

INTRODUCTION TO ECOLOGICAL NICHE MODELLING



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- To provide a theoretical base about Ecological Niche Modelling
- To give you an overview of the main questions, types of species' data, types of environmental data sources, main methodologies in ecological niche modelling
- To show you the limitations of ecological niche models
- To explain which methods to use depending on your aims and data
- To show how to perform simple and intermediate analyses using R
- To outline solutions for more advanced research problems

I will be extremely happy if your learn two things here:

- 1) Maxent does not use pseudo-absences**
- 2) The results of presence-only model does not represent the same thing than a presence-absence model**

Let's see if after five days I am able to teach you successfully

NOT A COURSE ABOUT GIS

NOT A COURSE ABOUT R

By the end of this 5-day practical course, attendees will have the capacity:

- **to perform ecological niche models**
- **to understand their results**
- **to choose and apply the correct methodology depending in the aim of your study and type of datasets**

Lectures

Whole first day: theoretical introduction

Remaining days: small lectures before each practical

Practicals

For different ecological niche modelling methods:

1. Using mainly R
2. Small introduction about GIS data preparation
3. Fourth day afternoon: students' voluntary small talks to discuss your problems and necessities
3. Last day for playing with your own data

BEFORE OR AFTER DINNER

Book your time if you want to discuss your research with me

VISIT THE COURSE PAGE IN FACEBOOK USEFUL POSTS!

The screenshot shows the Facebook page for 'Introduction to Ecological Niche Modelling'. The page header includes the Facebook logo, the page name, and navigation links like 'Home', 'Inbox', 'Notifications', 'Insights', and 'Publishing Tools'. The main content area features a post from the page, dated 45 minutes ago, with the text 'Registration is still open!!'. Below this is a map showing the distribution of species across different regions. To the right of the map is a section titled 'Ecological niche modelling using R' with a 'Going' button. Below this is a section titled 'Effects of spatial autocorrelation and imperfect detection on species distribution models' with a 'Boost Post' button. The right sidebar shows a list of 'YOUR PAGES' and 'CONTACTS'.

Introduction to Ecological Niche Modelling shared their event...

45 mins · €

Registration is still open!!

2050

Introduction to Ecological Niche Modelling
@enmintrio

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January 30 at 7:59pm · €

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YOUR PAGES

Introduction to Ecological Niche Modelling

CONTACTS

Raquel Ribeiro
Edvárd Mizsei
Jose Manuel N Azevedo
Kevin Mulder
Pierre-André Crochet
Lia Bárbara Duarte
Filipe Serrano
Pedro Alves
Tiago Sousa Neves
Sara Cristina Lopes
Ibán Hernández Malvar
Carlos Baraza
Madalena Boto
Luis Ceriaco
Gonçalo Espregueira
Miguel Araújo
Carlos Cabido

MORE CONTACTS (13)

Paulo Ormino

ORGANISATION OF THE COURSE

<u>Dia 1</u>	<u>Dia 2</u>	<u>Dia 3</u>	<u>Dia 4</u>	<u>Dia 5</u>
Introduction to <u>ENM</u> theory	Preparing variables	<u>Biomod</u> practice	<u>Ecospat</u> practice	Final practice
Problems on <u>ENM</u> + <u>ENM</u> methods	Preparing variables	<u>Biomod</u> practice	<u>Ecospat</u> practice	Final practice
Lunch time	Lunch time	Lunch time	Lunch time	Lunch time
Conceptual and practice steps to calculate <u>ENM</u>	<u>Dismo</u> practice	<u>Maxent</u> practice	Students talks	Final practice
Applications of <u>ENMs</u>	<u>Dismo</u> practice	<u>Maxent</u> practice	Students talks	Final practice

Theoretical lectures first day

Small theoretical introductions

Practical lectures

Students' talks: present your research work

Final practice: bring your own data!!

Monday 19th – Classes from 09:30 to 18:00

Elementary concepts on Ecological Niche Modelling

Module 1: Introduction to ENM theory.

