Metaspectral

AI for next-generation sensing

Team

Our team brings deep domain expertise

Francis Doumet

CEO – 10 Years in software for Fortune 500

Migel Tissera

Co-Founder, Director – PhD in Deep Learning

Guillaume Hans

Senior Scientist – PhD in Chemometrics

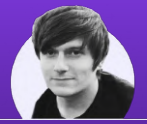
Leigh Martin-Boyd

Program Director, ISR, Hyperspectral at MDA

Advisors

Major-General David Fraser

Ex- NATO Commander of Southern Afghanistan



Jude Gomila

Early investor in 17 unicorns

Dennis Pilarinos

Ex-Director,Apple

Milun Tesovic

Partner, Expa

Investors

SOMA CAPITAL

VILLAGE GLOBAL

Acequia Capital

N49P

Company

Building the next-generation of industrial sensing

Selected by **NASA** for installation on the **International Space Station**

Customers

Patents

Issued

- US Patent Numbers: 11,386,582 (2022); 11,915,458 (2024)

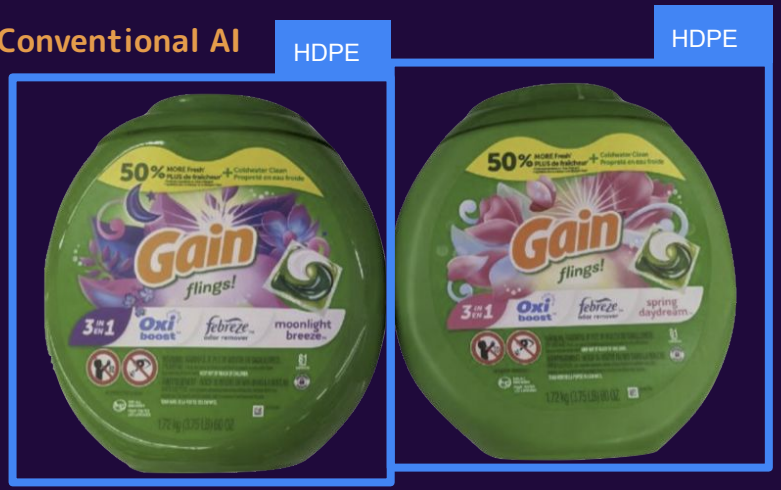
Pending

- US Application Numbers: 20240288308, 20240290091

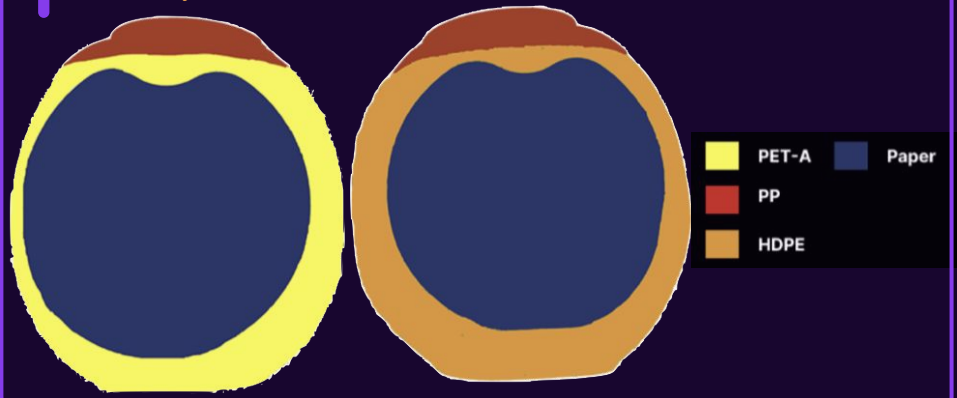
Conventional AI incorrectly identifies challenging packaging/ materials

- **E.g.: Black plastics**, multi-layered or **mixed-polymer** materials, **different grades** of the same polymer

