EUROSDR WEBINAR · EVOLUTIONS IN THE PRODUCTION, REPRESENTATION AND USE OF 3D GEOINFORMATION

AI for LiDAR Processing at National Scale: Digital Twin Germany

Nejc Dougan • CTO, Flai • 19 June 2026

ABOUT FLAI

Geospatial intelligence, powered by AI

- **AI software company** building advanced tools and solutions for the geospatial industry.
- **Deep expertise** in AI, LiDAR, point clouds, and geoinformatics.
- **Supporting** governments, defence, and enterprises worldwide.
- **Delivering** secure, scalable, and accurate geospatial intelligence.

200+
Customers

9
Production AI models

50–99%
Time savings

TRUSTED BY

Republic of Estonia Land and Spatial Development Board

esa

Woolpert

Dewberry

SAM

THE FLAI DIFFERENCE

Built for Real-World Data

LiDAR sensor agnostic

HEXAGON

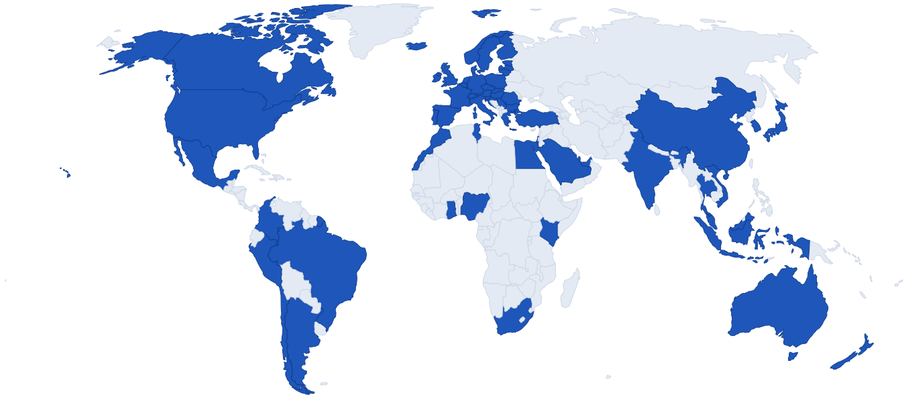
RIEGL®

TELEDYNE | Optech

DJI ENTERPRISE
ZENMUSE L3

...and others

Location-Independent AI



AI models built from global training data for:

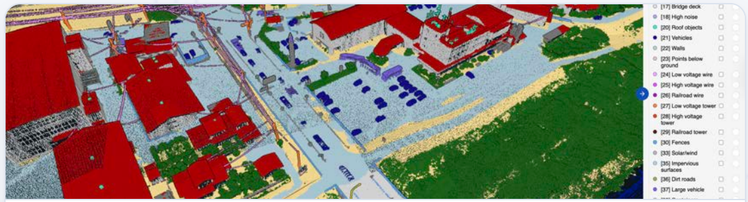
> 60 countries **> 60 classes**

LiDAR platform agnostic

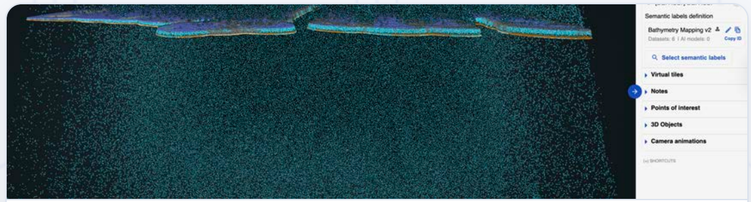
AI MODEL PORTFOLIO

Nine production-grade models — one engine, every vertical

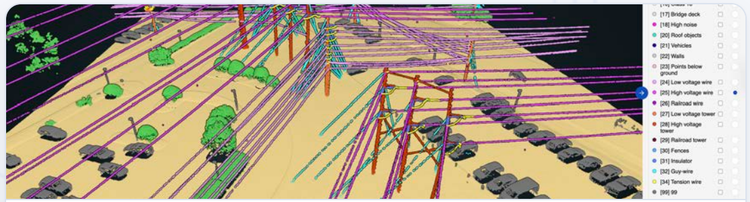
Today: specialised models per vertical · **Next: building 3D spatial foundation models**



