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#####
# Model calibration using kuenm and Maxent #
#####

# Description
## The following script helps to perform the process of model calibration using
## Maxent through the R package kuenm. Model calibration consists of a series of
## steps starting in the creation of several models and ending in the selection
## of parameter settings that produce the best models. To detect which ones are
## the models with best results a robust evaluation process must be performed. In
## the example, models are selected based on statistical significance, omission
## rates based on a predefined Error, and model complexity. The metrics used here,
## are partial ROC, omission rates, and AICc, in that order.

## The main processes are performed the package kuenm from GitHub. To install
## this package see instructions in https://github.com/marloncobos/kuenm.

# loading needed package
# assuming that you installed kuenm, load it, if not installed see
# https://github.com/marloncobos/kuenm for instructions
library(kuenm)

# set your working directory
setwd("C:/FC-RM")

# Candidate model creation
## check the functions help to understand arguments by typing '??kuenm', press enter and
## check kuenm_cal documentation.

## preparing arguments (Change "YOUR/DIRECTORY" by your pertinent directory)
occ_joint <- "Mhenryi_joint.csv"
occ_tra <- "Mhenryi_train.csv"
M_var_dir <- "Environ_variables"
batch_cal <- "Candidate_models"
out_dir <- "Candidate_models"
reg_mult <- seq(0.1, 4, 0.1)
f_clas <- c("no.t")
args <- NULL # e.g., "maximumbackground=20000" for increasing the number of pixels in
the background or
# note that some arguments are fixed in the function and should not be
changed
maxent_path <- "C:/FC-RM" # where Maxent is
wait <- FALSE
```

```
run <- TRUE
```

```
## runing candidate models
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```
kuenm_cal(occ.joint = occ_joint, occ.tra = occ_tra, M.var.dir = M_var_dir,  
          batch = batch_cal, out.dir = out_dir, reg.mult = reg_mult, f.clas = f_clas,  
          args = args, maxent.path = maxent_path, wait = wait, run = run)
```

```
# Candidate model evaluation and selection (YOU CAN DO THIS WHILE CANDIDATE MODELS  
ARE BEING CREATED)
```

```
## check the functions help to understand arguments
```

```
## preparing arguments (Change "YOUR/DIRECTORY" by your pertinent directory)
```

```
occ_test <- "Mhenryi_test.csv"
```

```
out_eval <- "Calibration_Results"
```

```
threshold <- 5
```

```
rand_percent <- 50
```

```
iterations <- 500
```

```
kept <- TRUE
```

```
selection <- "OR_AICc"
```

```
parallel_proc <- 10
```

```
## runing candidate models
```

```
cal_eval <- kuenm_ceval(path = out_dir, occ.joint = occ_joint, occ.tra = occ_tra,  
                       occ.test = occ_test, batch = batch_cal, out.eval = out_eval,  
                       threshold = threshold, rand.percent = rand_percent,  
                       iterations = iterations, kept = kept, selection = selection,  
                       parallel.proc = parallel_proc)
```

```
# CHECK RESULTS IN WORKING DIRECTORY AND IN THE OBJECT CREATED BEFORE.
```