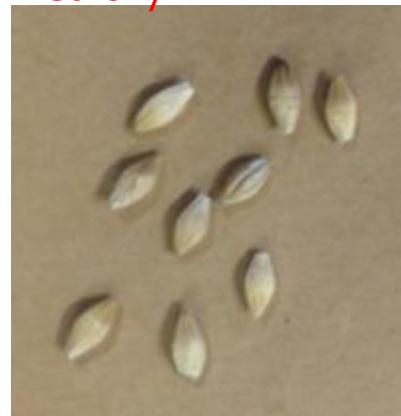
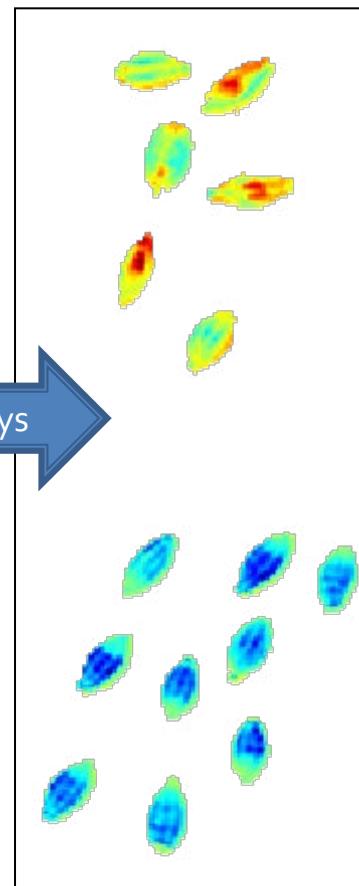
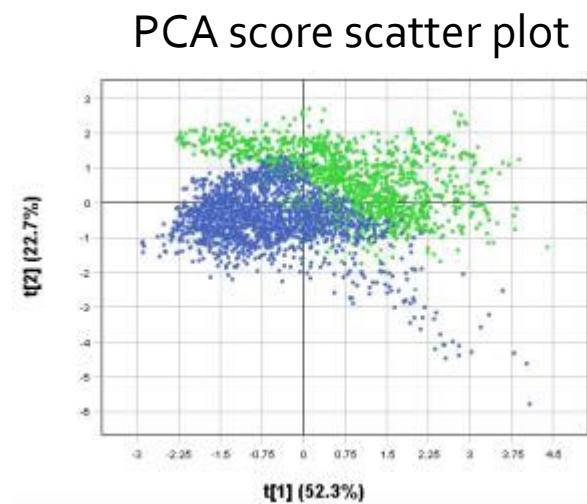
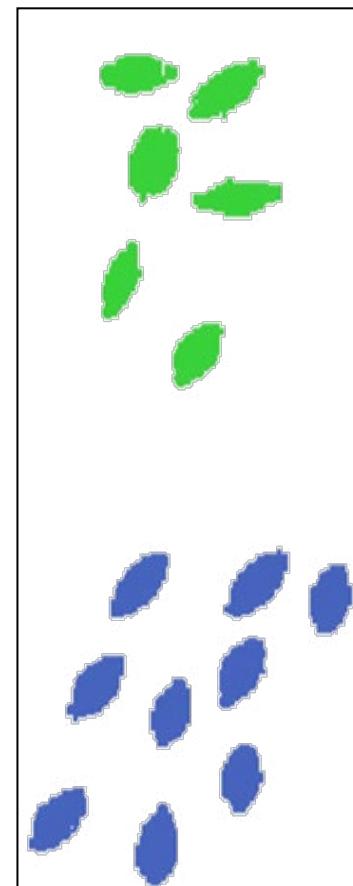


Image analysis

Chemical variation



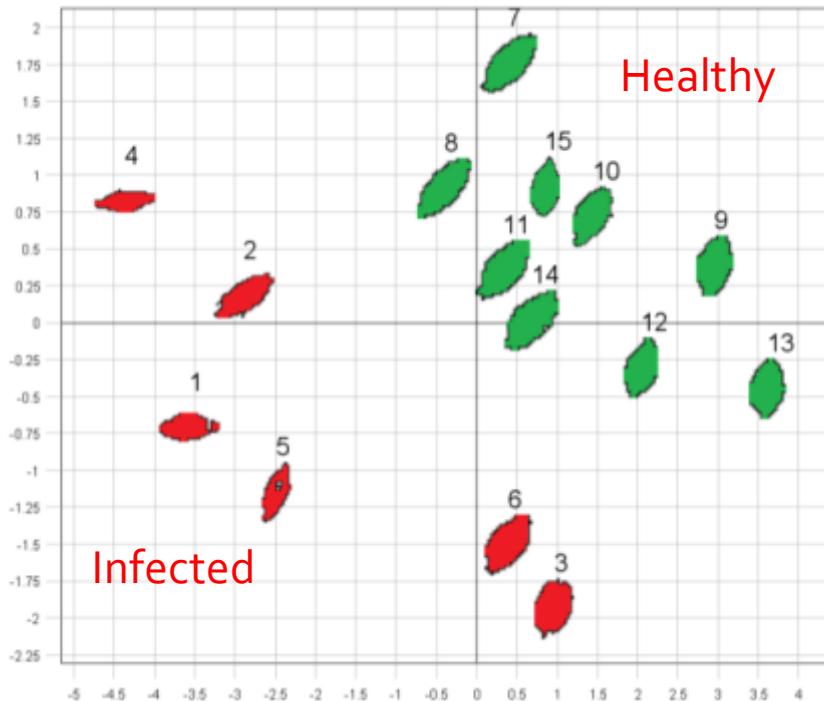
Classification



Combine chemistry and structure for improved discrimination

Prediktera.

