Package 'frenchFISH'

April 23, 2024

Type Package

Title Poisson Models for Quantifying DNA Copy-number from FISH Images of Tissue Sections

Version 1.15.0

Author Adam Berman, Geoff Macintyre

Maintainer Adam Berman <agb61@cam.ac.uk>

Description FrenchFISH comprises a nuclear volume correction method coupled with two types of Poisson models: either a Poisson model for improved manual spot counting without the need for control probes; or a homogenous Poisson Point Process model for automated spot counting.

License Artistic-2.0

Encoding UTF-8

Imports utils, MCMCpack, NHPoisson

RoxygenNote 7.0.2

Suggests knitr, rmarkdown, testthat

biocViews Software, BiomedicalInformatics, CellBiology, Genetics, HiddenMarkovModel, Preprocessing

VignetteBuilder knitr

git_url https://git.bioconductor.org/packages/frenchFISH

git_branch devel

git_last_commit 3c8c9c1

git_last_commit_date 2023-10-24

Repository Bioconductor 3.19

Date/Publication 2024-04-23

Contents

areAllNonnegativeIntegers 2
checkAutomaticCountsEstimatesArguments 2

checkManualCountsEstimatesArguments 3
convertFishalyserCsvToCountMatrix 4
generatePPdat 4
getAutomaticCountsEstimates 5
getAverageVolumeFrac 6
getManualCountsEstimates 6
getMaxVolumeFrac 7
getMinVolumeFrac 7
getVsegFrac 8

Index **9**

`areAllNonnegativeIntegers` *Helper function to check if all values in the input count matrix are either NA, NaN, or non-negative integers*

Description

Helper function to check if all values in the input count matrix are either NA, NaN, or non-negative integers

Usage

```
areAllNonnegativeIntegers(count_matrix)
```

Arguments

`count_matrix`	The count matrix

Value

TRUE if all values in count_matrix are non-NA/NaN, non-negative integers; otherwise FALSE

`checkAutomaticCountsEstimatesArguments` *Helper function to check the arguments input to getAutomaticCountsEstimates*

Description

Helper function to check the arguments input to getAutomaticCountsEstimates

Usage

```
checkAutomaticCountsEstimatesArguments(probeCounts, radius, height)
```

Arguments

probeCounts	A matrix where the first column contains the areas of the nuclear blobs (this column must be named "area" and the unit of its entries must be the square of the unit used to measure radius and height) and the remaining columns (one per probe) contain the spot counts for different probes in each nuclear blob
radius	The cells' nuclear radius (must be measured in same unit as height)
height	The section height (must be measured in same unit as radius)

Value

Nothing if all checks are passed; otherwise throws an error or warning message

---

checkManualCountsEstimatesArguments

Helper function to check the arguments input to getManualCountsEstimates

---

Description

Helper function to check the arguments input to getManualCountsEstimates

Usage

```
checkManualCountsEstimatesArguments(probeCounts, radius, height)
```

Arguments

probeCounts	A matrix of manual spot counts with columns for probes and rows for nuclei
radius	The cells' nuclear radius (must be measured in same unit as height)
height	The section height (must be measured in same unit as radius)

Value

Nothing if all checks are passed; otherwise throws an error or warning message

convertFishalyserCsvToCountMatrix *Function to convert CSV output of the FISHalyseR automatic FISH splot counting software to a count matrix suitable for input to frenchFISH's getAutomaticCountsEstimates*

Description

Function to convert CSV output of the FISHalyseR automatic FISH splot counting software to a count matrix suitable for input to frenchFISH's getAutomaticCountsEstimates

Usage

```
convertFishalyserCsvToCountMatrix(pathToFishalyserCsv)
```

Arguments

pathToFishalyserCsv — The path to the CSV file of automatic spot counts outputted by FISHalyseR

Value

A count matrix suitable for input to getAutomaticCountsEstimates

Examples

```
probeCounts<-convertFishalyserCsvToCountMatrix(
    system.file("extdata", "SampleFISH.jpg_data.csv", package="frenchFISH"))
```

generatePPdat *Helper function to convert spot counts and nuclear area measurements into continuous events for Poisson point estimation*

Description

Helper function to convert spot counts and nuclear area measurements into continuous events for Poisson point estimation

Usage

```
generatePPdat(area, spots)
```

Arguments

area	The nuclear area
spots	The number of spots counted

Value

Vector of continuous events for Poisson point estimation

`getAutomaticCountsEstimates` *FrenchFISH function for generating Poisson point estimates of spot counts from spot counts which have been automatically generated.*

Description

FrenchFISH function for generating Poisson point estimates of spot counts from spot counts which have been automatically generated.

