

Marine video monitoring advances leveraging HPC infrastructure

Louis Roman Fiorina¹, Ghaith Chaabane², Tomáš Martinović², Victor Anton⁴, Kalindi Fonda⁴, Tuomas Rossi³, Matthias Obst¹

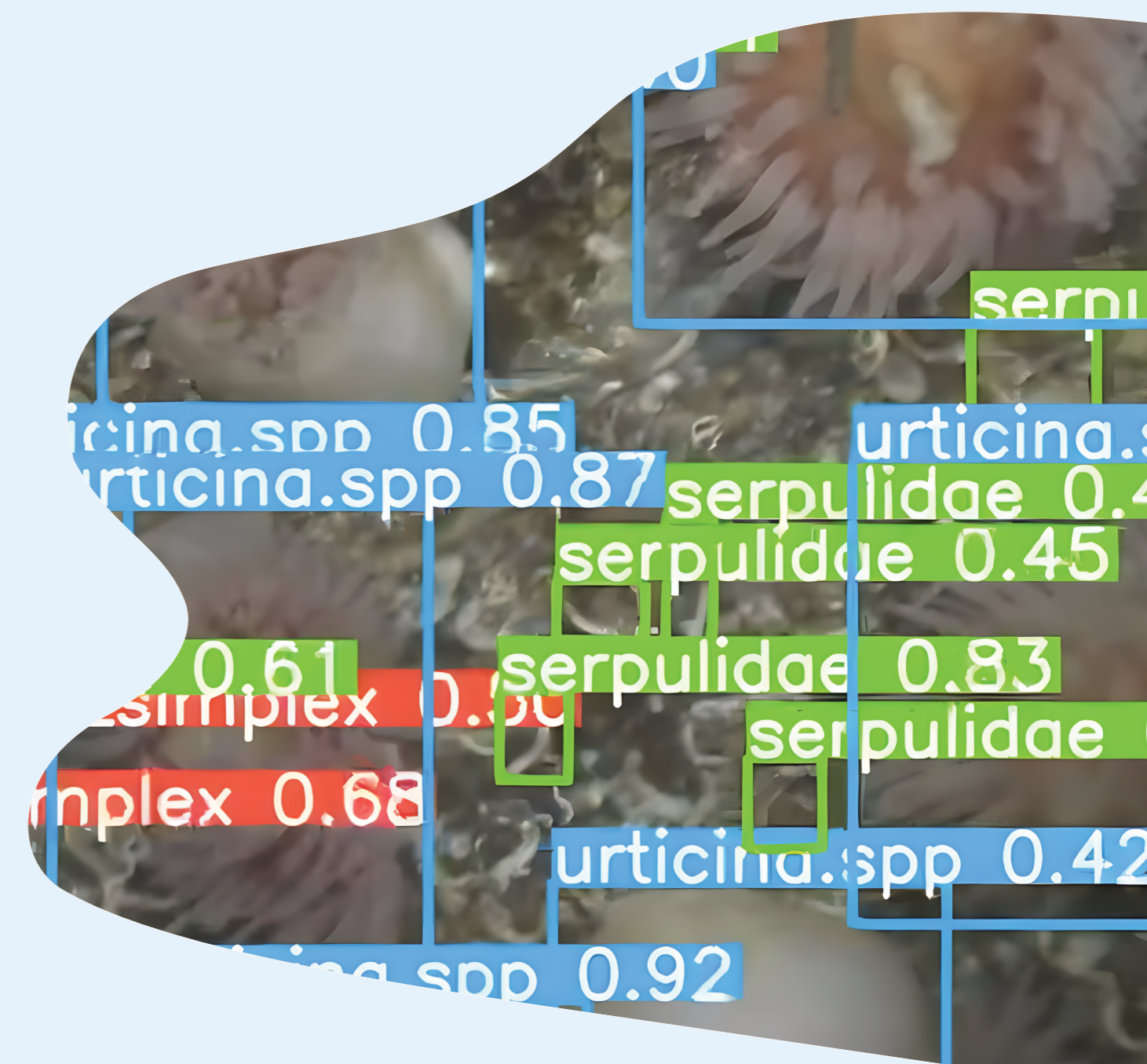
¹Department of Marine Sciences, University of Gothenburg, ²IT4Innovations, VSB - Technical University of Ostrava, Czech Republic, ³CSC – IT Center for Science Ltd., Finland, ⁴Wildlife.ai - New Zealand

Challenges in data driven marine research

Coastal marine ecosystems face mounting pressures from climate change, habitat disturbance, and invasive species. Image-based monitoring can generate the evidence needed for effective management, but the volume of underwater footage collected by remotely operated vehicles, autonomous platforms, and survey cameras creates a processing bottleneck that manual review cannot solve at scale.