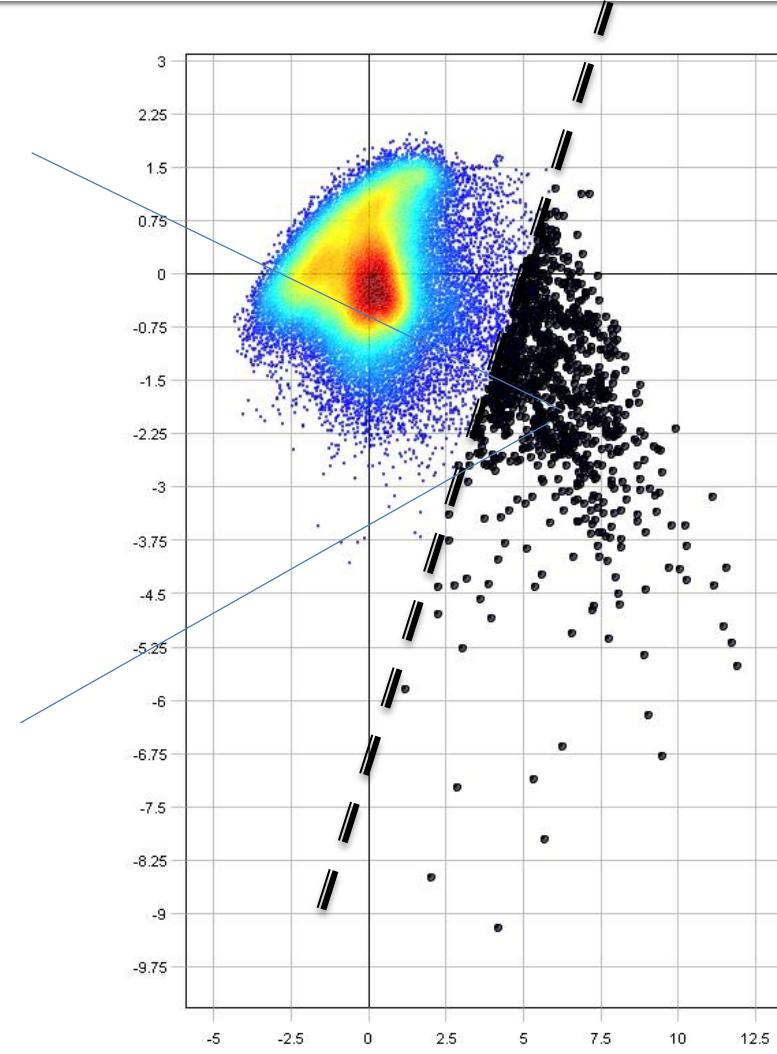
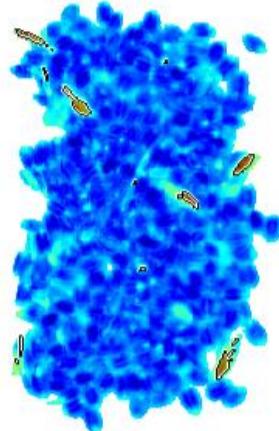
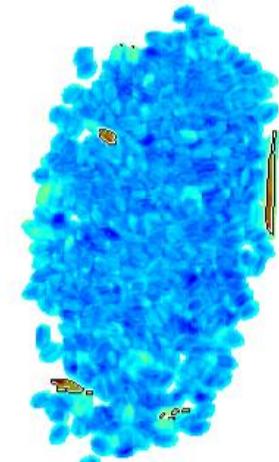
Score scatter plot based on average spectra for each seed



Name	Area	D1	D2	Circumference	Regularity	Roundness
1	203	24.12	11.14	59	0.86	0.40
2	232	26.87	11.78	59	0.92	0.39
3	262	23.72	14.55	56	1.02	0.50
4	204	27.38	10.58	59	0.86	0.33
5	160	24.34	9.37	48	0.93	0.34
6	199	22.43	11.84	47	1.06	0.50
7	229	25.43	11.48	52	1.03	0.44
8	205	24.84	10.63	50	1.02	0.40
9	205	21.35	12.61	48	1.06	0.56
10	212	23.31	12.81	50	1.03	0.45
11	214	24.20	11.79	51	1.02	0.46
12	180	21.19	11.39	45	1.06	0.50
13	193	20.38	12.32	44	1.12	0.59
14	222	24.08	12.28	51	1.04	0.48
15	232	25.16	12.47	52	1.04	0.41

