

Package ‘spectratrait’

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Title A simple add-on package to aid in the fitting of leaf-level spectra-trait PLSR models

Version 1.1.1

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Description Provides functions to conduct standardized leaf-level spectra-trait PLSR model fitting including uncertainty analysis that follow DOI: <https://doi.org/10.1111/nph.16123>

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Encoding UTF-8

LazyData true

Roxygen list(markdown = TRUE)

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Imports httr (>= 1.4.2),
readr (>= 1.3.1),
pls (>= 2.7-2),
dplyr (>= 1.0.1),
magrittr (>= 2.0.1),
reshape2 (>= 1.4.4),
here (>= 0.1),
plotrix (>= 3.7-8),
ggplot2 (>= 3.3.2),
gridExtra (>= 2.3),
scales (>= 1.1.1)

Suggests devtools (>= 2.3.1),
remotes (>= 2.2.0),
RCurl (>= 1.98-1.2),
knitr

Depends R (>= 2.10)

VignetteBuilder knitr

NeedsCompilation no

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create_data_split	<i>Create a calibration (training) / validation data split for PLSR model fitting and testing</i>
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Description

Create a calibration (training) / validation data split for PLSR model fitting and testing

Usage

```
create_data_split(
  dataset = NULL,
  approach = NULL,
  split_seed = 123456789,
  prop = 0.8,
  group_variables = NULL
)
```

Arguments

dataset	input full PLSR dataset to split into cal/val datasets
approach	approach to splitting the dataset. Options: base or dplyr
split_seed	random seed to use for splitting data
prop	the proportion of data to preserve for calibration (e.g. 0.8) and validation (0.2). This sets the calibration proportion
group_variables	Use factor variables to conduct a stratified sampling for cal/val

Value

output_list A list containing the calibration dataset (cal_data) and validation dataset (val_data)

Author(s)

Julien Lamour, Jeremiah Anderson, Shawn P. Serbin

ely_plsr_data	<i>Ely et al (2019) example leaf-level PLSR dataset.</i>	<i>DOI:</i>
	<i>https://doi.org/10.1093/jxb/erz061</i>	

Description

Ely et al (2019) example leaf-level PLSR dataset. DOI: <https://doi.org/10.1093/jxb/erz061>

Usage

```
ely_plsr_data
```

Format

An object of class `data.frame` with 178 rows and 1908 columns.

f.coef.valid	<i>f.coef.valid</i>
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Description

f.coef.valid

Usage

```
f.coef.valid(plsr.out, data_plsr, ncomp, inVar)
```

Arguments

plsr.out	plsr model obtained with <code>jackknife = TRUE</code>
data_plsr	data used for the plsr model with Spectra the matrix of spectra
ncomp	number of selection components
inVar	Name of the PLSR model response variable

Value

B returns the intercept and the coefficients of the jackknife or bootstrap validation

Author(s)

Julien Lamour

`f.plot.coef`*f.plot.coef*

Description`f.plot.coef`**Usage**

```
f.plot.coef(  
  Z,  
  wv,  
  xlim = NULL,  
  position = "topright",  
  type = "Coefficient",  
  plot_label = NULL  
)
```

Arguments

<code>Z</code>	Coefficient matrix with each row corresponding to the coefficients and wavelength in columns
<code>wv</code>	vector of wavelengths
<code>xlim</code>	vector to change the default xlim of the plots (ex <code>xlim = c(500, 2400)</code>)
<code>position</code>	Position of the legend (see base function legend for help)
<code>type</code>	Name of the y axis and of the legend
<code>plot_label</code>	optional plot label to include with the figure

Author(s)

Julien Lamour

`f.plot.spec`*f.plot.spec*

Description`f.plot.spec`**Usage**

```
f.plot.spec(  
  Z,  
  wv,  
  xlim = NULL,  
  position = "topright",  
  type = "Reflectance",  
  plot_label = NULL  
)
```

