Autonomous Drones for Infrastructure Inspection

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Photo: Field Group

High-value use case for I&M that requires AI, data, and robotics

- Significant value potential
  - In Norway, > 80% of all lines and masts must be inspected annually by law.
  - Regional networks cross many 100s of kms of inaccessible terrain.
  - Inspections traditionally carried out by helicopter or on foot – this is time consuming, costly, and dangerous.

- Commercially viable solution only possible with advances in AI, data, and robotics.

Photos: Field Group

Collaboration between research and industry

One of Europe's largest geodata collection and analytics firms

Field

One of Europe's largest independent R&D organisations

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Norway's largest grid network – area larger than Denmark

- SmartWing (2019-2021) and SWIFTER (2020-2024): industrial research projects funded by Norwegian Research Council
- Goal to develop the technologies necessary to enable commercially viable drone-based grid inspection:
  - Long-range, autonomous platform
  - Multimodal sensor suite with embedded AI
  - Automated analytics for modelling and fault detection
- Technologies are now deployed for commercial operations.
- Grid operators in Norway now exclusively using drone-based services for inspections.
- Field Group has grown from small start-up to one of Europe's largest geodata collection and analytics firms – 300+ employees operating out of 13 offices across Europe and US.

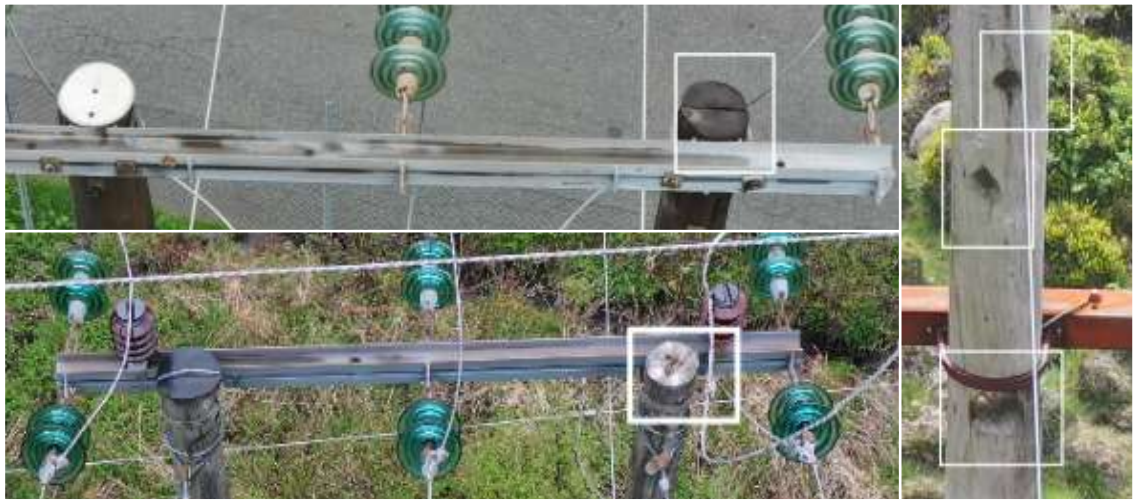
Long-range, autonomous platform

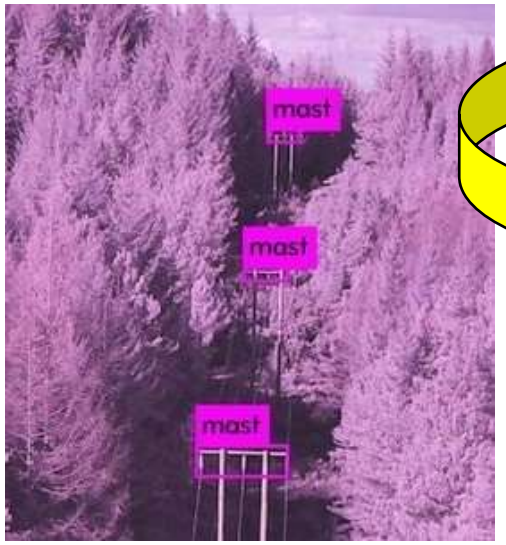
- Long-range BVLOS platform
  - > 20 km flight range
  - More agile and flexible than fixed-wing
- > 150,000 km fully automated flights

- Custom multi-modal sensor payload

Multimodal sensor suite with embedded AI

- Onboard detection of masts in oblique images for steering inspection camera.
  - Maximise data quality, consistency
- Offboard hierarchical DCNNs for image-based anomaly detection
  - Only necessary AI on board

