SMP SPECTRA - Report

2024-12-09, Paulo de Boer, Peter Meewisse

WAGENINGEN UNIVERSITY & RESEARCH

HILTON FOODS

PLUKON food group

Videometer

PhotonMission

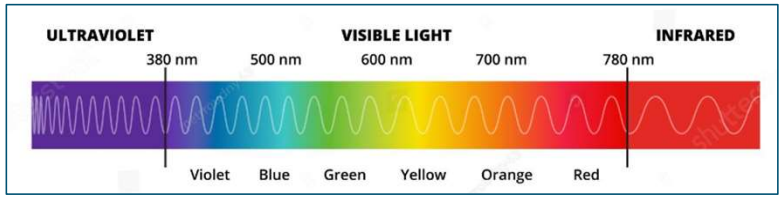
MOWI

Project aims SMP SPECTRA

- Explore the potential of SI for beef and poultry meat and compare physicochemical changes detected during different storage scenarios with conventional methods to assess (microbiological) quality.

- Evaluate how spectra fingerprints can be related to microbiological status or activity levels of the beef and poultry meat products.

- Draft a public private partnership proposal on the topic for further development and validate for other food categories and for the use of prediction purposes for the food industry.



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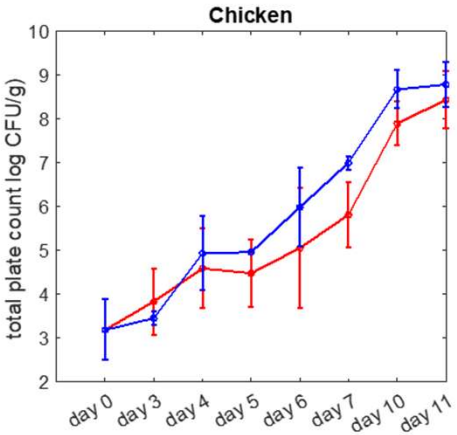
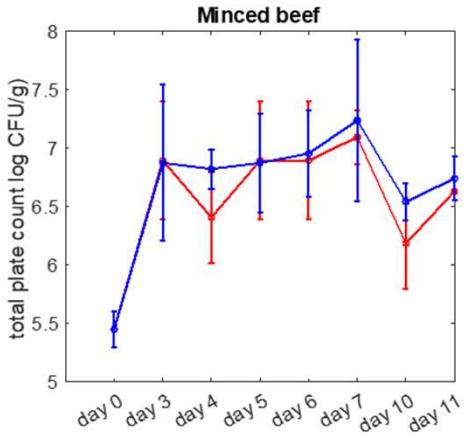
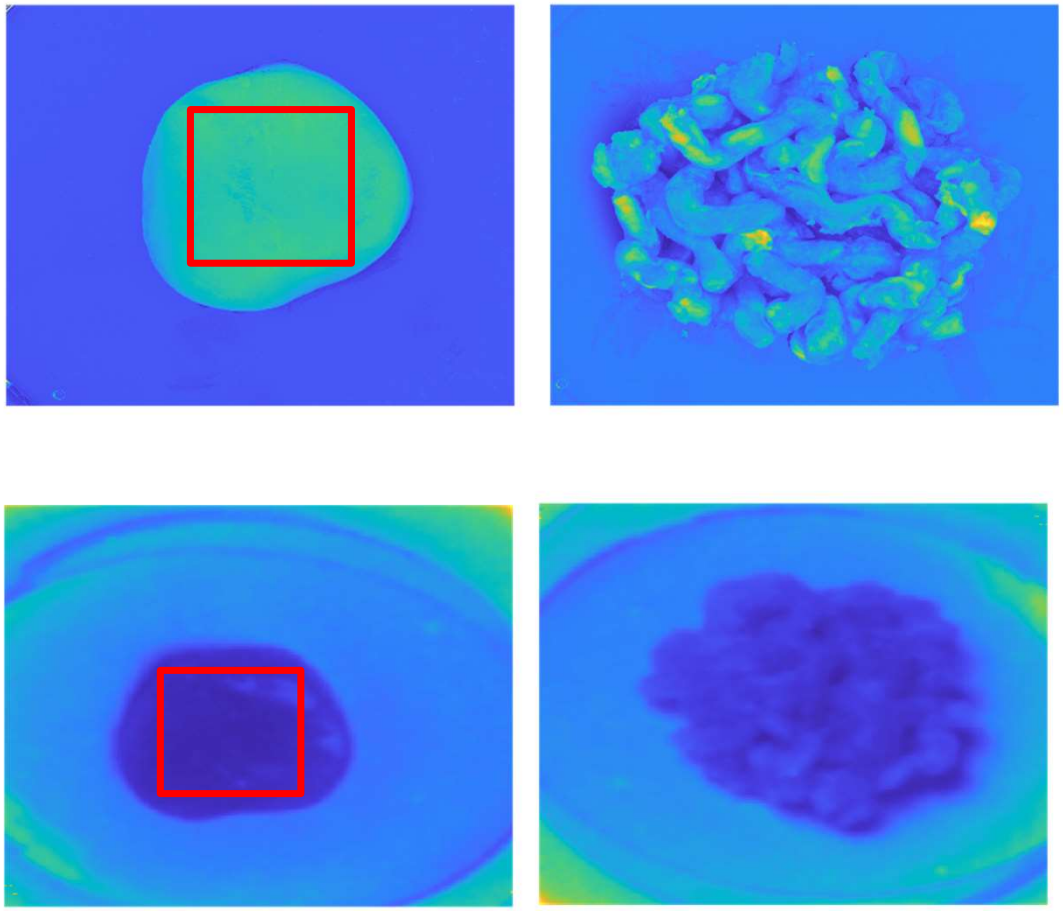
Spectral images vs. microbial count

