

From: Oliver Hooker
Subject: Ecological niche modelling using R - 16-20 October 2017 - Scotland

Ecological niche modelling using R (ENMR01)

Delivered by Dr. Neftali Sillero

https://urldefense.proofpoint.com/v2/url?u=http-3A___www.prstatistics.com_course_ecological-2Dniche-2Dmodelling-2Dusing-2Dr-2Dd=CwIF-g&c=Ngd-ta5yRYsqeUsEDgxcqYYY1Xs5ogLXWPA_2Wlc4&r=e2OJ1azRf8ihJzb2HxZT0AqoiqLvxfeeATyN59ZLol&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=7XWvahrW1SMgen-2lu7NzHjR3pv6kPLRmx6P0kUso&e=enmr01/

This course will run from 16th – 20th October 2017 at SCENE field station, Loch Lomond national park, Scotland

The course will cover the base theory of ecological niche modelling and its main methodologies. By the end of this 5-day practical course, attendees will have the capacity to perform ecological niche models and understand their results, as well as to choose and apply the correct methodology depending on the aim of their type of study and data.

Ecological niche, species distribution, habitat distribution, or climatic envelope models are different names for similar mechanistic or correlative models, empirical or mathematical approaches to the ecological niche of a species, where different types of ecogeographical variables (environmental, topographical, human) are related with a species physiological data or geographical locations, in order to identify the factors limiting and defining the species' niche. ENMs have become popular due to the need for efficiency in the design and implementation of conservation management.

The course will be mainly practical, with some theoretical lectures. All modelling processes and calculations will be performed with R, the free software environment for statistical computing and graphics (https://urldefense.proofpoint.com/v2/url?u=http-3A___www.r-2Dproject.org_&d=CwIF-g&c=Ngd-ta5yRYsqeUsEDgxcqYYY1Xs5ogLXWPA_2Wlc4&r=e2OJ1azRf8ihJzb2HxZT0AqoiqLvxfeeATyN59ZLol&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=jTzkdDugkhAy4SS_A-uUMKWy-2IM2F_kKzMSXISNpRk&e=). Attendees will learn to use modelling algorithms like Maxent, Bioclim, Domain, and logistic regressions, and R packages for computing ENMs like Dismo and Biomod2. Also, students will learn to compare different ecological niche models using the Ecospat package.

Course content is as follows:

Monday 16th – Classes from 09:00 to 17:00

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.

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 17th – Classes from 09:00 to 17:00

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 18th – Classes from 09:00 to 17:00

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 19th – Classes from 09:00 to 17:00

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 successfully obtain an ENM.

Friday 20th – Classes from 09:00 to 17:00

Run ecological niche models with your own data.

Module 12: 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.

Please email any inquiries to oliverhooker@prstatistics.com or visit our website www.prstatistics.com

Please feel free to distribute this material anywhere you feel is suitable

1. MODEL BASED MULTIVARIATE ANALYSIS OF ECOLOGICAL DATA USING R

(January 2017) #MBMV

https://urldefense.proofpoint.com/v2/url?u=http-3A___www.prstatistics.com_course_model-2Dbase-2Dmultivariate-2Danalysis-2Dof-2Dd=CwIF-g&c=Ngd-ta5yRYsqeUsEDgxcqYYY1Xs5ogLXWPA_2Wlc4&r=e2OJ1azRf8ihJzb2HxZT0AqoiqLvxfeeATyN59ZLol&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=_6Ex_ycHt89brGip50PEmmpuejAhu9sxYxXtAj9Z2TY&e=abundance-data-using-r-mbmv01/

2. ADVANCED PYTHON FOR BIOLOGISTS (February 2017) #APYB

https://urldefense.proofpoint.com/v2/url?u=http-3A___www.prstatistics.com_course_advanced-2Dpython-2Dbiologists-2Dapyb01_&d=CwIF-g&c=Ngd-ta5yRYsqeUsEDgxcqYYY1Xs5ogLXWPA_2Wlc4&r=e2OJ1azRf8ihJzb2HxZT0AqoiqLvxfeeATyN59ZLol&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=bqeMy0ztrv4meYuvf5FIP8KNZMvKJabm15t6o-Wlk00&e=

3. STABLE ISOTOPE MIXING MODELS USING SIAR, SIBER AND MIXSIAR USING R

(February 2017) #SIMM

https://urldefense.proofpoint.com/v2/url?u=http-3A___www.prstatistics.com_course_stable-2Disotope-2Dmixing-2Dmodels-2Dusing-2Dr-2Dd=CwIF-g&c=Ngd-ta5yRYsqeUsEDgxcqYYY1Xs5ogLXWPA_2Wlc4&r=e2OJ1azRf8ihJzb2HxZT0AqoiqLvxfeeATyN59ZLol&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=HXLnymvFqlgIzY09arVZIGm0Z9D7A8KtaDdGpt_pK98&e=simm03/