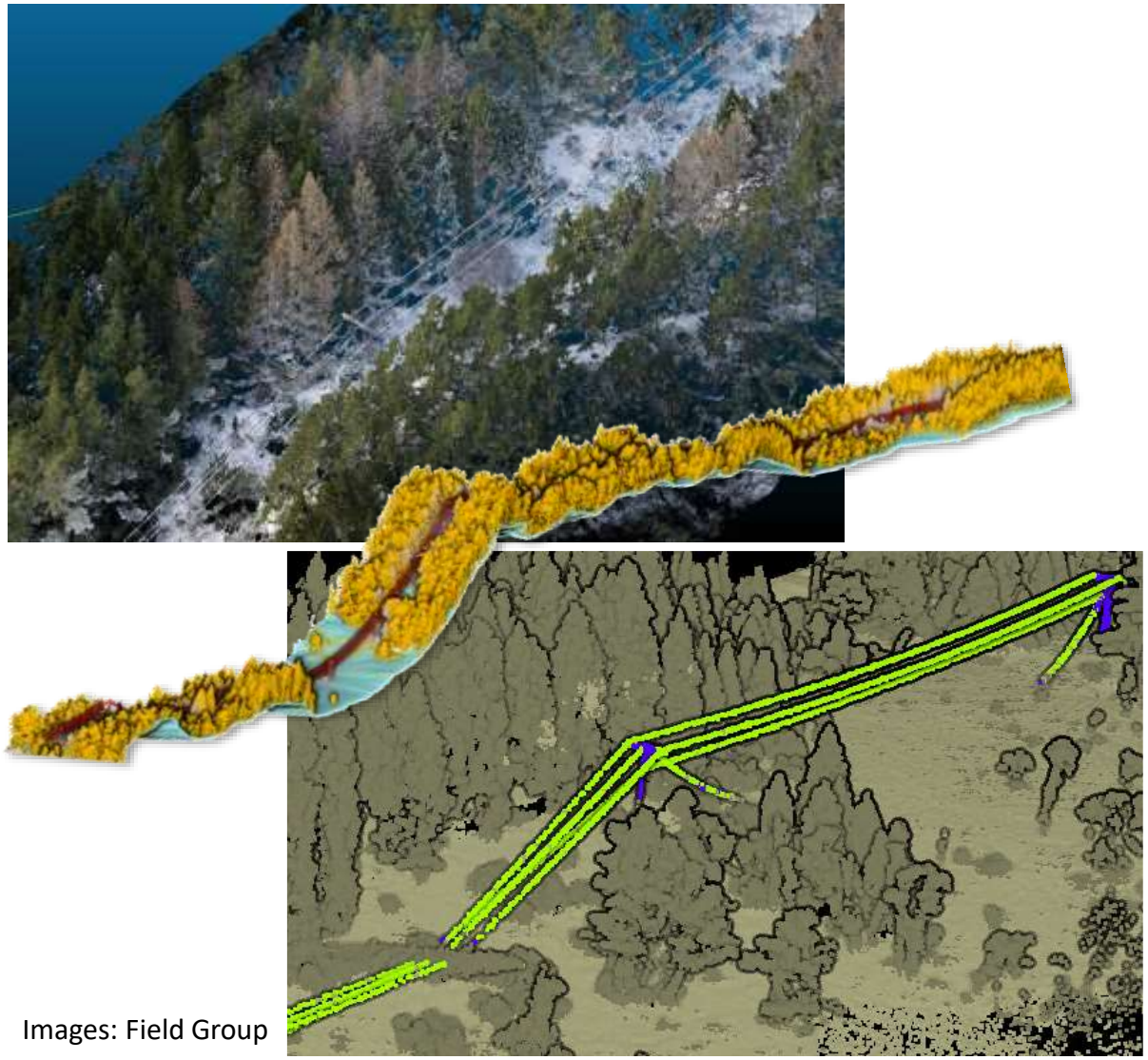




Images: Field Group

Automated analytics for modelling and fault detection

- Bespoke DL model with sparse convolutions for fast and efficient classification of 3D data.
- Multi-task learning with novel receptive field design preserves context and improves robustness.
- Modelling of power lines and masts, even under fault conditions.
- Near real-time, providing feedback in the field.



Images: Field Group

Summary

- Grid inspection is a high-value use case for AI, data, and robotics within I&M.
- Technology now commercially viable, but still maturing. Businesses must trust technology.
- Transformative for early-adopters.
- Industry-research partnerships crucial in this case for developing key enabling technologies.

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