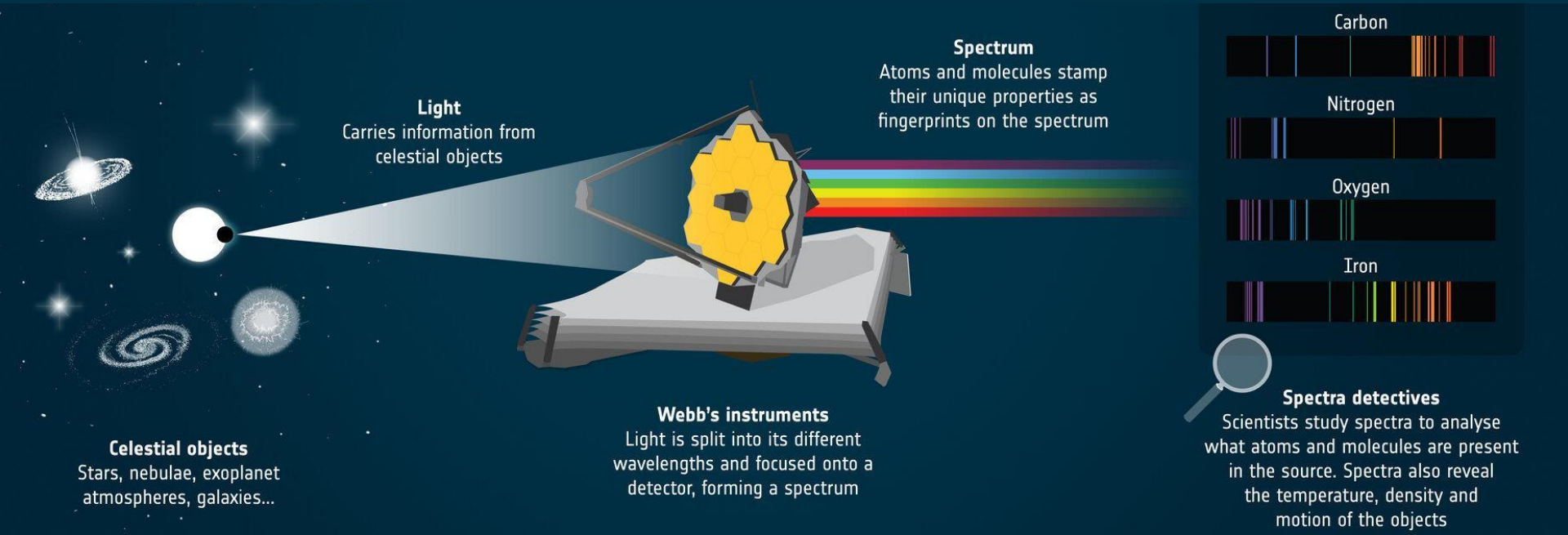
Conventional AI



Reality



Hyperspectral imaging



Opportunity

Hyperspectral imaging opens the world to the missing data, but it can’t scale

Hyperspectral Imaging noun

A technique that analyzes a wide spectrum of light instead of just assigning primary colors (red, green, blue) to each pixel.

Long wait times

Up to hours to generate results, causing delays in data processing and analysis.

No data sharing capabilities

Do not allow for easy sharing of data, making **collaboration** and analysis across teams **difficult** and **time-consuming.**

Inability to Detect Rare or Hidden Targets

Classical analysis techniques (e.g. ACE) **fail to detect rare or hidden targets,** limiting their effectiveness

Innovation

We combine optimal compression, sub-pixel, analysis, and deep learning to unlock operational feasibility

$0

retooling cost

180x

fewer false-alarms than conventional analysis techniques (e.g. ACE)

Data Compression

- AI-based processing (US patent 11,386,582)
- FPGA implementations of algorithms designed by the Consultative Committee for Space Data Systems (CCSDS)
- Lossless compression: as little as 30% of the original size
- Near-lossless compression: as little as 9% of the original size
- Compression throughput of up to 37 Gbps
- Power consumption: 1 – 4 W

Sub-Pixel Level Analysis

- US Patent Application No. 18/175,264
- Breakdown individual pixels
- Identify constituent materials (“endmembers”) and their proportions (“abundance factors”)
- Classical methods like Multivariate Curve Resolution (MCR) and Adaptive Cosine Estimation (ACE) have accuracy limitations for target detection

Deep Learning

Unique Neural Network Architectures

- Peer reviewed by Defence Research and Development Canada (DRDC)
- Create synthetic datasets using:
- Randomly generated abundance factors using Dirichlet distributions
- Linear and non-linear techniques of embedding endmembers in target images