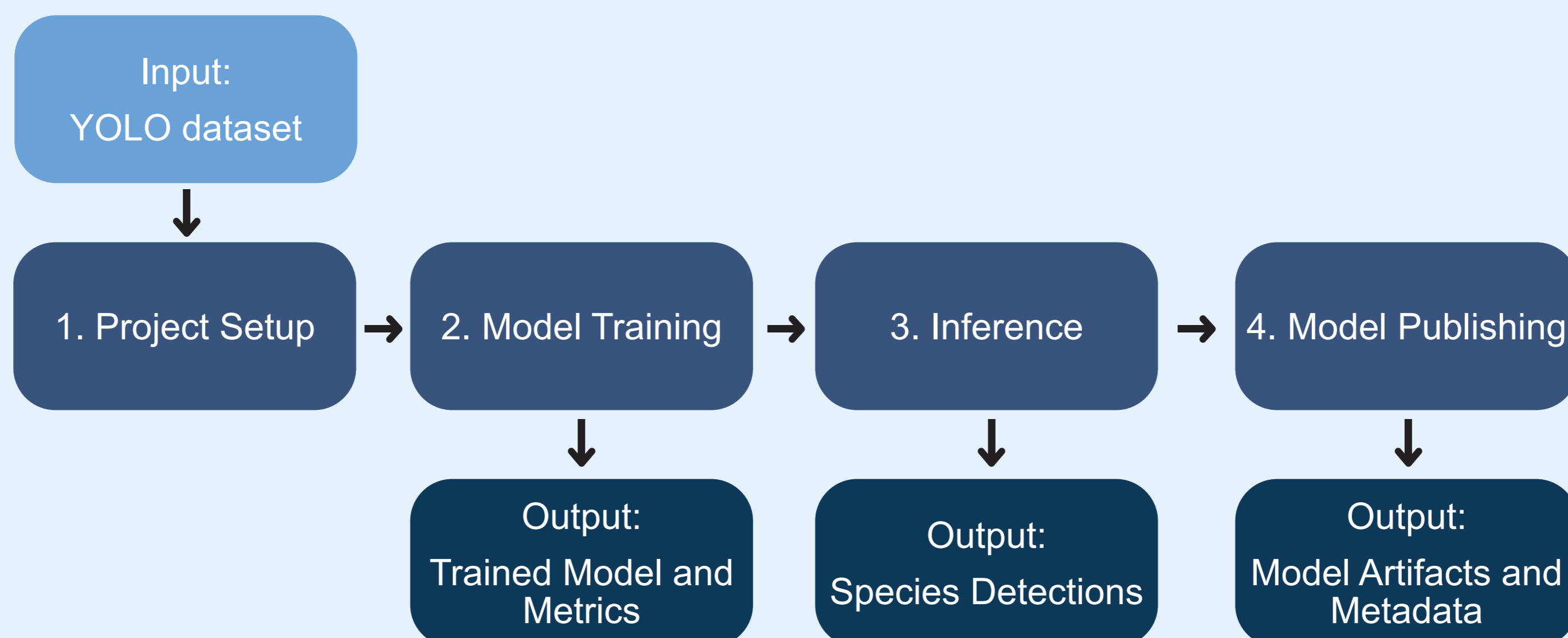
Our solution to tackle these challenges

As part of the DTO-Bioflow project, we use the LUMI EuroHPC supercomputer to train and fine-tune object detection and segmentation models for underwater imagery. We call this system SUBSIM, the Swedish platform for subsea image analysis, providing open-source computer vision support to track species richness and abundance in coastal habitats. This supports biodiversity assessment and evidence-based management of marine protected areas, offshore wind sites, and invasive species monitoring programs.



Scalable Jupyter Notebook Workflow

The workflow is structured as four reproducible stages — project setup, model training, inference, and publishing — illustrated in the diagram. Each stage is implemented as a Jupyter notebook, making the pipeline readable, auditable, and transferable across teams and institutions. Containerization ensures the same environment runs consistently from a researcher's laptop, through shared cloud infrastructure such as EDITO, up to LUMI HPC nodes, without requiring changes to the basic code.



From adoption to shared knowledge easily

This design enables easy adoption and scaling. Early-stage exploration happens locally; production training and large-scale inference run on HPC. Versioned model artifacts and experiment tracking make results reusable and comparable across projects. SUBSIM provides a practical, open pathway from raw underwater footage to validated, publishable ecological knowledge.



Subscribe to our Newsletter!

@DTOBioFlow
 @DTOBioFlowProject
 company/dto-bio-flow