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multi-Risk sciEnce for resilienT commUnities undeR a changiNg climate

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1. Technical references

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* PU = Public

PP = Restricted to other programme participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

CO = Confidential, only for members of the consortium (including the Commission Services)

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2. ABSTRACT

The escalating threat posed by Invasive Alien Species (IAS) amidst climate change and increasing human maritime activities requires urgent and effective management strategies.

The capability to identify potential habitats rapidly and reliably for IAS at fine spatial-temporal scales is crucial for mitigating their effects and optimizing monitoring efforts. Machine Learning (ML) algorithms within Ecological Niche Modelling (ENM) are promising tools in this context, thanks to the increasingly available high quality environmental and occurrence data.

However, the effective utilization of ML in ENM requires a strong understanding of the underlying assumptions, a clear addressing of biases in data, extended hyperparameter tuning and a reliable model performance evaluation.

This work aims to develop a comprehensive framework that addresses these challenges by providing a systematic approach to ENM studies. It seeks to incorporate state-of-the-art techniques for mitigating common data biases, conducting hyperparameter tuning, enhancing the model evaluation phase, and generating uncertainty maps for future projection analysis. This multi-faceted approach is designed to improve the reliability and interpretability of ENM outcomes, thereby facilitating more informed decision-making in IAS monitoring and management.

The work unfolds in three main phases: (1) comprehensive literature review on the topic to identify crucial ENM phases, challenges and proposed solutions; (2) design of the framework; (3) practical implementation of the framework in a real case study.

Although centered around MaxEnt, a prominent ML algorithm in ENM studies, the framework is designed to be adaptable to other presence-only modelling approaches.

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