

Hackathon Case Study 4: AI Drone Inspection of Offshore Turbine Blades

Ørsted and SkySpecs. Student Version.

The Scenario

Offshore wind turbine blades are enormous, some over 80 metres long, and they need regular inspection for cracks, erosion and other damage that could cause a catastrophic failure. Traditionally, this meant sending technicians up on ropes: a slow, expensive and genuinely dangerous job, especially offshore where weather and access add further risk.

At Ørsted's Burbo Bank Extension wind farm off Liverpool Bay, 32 turbines with 80-metre blades were inspected using drones instead, working with the robotics company SkySpecs. The drones flew a standard route around each blade, capturing high-resolution images that were then reviewed for damage. What used to take around two hours per blade dropped to about 20 minutes. No one had to leave the ground.

Since then, researchers have gone further, training an AI model called BladeNet directly on the image data these inspections produced. It automatically detects surface faults on the blades' glass-fibre composite material, reaching very high precision without needing much manual labelling of images by a human expert first. In effect, the inspection data collected for one purpose, checking blades at Burbo Bank, became the training set for a tool that could eventually inspect blades anywhere.

The safety and efficiency gains here are hard to argue with. But automating a safety-critical inspection, and building new AI products out of a company's operational data, raises questions that go beyond how fast the drone can fly.

Further Reading

- Ørsted, *The future is here: automated drone robots inspect massive 80m wind turbine blades*: orsted.co.uk
- Wind Power Engineering, *SkySpecs conducts drone inspection of world's largest offshore wind-turbine blades*: windpowerengineering.com
- ScienceDirect, *Artificial intelligence-based blade identification in operational wind turbines through similarity analysis aided drone inspection*: sciencedirect.com

RRI Discussion Questions

Work through these following six questions as a team.

1. Anticipate

When Ørsted and SkySpecs first automated blade inspection, the goal was clearly speed and safety. What risks do you think are easy to overlook when a new inspection method looks like a straightforward improvement on every visible measure, compared with the old, dangerous, manual method it's replacing?

2. Reflect

BladeNet was trained on Ørsted's inspection images by researchers, not by Ørsted's own team. What questions does that raise about who owns the value created from operational data collected for one purpose, safety inspection, once it's reused for another, building a commercial or research AI tool? Should Ørsted have a say in, or a share of, what BladeNet becomes?

3. Engage

If a drone-and-AI inspection system misses a defect that later causes a blade failure, several parties could plausibly be blamed: Ørsted for approving the process, SkySpecs for the flight and imaging technology, whoever built the AI defect-detection model, or the technicians who used to do this job and might have caught something the AI didn't. Who do you think should carry the most responsibility, and does the answer change depending on how the failure happened?

4. Act

As AI-based inspection becomes standard practice across the wind industry, what happens to the technicians who used to do rope-access blade inspection, and to the tacit knowledge they built up over years of hands-on work? Is there a risk that this expertise disappears from the industry faster than anyone realises, and what would it look like to lose it?

5. Scoring It

Using ORBIT's own tools, score this case study: what Technology Readiness Level (TRL) would you assign it, which Sustainable Development Goals does it affect, and what RRI Intensity Level (RIL) does that combination suggest? Be ready to explain your reasoning, since two teams might reasonably score this differently.

6. Your Proposal

You've been asked to advise a UK offshore wind operator that is about to sign a contract with a drone inspection provider. As a team, draft a short (3-5 point) proposal covering:

- What the contract should say about liability if the AI system misses a defect that later causes a failure
- What the contract should say about who owns any AI model trained on the operator's inspection data, and what happens to the operator's remaining human inspection expertise
- How you'd explain the change to the technicians whose jobs are affected

Presentation Task

In your team, prepare a 15-minute presentation covering your answers to all six questions above, with at least one slide per question. You should all participate in both the development and delivery of your presentation.