

## PC prior for $\alpha$ in the Weibull likelihood

### Parametrization

The PC prior for the  $\alpha$  parameter in the Weibull likelihood, has

$$\text{KLD}(\alpha) = (\Gamma((1 + \alpha)/\alpha)\alpha + \alpha \log(\alpha) - \alpha\gamma + \gamma - \alpha)/\alpha$$

where  $\gamma = 0.5772156649\dots$  is Euler's constant. The base-model is  $\alpha = 1$ , and the expression for the prior follow from

$$d(\alpha) = \sqrt{2\text{KLD}(\alpha)}$$

and

$$\pi(\alpha) = \frac{\lambda}{2} \exp(-\lambda d(\alpha)) \left| \frac{\partial d(\alpha)}{\partial \alpha} \right|$$

for  $\lambda > 0$  and  $\alpha > 0$ . The density, cumulative distribution function, quantile function, and a random number generator for this distribution are implemented in the `inla.pc.{d,p,q,r}alphaw` functions. Internally, R-INLA uses  $\theta = \log(\alpha)$  rather than  $\alpha$ , and the prior for  $\theta$  follows accordingly.

### Specification

This prior for the hyperparameters is specified inside the `hyper`-specification, as

```
hyper = list(<theta> = list(prior="pc.alphaw", param= <lambda>))
```

### Example

#### Notes

- The default value is  $\lambda = 5$ .
- See also functions `inla.pc.{d,p,q,r}alphaw`