

LGCP with PC priors

Patrick Brown

March 10, 2021

```
library('mapmisc')
library("geostatsp")
data('murder')
data('torontoPop')
```

```
if(requireNamespace("rgdal") & requireNamespace("rgeos")) {
  murderT = spTransform(murder, omerc(murder, angle=-20))
  borderT = spTransform(torontoBorder, projection(murderT))
  borderC = crop(borderT, extent(-12700, 7000, -7500, 3100))
}

## Loading required namespace:  rgdal
## Loading required namespace:  rgeos
## Warning in spTransform(theCentre, crsLL): NULL target CRS comment, falling
back to PROJ string
## Warning in spTransform(theCentreSp, qq):  NULL source CRS comment, falling
back to PROJ string

covList = list(
  pop=torontoPdents,
  inc = log(torontoIncome) )

formulaHere = ~ inc + offset(pop, log=TRUE)
```

LGCP with priors given by quantiles

```
if(requireNamespace("rgdal", quietly=TRUE) & requireNamespace("rgeos", quietly=TRUE) & r
  resG=lgcp(
    formula = formulaHere,
```

```

        data=murderT,
        grid=squareRaster(borderC, 30),
        covariates=covList,
        border=borderC, buffer=2000,
        prior = list(
            sd = c(lower = 0.2, upper = 2),
            range = c(lower = 2, upper=20)*1000),
        control.inla=list(strategy='gaussian')
    )
} else {
    resG = NULL
}

```

LGCP with penalised complexity prior

$pr(sd > 1) = 0.05$ and $pr(phi < 0.2) = 0.95$

```

if(requireNamespace("rgdal", quietly=TRUE) & requireNamespace("rgeos", quietly=TRUE) & r
    resP=lgcp(formulaHere, data=murderT,
        grid=squareRaster(borderC, 30),
        covariates=covList,
        border=borderC, buffer=2000,
        prior = list(
            sd = c(u=0.5, alpha=0.05),
            range = c(u=10*1000, alpha = 0.4)),
        control.inla = list(strategy='gaussian')
    )
} else {
    resP = NULL
}

```

LGCP with table priors

```

sdSeq = seq(0,4,len=501)
rangeSeq = seq(0,15*1000, len=501)
if(requireNamespace("rgdal", quietly=TRUE) & requireNamespace("rgeos", quietly=TRUE) & r
    resT=lgcp(formulaHere,
        data=murderT,
        grid=squareRaster(borderC, 30),
        covariates=covList,

```

```

        border=borderC, buffer=2000,
        prior = list(
            sd = cbind(sdSeq, dexp(sdSeq, 2)),
            range = cbind(rangeSeq, dexp(rangeSeq, 1/5000))
        )
        control.inla = list(strategy='gaussian')
    } else {
        resT = NULL
    }
}

```

Parameters

```

if(!is.null(resG$parameters))
  knitr::kable(resG$parameters$summary[,c(1,3,5)], digits=3)

```

```

if(!is.null(resP$parameters))
  knitr::kable(resP$parameters$summary[,c(1,3,5)], digits=3)

```

```

if(!is.null(resT$parameters))
  knitr::kable(resT$parameters$summary[,c(1,3,5)], digits=3)

```

Maps

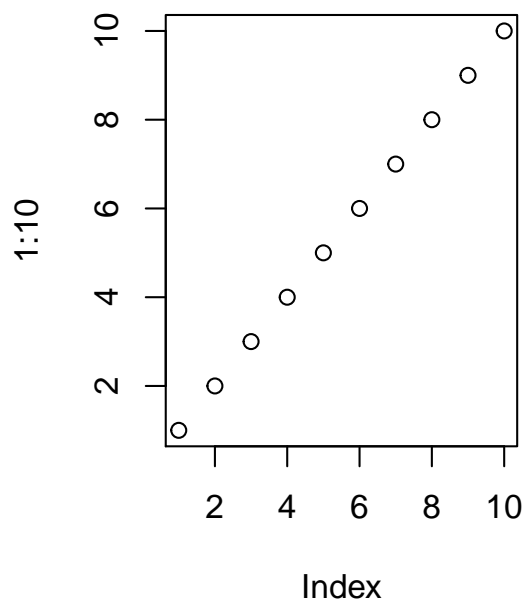


Figure 1: Priors and posteriors

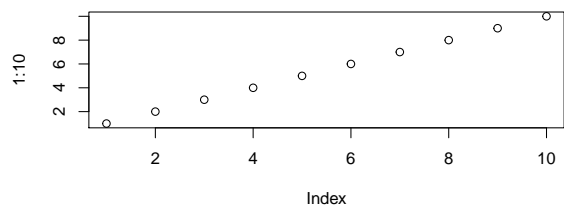


Figure 2: Random effects and fitted values