Biodiversity dynamics course

Data overview and First steps with MaxEnt

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Exercise

Using species presence data (e.g. sightings), we want to predict species‘ potential spatial range

And also predict the range under global change (i.e. under changed land use and climate)

Borneo data – overview see description in folder

At ****Groupdrive**_DataBorneo\BaseMaps**

- bio_asc_42.asc (land use raster data with 17 categories)
- Bor_PA.shp (protected areas shapefile)
- Bor_admin.shp (county borders)
- Sn_10000.shp (main rivers)

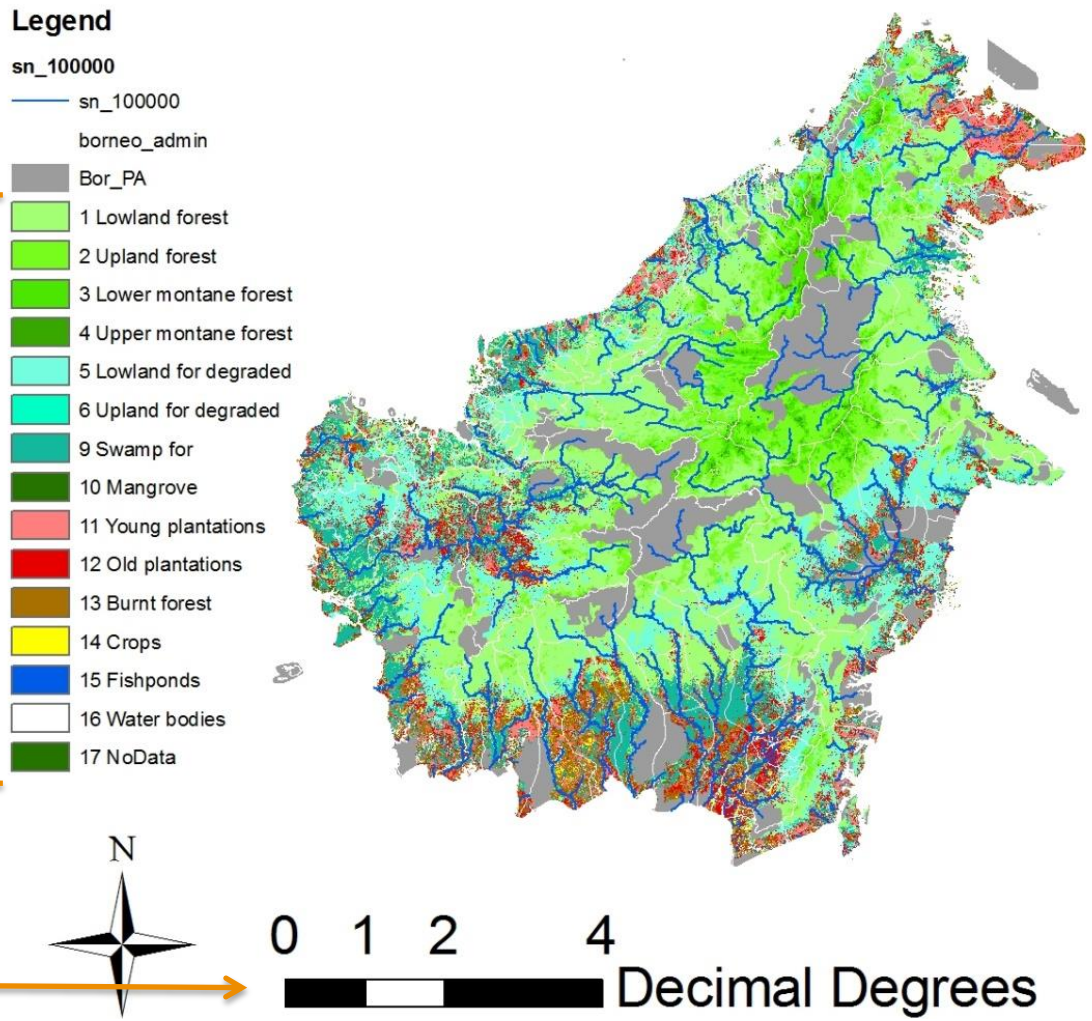
Have a look at the land use data