- Spectral images vs. microbial counts (total plate count (TPC) shown)





Videometer



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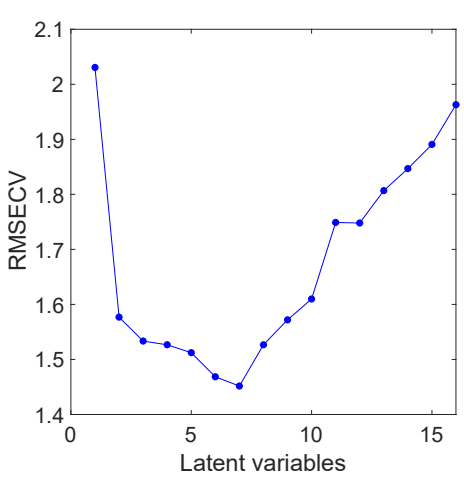
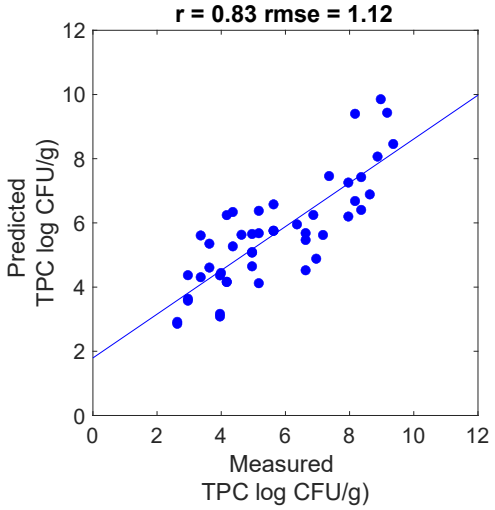
Correlation SI to microbial count

- The spectral data were linked with reference analysis data using partial least-square regression
- → Results presented are 'leave one out' (LOO) cross-validation, *i.e.*, model was calibrated on n-1 samples and tested on 1 left over sample