Usage

```
getAutomaticCountsEstimates(probeCounts, radius, height)
```

Arguments

`probeCounts`	A matrix where the first column contains the areas of the nuclear blobs (this column must be named "area" and the unit of its entries must be the square of the unit used to measure `radius` and `height`) and the remaining columns (one per probe) contain the spot counts for different probes in each nuclear blob
`radius`	The cells' nuclear radius (must be measured in same unit as `height`)
`height`	The section height (must be measured in same unit as `radius`)

Value

The Poisson point estimates of spot counts for each probe

Examples

```
automaticCountsEstimates<-getAutomaticCountsEstimates(
    cbind(area=c(250,300,450),
    red=c(0,2,4),
    green=c(5,3,1),
    blue=c(3,0,2)), 8, 4)
```

`getAverageVolumeFrac` *Helper function to get the average volume of nucleus sampled given the nucleus radius and section height*

Description

Helper function to get the average volume of nucleus sampled given the nucleus radius and section height

Usage

```
getAverageVolumeFrac(r, h)
```

Arguments

`r`	The nuclear radius
`h`	The section height

Value

The average volume of nucleus sampled given the nucleus radius and section height

`getManualCountsEstimates` *FrenchFISH function for generating volume adjusted spot counts from spots which have been manually counted (uses a Markov chain Monte Carlo method).*

Description

FrenchFISH function for generating volume adjusted spot counts from spots which have been manually counted (uses a Markov chain Monte Carlo method).

Usage

```
getManualCountsEstimates(probeCounts, radius, height)
```

Arguments

`probeCounts`	A matrix of manual spot counts with columns for probes and rows for nuclei
`radius`	The cells' nuclear radius (must be measured in same unit as `height`)
`height`	The section height (must be measured in same unit as `radius`)

Value

The volume adjusted spot counts for each probe that have been generated using MCMC modelling

Examples

```
manualCountsEstimates<-getManualCountsEstimates(cbind(red=c(0,2,4),
    green=c(5,3,1), blue=c(3,0,2)), 8, 4)
```

`getMaxVolumeFrac` *Helper function to get the maximum possible volume of nucleus sampled given the nucleus radius and section height*

Description

Helper function to get the maximum possible volume of nucleus sampled given the nucleus radius and section height

Usage

```
getMaxVolumeFrac(r, h)
```

Arguments

`r`	The nuclear radius
`h`	The section height

Value

The maximum possible volume of nucleus sampled given the nucleus radius and section height

---

`getMinVolumeFrac` *Helper function that returns the minimum possible volume of nucleus sampled given the nucleus radius and section height*

Description

Helper function that returns the minimum possible volume of nucleus sampled given the nucleus radius and section height

Usage

```
getMinVolumeFrac(r, h)
```

Arguments

`r`	The radius of the nuclei
`h`	The height of the section

Value

The minimum possible volume of nucleus sampled given the nucleus

`getVsegFrac` *Helper function that returns the fraction of the nucleus sampled for a specified distance from the midpoint*

Description

Helper function that returns the fraction of the nucleus sampled for a specified distance from the midpoint

Usage

```
getVsegFrac(d, h, r)
```

Arguments

`d`	The distance sampled from the midpoint
`h`	The height of the section
`r`	The radius of the nuclei

Value

The fraction of the nucleus sampled for a specified distance from the midpoint

Index

areAllNonnegativeIntegers, 2

checkAutomaticCountsEstimatesArguments, 2
checkManualCountsEstimatesArguments, 3
convertFishalyserCsvToCountMatrix, 4

generatePPdat, 4
getAutomaticCountsEstimates, 5
getAverageVolumeFrac, 6
getManualCountsEstimates, 6
getMaxVolumeFrac, 7
getMinVolumeFrac, 7
getVsegFrac, 8