Groupdrive_DataBorneo\BaseMaps

Hollow with white outline

bio_asc_42.asc

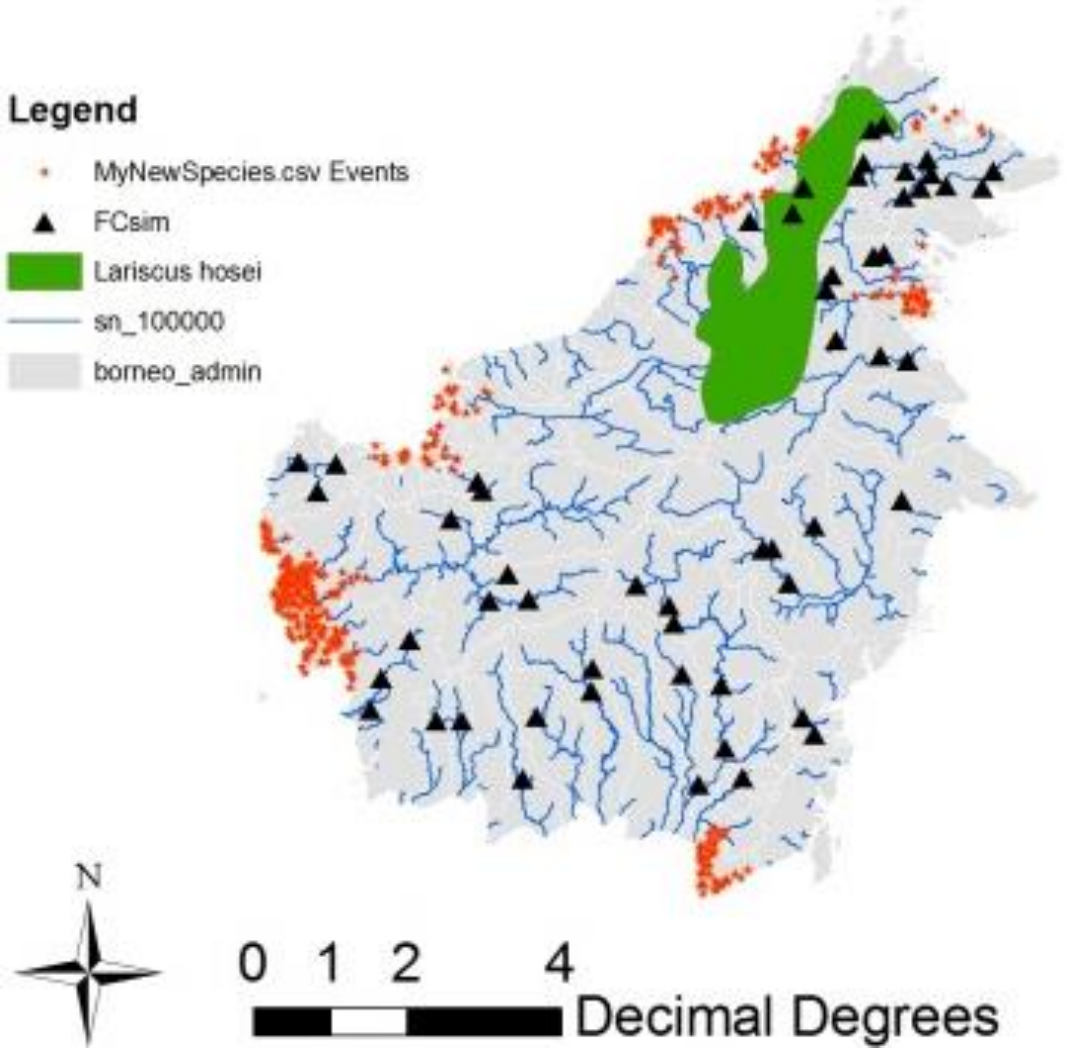
Category!!!!!



What is that in map units????

Have a look at some species data

At ****Groupdrive**_DataBorneo\BaseRecords**



Or in R…..

- Script from day ‚Spatial R‘…

MaxEnt input data needed

- Create a folder ‚MaxEntRes‘ in the output folder(!!!!)
  with subfolders ‚nobias‘ & ‚withbias‘

- You can also use the dir.create commands from the R-Script

```
--output
------MaxEntRes
----------nobias
----------withbias
```

MaxEnt input data needed

- Doublecklick on the MaxEnt.jar to open program

Input:

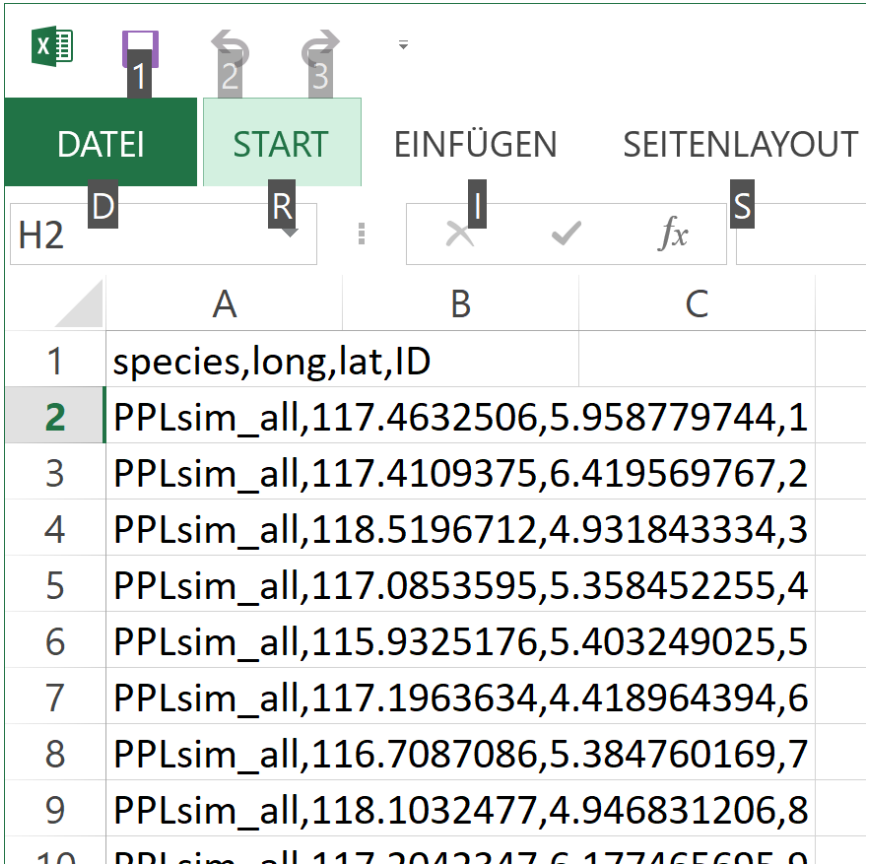
I. Location data of a species (point data)→ csv file in folder *BaseRecords*
II. Environmental Layers representing the background → ascii-files in folder *BaseMaps*

Optional:

III. A Bias file representing the sampling effort in each grid cell (also in *BaseMaps*)
IV. Projection Layers, e.g. future climate or land use (names need to be the same as basic input environmental layers) as in *FutureMaps* folder. Do not try to select an ascii, give the folder name!

