Package ‘LocFDRPois’

May 5, 2015

Title Functions for Performing Local FDR Estimation when Null and Alternative are Poisson

Version 1.0.0

Description The main idea of the Local FDR algorithm is to estimate both proportion of null observations and the ratio of null and alternative densities. In the case that there are many null observations, this can be done reliably, through maximum likelihood or generalized linear models. This package implements this in the case that the null and alternative densities are Poisson.

Depends R (>= 3.1.2)

Imports dplyr, ggplot2

License GPL-2

LazyData true

Suggests knitr

VignetteBuilder knitr

Author Kris Sankaran [aut, cre]

Maintainer Kris Sankaran <kriss1@stanford.edu>

NeedsCompilation no

Repository CRAN

Date/Publication 2015-05-05 06:43:01

R topics documented:

AnalyticalOptim ........................................ 2
BuildTable .............................................. 2
LLConstructor ........................................... 3
LocfdrFuns .............................................. 3
MixtureDensity .......................................... 4
NullDensity ............................................. 4
SummarizeLocfdr ....................................... 5

Index 6
### AnalyticalOptim

*Optimize lambda0 and pi0, using Poisson version of analytical approach in Efron's "Microarrays, Empirical Bayes, and the Two-Groups Model"*

In the paper, he derives formulas for arbitrary support. We use support [0, 1] for estimating the null. We initialize the search with lambda=0.05 and pi=0.95.

**Description**

Optimize lambda0 and pi0, using Poisson version of analytical approach in Efron's "Microarrays, Empirical Bayes, and the Two-Groups Model"

In the paper, he derives formulas for arbitrary support. We use support [0, 1] for estimating the null. We initialize the search with lambda=0.05 and pi=0.95.

**Usage**

AnalyticalOptim(r0, r1, N)

**Arguments**

- **r0**  The number of 0's in the data.
- **r1**  The number of 1's in the data.
- **N**   The total number of points in the data.

---

### BuildTable

*Build a table corresponding to the histogram of data*

**Description**

Build a table corresponding to the histogram of data

**Usage**

BuildTable(data)

**Arguments**

- **data**  The raw data (before histogramming) to estimate a mixture density for.

**Value**

X A data frame whose two columns are integer and number of times that integer appears in the data.
**LLConstructor**

Return log-likelihood function giving Poisson version of equation (4.6) in "Microarrays, Empirical Bayes, and the Two-Groups model" by Efron.

**Description**

Return log-likelihood function giving Poisson version of equation (4.6) in "Microarrays, Empirical Bayes, and the Two-Groups model" by Efron.

**Usage**

\[
\text{LLConstructor}(r0, r1, N0, N)
\]

**Arguments**

- **r0** The number of points equal to 0
- **r1** The number of points equal to 1
- **N0** The number of points equal to either 0 or 1
- **N** The total number of points

**Value**

\[
\text{LL} \text{ A function of lambda0 and pi0, given the current data log likelihood}
\]

---

**LocfdrFuns**

Run local fdr functions

**Description**

Run local fdr functions

**Usage**

\[
\text{LocfdrFuns(data, df, knots)}
\]

**Arguments**

- **data** The raw data (before histogramming) to estimate a mixture density for.
- **df** The number of degrees of freedom to use in the natural spline in fitting the mixture density.
- **knots** The positions of the knots to use in the natural spline fit.
Value
fdr The estimated local fdr function (can be called on numeric vectors).
pi0 The estimated proportion of data that lies in the poisson component
lambda0 The estimated parameter for the poisson component.
f0 The estimated null density function (can be called on numeric vectors.)
f The estimated mixture density function (can be called on numeric vectors.)

Description
Compute full mixture density for data, assuming exponential family model

Usage
MixtureDensity(data, df, knots)

Arguments
data The raw data (before histogramming) to estimate a mixture density for.

df The number of degrees of freedom to use in the natural spline in fitting the mixture density.

knots The positions of the knots to use in the natural spline fit.

Value
f_hat The estimated mixture density function (can be called on numeric vectors.)

Description
Estimate the density for the null data

Usage
NullDensity(data)

Arguments
data The raw data (before histogramming) to estimate a mixture density for.
Value

f_hat The estimated mixture density function (can be called on numeric vectors.)

Summary

Call and summarize output to LocfdrFuns

Description

Call and summarize output to LocfdrFuns

Usage

SummarizeLocfdr(x, df = 5, knots = c())

Arguments

x The raw data (before histogramming) to estimate a mixture density for.
df The number of degrees of freedom to use in the natural spline in fitting the mixture density.
knots The positions of the knots to use in the natural spline fit.

Value

pi0 The estimated proportion of data that lies in the poisson component
lambda0 The estimated parameter for the poisson component.
locfdr\_res The fdr, f0 and f functions evaluated on the support of x
locfdr\_fig A plot of the estimated locfdr fit
Index

AnalyticalOptim, 2
BuildTable, 2
LLConstructor, 3
LocfdrFuns, 3
MixtureDensity, 4
NullDensity, 4
SummarizeLocfdr, 5