

Wind/Whale Co-Existence: Artificial Intelligence for Predicting NARW Occurrences Near Offshore Wind Farms in the U.S. Mid-Atlantic

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Introduction

- It is critical to ensure that ongoing Offshore Wind (OSW) developments co-exist with the marine ecosystem.
- North Atlantic Right Whale (NARW) is one of the most endangered species of whales, with **less than 370 individuals remaining**.
- NARWs inhabit areas adjacent to the OSW lease areas in the U.S. Mid-Atlantic region, posing a potential risk of human activity interference.
- Despite industry standards mandating halting operations upon whale sightings, this practice is limited by whales being predominantly underwater, leading to a large number of false negatives (i.e., missed sightings).

Methods

- Prepared and preprocessed satellite data and glider data from Rutgers to detect patterns in NARW presence in regions covered by the gliders.
- Collaborated with research team to develop a **predictive model** that integrates environmental data to predict the presence of NARW in the US Mid-Atlantic.
- List of all tested models: Logistic Regression, KNN, SVM, Random Forest, **AdaBoost (best model)**, MLP, CNN, TabNet, ResNet

Results

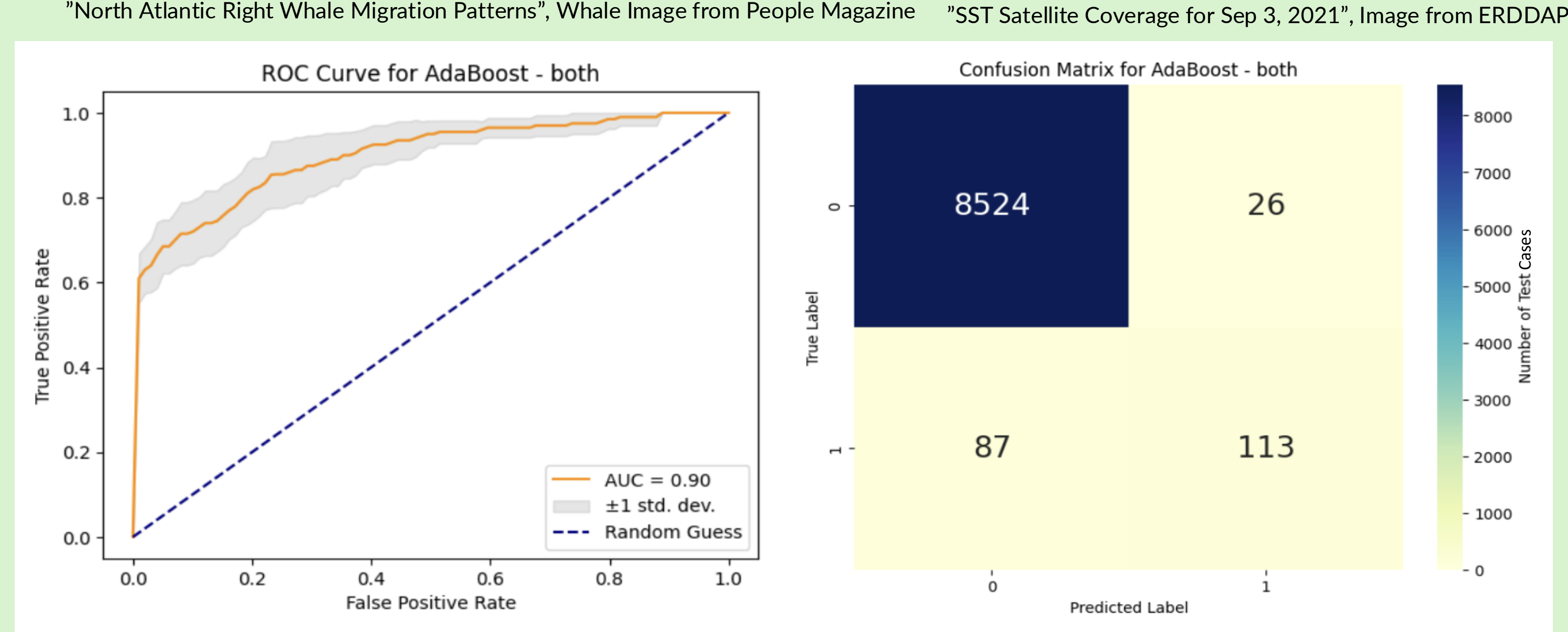
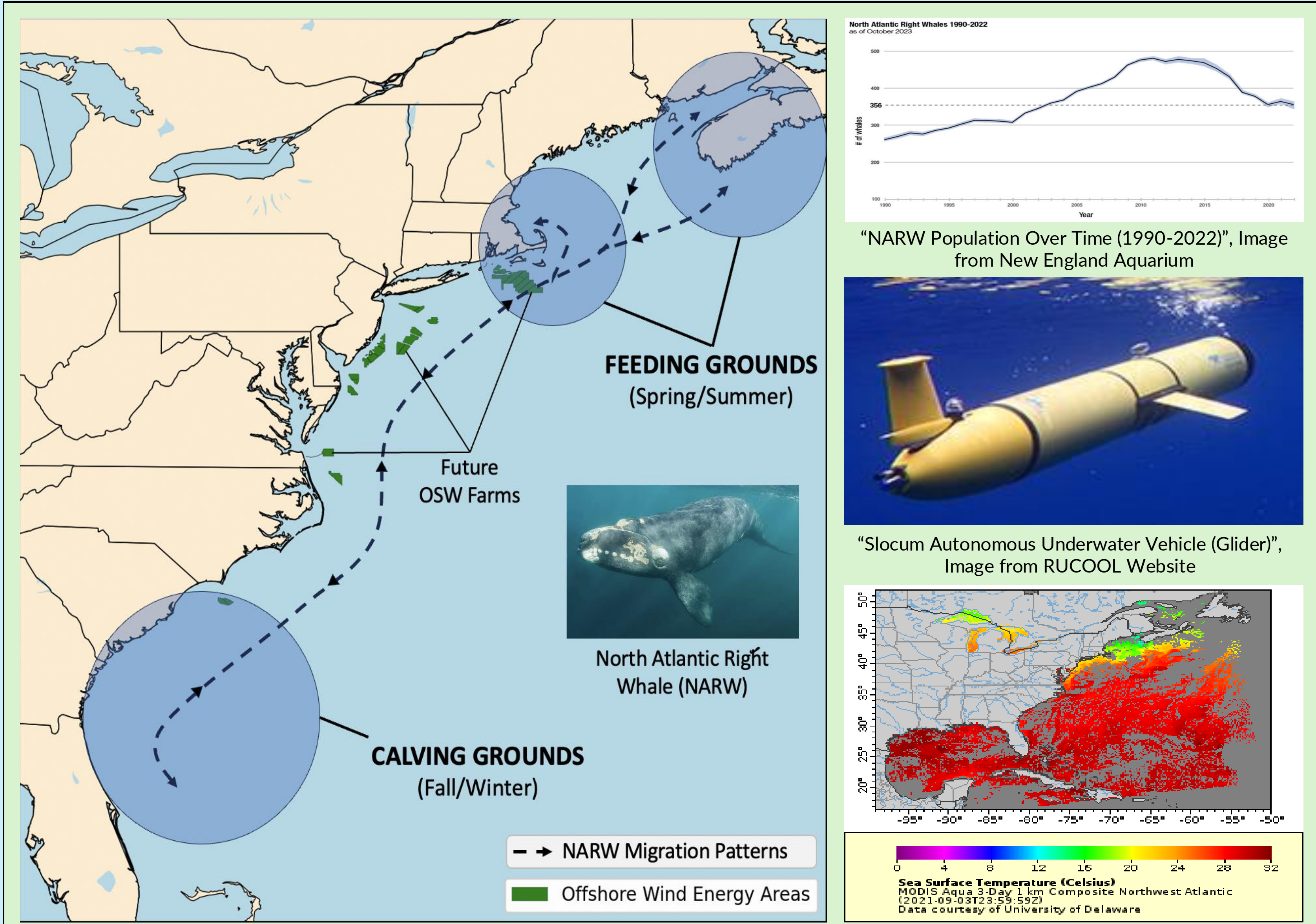
- Using Artificial Intelligence to detect whale presence has shown incredibly promising results, evidenced by a notable **True Positive Rate (TPR) of 56.5% and accuracy of 98.7%**.
- This machine learning model outperforms logistic regression (baseline), which typically yields TPR 16% and accuracy 96.1% for this data.
- Overall, the models performed significantly better when **both sources of data (glider and satellite)** are provided.

Discussion

- Additional glider deployments can cover a larger region and provide a **more representative sample** of NARW presence data.
- Using statistical methods to interpolate missing satellite data can **increase coverage** and improve the model.

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"ROC Curve and Confusion Matrix for AdaBoost model"

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