01 · AERIAL
Aerial Mapping
FlaiNET · 29 classes · F1 0.98+

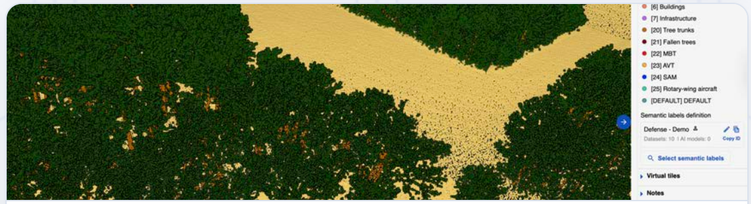


02 · PREPROC
Noise Filtering
Cross-cutting preprocessing

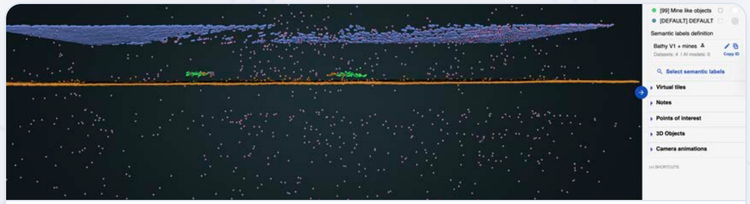


03 · UTILITIES
Utilities · Powerline
Vegetation + conductor classification

04 · MOBILE
Mobile Mapping
Vehicle-based MLS



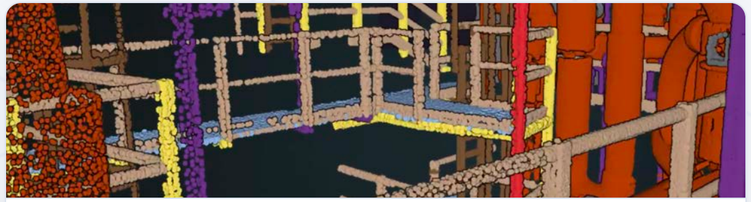
05 · DEFENSE
Defense & Security
3D scene understanding for GEOINT



06 · BATHY
Bathy Mapping
Bathymetry · water · seabed

07 · FORESTRY
Forestry Mapping
Species & biomass · 2026

08 · RAILROAD
Railroad
Rail corridor analysis



09 · INDOOR
Indoor Facility / BIM
Built-environment scans

02 / CASE STUDY

Digital Twin Germany

A national-scale 3D replica — and how AI makes processing it possible.

THE INITIATIVE

About Digital Twin Germany

- **National initiative** led by the BKG (Federal Agency for Cartography and Geodesy).
- Builds a **3D digital replica** of all of Germany.
- Supports **planning, crisis management, and sustainability**.

von Dömming, A., & Knöfel, P. (2025). Digital Twin Germany. EuroSDR Workshop – State-of-the-art 3D Mapping at National and Regional Mapping Agencies, Paris.

