

## von Mises

### Parametrisation

The (circular) von Mises distribution has density

$$p(y_i) = \frac{\exp(s_i \kappa \cos(x - \mu))}{2\pi I_0(s_i \kappa)}$$

where  $s_i > 0$  is a fixed scaling, the location is  $\mu$  and the precision-parameter is  $\kappa$ .

### Link-function

The linkfunction is given as

$$\mu = 2\pi \left( \frac{1}{1 + \exp(-\eta)} - 1/2 \right)$$

where  $\eta$  is the linear predictor.

### Hyperparameters

The hyperparameter is  $\kappa = \exp(\theta)$  and prior are given on  $\theta$

### Specification

- family="vm"
- Required arguments:  $y$  (and optional  $s$  through option scale)

### Hyperparameter spesification and default values

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hyper

theta

```
hyperid 109101
name precision
short.name prec
output.name.intern prec_intern for vm
output.name precision parameter for vm
initial 2
fixed FALSE
prior loggamma
param 1 0.01
to.theta function(x) log(x)
from.theta function(x) exp(x)
```

experimental TRUE

survival FALSE

discrete FALSE

link default circular tan tan.pi identity

pdf vm

## Example

In the following example we estimate the parameters in a simulated example.

```
library(circular)

lfun <- function(x) 2 * pi * (1/(1+exp(-x)) - 0.5)
lfuninv <- function(x) log((pi + x)/(pi - x))

n <- 300
x <- rnorm(n, sd = 0.2)
x <- x - mean(x)
mu <- lfun(0.1 + x)
kappa <- 10
y <- numeric(n)
for(i in 1:n) {
  y[i] <- rvonmises(1, circular(mu[i]), kappa)
}
r <- inla(y ~ 1 + x,
          data = data.frame(y, x),
          family = "vm",
          control.family = list(hyper = list(
                                prec = list(initial = log(kappa),
                                             fixed = TRUE))),
          verbose = TRUE)
summary(r)
```

## Notes

This distribution is experimental, and changes will occur.