

# Theme Session J Report

2024

Moving the latest developments from machine learning and AI closer to exploiting mountains and lakes of data

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## Session synopsis

This session aimed to increase the mutual understanding between machine learning (ML), artificial intelligence (AI) as well as fisheries and environmental science and management communities in order to optimise and utilise digital data services for ML and AI.

The session welcomed contributions on the following topics, with a focus on marine and wider environmental data, data services and applications:

- Practical implementations of ML and AI
- Data technology, software and services to enable ML and AI
- Current challenges and barriers to using open source marine data in ML and AI
- Standards and protocols for ML and AI applicable to marine sciences
- Ethics of using ML and AI in fisheries and environmental management
- Legal and regulatory aspects of using AI and ML in scientific processes for decision makers

The session included 17 presentations that were divided into thematic blocks:

- Acoustics (2)
- Image analysis (5)
- Other applications (2)
- Societal aspects (3)
- Pipelines and frameworks (3)
- Ethics (2)

In addition, there were 10 posters presented at the Tuesday poster session. The posters mirrored the session presentations, in that image, video image, and sound file analysis were the predominant use cases that the marine research community can see an immediate application of AI and ML in. Of special note are collaborations between research institutes and technology companies, which points to a growing trend in combining technical understanding with research-based challenges, see Vanhoorne et al (Belgium) for an example using synthetic fish.

As seen from the topics of the thematic blocks, they represented a wide range of approaches, some very technical, some applied to natural science or societal topics around fisheries, and ethics of using AI in the field of fisheries. This was seen as both a strength and a challenge. It was seen as a strength that AI and machine learning are used in many different branches of marine science, and the theme session participants were varied in their skills and areas of interest. However, this also presents a challenge in terms of keeping in touch; the ICES AI community is too varied to meaningfully form one working group or a mailing list, but the risk of fragmentation and poor information flow is also real.

It was clear from the presentations that there was overlap in the technologies used, plus a growing use of Cloud technologies for computing on demand. For example, Ikram Choudry of CEFAS (UK's Centre for Environment, Fisheries and Aquaculture Science), demonstrated reduced cost and time for Otolith-based stock discrimination by moving part of that workflow onto Cloud based computing on demand services such as Microsoft Azure. In contrast to this Cloud-based computing solution, was

the challenge presented by data processing and machine learning at sea as described by James Scott of CEFAS (developing edge-ai pipelines and cloud-based solutions for in situ imaging data). In this scenario, the cost and bandwidth of the Internet connection while at sea is a limiting factor to near real time machine learning processing of data streaming from sensors. The proposed solution to this is to use another technique from Cloud computing, called EDGE processing.

Several presentations were on the application of machine learning techniques to images of fish and otoliths. It was clear from the presentations that data scientists were using a number of distinct silos of images, implying that data scientists are using different training data sets to develop algorithms. Having a common archive of annotated imagery is an important step to bringing standardization in machine learning techniques across the ICES community, and is a good common goal for uniting the community.

The conference also hosted other related sessions: The AI thinking network session, Theme Session H on *“How can camera-based electronic monitoring improve bycatch management?”*, and perhaps with a bit lesser relatedness, Theme Session A: *“From echoes to ecology: The application of active acoustics beyond biomass estimates”*.

## **Conclusion**

The rise in the availability of machine learning tools has gone hand in hand with the corresponding rise in Cloud computing and Big Data analytics. A driver of this technology trend has been the need for the processing of social media and personal data from online apps. The ICES community are profiting from the development and availability of these tools. To fully capitalize from this opportunity, it is recommended the ICES ML community should share their experiences with the technologies with each other and seek ways to share resources, for example, via dedicated discussion forums, shared cloud storage for labelled imagery, and community developed Python/R libraries dedicated to fisheries data science.