PROJECT SPECIFICATIONS

National scale, by the numbers

356,794 km²
Total survey area

2024 – 25
Acquisition, March–November

Leaf-on
Survey timed for tree analysis

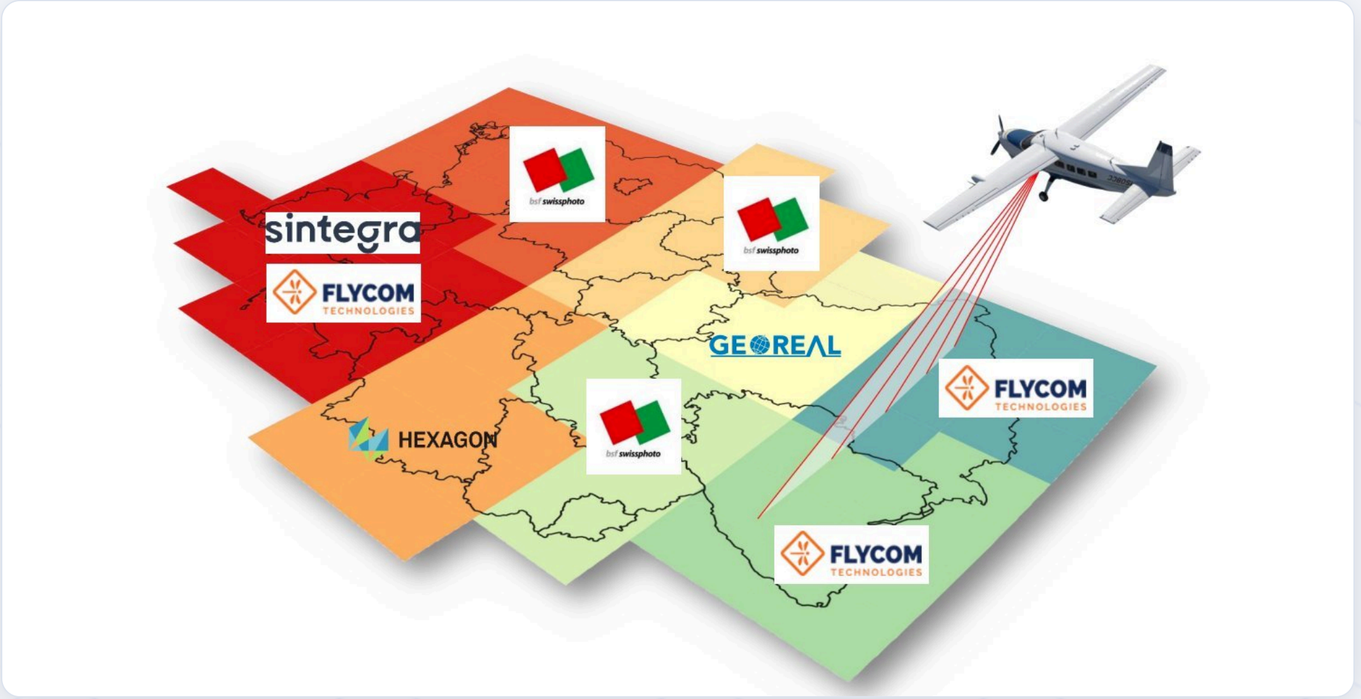
≥ 40 pts/m²
Point density

Von Dömming, A. (2025, June 18). Der Digitale Zwilling Deutschland – Exemplarischer Impuls Bund. Bundesamt für Kartographie und Geodäsie.

ACQUISITION PARTNER

Flycom Technologies' role

- Responsible for **~100,000 km²** of the national survey.
- Flown with **Pilatus aircraft**.
- **RIEGL VQ-1560 II-S** sensor.
- Experience from **nationwide projects** in Slovenia, Croatia, and Slovakia.



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APPROACH

Processing strategy

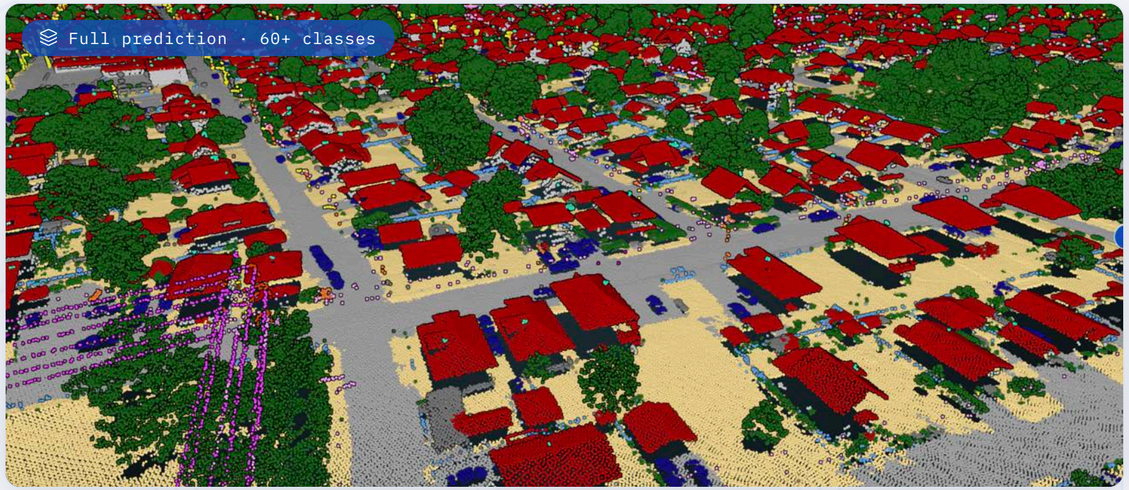
- **Automation is essential** at this scale.
- A mix of **traditional methods + AI**.
- **Ground** → traditional algorithms.
- **Above-ground** → AI (pretrained **FlaiNET** models + new categories).

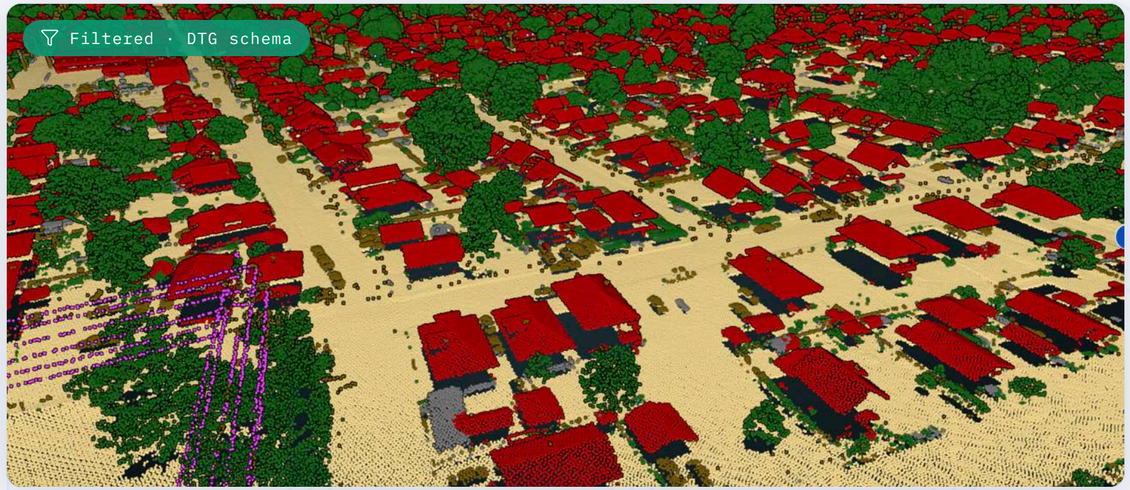
Examples of AI support

- Noise classification on strip level
- Powerline classification
- Wind turbine detection
- Bridge boundary optimization

