MobyGlobal: Real-Time Whale Detection Network Powered by a Custom CNN and 3D Printed Buoys

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Over 300,000 cetaceans die every year due to human activity–primarily ship collisions and fishing entanglements–with roughly 67% of all whale deaths attributed to human interactions. Many whale and dolphin populations are in decline, facing the threat of near-extinction. The North Atlantic Right Whale, specifically, is critically endangered, numbering only ~350. To combat this issue, we built a real-time Right Whale detection network comprised of 3D-printed buoys deployed across the Atlantic Ocean. This will prevent human-caused Right Whale deaths through monitoring whale locations and guiding ships away from collisions. Each buoy consists of an ESP32, solar panels, and a hydrophone, costing significantly less than current buoys. The buoy runs a Custom Convolutional-Block Attention Module (CBAM) on spectral, temporal, and harmonic features to detect Right Whales based on their vocalizations. We trained and tested our model on datasets from Cornell University and Watkins Marine Mammal Database, achieving a 0.9784 AUROC score that surpasses the 0.7214 benchmark set by Cornell while on lower parameters. Our detection network uses a three-step approach where captured audio is recorded on a buoy, sent to a cloud-based server that processes audio using our CBAM model, and then updated on client apps using our API, conveying real-time locations of whales. The data is then added to an open-source database, MobyGlobal, for public access/research.

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