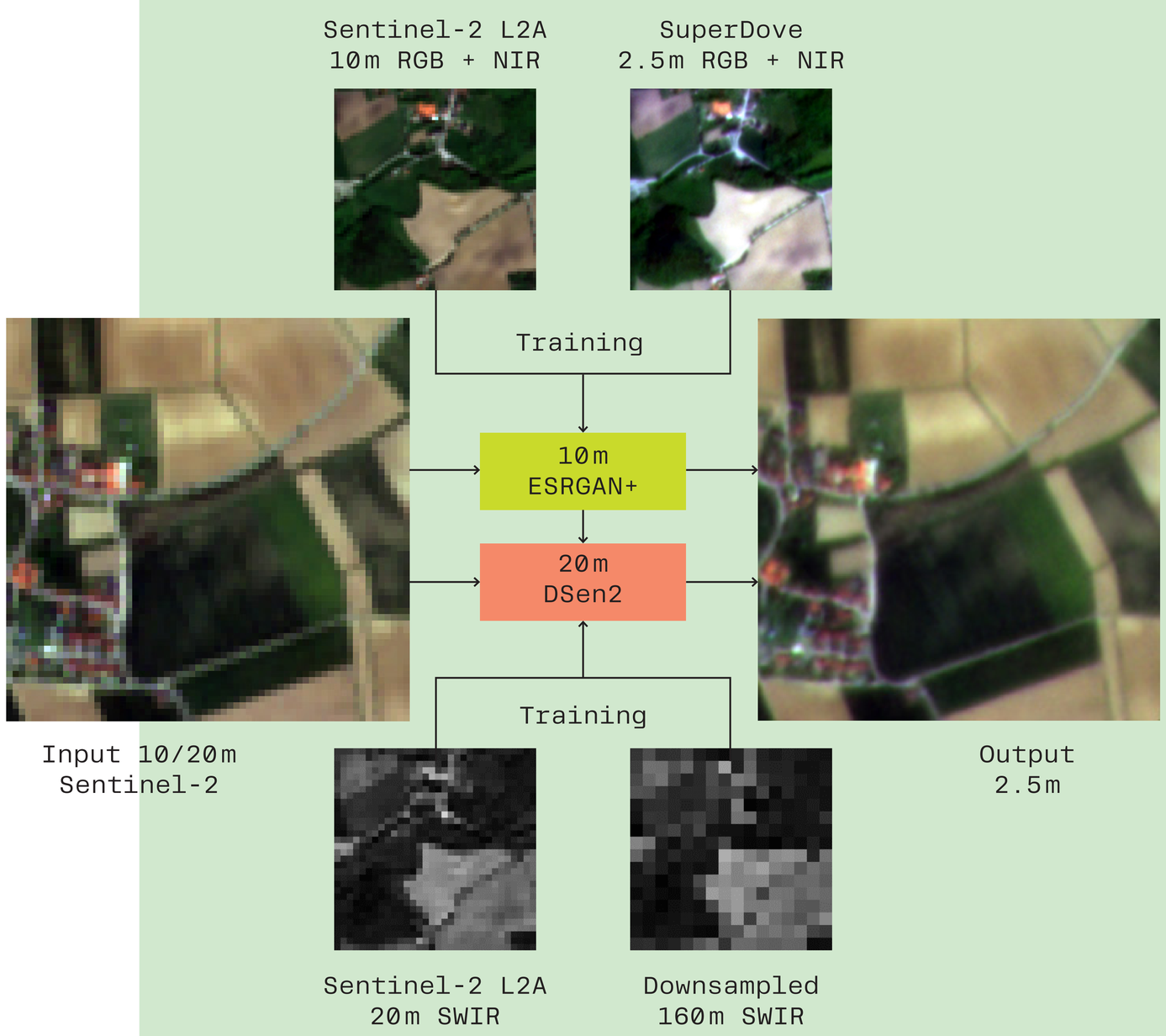
SMAIL: Super-Resolution-Based Monitoring through AI for Small Land Parcels

Initial situation: Agricultural land parcels in red are too small for automatic monitoring



Background

- Monitoring of all agricultural land required by EU's Common Agricultural Policy
- Check for compliance with conditions for subsidies
- Spot checks on site create considerable cost
- Alternative: monitoring with free Sentinel-2 satellite images

Problem

- Land parcels are too small for 10/20 m resolution of Sentinel-2 data
- Over one third of all parcels in Austria
- Automatic monitoring not possible

Our Approach

- Single-Image Super-Resolution Reconstruction
  - Use AI to super-resolve Sentinel-2 images to 2.5 m
  - Separate neural networks for 10 m and 20 m bands
- 10 m bands (Red, Green, Blue, Near Infrared)
  - ESRGAN+ generative adversarial network
  - Learn from commercial high-resolution satellite images
- 20 m bands (Short Wavelength Infrared)
  - DSen2 fully convolutional network
  - Learn from downsampled Sentinel-2 bands
- Combination to 10-band image at 2.5 m resolution

Project Results

- High-resolution multispectral satellite imagery for arbitrary remote sensing applications
- Low cost
- Evaluation
  - Preservation of spectral quality
  - Suitable for simple crop type classification
  - In progress: Performance in mowing event detection
  - In progress: Performance in phenology tasks
- Awarded with ICT Austria Juwelen 2023 in »Sustainable Digitalization«

Project duration: 01.05.2022 - 31.10.2024
Project number: FO999892195
Project partners: Agrarmarkt Austria, EOX IT Services GmbH, Paris-Lodron-Universität Salzburg, Fachbereich Geoinformatik - Z_GIS, VRVis Zentrum für Virtual Reality und Visualisierung Forschungs-GmbH

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