

Package ‘vMF’

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Type Package

Title Sampling from the von Mises-Fisher Distribution

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Description Provides fast sampling from von Mises-Fisher distribution using the method proposed by Andrew T.A Wood (1994) <[doi:10.1080/03610919408813161](https://doi.org/10.1080/03610919408813161)>.

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Encoding UTF-8

BugReports <https://github.com/ahoundetoungan/vMF/issues>

URL <https://github.com/ahoundetoungan/vMF>

Depends R (>= 3.5.0)

Imports Rcpp

LinkingTo Rcpp, RcppArmadillo

Suggests movMF, rbenchmark, knitr, rmarkdown, ggplot2, ddpcr

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VignetteBuilder knitr

NeedsCompilation yes

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CpvMF

Normalization constant of von Mises - Fisher distribution.

Description

CpvMF returns the normalization constant of von Mises - Fisher density.

Usage

```
CpvMF(p, k)
```

Arguments

p as sphere dimension.
k as the intensity parameter.

Details

The probability density function of the von Mises - Fisher distribution is defined by :

$$f(z|theta) = C_p(|theta|) \exp(ztheta)$$

$|theta|$ is the intensity parameter and $\frac{theta}{|theta|}$ the mean directional parameter. The normalization constant $C_p()$ depends on the Bessel function of the first kind. See more details [here](#).

Value

the normalization constant.

References

Wood, A. T. (1994). Simulation of the von Mises Fisher distribution. *Communications in statistics-simulation and computation*, 23(1), 157-164. <https://www.tandfonline.com/doi/abs/10.1080/03610919408813161>.

Hornik, K., & Grun, B. (2014). **movMF**: An R package for fitting mixtures of von Mises-Fisher distributions. *Journal of Statistical Software*, 58(10), 1-31. <https://epub.wu.ac.at/4893/>.

See Also

[rvMF](#) and [dvMF](#)

Examples

```
CpvMF(2, 3.1)
```

dvMF

PDF of the von Mises - Fisher distribution.

Description

dvMF computes the density of the von Mises - Fisher distribution, given a set of spherical coordinates and the distribution parameters.

Usage

```
dvMF(z, theta)
```

Arguments

z as the set of points at which the spherical coordinate will be evaluated. z may be an one row matrix or vector if it contain one spherical coordinates or a matrix whose each row is one spherical coordinates.

theta as the distribution parameter.

Details

The probability density function of the von Mises - Fisher distribution is defined by :

$$f(z|theta) = C_p(|theta|) \exp(ztheta)$$

$|theta|$ is the intensity parameter and $\frac{theta}{|theta|}$ the mean directional parameter. The normalization constant $C_p()$ depends on the Bessel function of the first kind. See more details [here](#).

Value

the densities computed at each point

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References

Wood, A. T. (1994). Simulation of the von Mises Fisher distribution. *Communications in statistics-simulation and computation*, 23(1), 157-164. <https://www.tandfonline.com/doi/abs/10.1080/03610919408813161>.

Hornik, K., & Grun, B. (2014). **movMF**: An R package for fitting mixtures of von Mises-Fisher distributions. *Journal of Statistical Software*, 58(10), 1-31. <https://epub.wu.ac.at/4893/>.

See Also

rvMF and CpMF

Examples

```
{ }
# Draw 1000 vectors from vM-F with parameter 1, (1,0)
z <- rvMF(1000,c(1,0))

# Compute the density at these points
dvMF(z,c(1,0))

# Density of (0,1,0,0) with the parameter 3, (0,1,0,0)
dvMF(c(0,1,0,0),c(0,3,0,0))
```

 rvMF

Sample from von Mises - Fisher distribution.

Description

rvMF returns random draws from von Mises - Fisher distribution.

Usage

```
rvMF(size, theta)
```

Arguments

size	as the number of draws needed.
theta	as the distribution parameter.

Details

The parameter theta is such that $\dim(\theta)$ is the sphere dimension, $|\theta|$ the intensity parameter and $\frac{\theta}{|\theta|}$ the mean directional parameter.

Value

A matrix whose each row is a random draw from the distribution.

References

- Wood, A. T. (1994). Simulation of the von Mises Fisher distribution. *Communications in statistics-simulation and computation*, 23(1), 157-164. <https://www.tandfonline.com/doi/abs/10.1080/03610919408813161>.
- Hornik, K., & Grun, B. (2014). **movMF**: An R package for fitting mixtures of von Mises-Fisher distributions. *Journal of Statistical Software*, 58(10), 1-31. <https://epub.wu.ac.at/4893/>.

Examples

```
# Draw 1000 vectors from vM-F with parameter 1, (1,0)
rvMF(1000,c(1,0))

# Draw 10 vectors from vM-F with parameter sqrt(14), (2,1,3)
rvMF(10,c(2,1,3))

# Draw from the vMF distribution with mean direction proportional
# to c(1, -1) and concentration parameter 3
rvMF(10, 3 * c(1, -1) / sqrt(2))
```

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