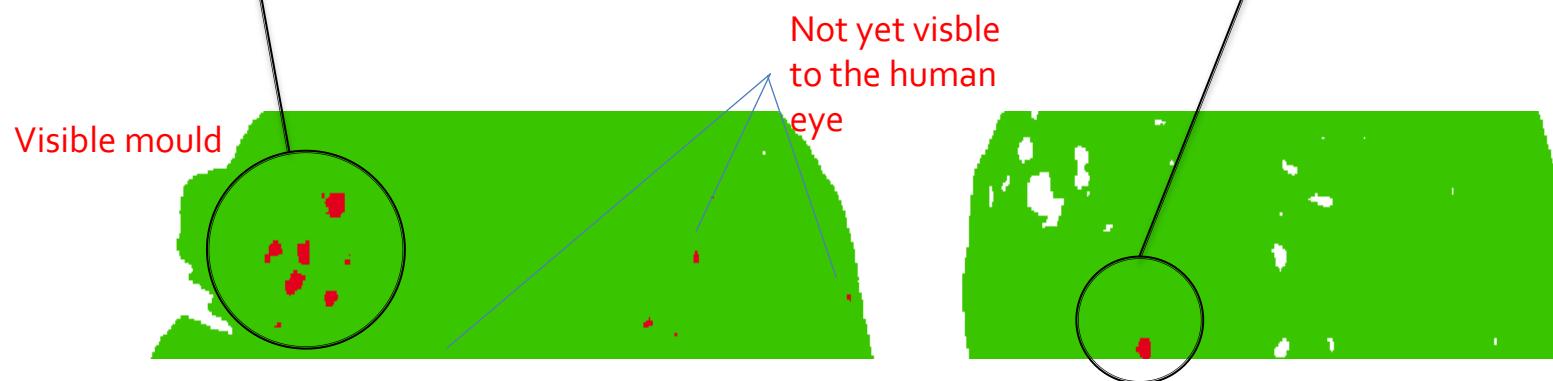
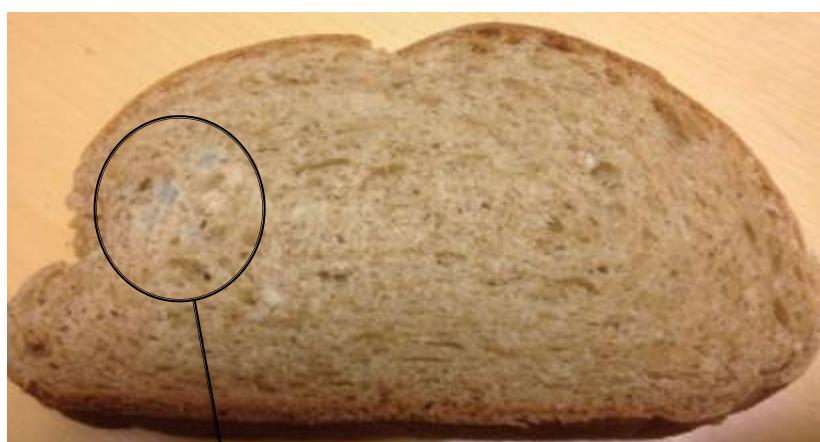
Detection of shell and twigg

Prediktera.



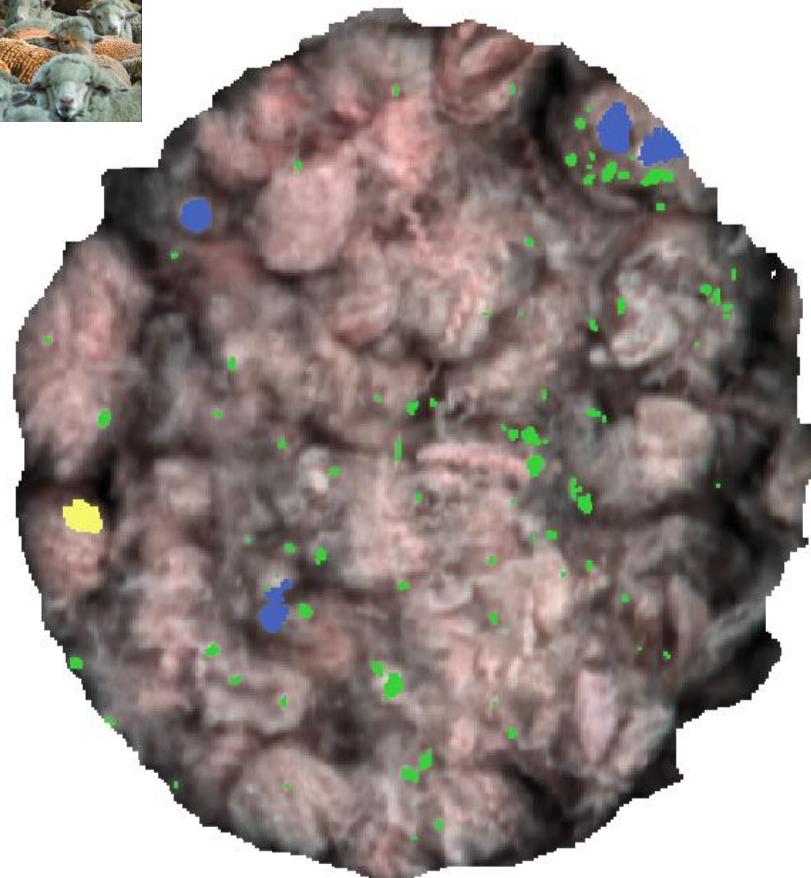
Detection of mould on bread

Prediktera.



Classification example: Vegetable matter contaminants in wool

Prediktera.



