HySpex for Defense

Trond Løke - CEO

Norsk Elektro Optikk AS (NEO)

- Norsk Elektro Optikk AS owned (100%) by Irma Salo Jæger og Tycho Jægers foundation

- Foundations vision: to support Art and Physics
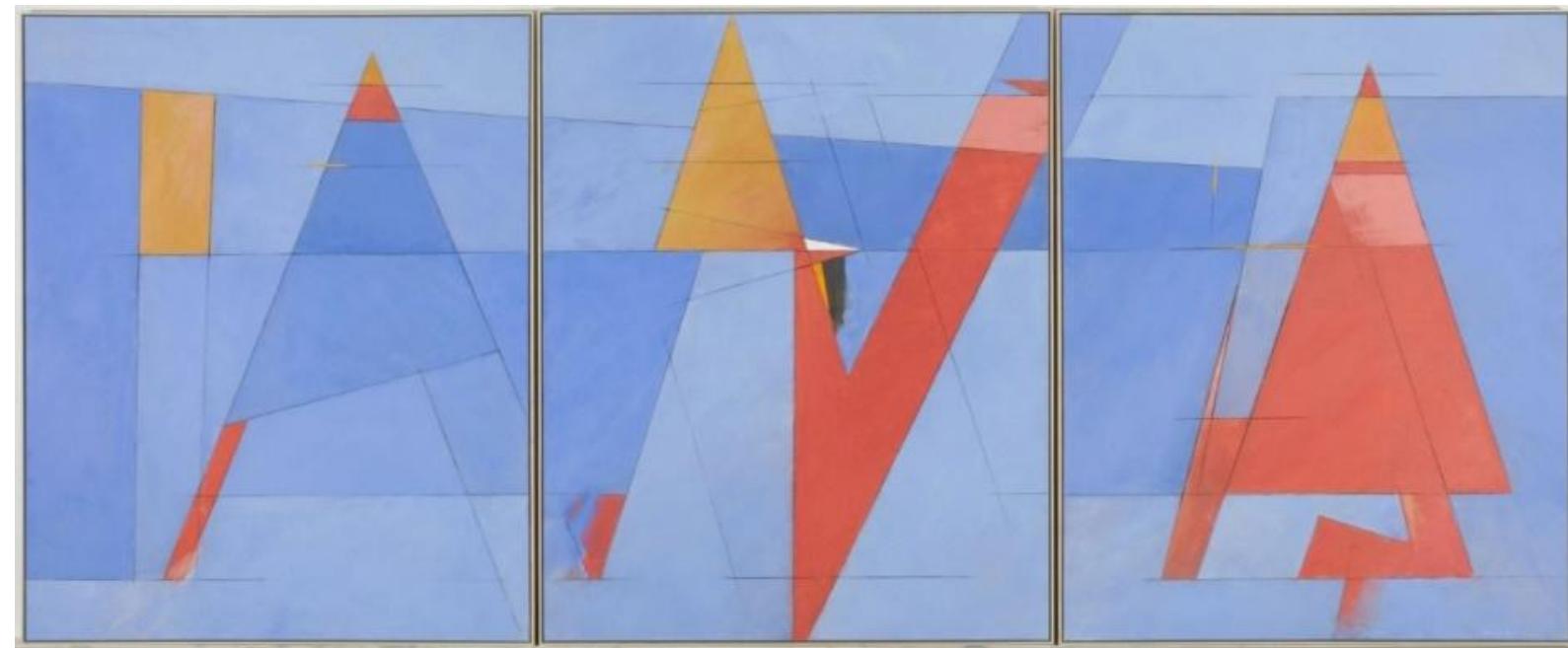
Irma Salo Jæger (1928 -)

NEO is a fast-growing tech company with heavy R&D focus

Company overview

- **Founded in 1985** as a spin-off from Norwegian Defense Research Establishment (FFI)

- Owned by a non-profit foundation with a vision of supporting **art and physics**

- Does **research in electro optics** with the objective to develop **state of the art products** for an international market

- R&D projects should have **high risk profile**.