Novel Loss Function

- Soft-Attention Spectral Loss (SAS-Loss) to train the neural network to focus on visual features of the input spectra

Generative AI

- Proprietary LLM models
- Replaces the need for expert domain knowledge (e.g. geologists, remote sensing scientists)
- Trains analysts on model building
- Automatically detects features, targets in an image
- Automates lengthy/tedious tasks

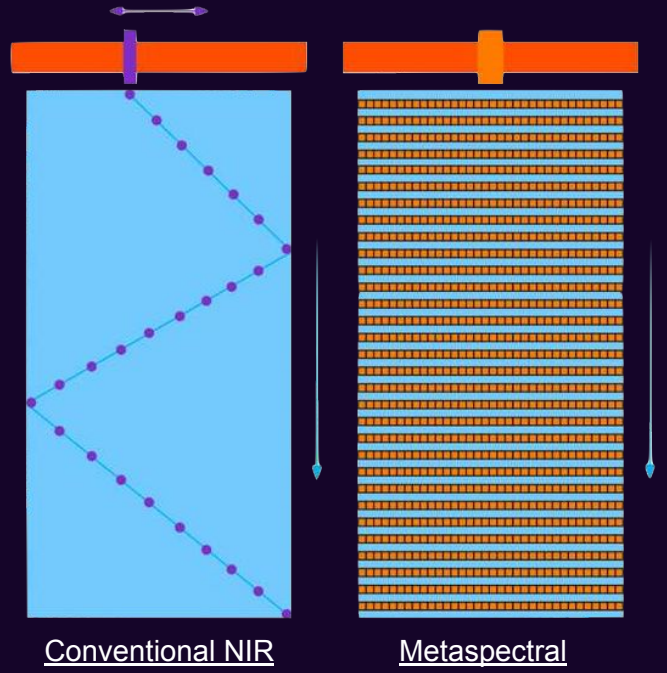
Mixed material identification & sorting

Materials:

- PP
- PP-GF
- PP-TD
- PE
- PVC
- Paper
- Glass
- PS
- ABS
- PC
- PC-GF
- PC-FR
- PC-ABS
- TPO
- PA
- Cardboard
- Neoprene
- PU
- EPDM
- Metals

Advanced polymer identification

- Sort virtually any polymer **at the molecular level**, including: **black plastics**, transparent objects, **thin film**, **flexibles**, multi-layered or **mixed-polymer** materials.
- **Pixel-by-pixel** level identification of materials on an object
- Sort objects composed of multiple polymer types
- Differentiate between **different grades** of the same polymer