PLS-DA classification

Contamination
Burrs
HardHeads
Seeds

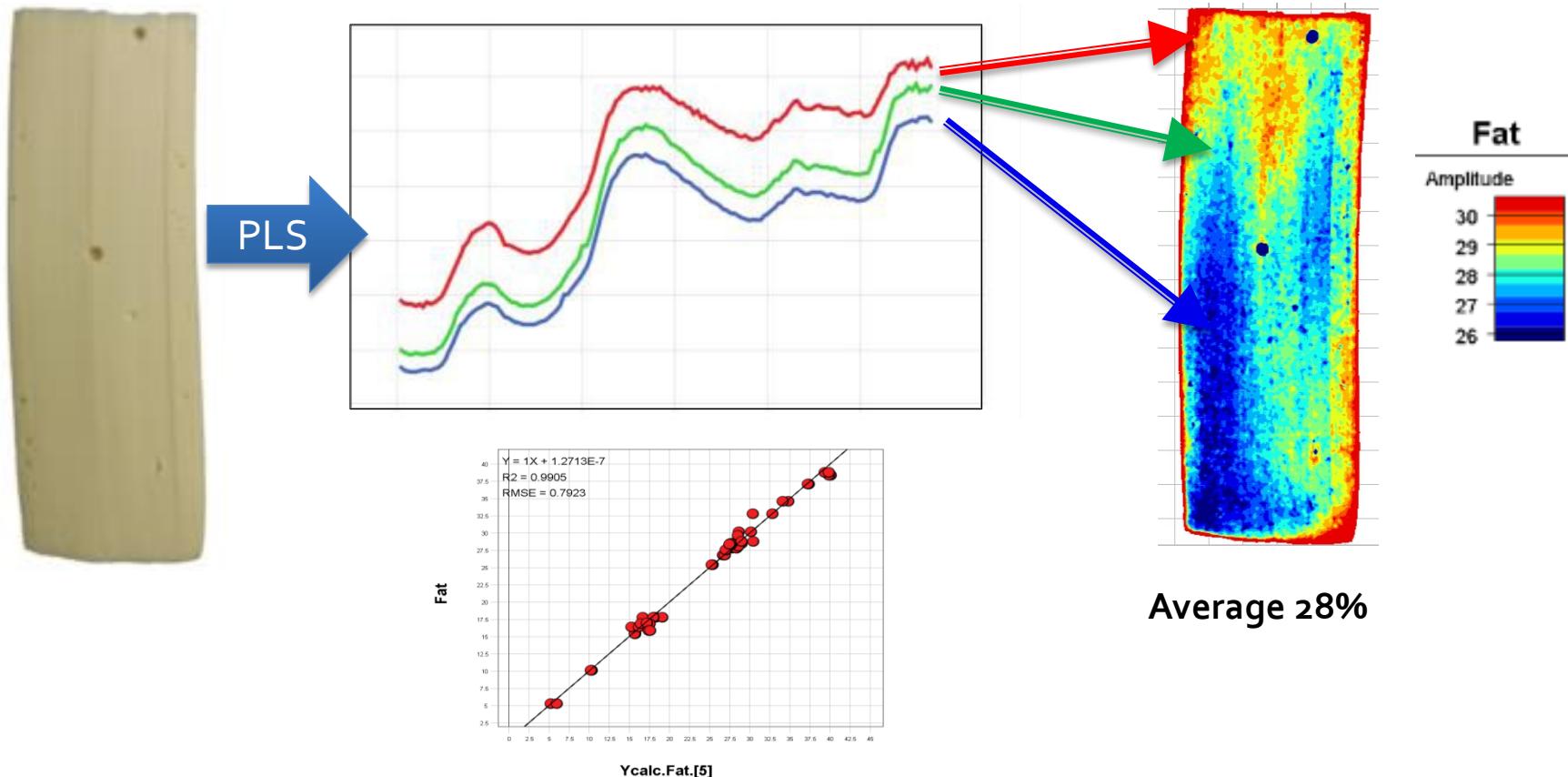
Statistics
VB(%) = 44
VM(%) = 17
HH(%) = 0.09
seed(%) = 9.43
Burr(%) = 7.75



Quantification of fat in cheese

Prediktera.

Measurement of fat % in cheese

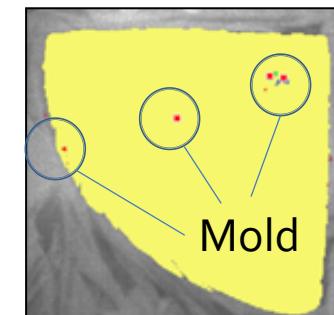
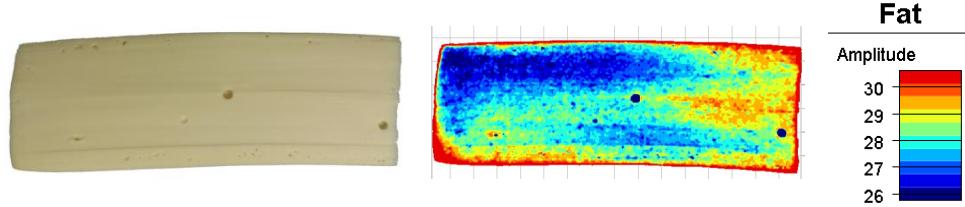


Cheese application areas

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Additional application areas:

- Quantification of fat, water, protein etc.
- Analyse hole structure
- Variation in wax layer
- Detection of mold
- Monitor maturity of cheese