CLASSIFICATION

Predict everything — then deliver the project schema





PRETRAINED FLAI AI MODEL · 60+ CLASSES

- **1** · Other / Unclassified
- **2** · Ground
- **3** · Vegetation
- **6** · Buildings (roof)
- **7** · Low noise
- **9** · Water
- **17** · Bridge decks
- **18** · High noise
- **20** · Roof objects
- **21** · Vehicles
- **22** · Facade
- **23** · Below ground
- **24/25** · LV / HV wires
- **26** · Railroad wires
- **27/28** · LV / HV towers
- **29** · Railroad towers
- **30** · Fences
- **+33** · Wind, solar

→

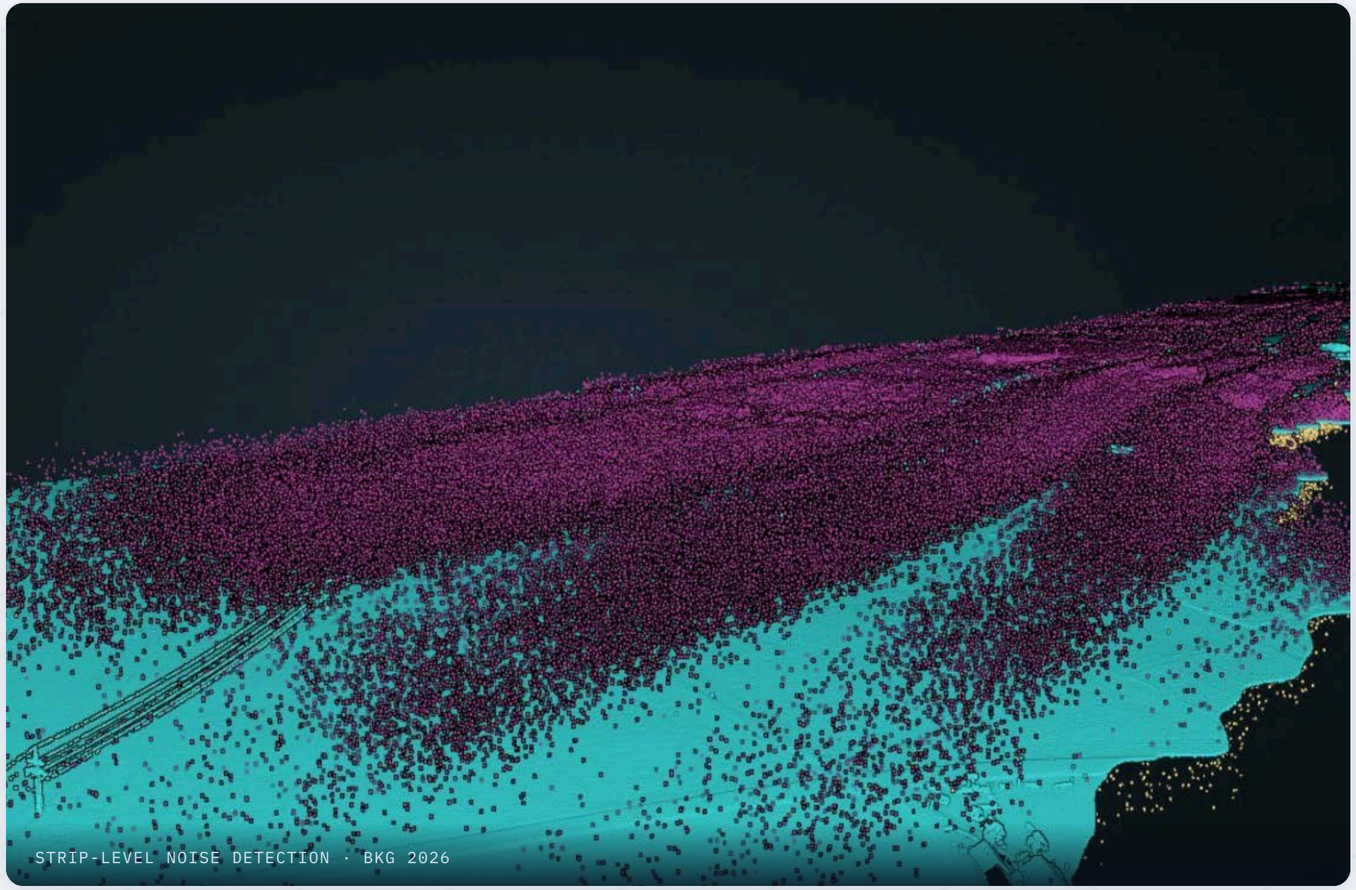
DIGITAL TWIN GERMANY · 10 CLASSES

- **1** · Unclassified
- **2** · Ground
- **3,4,5** · Low / Mid / High veg.
- **6** · Buildings
- **7** · Low noise
- **9** · Water
- **17** · Bridge decks
- **18** · High noise
- **64** · HV powerlines
- **19** · Other — wind, solar, tower >15 m, pipeline

AI SUPPORT · 01

Noise classification on strip level

- Strips can have **different noise patterns**.
- Noisy strips are an **issue when preprocessing**.
- The AI model **detects noise before tiling**.
- Improves **matching & georeferencing**.



