**Sw-YoloX: An anchor-free detector based transformer for sea surface object detection**

We propose Sw-YoloX, which can make use of the global modelling capability to encode the key semantics of sea surface objects, in order to address the issue of blurred images of sea surface objects brought on by the complex and undulating sea surface environment. This method can obtain global features that CNN is unable to capture. The decoupled head is employed as the prediction portion after the convolutional block attention module (CBAM) and atrous spatial pyramid pooling (ASPP) module are combined in the detector's neck. We also combine other training techniques, such as the SimOTA approach (simple optimal transport assignment) and multi-model integration, to significantly enhance the performance of the detector. Finally, using data from sea surface monitoring in Xiamen, China, we build the XM-10000 dataset for validation.

Sw-YoloX performs better with end-to-end training than the baseline and mainstream detector, with an F1-Score of 78.1, a mean average precision of 54.4, and an average recall of 72.0. This study, which is currently being used in the coastal defence division of Xiamen, China, has significant ramifications for finding survivors and stopping smuggling.

This study suggests a new detector called Sw-YoloX that excels at complex sea surface item identification tasks. It is based on the transformer and anchor-free processes, along with a number of improvement methods and heuristic training strategies. The results of the comparative trials and the ablation experiments show that Sw-YoloX has a bigger accuracy advantage than the conventional CNN + anchor base structure and that it performs significantly better than the original detector. For the purpose of detecting drowning and stowaways on the sea surface, our detector has been successfully used in Xiamen, China, and the algorithm's dependability and robustness have been proven.

Future research can further reduce the convolutional layers or fully connected layers with lower weights using the pruning algorithm. A fresh lightweight network can also be created at the same time. presented with reference to the Sw-YoloX architecture to achieve accurate object recognition on intricate sea surfaces. Sw-YoloX, the detector that was produced as a result, is intended to serve as a baseline for future study and as an inspiration for sea surface item detection. Additionally, the concept of combining anchor-free design with transformer can be used in various object detection disciplines.