

Package ‘prob.4.2.comp.stats’

July 26, 2021

Title Solution for Problem 4.2 in Computation Statistics by Givens

Version 1.0.0.0

Description Implements EM point estimator and its covariance estimator for problem 4.2 in Computation Statistics by Givens.

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Encoding UTF-8

LazyData true

Roxygen list(markdown = TRUE)

RoxygenNote 7.1.1.9001

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em.counts_to_responses

Convert counts to individual responses

Description

There are many ways to represent the same data. In problem 4.2, the data is given in the form of counts. This is the inverse of em.counts_to_responses, e.g.,

```
xs <- em.counts_to_responses(counts)
em.responses_to_counts(xs) == counts
em.counts_to_responses(em.responses_to_counts(xs)) == xs.
```

Usage

```
em.counts_to_responses(counts)
```

Arguments

counts count data

Value

the count data converted to response data, say counts = (379,299,...), then 379 responded 0 encounters, 299 responded 1 encounter, ...

Examples

```
# let counts be the count data
counts[j] # denotes number of respondents with j risky sexual encounters.
xs <- em.counts_to_responses(counts)
xs[k] # denotes the response of the i-th person
```

em.cov.bs

Bootstrap covariance estimator of EM point estimator

Description

Estimate the covariance of the EM point estimator for $\theta = (\alpha, \beta, \mu, \lambda)$ using Bootstrapping.

Usage

```
em.cov.bs(theta.em, counts, m = 2000, eps = 1e-06, debug = F)
```

Arguments

theta.em An EM point estimator of θ given observed counts
counts observed count data (n_0, n_1, \dots, n_6)
m maximum bootstrap replicates
eps EM algorithm epsilon stopping condition
debug whether to print out debugging info while running

em.cov.info	<i>Covariance matrix of EM point estimator based on the observed information matrix</i>
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Description

Covariance matrix of EM point estimator based on the observed information matrix

Usage

```
em.cov.info(theta.em, counts)
```

Arguments

theta.em	An EM point estimator of theta given observed responses
count	Observed sample of counts

em.estimator	<i>EM algorithm</i>
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Description

EM algorithm estimator for problem 4.2

Usage

```
em.estimator(theta, counts, eps = 1e-06, debug = T)
```

Arguments

theta	a starting guess for theta = (alpha,beta,mu,lambda)
counts	observed count data (n0,n1,...,n16)
eps	stopping condition
debug	whether to print out debugging info while running

em.loglike	<i>log-likelihood function for problem 4.2</i>
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Description

log-likelihood function for problem 4.2

Usage

```
em.loglike(theta, counts)
```

Arguments

theta	evaluated at $\theta = (\alpha, \beta, \mu, \lambda)$
data	observed counts

em.responses_to_counts	<i>Convert individual response data to count data</i>
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Description

This is the inverse of `em.counts_to_responses`, e.g., `em.responses_to_counts(em.counts_to_responses(counts)) == counts` and `em.counts_to_responses(em.responses_to_counts(data)) == data`.

Usage

```
em.responses_to_counts(data)
```

Arguments

data	response data
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Value

response data converted to count data

em.sd.bs	<i>Standard error of EM point estimator based on Bootstrapping sample covariance</i>
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Description

Standard error of EM point estimator based on Bootstrapping sample covariance

Usage

```
em.sd.bs(  
  theta.em,  
  counts,  
  m = 10000,  
  em.eps = 1e-06,  
  bs.eps = 1e-04,  
  debug = F  
)
```

Arguments

theta.em	An EM point estimator of theta given observed responses
count	Observed sample of counts

em.sd.info	<i>Standard error of EM point estimator based on the observed information matrix</i>
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Description

Standard error of EM point estimator based on the observed information matrix

Usage

```
em.sd.info(theta.em, counts)
```

Arguments

theta.em	An EM point estimator of theta given observed responses
count	Observed sample of counts

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