

Package ‘stapler’

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Version 0.6.6

Title Simultaneous Truth and Performance Level Estimation

Description An implementation of Simultaneous Truth and Performance Level Estimation (STAPLE) <doi:10.1109/TMI.2004.828354>. This method is used when there are multiple raters for an object, typically an image, and this method fuses these ratings into one rating. It uses an expectation-maximization method to estimate this rating and the individual specificity/sensitivity for each rater.

License GPL-3

Imports matrixStats, RNifti

Suggests knitr, rmarkdown, covr, testthat, spelling

Encoding UTF-8

LazyData true

ByteCompile true

Type Package

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VignetteBuilder knitr

URL <https://github.com/muschellij2/stapler>

BugReports <https://github.com/muschellij2/stapler/issues>

RoxygenNote 6.1.1

Language en-US

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staple	<i>Generic STAPLE Algorithm</i>
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Description

Tries to do the correct STAPLE algorithm (binary/multi-class) for the type of input (array/matrix/list of images/filenames of images)

Usage

```
staple(x, ..., set_orient = FALSE)

## Default S3 method:
staple(x, ..., set_orient = FALSE)

## S3 method for class 'list'
staple(x, ..., set_orient = FALSE)

## S3 method for class 'character'
staple(x, ..., set_orient = FALSE)

## S3 method for class 'array'
staple(x, ..., set_orient = FALSE)
```

Arguments

x	a nxr matrix where there are n raters and r elements rated, a list of images, or a character vector. Note, readNifti is used for image filenames
...	Options for STAPLE, see staple_bin_mat and staple_multi_mat
set_orient	Should the orientation be set to the same if x is a set of images, including niftiImages.

staple_bin_img	<i>Run STAPLE on a set of nifti images</i>
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Description

Run STAPLE on a set of nifti images

Usage

```
staple_bin_img(x, set_orient = FALSE, verbose = TRUE, ...)
```

```
staple_multi_img(x, set_orient = FALSE, verbose = TRUE, ...)
```

Arguments

x	Character vector of filenames or list of arrays/images
set_orient	Should the orientation be set to the same if the images are niftiImages
verbose	print diagnostic messages
...	Additional arguments to staple_bin_mat

Value

A list similar to [staple_bin_mat](#), but has a resulting image

Examples

```
n = 5
r = 1000
x = lapply(seq(n), function(i) {
  x = rbinom(n = r, size = 1, prob = 0.5)
  array(x, dim = c(10,10, 10))
})
staple_out = staple_bin_img(x, set_orient = FALSE)

n = 5
r = 1000
x = lapply(seq(n), function(i) {
  x = rbinom(n = r, size = 5, prob = 0.5)
  array(x, dim = c(10,10, 10))
})
staple_out = staple_multi_img(x, set_orient = FALSE)
```

staple_bin_mat *STAPLE on binary matrix*

Description

STAPLE on binary matrix

Usage

```
staple_bin_mat(x, sens_init = 0.99999, spec_init = 0.99999,
  max_iter = 10000, tol = .Machine$double.eps, prior = "mean",
  verbose = TRUE, trace = 25)
```

Arguments

x	a nxr matrix where there are n raters and r elements rated
sens_init	Initialize parameter for sensitivity (p)
spec_init	Initialize parameter for specificity (q)
max_iter	Maximum number of iterations to run
tol	Tolerance for convergence
prior	Either "mean" or a vector of prior probabilities,
verbose	print diagnostic messages
trace	Number for modulus to print out verbose iterations

Value

List of output sensitivities, specificities, and vector of probabilities

Examples

```
n = 5
r = 1000
sens = c(0.8, 0.9, 0.8, 0.5, 0.8)
spec = c(0.9, 0.75, 0.99, 0.98, 0.92)
suppressWarnings(RNGversion("3.5.0"))
set.seed(20171120)
n_1 = 200
n_0 = r - n_1
truth = c(rep(0, n_0), rep(1, n_1))
pred_1 = rbinom(n = n, size = n_1, prob = sens)
pred_0 = rbinom(n = n, size = n_0, prob = spec)
pred_0 = sapply(pred_0, function(n) {
  sample(c(rep(0, n), rep(1, n_0 - n)))
})
pred_1 = sapply(pred_1, function(n) {
  sample(c(rep(1, n), rep(0, n_1 - n)))
})
```

```
pred = rbind(pred_0, pred_1)
true_sens = colMeans(pred[ truth == 1, ])
true_spec = colMeans(1-pred[ truth == 0, ])
x = t(pred)
staple_out = staple_bin_mat(x)
staple_out_prior = staple_bin_mat(x, prior = rep(0.5, r))
```

staple_example_data *STAPLE Example Data*

Description

STAPLE Example Data

Usage

```
staple_example_data()
```

Value

Character vector of filenames

Examples

```
staple_example_data()
```

staple_multi_mat *STAPLE on Multi-class matrix*

Description

STAPLE on Multi-class matrix

Usage

```
staple_multi_mat(x, sens_init = 0.99999, spec_init = 0.99999,
  max_iter = 10000, tol = .Machine$double.eps, prior = "mean",
  verbose = TRUE, trace = 25, ties.method = c("first", "random",
  "last"))
```

Arguments

<code>x</code>	a <code>n</code> x <code>r</code> matrix where there are <code>n</code> raters and <code>r</code> elements rated
<code>sens_init</code>	Initialize matrix for sensitivity (<code>p</code>)
<code>spec_init</code>	Initialize matrix for specificity (<code>q</code>)
<code>max_iter</code>	Maximum number of iterations to run
<code>tol</code>	Tolerance for convergence
<code>prior</code>	Either "mean" or a matrix of prior probabilities,
<code>verbose</code>	print diagnostic messages
<code>trace</code>	Number for modulus to print out verbose iterations
<code>ties.method</code>	Method passed to <code>max.col</code> for hard segmentation

Value

List of matrix output sensitivities, specificities, and matrix of probabilities

Examples

```
rm(list = ls())
x = matrix(rbinom(5000, size = 5, prob = 0.5), ncol = 1000)
sens_init = 0.99999
spec_init = 0.99999
max_iter = 10000
tol = .Machine$double.eps
prior = "mean"
verbose = TRUE
trace = 25
ties.method = "first"

res = staple_multi_mat(x)
```

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