Sub-Pixel Level Technology

- 89% PE
- 11% PVC

- 92% Conveyor Belt
- 8% PVC

Sub-pixel AI detects invisible flexible material / contaminants

RGB

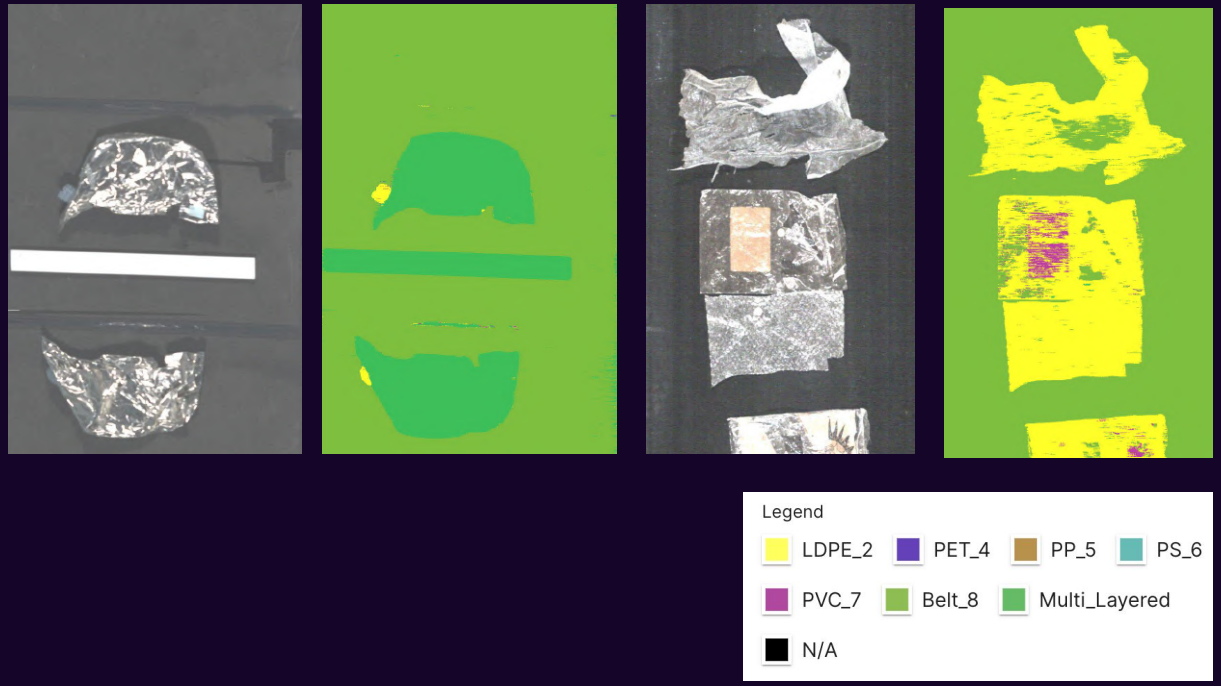
Conventional hyperspectral

Flexible transparent PVC object detected