- Delivers **state-of-the-art hyperspectral cameras** for a wide range of applications through HySpex

- **Headquarters in Oslo** with sales office in the U.S and EU and a subsidiary company in Sweden

- Currently **~60 employees**, half of which work in **R&D**

CAGR from commercial activities 2017-2023

CAGR +43%

2017 2018 2019 2020 2021 2022 2023

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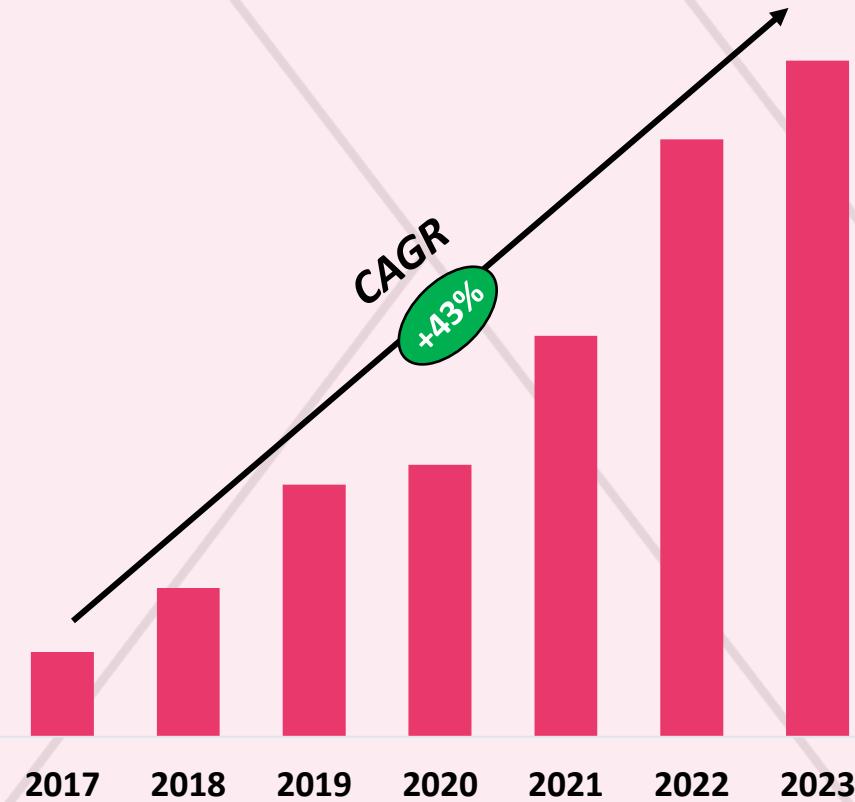
HySpex
by neo

# Multi-scale hyperspectral offerings from HySpex

Some of the defense applications

- **Target detection and identification**
  - Anomaly detection
  - Signature based detection

- **Camouflage and Concealment Assessment**
  - We sell system to camouflage manufactureres.

- **Surveillance and Reconnaissance**
  - Moisture maps (Detecting disturbed earth)
  - Vegetation maps

- **Material and Chemical Detection**
  - Detect chemical warfare agents or fuel spills.
  - Explosives.
  - Monitor environmental contamination from military activity.

- **Change Detection Over Time**
  - Identify new constructions, vehicle tracks, vegetation changes, or alterations in terrain indicative of military activity.

Vehicles hardly detectable visually
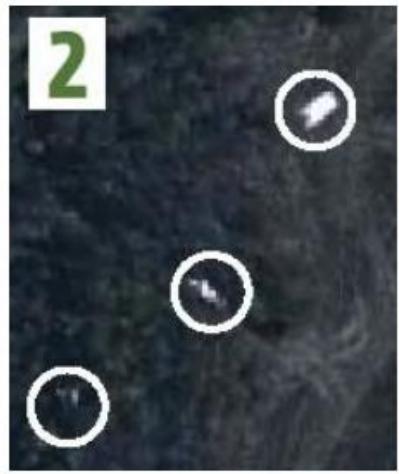
Anomaly detection algorithms reveal the vehicles
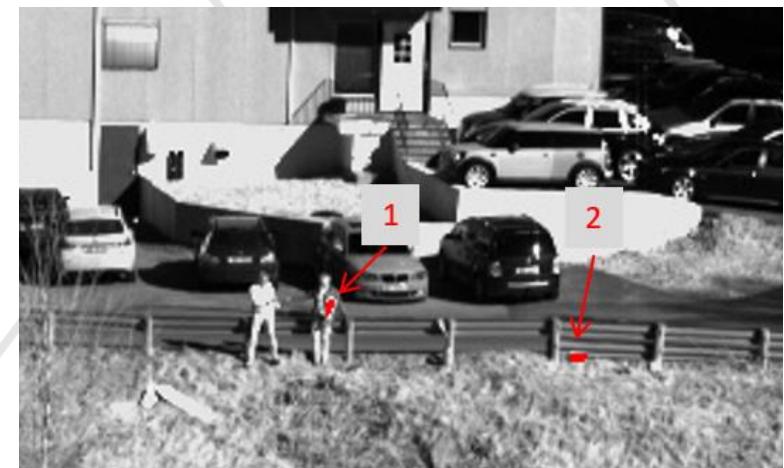
Real-Time processing software