Other benefits:

- Analyse whole cheese blocks, cut, sliced or grated cheese
- No sample preparation required
- Analyses pre-packaged product (for example through plastic packaging)
- Non-destructive

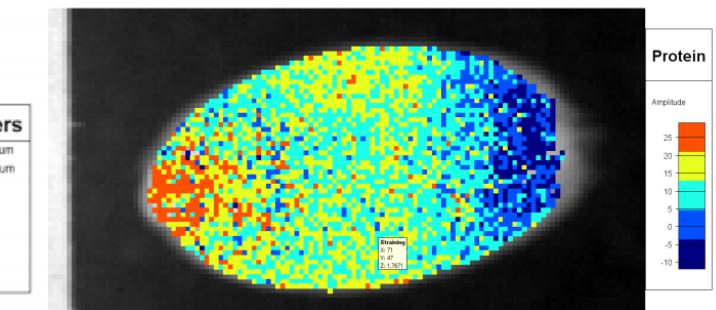
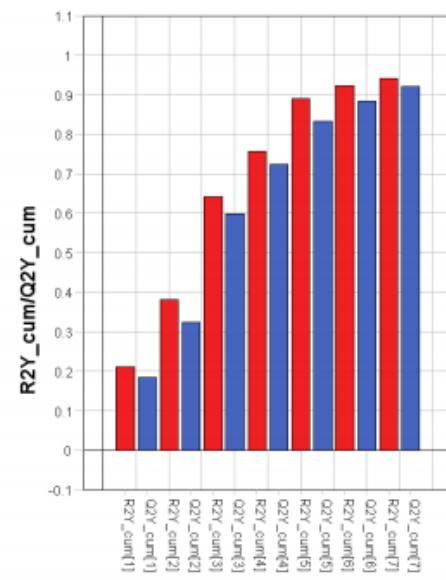
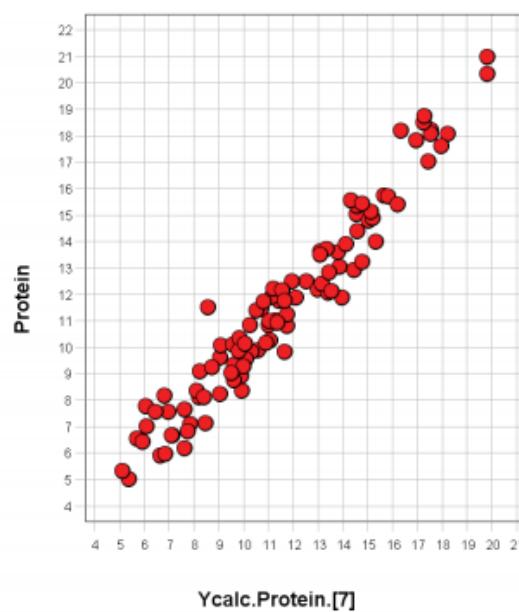
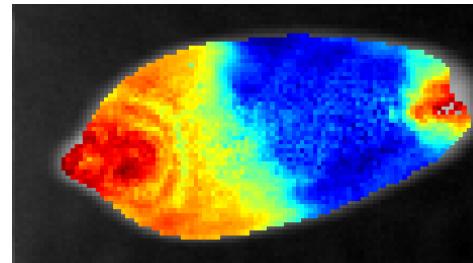


Quantification example: Protein in individual wheat grains

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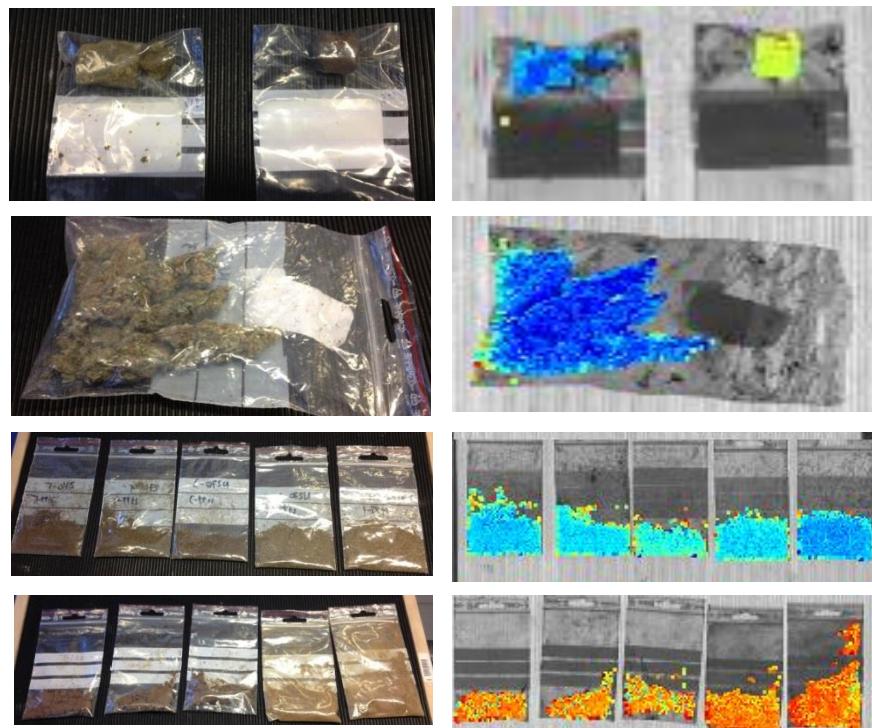
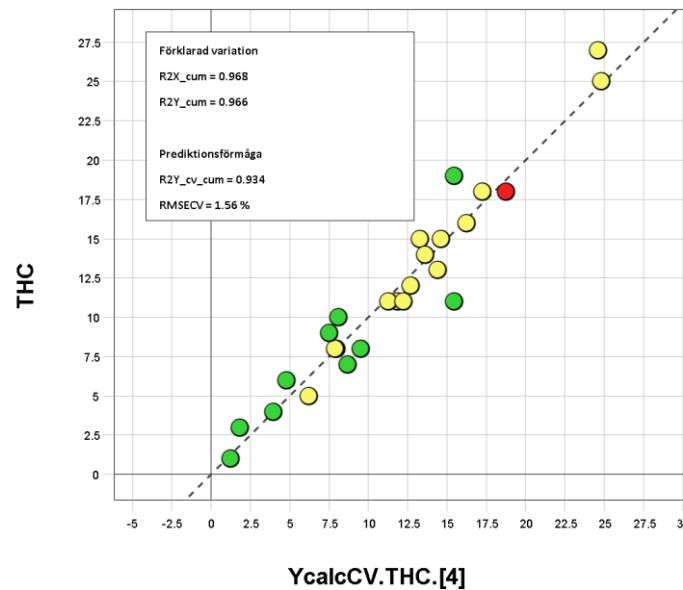
Macro lense, 30 microns/ pixel