Arguments

Z	Spectra matrix with each row corresponding to a spectra and wavelength in columns
wv	vector of wavelengths corresponding to the column of the spectra matrix Z
xlim	vector to change the default xlim of the plots (ex xlim = c(500, 2400))
position	Position of the legend (see base function legend for help)
type	Name of the y axis and of the legend. E.g. Reflectance, Transmittance
plot_label	optional plot label to include with the figure

Author(s)

Julien Lamour, Shawn P. Serbin

find_optimal_components

Applies different methods for the determination of the optimal number of PLSR model components

Description

Applies different methods for the determination of the optimal number of PLSR model components

Usage

```
find_optimal_components(
  dataset = NULL,
  targetVariable = NULL,
  method = "pls",
  maxComps = 20,
  iterations = 20,
  seg = 100,
  prop = 0.7,
  random_seed = 123456789
)
```

Arguments

dataset	input full PLSR dataset. Usually just the calibration dataset
targetVariable	What object or variable to use as the Y (predictand) in the PLSR model? Usually the "inVar" variable set at the beginning of a PLS script
method	Which approach to use to find optimal components. Options: pls, firstPlateau, firstMin
maxComps	maximum number of components to consider
iterations	how many different permutations to run
seg	For the built-in pls method, how many different data segments to select from the input dataset
prop	proportion of data to preserve for each permutation
random_seed	random seed to use for splitting data

Value

nComps the optimal number of PLSR components

Author(s)

Julien Lamour, Jeremiah Anderson, Shawn P. Serbin

find_optimal_comp_by_groups

Uses the firstMin and firstPlateau methods for the determination of the optimal number of PLSR model components, by group (i.e. optimal selection by stratification)

Description

Uses the firstMin and firstPlateau methods for the determination of the optimal number of PLSR model components, by group (i.e. optimal selection by stratification)

Usage

```
find_optimal_comp_by_groups(
  dataset = NULL,
  targetVariable = NULL,
  method = "firstPlateau",
  maxComps = 20,
  iterations = 20,
  prop = 0.7,
  random_seed = 123456789,
  group_variables = NULL
)
```

Arguments

dataset	input full PLSR dataset. Usually just the calibration dataset
targetVariable	What object or variable to use as the Y (predictand) in the PLSR model? Usually the "inVar" variable set at the beginning of a PLS script
method	Which approach to use to find optimal components. Options: firstPlateau, first-Min
maxComps	maximum number of components to consider
iterations	how many different permutations to run
prop	proportion of data to preserve for each permutation
random_seed	random seed to use for splitting data
group_variables	group_variables character vector of the form c("var1", "var2"... "varn") providing the factors used for stratified sampling.

Value

nComps the optimal number of PLSR components

Author(s)

asierrl, Shawn P. Serbin

get_ecosis_data

*Function to pull data from EcoSIS using the EcoSIS API***Description**

Function to pull data from EcoSIS using the EcoSIS API

Usage

get_ecosis_data(ecosis_id = NULL)

Arguments

ecosis_id the alphanumeric EcoSIS API dataset ID

Value

EcoSIS spectral dataset object

Author(s)

Shawn P. Serbin, Alexey Shiklomanov

Examples

```
## Not run:
ecosis_id <- "960dbb0c-144e-4563-8117-9e23d14f4aa9"
dat_raw <- get_ecosis_data(ecosis_id = ecosis_id)
head(dat_raw)
names(dat_raw)[1:40]

## End(Not run)
```

percent_rmse

*Calculate RMSE and percent RMSE with PLSR model results***Description**

Calculate RMSE and percent RMSE with PLSR model results

Usage

```
percent_rmse(
  plsr_dataset = NULL,
  inVar = NULL,
  residuals = NULL,
  range = "full"
)
```

