perClass Mira®

The easiest user interface for spectral imaging with real-time deployment

Agro & Food

- Plant phenotyping
  - segmenting plant parts
  - disease detection (virus and fungal infections)
  - estimation of plant stress / nitrogen content / ...
  - estimation and mapping of dry matter content
- Food authenticity by geographical origin and variety
- Foreign object detection in food processing
  (stone, plastic, nut shells, wood)
- Food sorting applications such as
  - Detect greening, rot and peel in French fries
  - Detect seed potato diseases
- Detect overripe or firm fruit
- Sort by brix, acidity, limonin content in fruit
- Characterize meat marbling, fat content
- Estimate protein content in animal feed
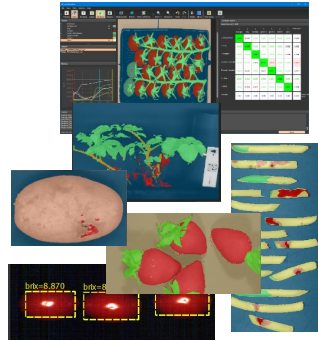
Recycling & Material Science

- Plastic separation
- Sorting of textiles by material
  irrespective of color (also dark textiles)
- Paper sorting
- Material transition identification
- Characterization of microplastics
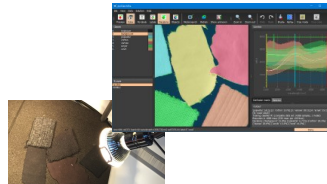
Medical & Pharma, Forensic

- Tissue classification
- Pill type identification
- Blood smear analysis
- Detecting sufficient oxygenation
- Wound assessment
- Blood detection
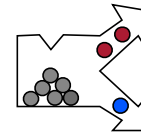- Crime-scene documentation
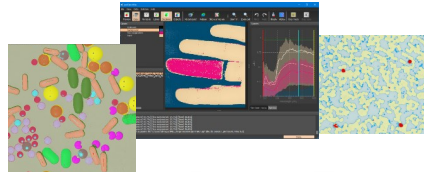
Remote Sensing & Environmental

- Land cover classification
- In-flight image segmentation for drone
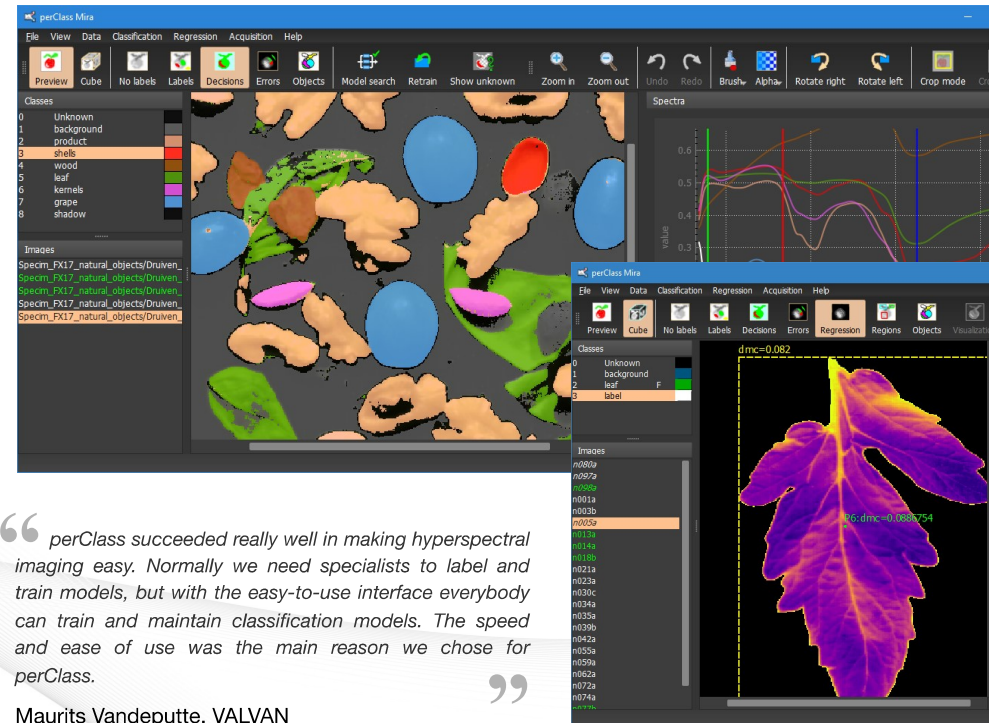 operations (plants, soil types, fruit)
- Cloud removal
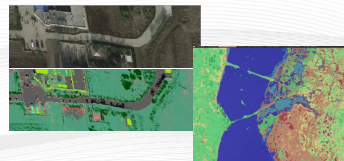
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> *perClass succeeded really well in making hyperspectral imaging easy. Normally we need specialists to label and train models, but with the easy-to-use interface everybody can train and maintain classification models. The speed and ease of use was the main reason we chose for perClass.*

Maurits Vandeputte, VALVAN

The Challenge

Modern spectral sensors provide **gigabytes of high-resolution images** with hundreds of bands. The interpretation process is currently **very time-consuming**. It typically requires **programming** and a high-level of expertise in applied statistics, machine learning and chemometrics. The path to **real-time production** is often unclear and deployed solutions are **not easily reconfigurable**.