4. NETWORK ANALYSIS FOR ECOLOGISTS USING R (March 2017) #NTWA

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_course_network-2Danalysis-2Decologists-2Dntwa01_&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=jReldjmxCCxtS_dKE0N2eGuqYfjJWCvRhNlpL8o&e=

5. ADVANCES IN MULTIVARIATE ANALYSIS OF SPATIAL ECOLOGICAL DATA

(April 2017) #MVSP

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_course_advances-2Din-2Dspatial-2Danalysis-2Dof-2D&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=4wyFCUw72dCH9Ah0egn3pRiPYKuScBKQP-KcVP8t8&e=
multivariate-ecological-data-theory-and-practice-mvsp02/

6. INTRODUCTION TO STATISTICS AND R FOR BIOLOGISTS (April 2017) #IRFB

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_introduction-2Dto-2Dstatistics-2Dand-2Dr-2Dfor-2D&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=WZPDdNldM2-6Hz3oXsopTwiQfsW56g4ndV-CoxJQcE&e=
biologists-irfb02/

7. ADVANCING IN STATISTICAL MODELLING USING R (April 2017) #ADV R

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_course_advancing-2Dstatistical-2Dmodelling-2Dusing-2Dr-2D&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=Yzrx8LBdREkerMmMrY30XPHY0MMrTJLmieIsRTfmAWw&e=
advr05/

8. INTRODUCTION TO BAYESIAN HIERARCHICAL MODELLING (May 2017) #IBHM

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_course_introduction-2Dto-2Dbayesian-2Dhierarchical-2D&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=SL592a0ekmbuzPznHLPNxDgGqXFvKZbrO2DPOHGI&e=
modelling-using-r-ibhm02/

9. GEOMETRIC MORPHOMETRICS USING R (June) #GMMR

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_course_geometric-2Dmorphometrics-2Dusing-2Dr-2Dgmmr01_&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=r844XXi4m0zOWnFZqjjq_rRHOcqzqV51W0z1bD8C9I&e=

10. MULTIVARIATE ANALYSIS OF SPATIAL ECOLOGICAL DATA (June 2017) #MASE

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_course_multivariate-2Danalysis-2Dof-2Dspatial-2D&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=bLDCnOcnOFMxTisGQHsYClu-Wjh0wffciTWISu3WBHA&e=
ecological-data-using-r-mase01/

11. BIOINFORMATICS FOR GENETICISTS AND BIOLOGISTS (July 2017) #BIGB

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_course_bioinformatics-2Dfor-2Dgeneticists-2Dand-2D&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=4SouC00eenCuMbYuzH7J52vUNKmR50f1iz0X_yYR0&e=
biologists-bigb02/

12. SPATIAL ANALYSIS OF ECOLOGICAL DATA USING R (August 2017) #SPAE

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_course_spatial-2Danalysis-2Decological-2Ddata-2Dusing-2Dr-2D&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=Sayxrl0hedAnbKR915nSE419tVg7YsSq122YngtleFw&e=
spae05/

13. ECOLOGICAL NICHE MODELLING (October 2017) #ENMR

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enmr01/

14. APPLIED BAYESIAN MODELLING FOR ECOLOGISTS AND EPIDEMIOLOGISTS

(November 2017)

https://urldefense.proofpoint.com/v2?url?u=http-3A_www.prstatistics.com_course_applied-2Dbayesian-2Dmodelling-2Decologists-2D&d=CwIF-g&c=Ngd-ta5yRysqeUsEDgxcqsYYY1Xs5ogLxWPA_2Wlc4&r=e2OJ1azRfN8ihJzb2HxZT0AqoiqLvxfeeTyN59ZLoI&m=29MCwC7KFB9V9taQDWitF2YPGXuvueu7i9cq7xkVvc&s=kzrz8r7_inQE3BNZT2JbhXk0EA_eqNVYrj9QajHNo-o&e=
epidemiologists-abme03/

15. GENETIC DATA ANALYSIS USING R (October TBC)

16. INTRODUCTION TO BIOINFORMATICS USING LINUX (October TBC)

17. LANDSCAPE (POPULATION) GENETIC DATA ANALYSIS USING R (November TBC)

18. PHYLOGENETIC DATA ANALYSIS USING R (November TBC)

19. INTRODUCTION TO METHODS FOR REMOTE SENSING (December 2017 TBC)

20. ADVANCING IN STATISTICAL MODELLING USING R (December 2017 TBC)

21. INTRODUCTION TO PYTHON FOR BIOLOGISTS (December 2017 TBC)

22. DATA VISUALISATION AND MANIPULATION USING PYTHON (December 2017 TBC)

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