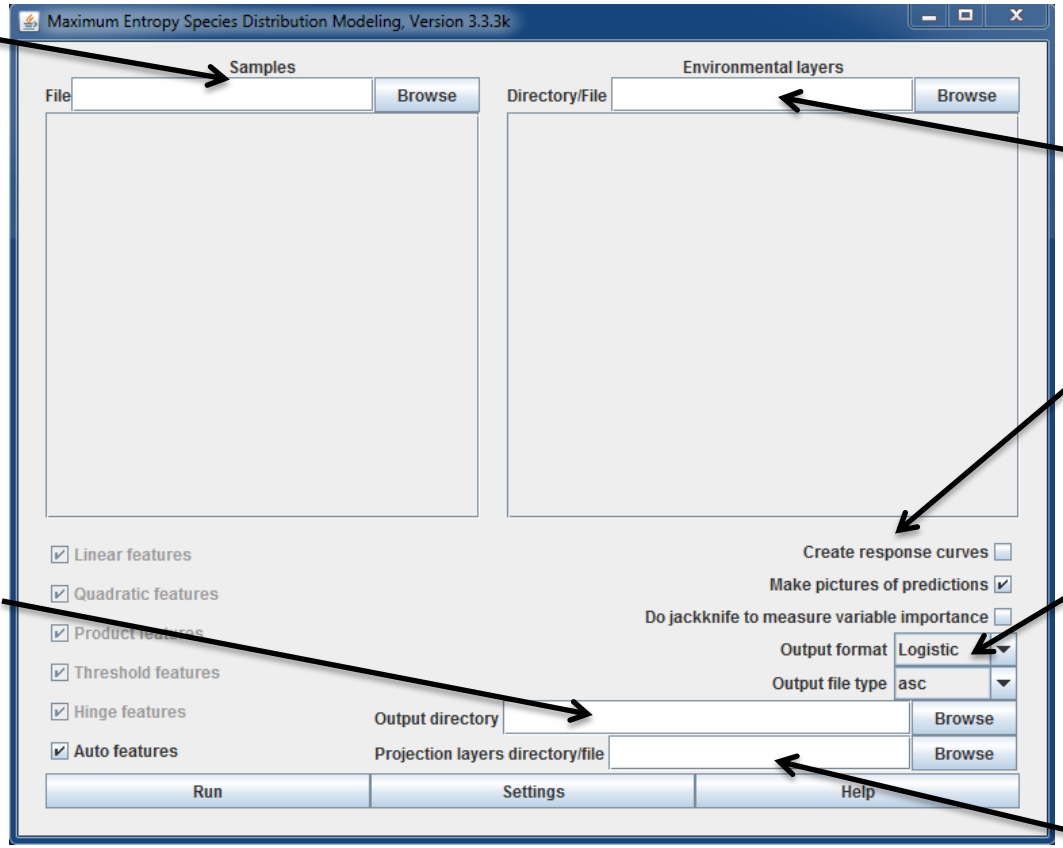
MaxEnt input structure

- Spatial maps as ascii files! (no geotiffs or geopackages)
- Comma-delimited csv with columns species name, long (x-var), lat (y-var), ID



MaxEnt GUI – Main (TU: open R:/ Maxent.exe)