The Solution

perClass Mira enables anyone to create and deploy automatic interpretation solutions without programming or machine learning expertise.
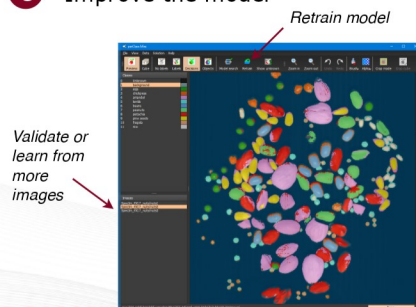
The Workflow

1 Define classes of interest

Paint labels

Load one or more images
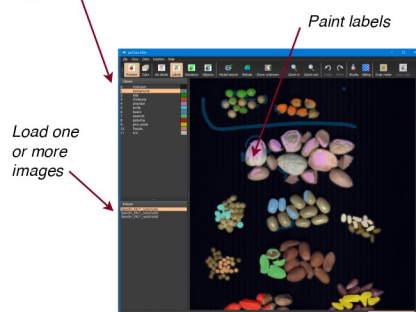
2 Automatic model-search

Inspect decisions

3 Improve the model
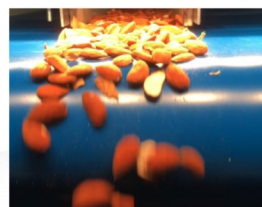
Retrain model

Validate or learn from more images

Active Learning guidance to paint new relevant labels

4 Deploy in your application

with perClass Mira Runtime

Validate speed directly from GUI with live acquisition.
Runtime provides object coordinates to drive actuators.

Key features

▸ Easy-to-use, results in minutes
▸ **Automatic model building** using state-of-the-art Machine Learning
▸ **Intuitive and precise** labeling and annotation tools
▸ Higher quality labeling with Active Learning guidance
▸ **Scalability** to hundreds of scans
▸ Batch export of data extracted per scan or per object
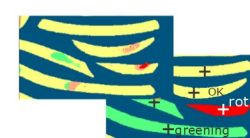▸ Apply models to **live data stream** from supported cameras

Use-cases

Foreign object detection
Example: Nut shells removal
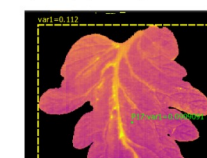Object coordinates/sizes

Object classification
Example: French fries grading
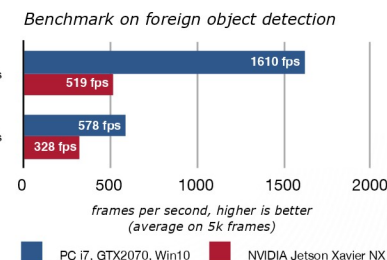Content-based object decisions

Object quality
Example: Moisture content
Quality per-object and pixel

High-speed deployment with perClass Mira Runtime

▸ Easy integration (<1h)
▸ Line-scan and snapshot processing
▸ Delivers object positions
▸ Reconfigurable reflectance correction
▸ Multi-core CPU and GPU support
▸ Real-time capable

Measuring processing speed starting from full raw frames of a line-scan camera (640 pixels, 224 bands) until object coordinates. Classifying two product types, four contaminants.

Benchmark on foreign object detection

14 bands — 1610 fps / 519 fps
224 bands — 578 fps / 328 fps

frames per second, higher is better
(average on 5k frames)

■ PC i7, GTX2070, Win10   ■ NVIDIA Jetson Xavier NX

Data formats

▸ Generic format support (ENVI cubes, Matlab® .mat files, Tiff files)
▸ Presets for common camera types such as Corning, Cubert, IMEC, Inno-spec, Headwall, Hyspex, OceanInsight, Resonon, Senop, Specim, Silios

System requirements

▸ **perClass Mira GUI**
  ▸ MS Windows 10, 64-bit
  ▸ Optional NVIDIA GPU
     with CUDA10 and later or OpenCL

▸ **perClass Mira Runtime DLL**
  ▸ MS Windows 10, 64-bit
  ▸ Linux 64-bit (NVIDIA® Jetson™)