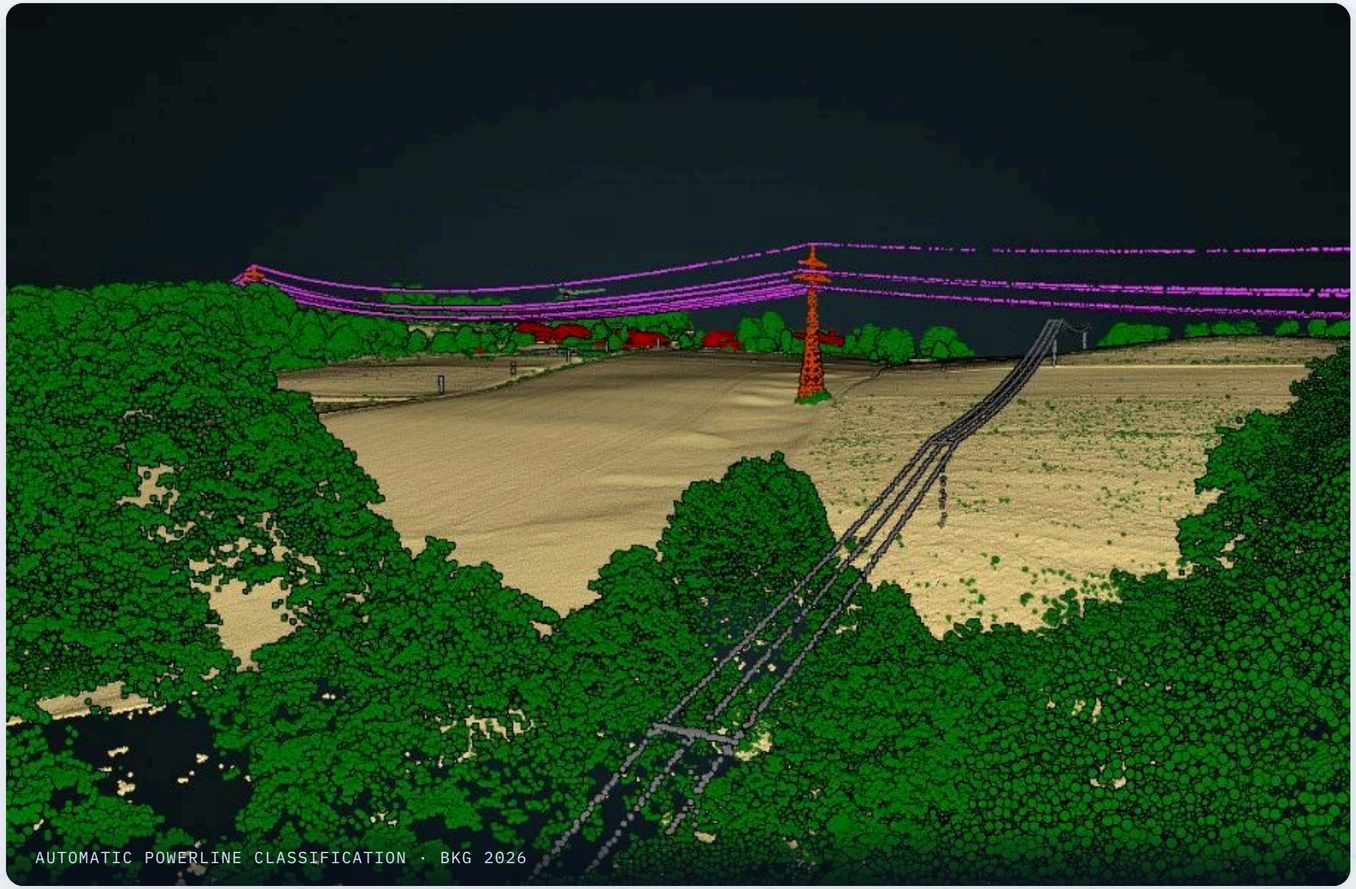
STRIP-LEVEL NOISE DETECTION · BKG 2026

AI SUPPORT · 02

Power line classification

High and low voltage classes available by default.

No manual setup — wires separated automatically from vegetation and structures.

