GLOSSA: A User-Friendly Shiny App for Machine Learning Global Scale Marine Species Distribution Models (SMDs)

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Species Distribution Models (SDMs) are widely used in ecology and conservation to predict current, past, and future geographic distribution and suitable habitats of species. SDMs serve as a useful tool for understanding ecological relationships and making informed decisions in conservation and resource management. Several studies have highlighted the worldwide impact of climate change on marine ecosystems, revealing how marine species are adapting and potentially changing their distributions. Therefore, predicting the spatial-temporal distribution of species is essential in ecological and conservation research. Bayesian Additive Regression Trees (BART), a nonparametric machine learning approach based on a sum-of-trees model, has emerged as a promising method for SDMs. By incorporating georeferenced records of global scale marine species and environmental data, BART can assess how species respond to environmental conditions and predict their possible past and future habitats based on environmental changes. In addition, these models could provide a valuable approach to inform and empower the inputs of global Marine Ecosystem Models (MEMs). To make this tool and this framework more accessible to users, we present GLOSSA (GLobal Ocean Species Spatiotemporal Analysis), a user-friendly Shiny application in R designed to apply BART to global scale marine data, allowing users to easily predict native ranges, suitable habitats, and response curves for environmental variables of marine species. With GLOSSA, researchers gain access to a powerful and easy-to-use tool for projecting the past, present and future geographical distribution of marine species.

Keywords: Species Distribution Model (SDM), BART, Shiny, global scale, climate change.