Some of the used UAV platforms
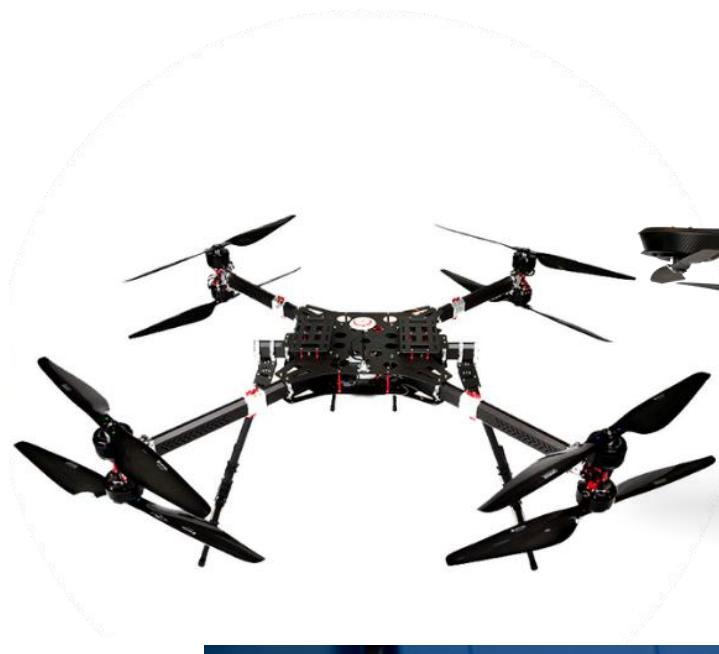
Our vision

Build a solution for real time processing of hyperspectral data from any airborne platform

- Remove the huge overhead in data storage (Raw data + ~5%)

- Lower the user threshold and cost with data processing

- Increase widespread use of hyperspectral data for many different end user applications

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The Case Against Rasterization

Rasterization introduces several issues:

- Pixel duplication and elimination

- Geometric distortion

- Inaccurate neighbor relationships

- Misrepresentation of small or edge features

A

N

Square Pixel Resampling Approach
Resulting in Pixel Duplication (Oversampling)