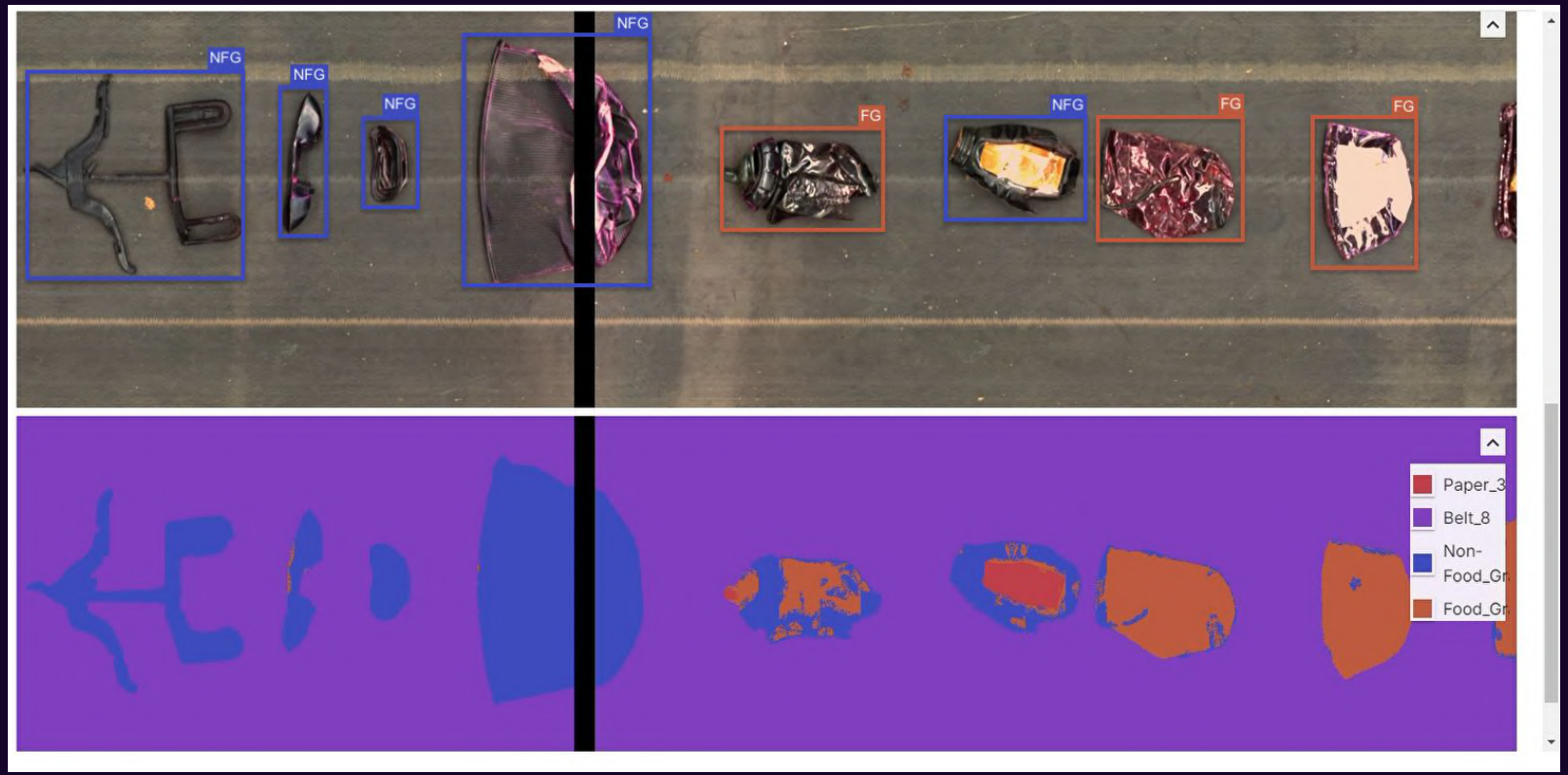
Metaspectral AI

Flexible material identification & sorting

- **>90% accuracy**
- **Quantify polymer blends**
  - (e.g.: quantity of brominated or non-brominated fire-retardants in ppm)

