

# Package ‘frenchFISH’

March 30, 2021

**Type** Package

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

**Version** 1.2.0

**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** RELEASE\_3\_12

**git\_last\_commit** 9a75ff7

**git\_last\_commit\_date** 2020-10-27

**Date/Publication** 2021-03-29

## R topics documented:

areAllNonnegativeIntegers . . . . .	2
checkAutomaticCountsEstimatesArguments . . . . .	2
checkManualCountsEstimatesArguments . . . . .	3
convertFishalyserCsvToCountMatrix . . . . .	3
generatePPdat . . . . .	4
getAutomaticCountsEstimates . . . . .	4
getAverageVolumeFrac . . . . .	5

getManualCountsEstimates . . . . .	5
getMaxVolumeFrac . . . . .	6
getMinVolumeFrac . . . . .	6
getVsegFrac . . . . .	7

<b>Index</b>	<b>8</b>
--------------	----------

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 spot counting software to a count matrix suitable for input to frenchFISH's getAutomaticCountsEstimates*

---

**Description**

Function to convert CSV output of the FISHalyseR automatic FISH spot 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	<i>Helper function to convert spot counts and nuclear area measurements into continuous events for Poisson point estimation</i>
---------------	---

---

**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	<i>FrenchFISH function for generating Poisson point estimates of spot counts from spot counts which have been automatically generated.</i>
-----------------------------	--

---

**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	<i>Helper function to get the maximum possible volume of nucleus sampled given the nucleus radius and section height</i>
------------------	--

---

**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	<i>Helper function that returns the minimum possible volume of nucleus sampled given the nucleus radius and section height</i>
------------------	--

---

**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

---

<i>getVsegFrac</i>	<i>Helper function that returns the fraction of the nucleus sampled for a specified distance from the midpoint</i>
--------------------	--

---

**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, [3](#)

generatePPdat, [4](#)

getAutomaticCountsEstimates, [4](#)

getAverageVolumeFrac, [5](#)

getManualCountsEstimates, [5](#)

getMaxVolumeFrac, [6](#)

getMinVolumeFrac, [6](#)

getVsegFrac, [7](#)