B

Square Pixel Resampling Approach
Resulting in Pixel Loss (Undersampling)
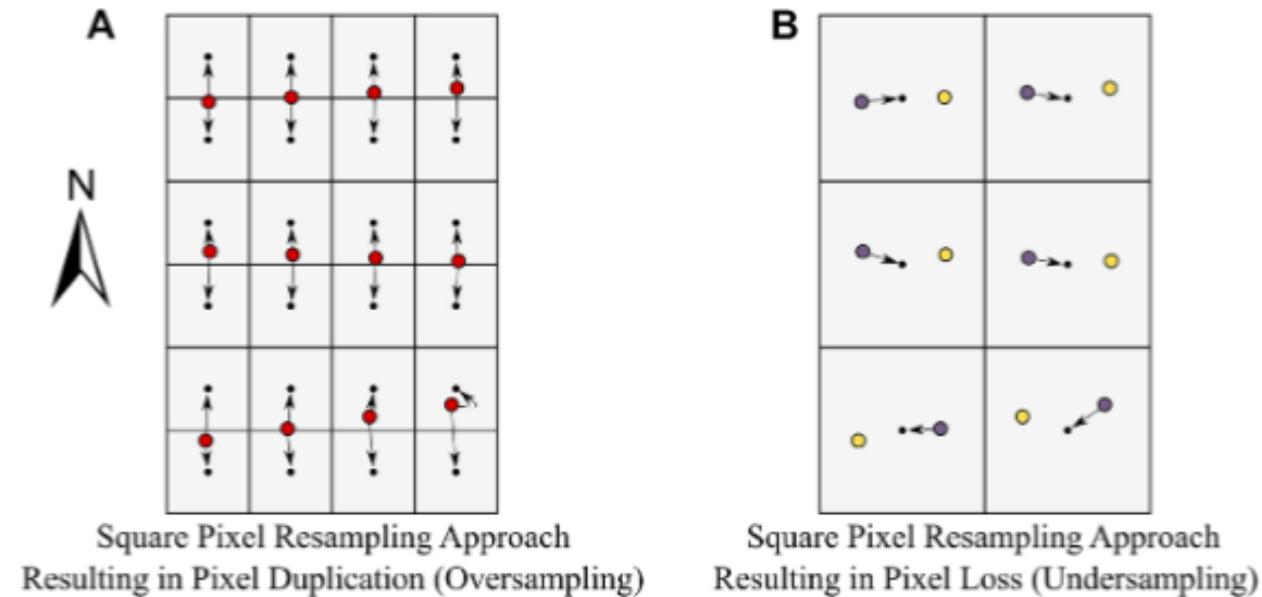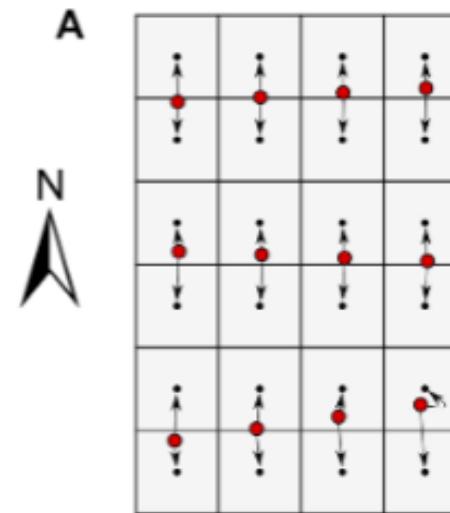
- **Properly Sampled Hyperspectral Data Point**
- **Lost Hyperspectral Data Point**
- **Duplicated Hyperspectral Data Point**

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Hypermesh: A Smarter Structure for Hyperspectral Data

- Each vertex corresponds to a pixel with a known (x, y, z) coordinate.
- Topological relationships between neighboring pixels are preserved.
- Spectral data is directly linked to each vertex.
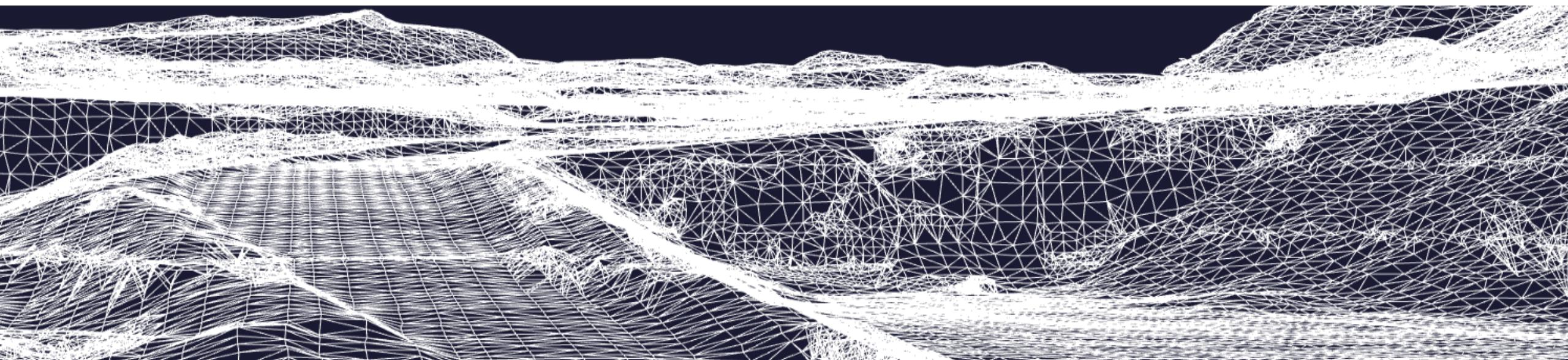
BENEFITS OF HYPERMESH OVER RASTER GRIDS

- **Preserves Integrity:** No pixel loss or duplication; spatial and spectral data remain intact.

- **Highly Efficient:** Uses less than 10% additional storage over raw data.

- **Accelerated Processing:** Graph-based algorithms can perform fast neighborhood searches and segmentation.

- **Ready for the Web:** Compatible with real-time rendering engines; view in browsers without specialized software.

GPUs loves meshes!

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Questions?

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