I. Location data of species (use RIVERsim.csv)



II. Environmental layers (bio_asc_42.asc is category!)

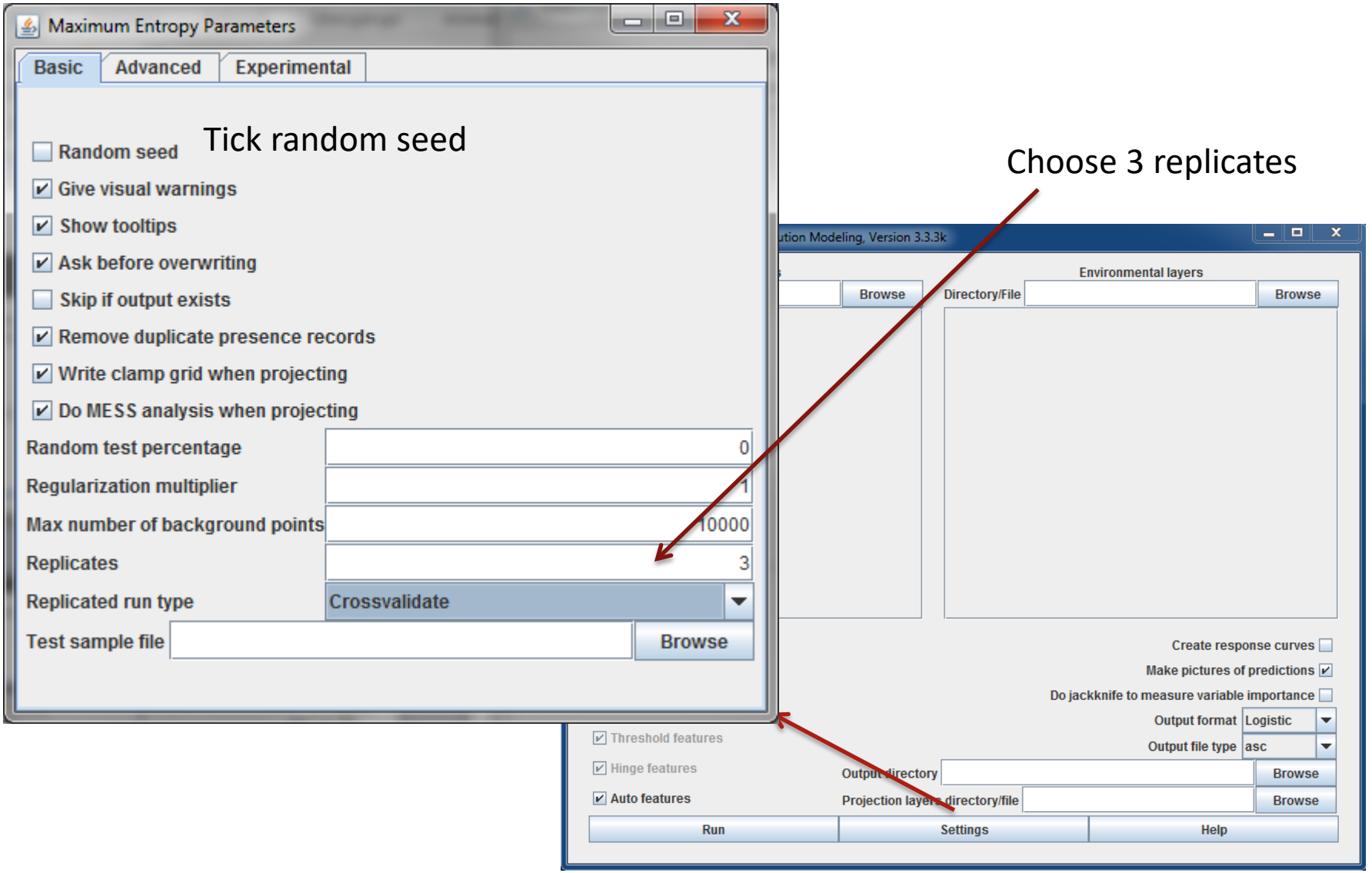
Tick response curves

Output folder: where we want to save the result, e.g. MaxEntRes/nobias

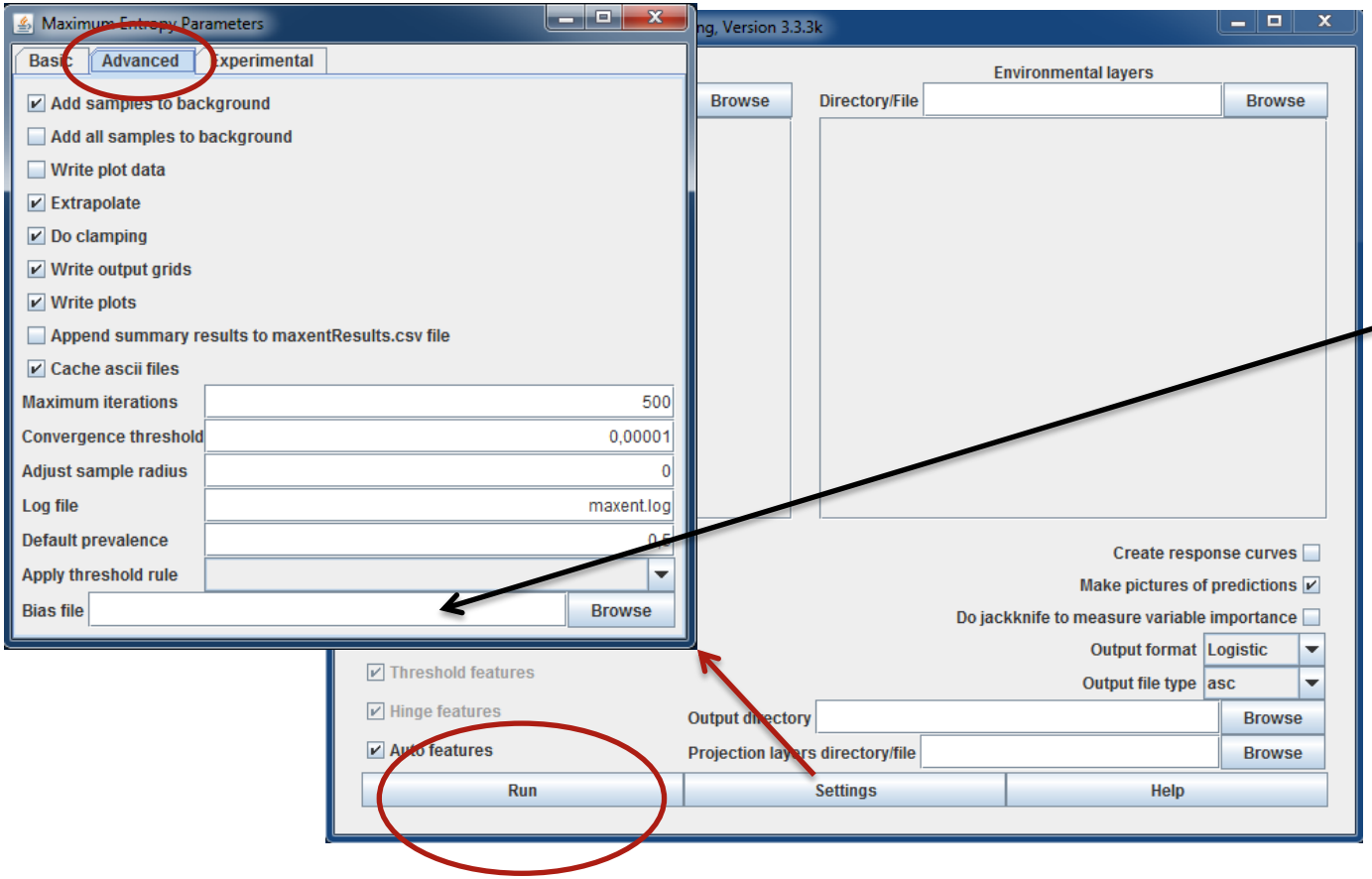
Choose logistic