THC quantification in cannabis and hashish

Prediktera.

Actual vs. Predicted THC %

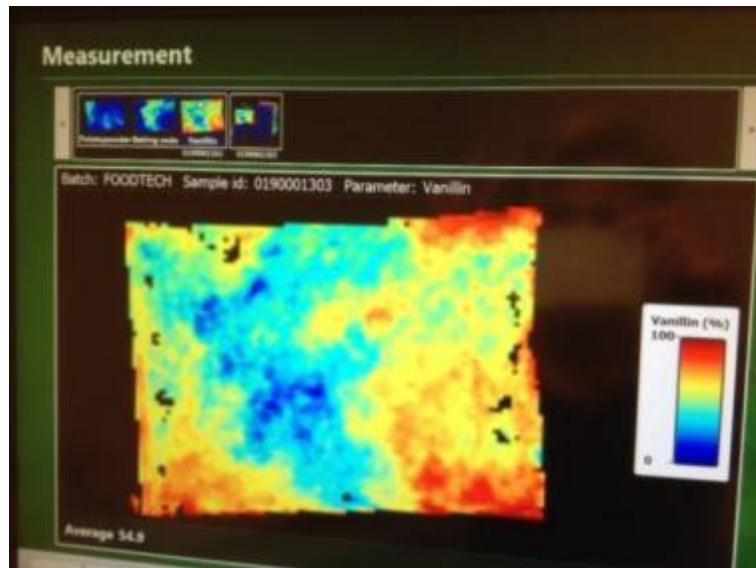


Homogeneity of mixed powders

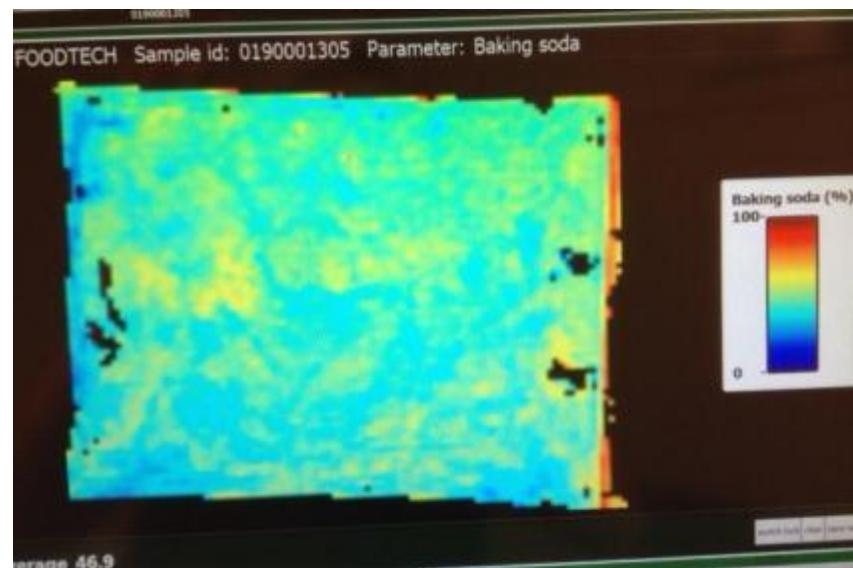
Prediktera.



