EXECUTIVE SUMMARY

European Parliament

Research for PECH Committee – Artificial Intelligence and the fisheries sector

This study reviews the main applications of Artificial Intelligence (AI) systems in fisheries and identifies current challenges for fisheries that have the potential to be dealt with through AI.

Legal analysis of relevant EU fisheries legislation that enables the use of AI systems

The AI-related legal analysis in fisheries found that: 1) there is no explicit reference to AI systems in the most relevant EU fisheries legislation, but there are references to digitalisation that could include AI systems; 2) the most relevant fisheries legislation is drafted in a way that enable the use of AI systems; 3) the broad-ranging nature of the Artificial Intelligence Act (AIA) proposal makes its application to the fisheries sector straightforward; 4) there are some concerns that the General Data Protection Regulation would require adaptation to the new realities brought by AI technologies; and, 5) several third countries are considering AI methods for further automation of Electronic Monitoring systems.

Analysis of the current and potential use of AI techniques in the fisheries sector

The review of AI techniques in fisheries revealed that: 1) Machine Learning (ML) approaches have been used to automate biological sample processing; 2) ML has been applied after image analysis and on acoustic data to count and measure organisms; 3) research on catch classification by species and sizes using AI has increased; 4) ML is being applied to automatically classify or determine fishers' behaviour; 5) knowledge-based and expert systems have been applied to early warning systems and marine spatial planning; 6) traditional rule-based expert systems have been mainly applied in data-limited situations; 7) statistical approaches, Bayesian estimation, search and optimization methods are not traditionally considered AI, but can be integrated into AI systems; 8) some of the uses identified are applied to stock assessments and species distribution models; and, 9) fishing vessels could improve energy efficiency and reduce their CO_2 footprint by using AI systems.

The present document is the executive summary of the study on Artificial Intelligence and the fisheries sector. The full study, which is available in English can be downloaded at: https://bit.ly/3yy48iw

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Specific fisheries topics discussion on the use of AI systems

Firstly, seafood in all of the supply chain is analysed: 1) AI shows promising uses for traceability and seafood product integrity; 2) limited data generation and collection is the main barrier; 3) the processing industry is starting to use AI systems in automation processes; 4) AI proofs-of-concept have been developed in the field of logistics; and, 5) ML has been used to infer consumer behaviour and economic growth forecasting.

The second topic analysed is the use of AI for more selective fishing techniques: 1) there is a mismatch between fisheries selectivity improvement management goals and industry's tools to comply with regulations; 2) species selectivity can be further improved with AI; and, 3) AI systems aimed at automated species forecasting and detection, identification and sizing of catches could allow improving fishing decisions and enable quota tracking.

The third discussion topic assesses the use of AI as a driving force for young people to seek jobs in fisheries: 1) AI, similarly to digitalisation, is likely to create new skilled jobs while decreasing the need for low skilled ones in the fisheries sector; 2) the marine transport sector has developed AI systems focused on ship failure prediction and anomaly detection that could be applied in fishing vessels; and, 3) a more digitalised and AI-based fisheries sector might attract new young talent, but will be competing against other industries currently offering higher incentives.

Good practices in fisheries that could be useful for future good practices within the fisheries sector when developing or using AI are also analysed. Best practices guidelines for different fishery facets are commonly used by management organisations to increase their sustainability and AI technology should follow this example.

Finally, there are general AI groups and networks at the European level, but they lack marine domain knowledge to develop fit-for-purpose AI systems for fisheries. There is at least one European working group focusing on AI for fisheries and several fisheries groups where AI has been discussed, but there is a shortage of sufficient resources.

Conclusions and recommendations for AI systems use in fisheries

The last chapter summarizes opportunities and obstacles to the application of AI in the fisheries sector based on the findings of previous chapters.

Main opportunities identified are: 1) increased transparency of fishing activity and reduced impact on the environment, thereby improving the public image of the sector; 2) early warning, forecasting and spatial planning systems can help in the planning activities considering trade-offs between them; 3) accelerated and increased data acquisition and coverage for stock assessments, sustainability indicators evaluation and other management data needs; 4) increased economic sustainability of the fishing industry, by reducing operational costs; and, 5) the modernisation of fisheries and its subsequent attractiveness to the younger population.

Main obstacles identified are: 1) industry trust and reluctance; 2) initial costs and lack of expertise; and, 3) legal and bureaucratic uncertainty.

Although some AI approaches are considered black boxes (e.g. Artificial Neural Networks), there are other suitable AI methods to understand the basis, processes and model forecasts and their uncertainty (e.g. Bayesian Networks).

Finally, the study ends with the following policy recommendations for the best use of AI in fisheries and its supply chain:

1. Amend Regulations that are or will be subject to revision in this field to include a reference to AI systems and AIA definition in paragraphs where digital transformation and new technologies are mentioned.

2. Amend the AIA proposal to include the fisheries sector. Its Recital 3 currently reads "[…] in healthcare, farming, education […]", it could be amended to "[…] in healthcare, farming and fishery, education […]".

3. Promote formation of interdisciplinary fisheries experts with AI related skills and multidisciplinary teams (e.g., AI, biological, economic, and legal disciplines).

4. Find ways to incentivise job opportunities and promotion of multidisciplinary and interdisciplinary experts not only in academia but also in the private fishery sector.

5. Attract young workers and empower women with AI skills in fisheries sector jobs through dissemination of information programs and by providing adequate incentives.

6. Promote private data collection and sharing, including appropriate data aggregation and anonymization safety protocols to facilitate industry trust.

7. Support the development of good AI practices and standards for statistical validation and ground truth verification to increase consumer and industry trust in AI performance, also supported by strong science fit-for-purpose applications aligned with sustainability goals.

8. Regulate the role of AI technological providers, ensuring some degree of experience in fisheries to prevent untrustworthy and not-fit-for-purpose AI systems (e.g., establishment of audited registration programs).

9. Create regulations limiting the access of certain kinds of AI systems to the fisheries sector to help avoid their application in illegal or unethical activities (e.g., through regional fisheries management organisations (RFMOs) or registers for vessel compliance with sustainability practices from trustworthy organisations).

10. Support the development of good AI practice guidelines in fisheries through collaboration with stakeholders and organisations (e.g., RFMOs, certification agencies, NGOs) using mechanisms and principles proven to be successful in other types of fisheries best practices guidelines.

11. Promote AI awareness, both benefits and constraints, among managers and industry to improve adoption processes at the whole supply chain.

12. Promote collaboration between universities, firms, AI developers and other stakeholders in fisheries though specific funding, specialized centres, and multidisciplinary networks.

13. Promote technological development integrated with AI systems to develop more selective fishing gears and fishing strategies by funding AI research and vessels digitalisation.

Further information

This executive summary is available in the following languages: English, French, German, Italian and Spanish. The study, which is available in English, and the summaries can be downloaded at: https://bit.ly/3yy48iw

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