Habitat Suitability Analysis of Bijaya Sal

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Contents

1 Load Packages

```
library(sf) # Load raster and Vector data
library(mapview) # Visualization of Vector Data
library(raster) # Load raster and Vector data
library(spThin) #To thin the spatial data
library(usdm) # VIF (variance Inflation Factor)measures the severity of multicollinear
library(predicts)
library(RColorBrewer)
```

2 Load Presence data of Bijaya Sal (*Pterocarpus marsupium*)

The coordinate of present data is in WGS 84 UTM 44 system.

```
## [1] "id"       "easting"  "northing" "district"
```

3 Split of Data into Training and Test Set

The data is splited into Training and Test set. The 70% of the total data is used for training the model and rest data set is used for evaluate the model.

```
#make this example reproducible
set.seed(1)
#use 70% of dataset as training set and 30% as test set
sample <- sample(c(TRUE, FALSE), nrow(bijaysal), replace=TRUE, prob=c(0.7,0.3))
train  <- bijaysal[sample, ]
test   <- bijaysal[!sample, ]
```

3.1 Train data

```r
train_sf<-st_as_sf(train, coords = c("easting", "northing"), crs = 32644)
train_wgs<-st_transform(train_sf,crs=4326)
train_sp<-as_Spatial(train_wgs)
train_data<-data.frame(train_sp)
names(train_data)
```

```
## [1] "id"        "district"  "coords.x1" "coords.x2" "optional"
```

```r
names(train_data)[3]<- "lon"
names(train_data)[4]<- "lat"
train_data$species<-"bijayasal"
```

3.1.1 Spatial thining of Train data

Here we are going to keep only the train point which is 1 km far.

```r
#thinning the points
# thinned_data <- thin(
#   loc.data = train_data,
#   lat.col = "lat", #latitude, the string name should be modified accordingly
#   long.col = "lon", #longitude, the string name should be modified accordingly
#   spec.col = "species", #name of the column with species name
#   thin.par = 1, #distance of the thinned points
#   reps = 1, #number of repetition, for randomness
#   locs.thinned.list.return = TRUE, #If true, the 'list' of the data.frame of thinned
#   write.files = T, #whether to create the csv file or not
#   max.files = 10, #number of csv files created.
#   out.dir = "./data", #output directory in which the folder is created
#   out.base = "train", #the name of folders thus created
#   write.log.file = F, #whether to create log file or nor
#   log.file = "noct.txt" # create/append log file of thinning run
# )
```

```
train_pts<-read.csv("data/train_thin1.csv",header=T)
trainsf<-st_as_sf(train_pts, coords = c("lon", "lat"), crs = 4326)
#write_sf(trainsf,"./data/train_thined.shp")
```

3.2 Test data

```
test_sf<-st_as_sf(test, coords = c("easting", "northing"), crs = 32644)
test_wgs<-st_transform(test_sf,crs=4326)
test_sp<-as_Spatial(test_wgs)
test_data<-data.frame(test_sp)
names(test_data)
```

```
## [1] "id"        "district"  "coords.x1" "coords.x2" "optional"
```

```
names(test_data)[3]<- "lon"
names(test_data)[4]<- "lat"
test_data$species<-"bijayasal"
```

3.2.1 Spatial thining of Test data

Here we are going to keep only the test point which is 1 km far.

```
#thinning the points
# thinned_data <- thin(
#   loc.data = test_data,
#   lat.col = "lat", #latitude, the string name should be modified accordingly
#   long.col = "lon", #longitude, the string name should be modified accordingly
#   spec.col = "species", #name of the column with species name
#   thin.par = 1, #distance of the thinned points
#   reps = 1, #number of repetition, for randomness
#   locs.thinned.list.return = TRUE, #If true, the 'list' of the data.frame of thinned
#   write.files = T, #whether to create the csv file or not
#   max.files = 10, #number of csv files created.
#   out.dir = "./data", #output directory in which the folder is created
```

```
#   out.base = "test", #the name of folders thus created
#   write.log.file = F, #whether to create log file or nor
#   log.file = "noct.txt" # create/append log file of thinning run
# )
test_pts<-read.csv("data/test_thin1.csv",header=T)
testsf<-st_as_sf(test_pts, coords = c("lon", "lat"), crs = 4326)
#write_sf(testsf,"./data/test_thined.shp")
```

4 Loading Worldclim data and Topographic data

#BIO1 = Annual Mean Temperature #BIO2 = Mean Diurnal Range (Mean of monthly (max temp - min temp)) #BIO3 = Isothermality (BIO2/BIO7) (* 100) #BIO4 = Temperature Seasonality (standard deviation *100) #BIO5 = Max Temperature of Warmest Month #BIO6 = Min Temperature of Coldest Month #BIO7 = Temperature Annual Range (BIO5-BIO6) #BIO8 = Mean Temperature of Wettest Quarter #BIO9 = Mean Temperature of Driest Quarter #BIO10 = Mean Temperature of Warmest Quarter #BIO11 = Mean Temperature of Coldest Quarter #BIO12 = Annual Precipitation #BIO13 = Precipitation of Wettest Month #BIO14 = Precipitation of Driest Month #BIO15 = Precipitation Seasonality (Coefficient of Variation) #BIO16 = Precipitation of Wettest Quarter #BIO17 = Precipitation of Driest Quarter #BIO18 = Precipitation of Warmest Quarter #BIO19 = Precipitation of Coldest Quarter

```
ls.dir<-"./data/wc2.1_30s_bio/"
rlst <- list.files(ls.dir, pattern = "*.tif$",full.names = T)
worldclim<-rast(rlst)
names(worldclim)
```

```
##  [1] "bio1"  "bio10" "bio11" "bio12" "bio13" "bio14" "bio15" "bio16" "bio17"
## [10] "bio18" "bio19" "bio2"  "bio3"  "bio4"  "bio5"  "bio6"  "bio7"  "bio8"
## [19] "bio9"
```

```
projection(worldclim)
```

```
## [1] NA
```

```
####Load DEM data ####
elevation<-rast("./data/nepal_dem90m.tif")
elev<-resample(elevation,worldclim, method="bilinear")
#slope and Aspect from DEM
slope<- terrain(elev, "slope", unit= "degrees", neighbors=8)
aspect <- terrain(elev, "aspect",unit= "degrees", neighbors=8)
imag_com<-c(worldclim,elev,slope,aspect)
names(imag_com)
```

```
##  [1] "bio1"         "bio10"        "bio11"        "bio12"        "bio13"
##  [6] "bio14"        "bio15"        "bio16"        "bio17"        "bio18"
## [11] "bio19"        "bio2"         "bio3"         "bio4"         "bio5"
## [16] "bio6"         "bio7"         "bio8"         "bio9"         "nepal_dem90m"
## [21] "slope"        "aspect"
```

```
class(imag_com)
```

```
## [1] "SpatRaster"
## attr(,"package")
## [1] "terra"
```

```
#terra::writeRaster(imag_com,"./data/imag_com.tif",overwrite=TRUE)
```