Not well mixed



Well mixed



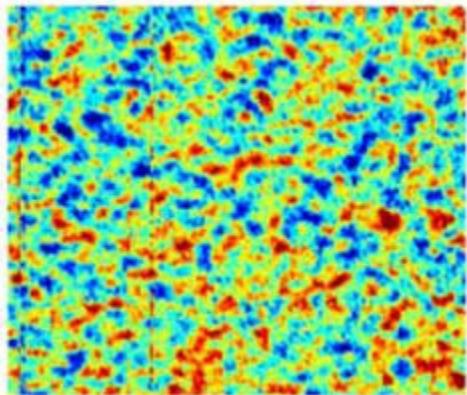
Homogeneity in spice mixture

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Three spices were mixed together and analysed

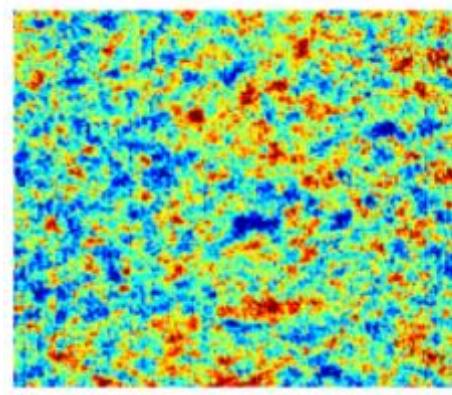
- Content (%) of each spice in the mixture
- Distribution of each spice

Garlic



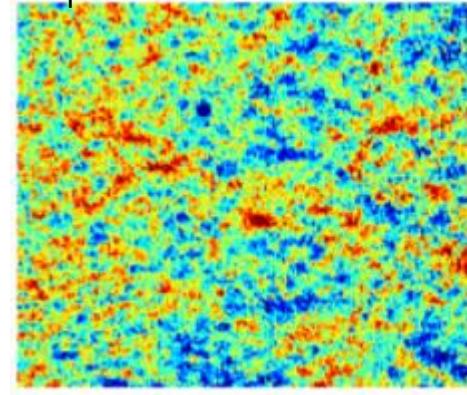
Average 29%

Chili



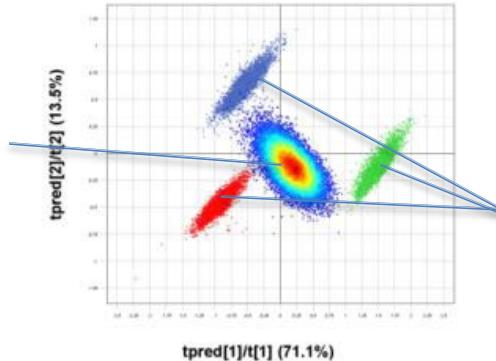
Average 25%

Paprika



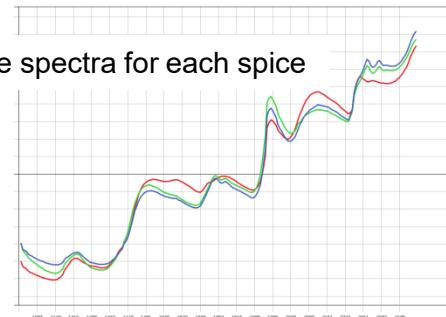
Average 46%

Mixture



Pure spice

Average spectra for each spice



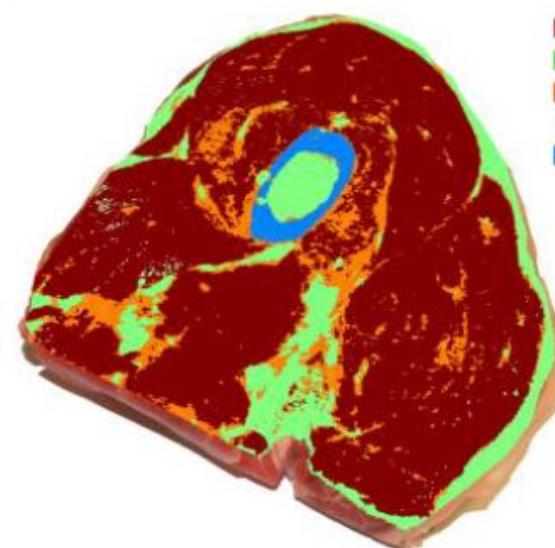
Chemical Image analysis of meat products

Prediktera.

Use the hyperspectral system to get a high resolution image of content and distribution in the meat product.

Example of parameters:

- Fat
- Protein
- Connective tissue
- Bone
- Water
- Salt
- Complex parameters such as:
 - Origin
 - Type of meat
 - Effect of aging/storage