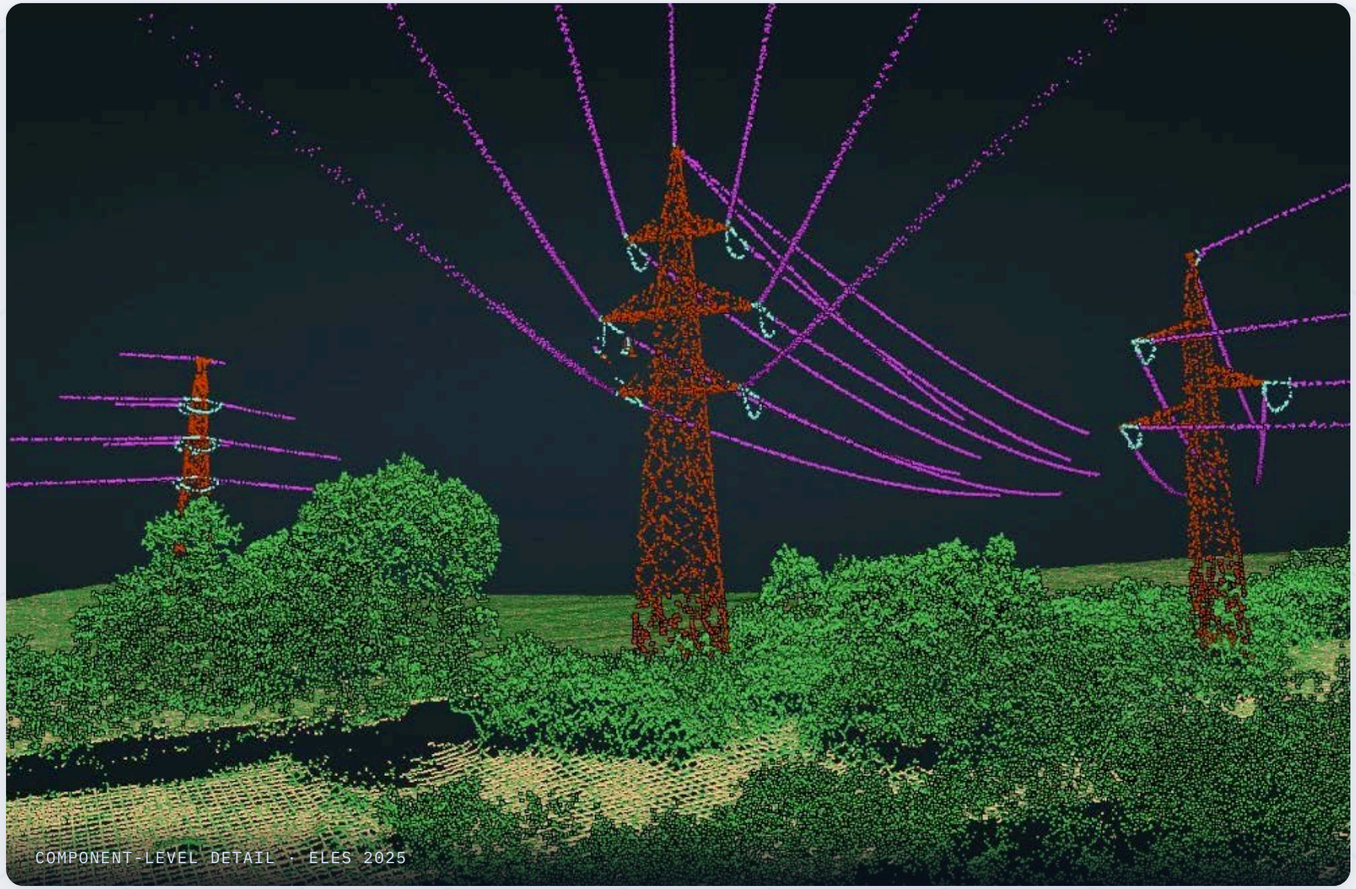


AUTOMATIC POWERLINE CLASSIFICATION · BKG 2026

AI SUPPORT · 03

Detailed classification

- Wires
- Towers
- Insulators & tension wires



COMPONENT-LEVEL DETAIL · ELES 2025

AI SUPPORT · 04

Wind turbine classification

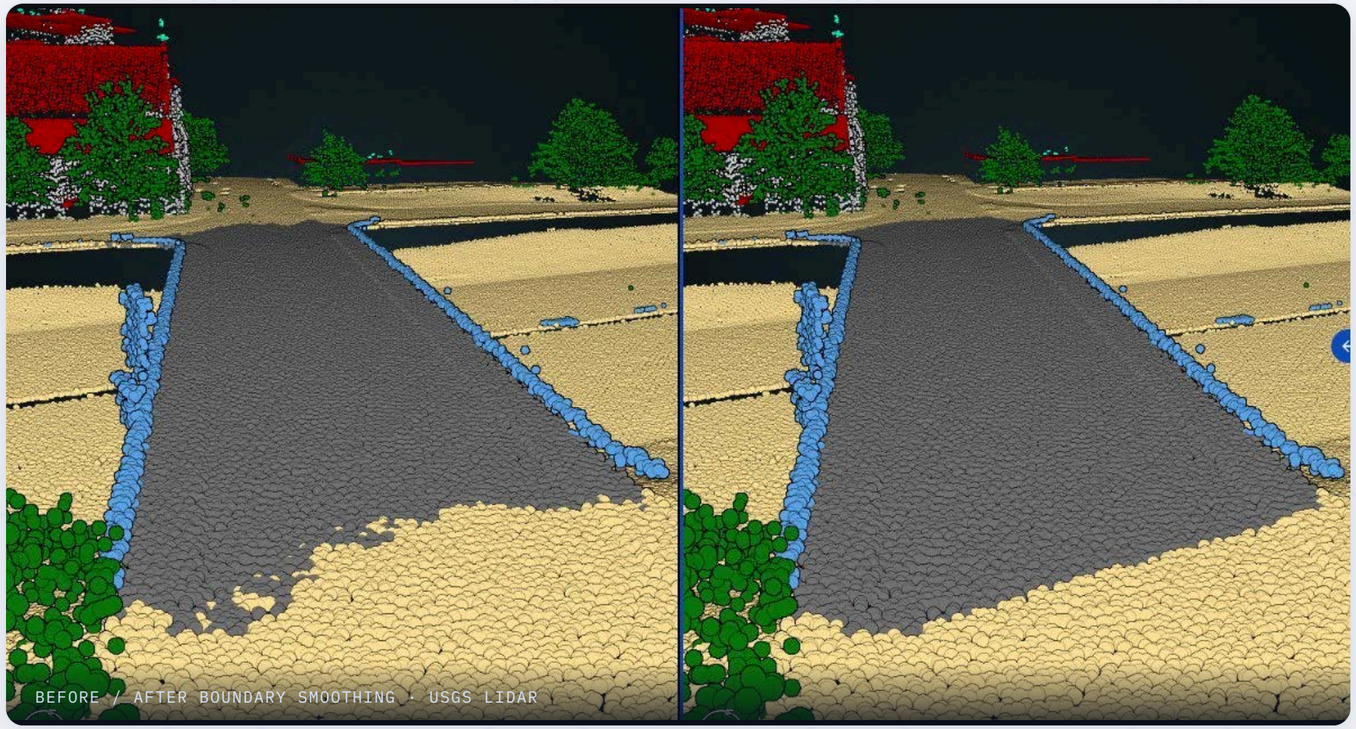
- **~29,000** onshore wind turbines in Germany.
- Automatic AI classification — **a new class**.
- Used for **aviation safety** — obstacle detection.

WIND TURBINE AS A DEDICATED CLASS · BKG 2026

AI SUPPORT · 05

Bridge classification

- AI classifies **bridges accurately**.
- Raw boundaries can appear **irregular**.
- Post-processing **"smooths boundaries between classes"**.
- Produces **clean, consistent edges**.



THE ANALYTICAL CORE

One engine — every 3D data type, every deployment

3D POINT CLOUD · 3DPC

- Topographic LiDAR
- Green bathymetric LiDAR
- Photogrammetry
- Sonar

MOUNTED ON