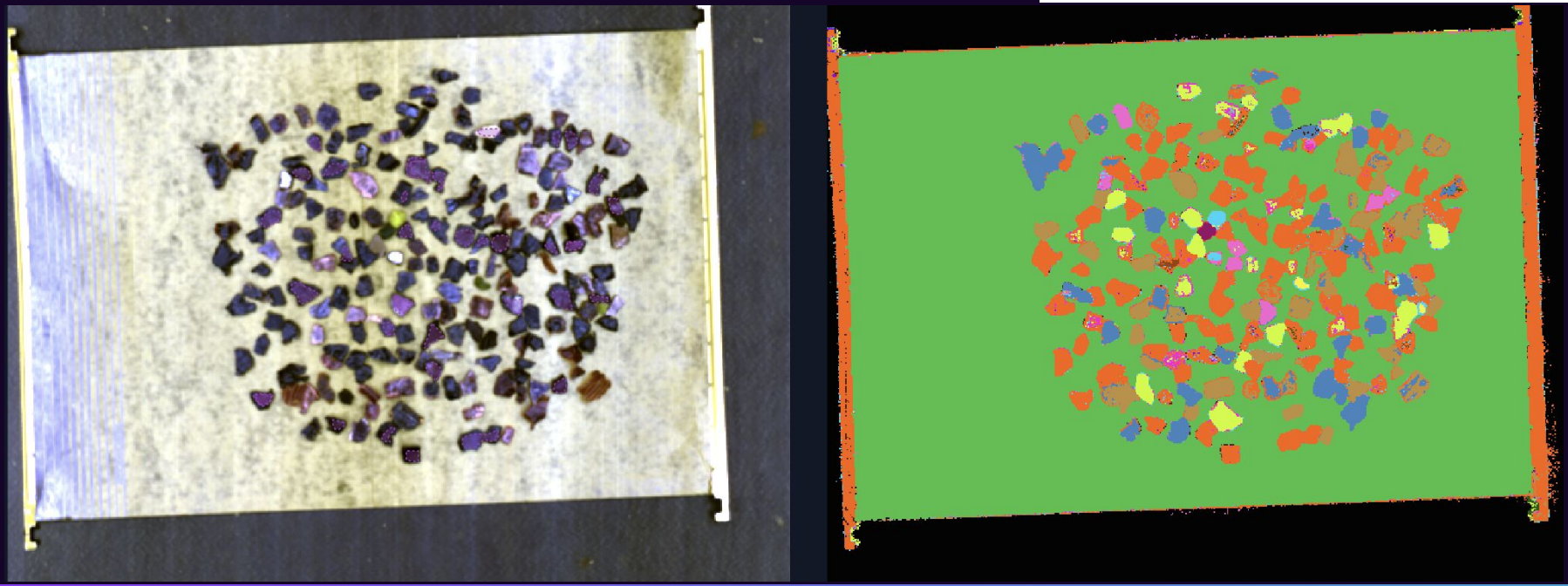


Food Grade / Non food grade PP



HARP: Hyperspectral Analysis for Recovering Polyolefins

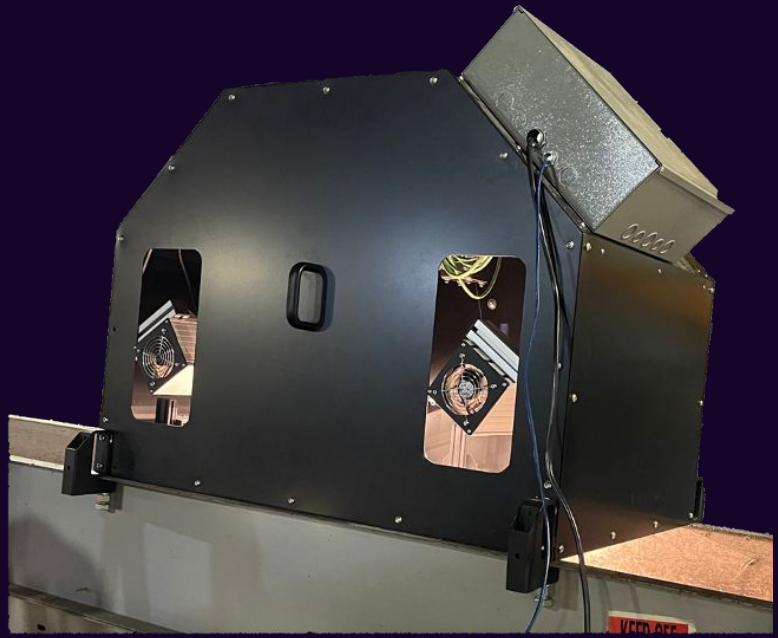
Automotive Shredder Residue (ASR)



HARP: Hyperspectral Analysis for Recovering Polyolefins

Fully-automated conveyor belt sampling / sorting of consumer packaging

- Comprehensive, **real-time** data on material **composition** and **distribution**
- Monitor material **grade**, **impurities**, or environmental **contaminants**
- **Immediate feedback** on stream quality to operators



Competitive Landscape

Train AI model in minutes to analyze data in milliseconds instead of hours

	Detect invisible features	Real-time analysis	Rare/ challenging target detection	Geospatial support	Industrial automation support	No domain expertise required	Integrated LLM
Metaspectral	✓	✓	✓	✓	✓	✓	✓
Data Robot				✓	✓	✓	
Landing AI		✓		✓	✓	✓	
Tomra	✓	✓			✓		
Pellenc	✓	✓			✓		

Competitive Advantage

Leading with Secured and Superior Spectral Intelligence

Data Dominance. Metaspectral's access to **unique** and diverse spectral data through collaborations with leading companies ensures **unmatched precision and accuracy**. This **exclusivity** forms a significant barrier for competitors.

Network Effects. As Metaspectral's models are trained on increasing amounts of data, they become **more robust** and **resilient**, outperforming in any environmental condition.

Partnerships. Strategic partnerships will unlock massive scale across diverse markets, from recycling to defense and space exploration by leveraging its partners' established infrastructure and market reach.

Intellectual Property. Proprietary data compression and AI network designs enable unparalleled real-time analysis, providing faster, more accurate insights than competitors. Patents solidify these innovations, creating strong barriers to entry and securing a sustainable technological edge.

Case Study

Merlin Plastics, Canada

- Canada's largest plastics recycler
- Fifth largest in the U.S.
- **3 units** deployed: automated auditing of incoming bales, black plastics identification, high-grade low-grade PET
- Over **3,500 lbs per hour** on a single conveyor system
- Pieces **as small as 0.5 cm**

Roadmap

Next 6-12 months

Flexible Packaging

- Identify a variety of monolayer and multilayer flexible plastics
- Includes those with additives

Black Plastics

- Post-consumer
- Automotive shredder residue (ASR)

Food-Grade

- Separate Food-grade from non-food-grade PP
- Post-consumer, toys, etc.

