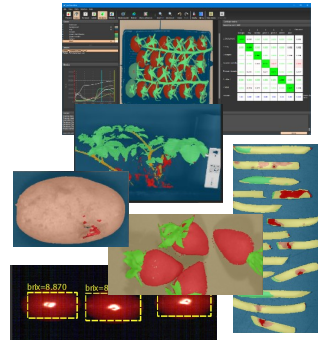


perClass Mira[®]

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

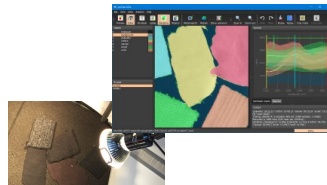
Agro & Food

- ▶ 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



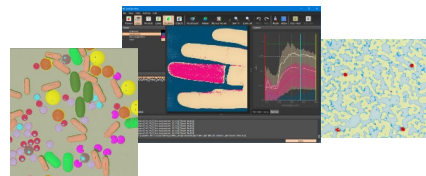
Recycling & Material Science

- ▶ Plastic separation
- ▶ Sorting of textiles by material irrespective of color (also dark textiles)
- ▶ Paper sorting
- ▶ Material transition identification
- ▶ Characterization of microplastics



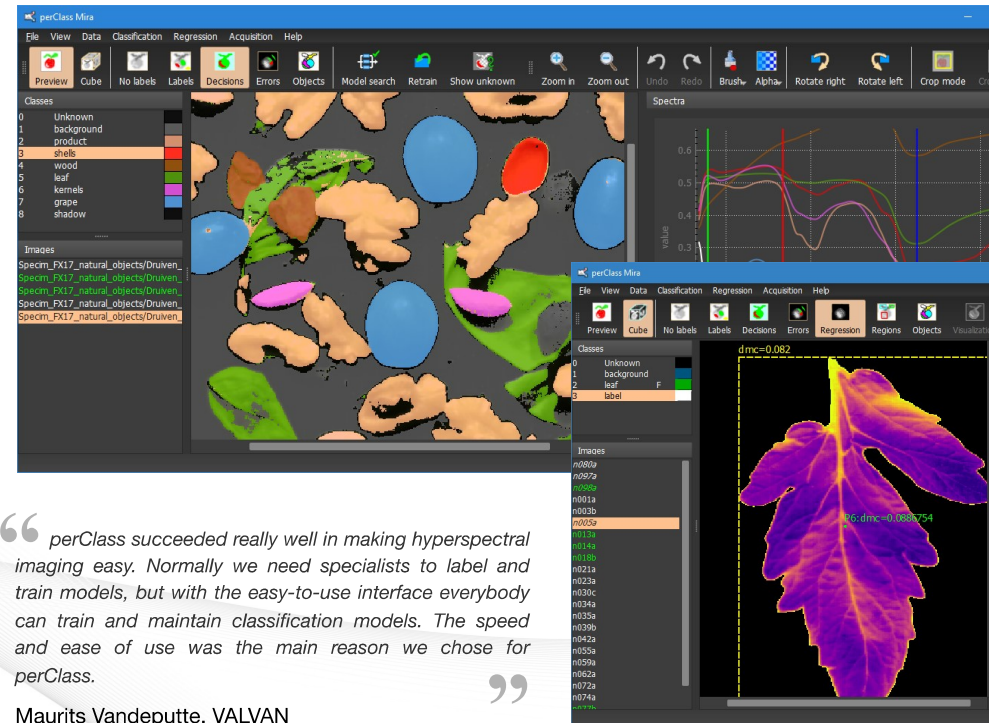
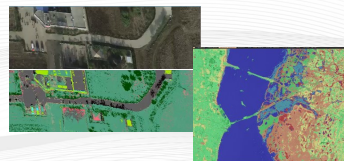
Medical & Pharma, Forensic

- ▶ 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



“ 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



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 Molengraaffsingel 12, 2629 JD, Delft, The Netherlands
 Phone: +31(0)648060368
 E-mail: info@perclass.com
<http://perclass.com>

The Challenge

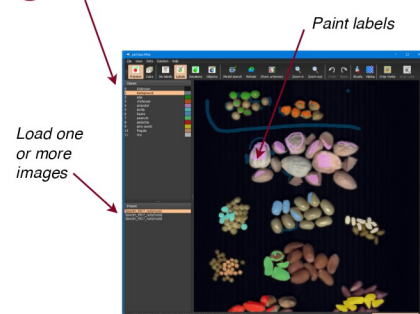
Modern spectral sensors provide **gigabytes of high-resolution images** with hundreds of bands. The interpretation process is currently **very time-consuming**. It typically requires **programming** and a high-level of expertise in applied statistics, machine learning and chemometrics. The path to **real-time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

The Solution

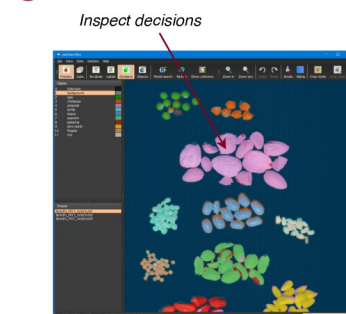
perClass Mira enables anyone to create and deploy automatic interpretation solutions without programming or machine learning expertise.

The Workflow

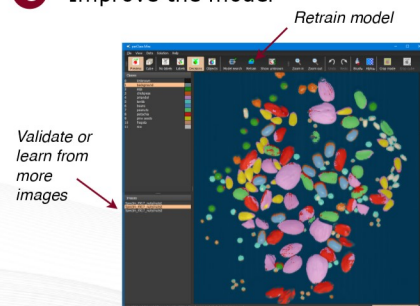
1 Define classes of interest



2 Automatic model-search

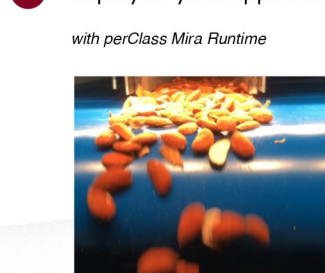


3 Improve the model



Active Learning guidance to paint new relevant labels

4 Deploy in your application



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

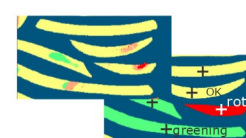
Foreign object detection

Example: Nut shells removal
Object coordinates/sizes



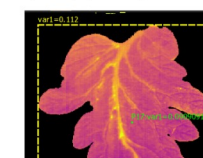
Object classification

Example: French fries grading
Content-based object decisions



Object quality

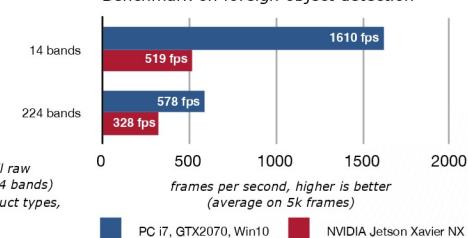
Example: Moisture content
Quality per-object and pixel



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

Benchmark on foreign object detection



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.

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, Hypspec, 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™)