IV. Projection layers = FutureMaps

MaxEnt GUI – Basic Settings



MaxEnt GUI – Advanced settings



III. Bias file (do runs with and without, save the different outputs in different folders)

Finally, RUN

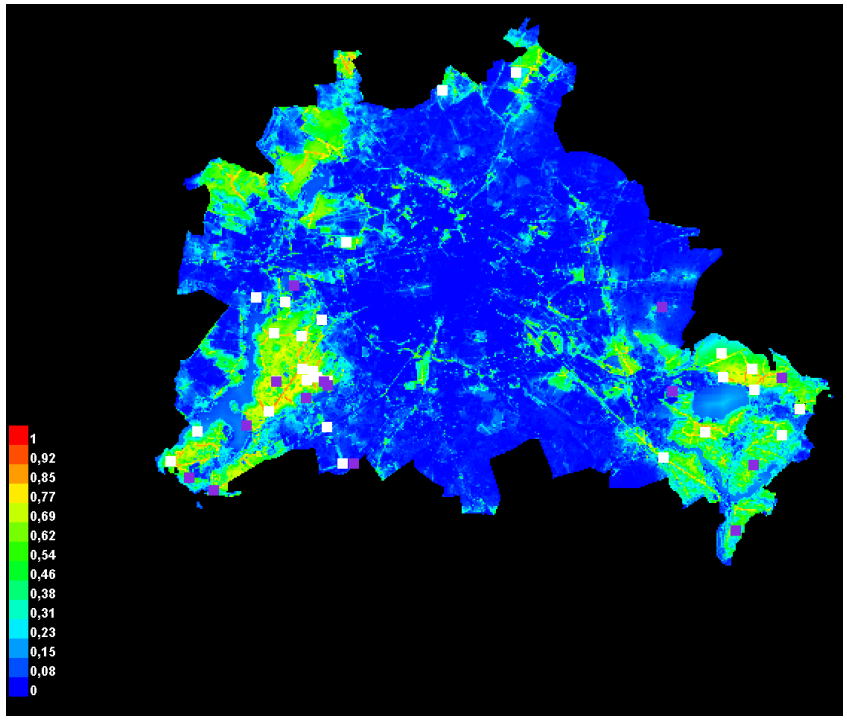
Do you get an error message?

- Why?

