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Abstract Submission

Informed Zero-Shot Classification of Elasmobranch Species: Integrating Expert Descriptions and Schematic Illustrations

Authors

Ismael Beviá Ballesteros ¹, Mario Jerez Tallón ¹, Bernabé Sánchez Sos ¹, Nieves Aranda Garrido ², Irene Antón Linares ², Isabel Abel Abellán ², Andrés Fuster Guilló ¹, Jorge Azorín López ¹

¹ Department of Computer Technology and Computing, University of Alicante, Spain

² Santa Pola Marine Research Centre (CIMAR), University of Alicante, Alicante, Spain

Abstract

Elasmobranchs, a group of cartilaginous fishes including sharks and batoids (rays and similar flattened species), are among the most threatened marine taxa, with over one-third of species at risk of extinction. Southeastern Spain has recently been identified as a key conservation area. Yet, while only two species are officially recorded, at least ten others have been documented. This highlights the urgent need for tools that support precise species identification in settings like fish markets and fisheries, which interact constantly with the marine environment. Despite this need, there is a notable lack of annotated datasets that address this issue in a targeted manner. Furthermore, the common practice of grouping multiple species under broad categories (such as “shark” or “ray”) significantly hinders precise identification and the development of effective conservation strategies. These challenges limit the applicability of popular approaches such as Convolutional Neural Networks (CNNs) and Vision Transformers (ViTs), which typically rely on task-specific training.

To overcome these limitations, we propose an informed classification and detection framework using a zero-shot multimodal strategy based on the Contrastive Language–Image Pretraining (CLIP) model. Our approach integrates prior theoretical knowledge in the form of expert-provided natural language descriptions and schematic illustrations that highlight distinctive visual traits. The resulting system enables informed inference based on expert sources and existing guides, promoting both interpretability and adaptability in new monitoring and management scenarios.

Keywords

zero-shot, prior knowledge, Elasmobranch identification, Informed machine learning, schematic illustrations