- UAV · HAPS · Manned aircraft
- Satellites
- Boats · Ships
- Mobile vehicles · Stationary masts

THE ANALYTICAL CORE

FlaiEngine

Pretrained **3D foundation models** with best-in-class semantic segmentation — trained on a large proprietary catalogue and the Flai Hub. When a new object or environment appears, we generate **synthetic training data** and rapidly **retrain to adapt**.

Flai WebApplication
Containerised · Docker · K8s · ECS

Flai CLI
Standalone · Windows · Linux

> **3DPC** is a digital representation of 3D terrain and environment, captured at **national, regional, and site** level. Flai works on all of it.

DEPLOYMENT SURFACES

- Managed cloud — AWS FRANKFURT
- Sovereign on-prem
- Air-gapped network
- Field edge
- Embedded onboard — UAV GIMBAL

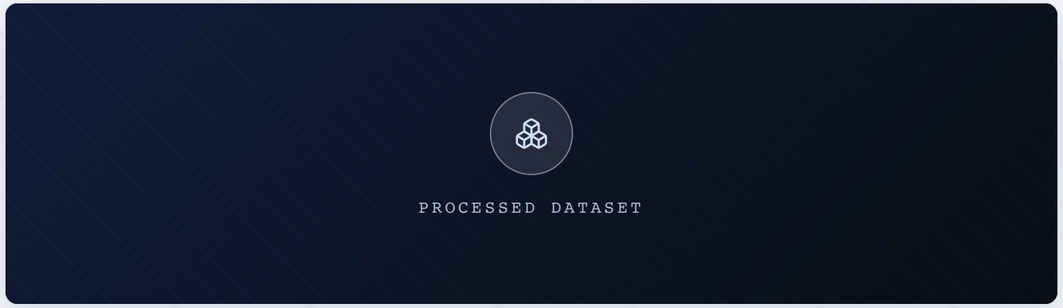
OUTPUTS

- Typed objects & ontology
- GIS-ready layers · LAS / COPC
- API · Agent queryable

