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# LBRT AND MACHINE LEARNING TO REDUCE MEGAFAUNA BYCATCH

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***Abstract* – The engineering challenge is to reduce and potentially eliminate sea turtle and other incidental megafauna bycatch from fishing nets while retaining the targeted fish. ASU BESTLab has employed LBRT (lighted bycatch reduction technology) and field tested it with encouraging results, showing a reduction in bycatch. To enhance bycatch reduction efforts, ASU BESTLab has developed a machine learning detection system for sea turtle recognition. The idea is to use images to train a machine learning model to detect if a sea turtle is venturing too close to the net and then to determine what sensory stimuli to send out to deter the sea turtle and at what setting.**

***Index Terms*—Reducing Bycatch, LBRT, Machine Learning, Sea Turtle Recognition, Smart Nets**

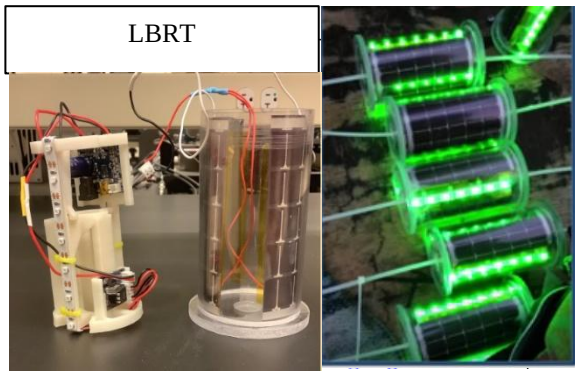
## 1. PROJECT DESCRIPTION

The oceans cover 71% of our planet and hold about 97% of all our water so a healthy Marine ecosystem translates into a healthy Planet, which means it is vital to reduce accidentally caught marine life known as bycatch from fishing net for two very important reasons: 1) to help endangered marine life recover their populations and 2) to maintain or improve the livelihood of fishers and fisheries to catch only what they want to in their nets. In response, ASU has developed a lighted bycatch reduction technology (LBRT) (Fig.1a) and integrated it into fishing nets. We tested our Smart Nets in the field and realized a 65-70% percent reduction in bycatch [1-3]. Fishers and fisheries are taking note and demand is rising for our LBRT product. So, in response we have plans to scale-up our production and handcraft 100 lighted BRTs.

Additionally, we seek to further reduce bycatch by including a machine learning (ML) detection system. The idea is to use images to train a machine learning model through iterative, pixel-by-pixel image processing to detect if a sea turtle is venturing too close to the net and then to determine what sensory stimuli to send out to deter the megafauna and at what setting. As shown (Fig. 1b), colored bars would indicate the confidence level in detection of valuable marine life.

We are currently extending this work further by first training and then testing an ML detection system with labeled ocean data images composed of the following binary classes: 1) images of submerged sea turtles and 2) images of submerged non sea turtles [4-5].

To train our ML system, we are employing the MATLAB Classification Learner App to compare the effectiveness of each learning algorithm. From metrics provided with the program, the best ML model can be determined and will be selected for use with an expanded test dataset.




(a) Lighted Bycatch Reduction Technology developed by ASU BESTLab. 10% Duty cycle green LEDs.


(b) Machine Learning Detection System for sea turtle recognition.

**Figure 1:** Images showing existing LBRT and future ML BRT detection and deterrent system.

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