Arguments

plsr_dataset	input plsr dataset
inVar	the trait variable used in the calculation of RMSE
residuals	predicted minus observed residual vector from either a cross-validation CV or independent validation
range	calculate over the full data range or the 95% of data range. options full or 95perc

Value

output a list containing the rmse and perc_rmse. output <- list(rmse = rmse, perc_rmse = perc_rmse)

Author(s)

Shawn P. Serbin

pls_permutation	<i>Run a PLSR model permutation analysis. Can be used to determine the optimal number of components or conduct a bootstrap uncertainty analysis</i>
-----------------	---

Description

See Serbin et al. (2019). DOI: <https://doi.org/10.1111/nph.16123>

Usage

```
pls_permutation(
  dataset = NULL,
  targetVariable = NULL,
  maxComps = 20,
  iterations = 20,
  prop = 0.7,
  verbose = FALSE
)
```

Arguments

dataset	input full PLSR dataset. Usually just the calibration dataset
targetVariable	What object or variable to use as the Y (predictand) in the PLSR model? Usually the "inVar" variable set at the beginning of a PLS script
maxComps	maximum number of components to use for each PLSR fit
iterations	how many different permutations to run
prop	proportion of data to preserve for each permutation
verbose	Should the function report the current iteration status/progress to the terminal or run silently? TRUE/FALSE. Default FALSE

Value

output a list containing the PRESS and coef_array. output <- list(PRESS=press.out, coef_array=coefs)

Author(s)

Julien Lamour, Shawn P. Serbin

```
pls_permutation_by_groups
```

Run a PLSR model permutation analysis stratified by selected "groups". Can be used to determine the optimal number of components or conduct a bootstrap uncertainty analysis

Description

Run a PLSR model permutation analysis stratified by selected "groups". Can be used to determine the optimal number of components or conduct a bootstrap uncertainty analysis

Usage

```
pls_permutation_by_groups(  
  dataset = NULL,  
  targetVariable = NULL,  
  maxComps = 20,  
  iterations = 20,  
  prop = 0.7,  
  group_variables = NULL,  
  verbose = FALSE  
)
```

Arguments

dataset	input full PLSR dataset. Usually just the calibration dataset
targetVariable	What object or variable to use as the Y (predictand) in the PLSR model? Usually the "inVar" variable set at the beginning of a PLS script
maxComps	maximum number of components to use for each PLSR fit
iterations	how many different permutations to run
prop	proportion of data to preserve for each permutation
group_variables	Character vector of the form c("var1", "var2" ... "varn") providing the factors used for stratified sampling in the PLSR permutation analysis
verbose	Should the function report the current iteration status/progress to the terminal or run silently? TRUE/FALSE. Default FALSE

Value

output a list containing the PRESS and coef_array. `output <- list(PRESS=press.out, coef_array=coefs)`

Author(s)

asierrl, Shawn P. Serbin, Julien Lamour

source_GitHubData	<i>Function to source text data from GitHub</i>
-------------------	---

Description

Function to source text data from GitHub

Usage

```
source_GitHubData(url, sep = ",", header = TRUE)
```

Arguments

url	http/https URL to the github dataset
sep	dataset file delimiter
header	TRUE/FALSE does the file have a column header?

Author(s)

gist.github.com/christophergandrud/4466237

testForPackage	<i>Function to check for installed package not presently used</i>
----------------	---

Description

Function to check for installed package not presently used

Usage

```
testForPackage(pkg)
```

VIP	<i>VIP returns all VIP values for all variables and all number of components, as a ncomp x nvars matrix.</i>
-----	--

Description

VIP returns all VIP values for all variables and all number of components, as a ncomp x nvars matrix.

Usage

```
VIP(object)
```

`VIPjh`*VIPjh returns the VIP of variable j with h components*

Description

VIPjh returns the VIP of variable j with h components

Usage

```
VIPjh(object, j, h)
```

`%notin%`*Not %in% function*

Description

Not %in% function

Usage

```
... %notin% NA
```

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