

# Package ‘vMF’

March 10, 2024

**Type** Package

**Title** Sampling from the von Mises-Fisher Distribution

**Version** 0.0.3

**Date** 2024-03-20

**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)>.

**License** GPL-3

**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

**RoxygenNote** 7.2.3

**VignetteBuilder** knitr

**NeedsCompilation** yes

**Author** Aristide Houndetoungan [cre, aut]

**Maintainer** Aristide Houndetoungan <[ahoundetoungan@gmail.com](mailto:ahoundetoungan@gmail.com)>

**Repository** CRAN

**Date/Publication** 2024-03-09 23:30:02 UTC

## R topics documented:

CpvMF	2
dvMF	3
rvMF	4
<b>Index</b>	<b>6</b>

---

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. doi: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. doi:10.18637/jss.v058.i10.

### 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

## Author(s)

Aristide Houndetoungan <<ariel92and@gmail.com>>

## References

Wood, A. T. (1994). Simulation of the von Mises Fisher distribution. *Communications in statistics-simulation and computation*, 23(1), 157-164. doi: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. doi:10.18637/jss.v058.i10.

## See Also

rvMF and CpvMF

**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. doi: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. doi:10.18637/jss.v058.i10.

**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))
```

# Index

\* **coordinates**

CpvMF, 2

dvMF, 3

rvMF, 4

\* **directional**

CpvMF, 2

dvMF, 3

rvMF, 4

\* **distribution**

CpvMF, 2

dvMF, 3

rvMF, 4

\* **simulations**

CpvMF, 2

dvMF, 3

rvMF, 4

\* **statistics**

CpvMF, 2

dvMF, 3

rvMF, 4

CpvMF, 2, 3

dvMF, 2, 3

rvMF, 2, 4