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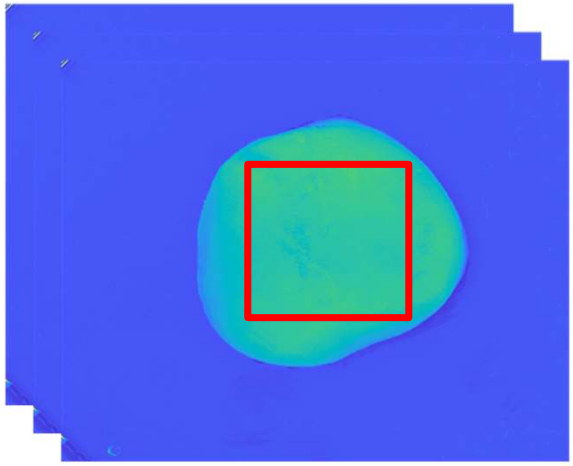
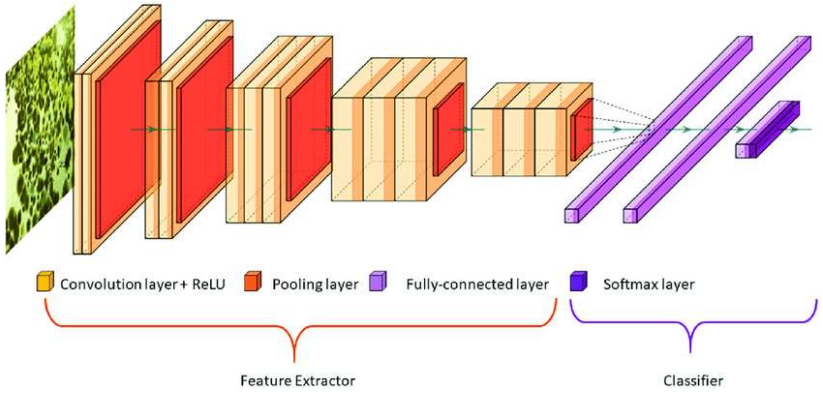
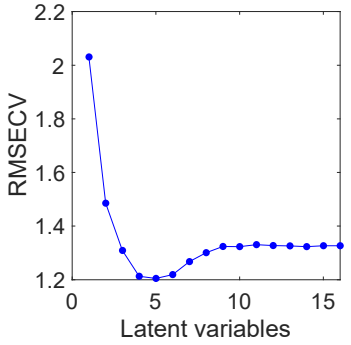
Deep feature extraction

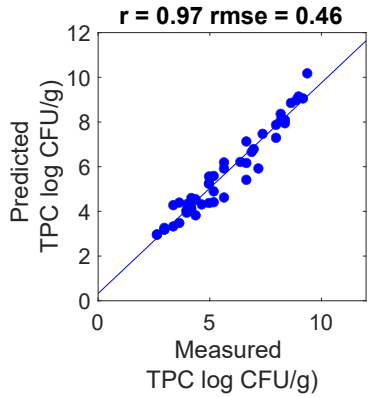
Deep features were extracted from spectral images and used for regression





Deep model for feature extraction





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Conclusions

- There is good correlation between spectral signals and the microbiological counts
- For chicken breast, the analysis is more reliable due to better microbiological data for model calibration
- The colour and fluorescence information appears to be more correlated to the microbiological parameters than NIR or SWIR
- All presented results are cross-validation analysis results, and independent validation of models is still required

Follow-up → PPP SPECTRA

- The SMP results strongly support the hypothesis that SI can be used as read-out for microbial status of perishable products
- → PPP proposal submitted and granted in which the use of SI will be further investigated as quick read-out of fresh product quality, and for prediction of shelf-life
- All SMP partners have indicated interest in joining the intended consortium
  - Also committed: Albert Heijn (retailer) and Mowi (fresh fish products)
  - Room for 2 additional (international) partners

Private partner (Hilton Foods) - Benefit

- Store waste is the main source of waste within the meat supply chain. Reducing store waste both helps to reduce food waste and to reduce the overall carbon emission of our products.
- Variability of shelf life in fresh meat is quite large due to wide sourcing, different ages of the raw materials and variability in processing. Shelf life is based on the worst case scenario to prevent spoiled products before end of shelf life. This results in an unused shelflife potential of 1-2 days for a significant part of our supplies.
- With SPECTRA technology we would be able to detect the relevant microload which enables us to give the optimal shelf life date on each pack.
- When successful we expect a reduction in store waste of appr. 0.5-1% ~ 250,000 – 500,000 kg meat/yr ~ 5-10 ktonnes CO_2-emission/yr.
- The SPECTRA project, supported by SMP, demonstrated it would be possible to detect microbiological contamination on meat at the moment of packaging. This is the first step to realize a way to predict shelf life in order to create a reliable flexible shelf life on pack.

Information

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To explore the potential of nature to improve the quality of life

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