MaxEnt output

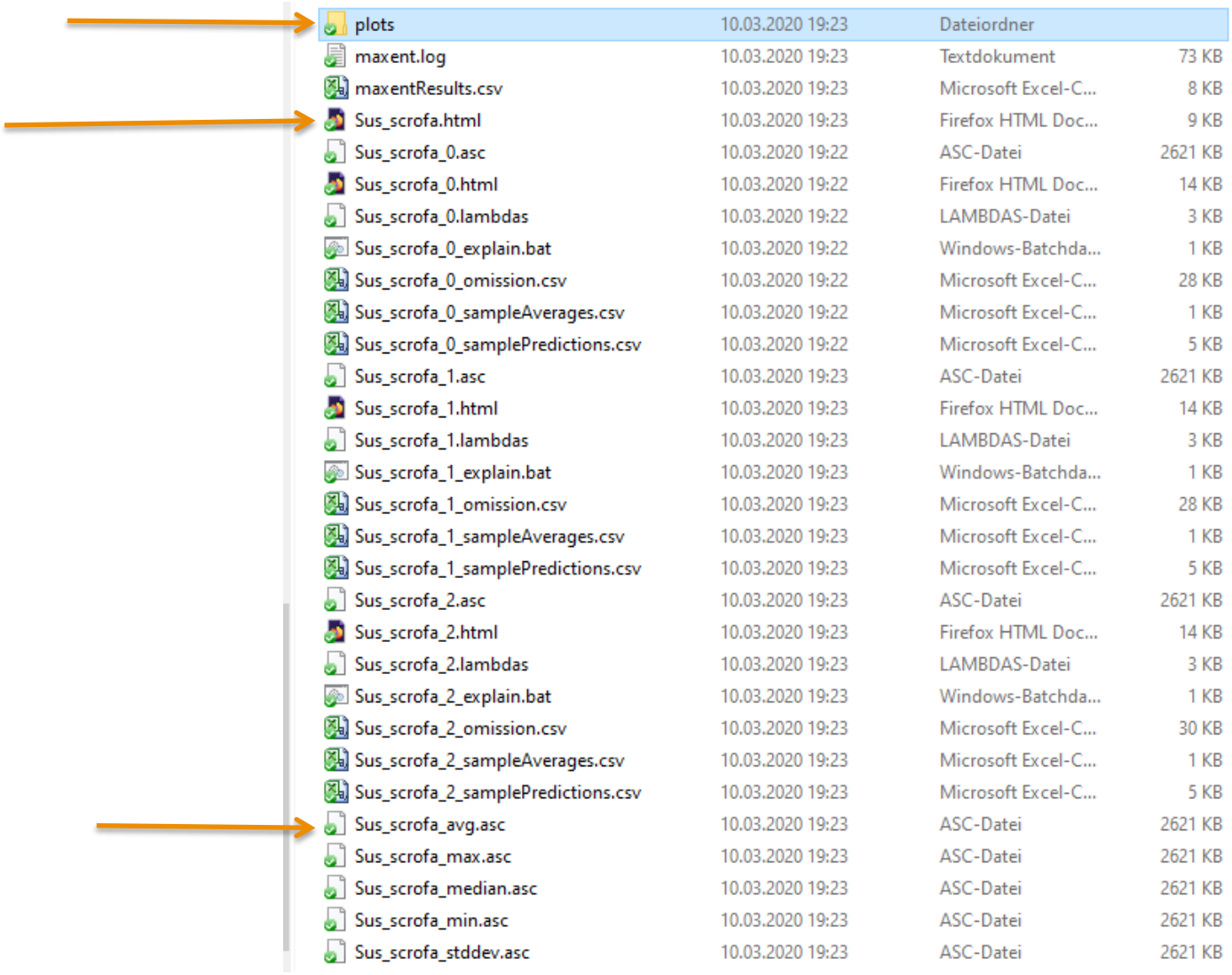
- Your output folder:
  ……\output\MaxEntRes\

  contains an html-file
- and the …avg_asc (average prediction from repetitons)



- And a folder with the plots

MaxEnt output:go to folder, e.g. nobias



plots	10.03.2020 19:23	Dateiordner	
maxent.log	10.03.2020 19:23	Textdokument	73 KB
maxentResults.csv	10.03.2020 19:23	Microsoft Excel-C...	8 KB
Sus_scrofa.html	10.03.2020 19:23	Firefox HTML Doc...	9 KB
Sus_scrofa_0.asc	10.03.2020 19:22	ASC-Datei	2621 KB
Sus_scrofa_0.html	10.03.2020 19:22	Firefox HTML Doc...	14 KB
Sus_scrofa_0.lambdas	10.03.2020 19:22	LAMBDAS-Datei	3 KB
Sus_scrofa_0_explain.bat	10.03.2020 19:22	Windows-Batchda...	1 KB
Sus_scrofa_0_omission.csv	10.03.2020 19:22	Microsoft Excel-C...	28 KB
Sus_scrofa_0_sampleAverages.csv	10.03.2020 19:22	Microsoft Excel-C...	1 KB
Sus_scrofa_0_samplePredictions.csv	10.03.2020 19:22	Microsoft Excel-C...	5 KB
Sus_scrofa_1.asc	10.03.2020 19:23	ASC-Datei	2621 KB
Sus_scrofa_1.html	10.03.2020 19:23	Firefox HTML Doc...	14 KB
Sus_scrofa_1.lambdas	10.03.2020 19:23	LAMBDAS-Datei	3 KB
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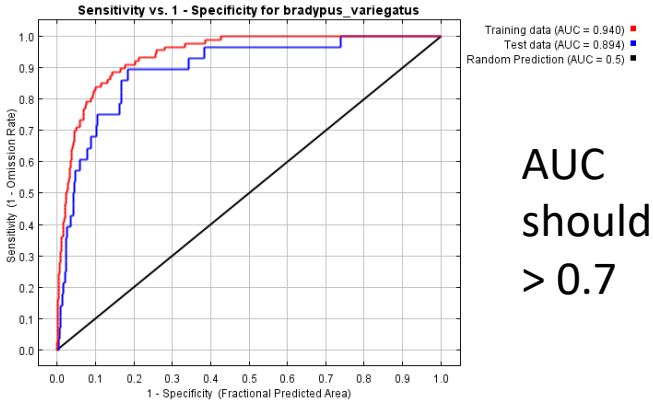
Sus_scrofa_1_sampleAverages.csv	10.03.2020 19:23	Microsoft Excel-C...	1 KB
Sus_scrofa_1_samplePredictions.csv	10.03.2020 19:23	Microsoft Excel-C...	5 KB
Sus_scrofa_2.asc	10.03.2020 19:23	ASC-Datei	2621 KB
Sus_scrofa_2.html	10.03.2020 19:23	Firefox HTML Doc...	14 KB
Sus_scrofa_2.lambdas	10.03.2020 19:23	LAMBDAS-Datei	3 KB
Sus_scrofa_2_explain.bat	10.03.2020 19:23	Windows-Batchda...	1 KB
Sus_scrofa_2_omission.csv	10.03.2020 19:23	Microsoft Excel-C...	30 KB
Sus_scrofa_2_sampleAverages.csv	10.03.2020 19:23	Microsoft Excel-C...	1 KB
Sus_scrofa_2_samplePredictions.csv	10.03.2020 19:23	Microsoft Excel-C...	5 KB
Sus_scrofa_avg.asc	10.03.2020 19:23	ASC-Datei	2621 KB
Sus_scrofa_max.asc	10.03.2020 19:23	ASC-Datei	2621 KB
Sus_scrofa_median.asc	10.03.2020 19:23	ASC-Datei	2621 KB
Sus_scrofa_min.asc	10.03.2020 19:23	ASC-Datei	2621 KB
Sus_scrofa_stddev.asc	10.03.2020 19:23	ASC-Datei	2621 KB