Definition of ecological niche model; introduction to species ecological niche theory, types of ecological niches, types of ENM, diagram BAM, ENMs as approximations to species' niches.

Module 2: Problems and limitations on ENM.

Assumptions and uncertainties, equilibrium concept, niche conservatism, autocorrelation and intensity, sample size, correlation of environmental variables, size and form of study area, thresholds, model validation, model projections.

Module 3: Methods on ENM.

Mechanistic and correlative models. Overlap Analysis, Biomod, Domain, Habitat, Distance of Mahalanobis, ENFA, GARP, Maxent, Logistic regression, Generalised Linear Models, Generalised Additive Models, Generalised Boosted Regression Models, Random Forest, Support Vector Machines, Artificial Neural Network.

Monday 19th – Classes from 09:30 to 18:00

Elementary concepts on Ecological Niche Modelling

Module 4: Conceptual and practice steps to calculate ENM.

How to make an ENM step-by-step.

Module 5: Applications of ENM.

Ecological niche identification, Identification of contact zones, Integration with genetical data, Species expansions, Species invasions, Dispersion hypotheses, Species conservation status, Prediction of future conservation problems, Projection to future and past climate change scenarios, Modelling past species, Modelling species richness, Road-kills, Diseases, Windmills, Location of protected areas.

Tuesday 20th – Classes from 09:30 to 18:00

Prepare environmental variables and run ecological niche models with dismo package.

Module 6: Preparing variables.

Choosing environmental data sources, Downloading variables, Clipping variables, Aggregating variables, Checking pixel size, Checking raster limits, Checking NoData, Correlating variables.

Module 7: Dismo practice.

How to run an ENM using the R package dismo.

Wednesday 21th – Classes from 09:30 to 18:00

Run ecological niche models with Biomod2 package and Maxent.

Module 8: Biomod2 practice.

How to run an ENM using the R package Biomod2.

Module 9: Maxent practice.

How to run an ENM using the R packages dismo and Biomod2 as well as Maxent software.

Thursday 22th – Classes from 09:30 to 18:00

Compare ecological niche models with ecospat.

Module 10: Ecospat practice.

Compare statistically two different ecological niche models using the R package Ecospat.

Module 11: Students' talks.

Attendees will have the opportunity to present their own data and analyse which is the best way to obtain successful ENM.

Friday 23th – Classes from 09:30 to 18:00

Run ecological niche models with your own data.

Module 11: Final practical.

In this practical, the students will run ENM with their own data or with a new dataset, applying all the methods showed during the previous days.

SPATIAL BIOLOGY LAB

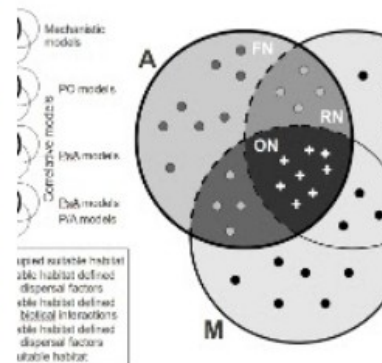
The **Spatial Biology Lab** analyses biological spatial patterns through multidisciplinary and multi-scale approaches, from global to local scale. The SBLab applies Geographical Information Systems, Remote Sensing data and techniques, Ecological Niche Models, and Spatial Statistics in ecology and nature conservation.

The main areas of research are:

- spatial ecology
- biogeography
- applied conservation



PEOPLE



PUBLICATIONS



PROJECTS



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<https://sites.google.com/view/sblab/home>

<https://sites.google.com/site/neftalisillero/>

RESEARCH CENTRE ON DIFFERENT ASPECTS OF GEO-SPATIAL SCIENCES

- Radioastronomy
- Remote Sensing
- Geomatic (Geographical Information Systems)
- GNSS
- Altimetry
- Spatial Biology
- Geo-Informatics
- Archaeology

RESEARCH LINES OF THE SPATIAL BIOLOGY LAB

- **Spatial ecology/biogeography**
- **Sampling object:** individuals, populations, species
- **Applied conservation:**
 - application of GIS and webGIS technologies
 - application of robotic technologies