Package 'FiSh'

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Type Package

Title Fisher-Shannon Method

Version 1.1

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Description Proposes non-parametric estimates of the Fisher information measure and the Shannon entropy power. More theoretical and implementation details can be found in Guignard et al. <doi:10.3389/feart.2020.00255>. A 'python' version of this work is available on 'github' and 'PyPi' ('FiShPy').

Imports fda.usc, KernSmooth

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Note The authors are grateful to Mikhail Kanevski, Federico Amato and Luciano Telesca for many fruitful discussions about the use and the application of Fisher-Shannon method.

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Contents

FiSh-package *FiSh: Fisher-Shannon Method*

Description

Proposes non-parametric estimates of the Fisher information measure and the Shannon entropy power. More theoretical and implementation details can be found in Guignard et al. <doi:10.3389/feart.2020.00255>. A 'python' version of this work is available on 'github' and 'PyPi' ('FiShPy').

Details

If this R code is used for academic research, please cite the following paper where it was developed:

F. Guignard, M. Laib, F. Amato, M. Kanevski, Advanced analysis of temporal data using Fisher-Shannon information: theoretical development and application in geosciences, 2020, doi: 10.3389/feart.2020.00255Frontiers in Earth Science, 8:255.

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References

S. J. Sheather and M. C. Jones (1991). A reliable data-based bandwidth selection method for kernel density estimation. Journal of the Royal Statistical Society, Series B, 53, 683 - 690.

M. P. Wand and M. C. Jones (1995). Kernel Smoothing. Chapman and Hall, London.

C. Vignat, J.F Bercher (2003). Analysis of signals in the Fisher–Shannon information plane, Physics Letters A, 312, 190, 27 – 33.

F. Guignard, M. Laib, F. Amato, M. Kanevski, Advanced analysis of temporal data using Fisher-Shannon information: theoretical development and application in geosciences, 2020, doi: 10.3389/feart.2020.00255Frontiers in Earth Science, 8:255.

nsrk *Normal scale rule for kernel density estimation*

Description

Bandwidth selector for non-parametric estimation. Estimates the optimal AMISE bandwidth using the Normal Scale Rule with Gaussian kernel.

Usage

```
nsrk(x, log_trsf=FALSE)
```

Arguments

x	Univariate data.
log_trsf	Logical flag: if TRUE the data are log-transformed (usually used for skewed positive data). By default log_trsf = FALSE.

Value

The bandwidth value.

References

M. P. Wand and M. C. Jones, (1995). Kernel Smoothing. Chapman and Hall, London.

Examples

```
x <- rnorm(1000)
h <- nsrk(x)
```

SEP_FIM *Fisher-Shannon method*

Description

Non-parametric estimates of the Shannon Entropy Power (SEP), the Fisher Information Measure (FIM) and the Fisher-Shannon Complexity (FSC), using kernel density estimators with Gaussian kernel.

Usage

```
SEP_FIM(x, h, log_trsf=FALSE, resol=1000, tol = .Machine$double.eps)
```

Arguments

x	Univariate data.
h	Value of the bandwidth for the density estimate
log_trsf	Logical flag: if TRUE the data are log-transformed (used for skewed data), in this case the data should be positive. By default, log_trsf = FALSE.
resol	Number of equally-spaced points, over which function approximations are computed and integrated.
tol	A tolerance to avoid dividing by zero values.

Value

A table with one row containing:

- `SEP` Shannon Entropy Power.
- `FIM` Fisher Information Measure.
- `FSC` Fisher-Shannon Complexity

References

F. Guignard, M. Laib, F. Amato, M. Kanevski, Advanced analysis of temporal data using Fisher-Shannon information: theoretical development and application in geosciences, 2020, doi: 10.3389/feart.2020.00255Frontiers in Earth Science, 8:255.

Examples

```
library(KernSmooth)
x <- rnorm(1000)
h <- dpik(x)
SEP_FIM(x, h)
```

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