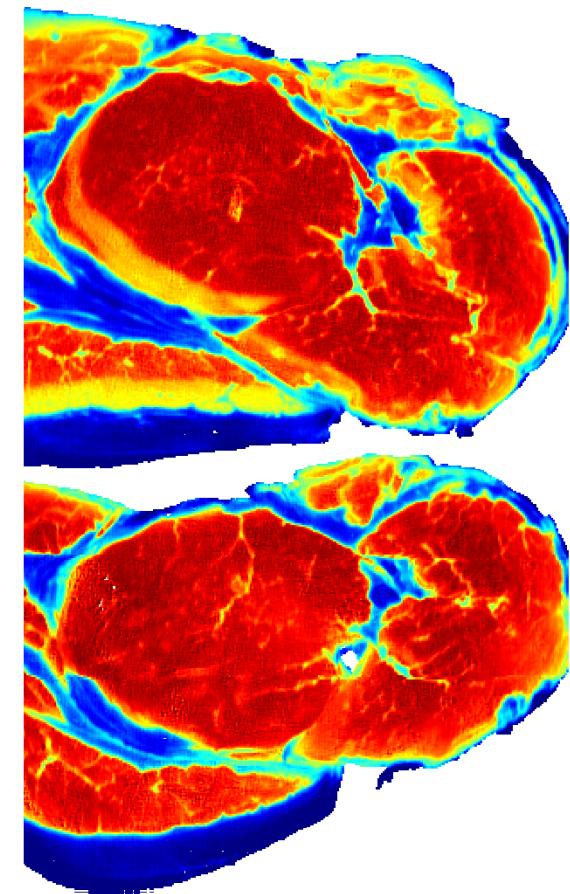


Grading of meat based on constitution

Analysis of fat content

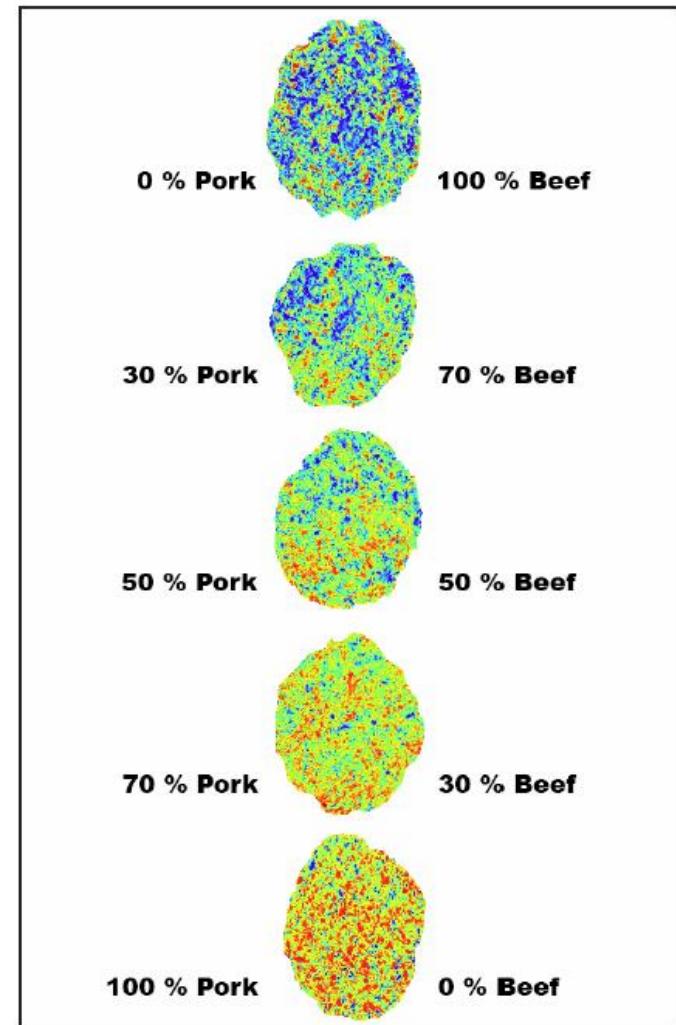
Prediktera.

- Content and distribution of:
 - Intramuscular fat (meat marble)
 - External fat (intermuscular fat)



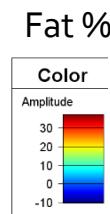
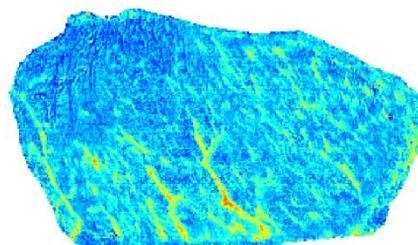
Amount of pork mixed with beef in hamburgers

Prediktera.

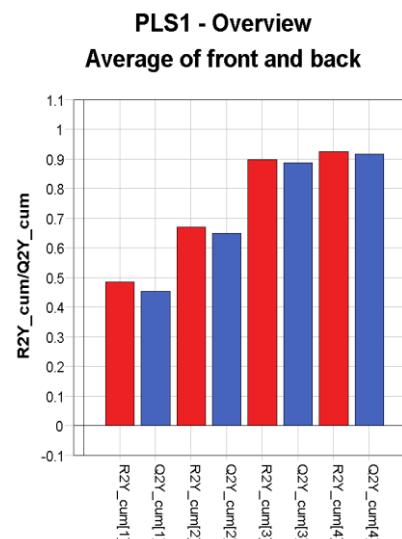
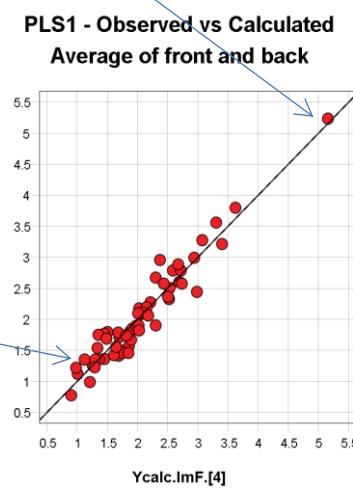


Quantification and spatial distribution of intra muscular fat in pork meat

Prediktera.



- Hyperspectral imaging provides a fast, non-destructive method that doesn't require sample preparation
- Quantification of the % fat for the whole sample and the spatial distribution of fat



Presented at NIR2015,
Iguassu Falls Brazil,
2015-10-22
Prediktera, Suisag

R² = 0.92
Q² = 0.91
RMSE = 0.21%