Contact Us

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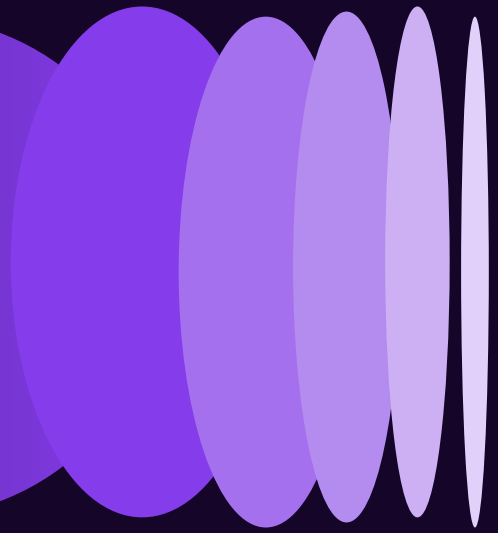
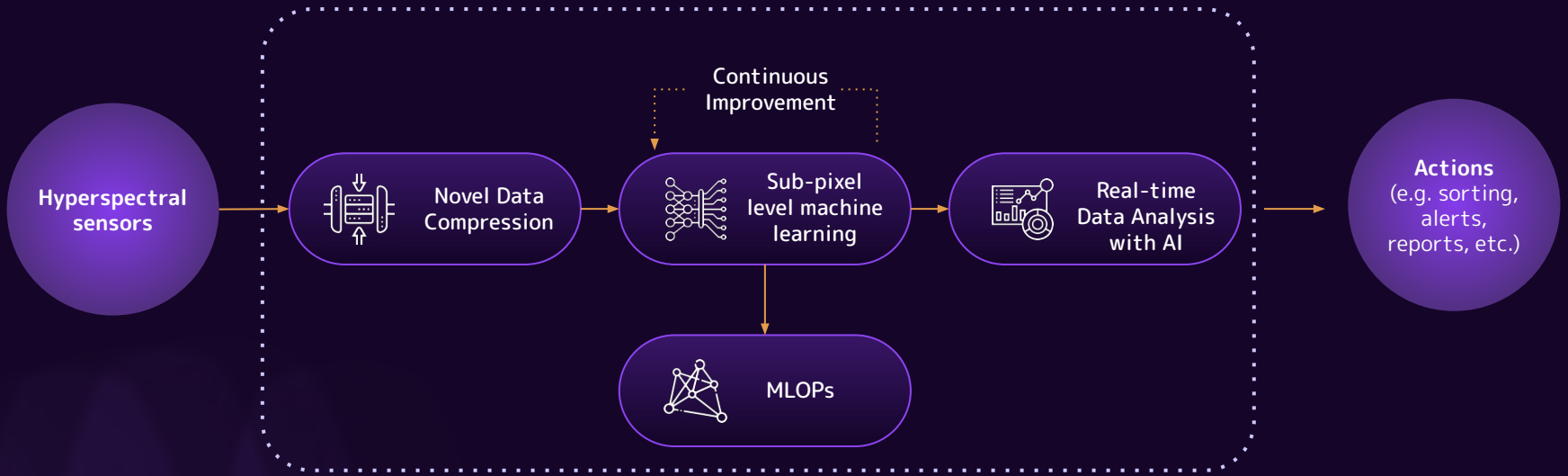


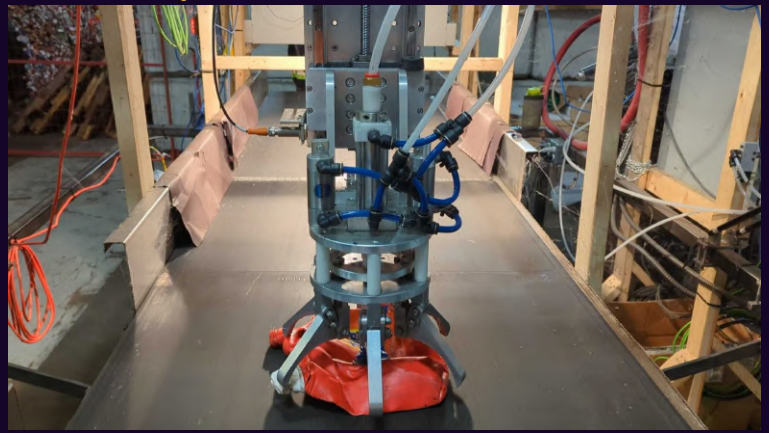
System

Ever-improving real-time analysis of challenging materials with novel compression, AI, & mechanical actions



Several downstream mechanical sorting options available

Robotic arm
(suction + gripper)



Air ejection system