Species distribution models (SDM)

AZTI

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Contents

About

This is a short tutorial for constructing species distribution models in R. It describes the whole process from downloading OBIS and GBIF data, generating pseudo-absence data, including environmental data, fitting the model, validating the model and generating the resulting maps for visualization.

The code is available in AZTI's github repository repository and the book is readily available here.

Chapter 1

Introduction

Species distribution models (SDMs) are numerical tools that combine observations of species occurrence or abundance at known locations with information on the environmental and/or spatial characteristics of those locations [Elith and Leathwick, 2009]. They are also known as …

A wide variety of methods have been used …

Reviews of SDM literature include …

One of the common problems is that, the fitted models do not agree with the ecological niche theory…

This book provides a tutorial on how to use shape-constrained generalized additive models to build SDMs. We follow the key steps in good modeling practice of SDMs [Elith and Leathwick, 2009]. We first start by downloading presence data from GBIF/OBIS datasets and we create pseudo-absence data. Then, we download data on environmental covariates and we extract their value at each of the presence/pseudo-absence data points. Based on this dataset, we conduct an exploratory analysis that will help us deciding on the best modelling approach. We fit the model to the dataset and we evaluate the quality of the fit and the realism of the fitted response function. We select a threshold value to transform the continuous probability predictions into binary responses and we validate the model using a k-fold approach. Finally, we show the predicted maps.

Chapter 2

Libraries

Load libraries that will be used

Chapter 3

Presence-absence data

Bla bla bla

3.1 Download presence data

Download from GBIF OBIS. Mireia

3.2 Create pseudo-absence data

Prevalence 50%

See code from ANICHO (mantaining some space around presences). Leire C.

Chapter 4

Environmental data

Bla bla bla

4.1 Download from public repositories

Download from Bio-oracle. Guillem le pasa el código a Mireia, que lo sube a github

4.2 Operations with rasters (maybe not needed)

We can complete this a bit more later on, though not necessary right now

Chapter 5

Prepare final dataset

Bla bla bla

5.1 Extract environmental data associated to presence-absence data

5.2 Exploratory plots

Chapter 6

Shape Constrained-Generalized Additive Models

One citation is [Citores et al., 2020]

Mention there is an alternative using `mboost` that won't be further developed here.

6.1 Model fit

6.2 Model selection

Chapter 7

Model validation

Bla bla

7.1 Optimum threshold

7.2 k-fold validation

Chapter 8

Prediction and maps

predict from fitted models and produce maps

Bibliography

L. Citores, L. Ibaibarriaga, D. J. Lee, M. J. Brewer, M. Santos, and G. Chust. Modelling species presence–absence in the ecological niche theory framework using shape-constrained generalized additive models. *Ecological Modelling*, 418:108926, 2020.

Jane Elith and John R. Leathwick. Species distribution models: Ecological explanation and prediction across space and time. *Annual Review of Ecology, Evolution, and Systematics*, 40(1):677–697, 2009. ISSN 1543-592X 1545-2069. doi: 10.1146/annurev.ecolsys.110308.120159.