MaxEnt output – the important results

Open the MySpecies_avg.html file

(examples taken from Phillips 2011 MaxEnt Tutorial; see your folder _HelpfulManuals)

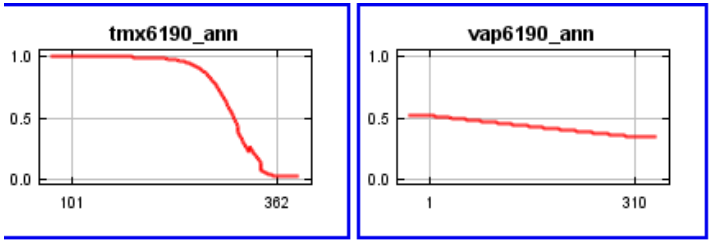


AUC should be > 0.7

Variable contribution

Variable	Percent contribution	Permutation importance
bio_asc_1	51.2	52.8
bio_asc_21	29.1	0.6
bio_asc_12	19.7	46.6

Response curve



Results summary

- ***maxentResults.csv*** - listing the number of training samples used for learning, values of training gain and test gain and AUC. Test gain and AUC are given only when a test sample file is provided or when a specified percentage of the samples is set aside for testing. If a jackknife is performed, the regularized training gain and (optionally) test gain and AUC for each part of the jackknife are included here.
- ***maxent.log*** - records the parameters and options chosen for the run, and some details of the run that are useful for troubleshooting.
- ***mySpecies.html*** - the main output file, containing statistical analyses, plots, pictures of the model, and links to other files. It also documents parameter and control settings that were used to do the run.
- ***mySpecies.asc* (or *mySpecies.grd*)** - containing the probabilities in ESRI ASCII grid format (or in DIVA-Gis format if -H switch is used)
- ***mySpecies.lambdas*** - containing the computed values of the constants *c1*, *c2*, ... (described below)
- ***mySpecies.png*** - is a picture of the prediction
- ***mySpecies_omission.csv*** - describing the predicted area and training and (optionally) test omission for various raw and cumulative thresholds
- various plots for jackknifing and response curves, in the *plots* subdirectory.

READ THE MAXENT TUTORIAL: Phillips 2011 A brief tutorial on MaxEnt
http://biodiversityinformatics.amnh.org/open_source/maxent/

http://web2.uconn.edu/cyberinfra/module3/outline.html; Day 4

Threshold (for later)

For one run (saved in an output folder), please open file:

- maxentResults.csv
- Go to column ’10 percentile training presence logistic threshold‘
- This value is separating the probability values into ‚likely‘ and ‚unlikely‘, meaning: it is the threshold of the probability values that contain 90% of the presence data.