RAW 3DPC · UNCLASSIFIED, UNPROCESSED

FLAIENGINE

PROCESSED · SEGMENTED, TYPED OBJECTS



CONTINUOUS IMPROVEMENT

Models that get sharper with every project

Retraining isn't a one-off — it's a loop. Every corrected project makes the next prediction better, fully under your control.

100% on-prem

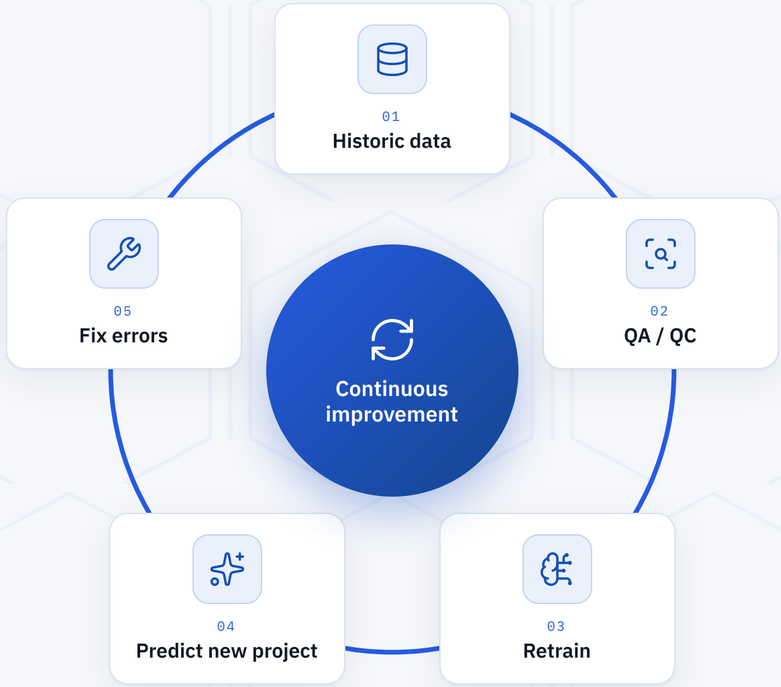
Retrain in your own environment — your data never leaves it. Full control over model, security & compliance.

Leverage your historical data

Turn years of labelled data into a competitive advantage — better accuracy, fewer edge-case errors.

Global → project-specific

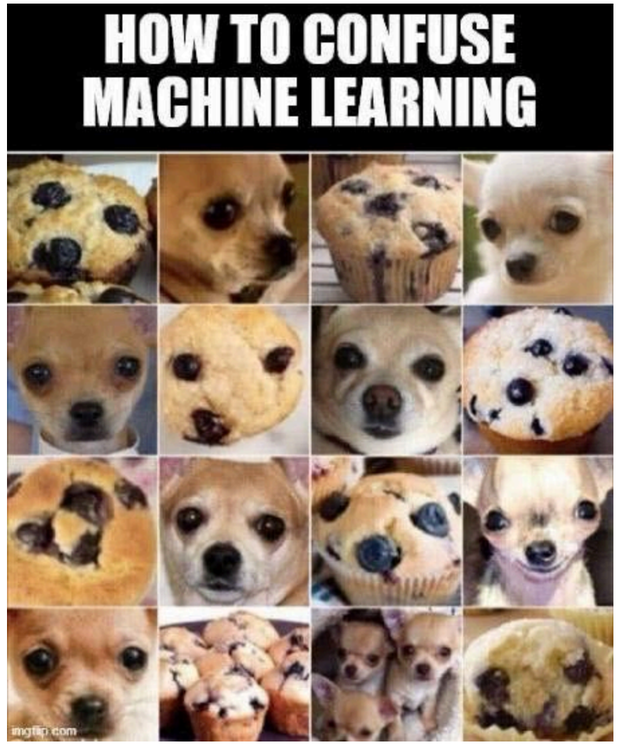
Fine-tune global models to your geographies, categories, and internal taxonomy.



WHY IT MATTERS

Benefits of AI processing in LiDAR

- It **speeds up delivery**.
- **All classes in one automated run**.
- Especially useful for **above-ground categories**.
- **Retraining possible** for specific categories.



…BECAUSE GOOD TRAINING DATA IS EVERYTHING.

flai

Let's transform your geospatial data into insight.

flai.ai Nejc Dougan · CTO