

LGCP with PC priors

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The data

```
library("geostatsp")
data('murder')
data('torontoPop')
murder = unwrap(murder)
torontoBorder = unwrap(torontoBorder)
torontoPdens = unwrap(torontoPdens)
torontoIncome = unwrap(torontoIncome)

covariates

theCrs = paste0("+proj=omerc +lat_0=43.7117469868935 +lonc=-79.3789787759006",
  " +alpha=-20 +gamma=0 +k=1 +x_0=0 +y_0=0 +datum=WGS84 +units=m +no_defs")
murderT = project(murder, theCrs)
borderT = project(torontoBorder, crs(murderT))
borderC = crop(borderT, ext(-12700, 7000, -7500, 3100))

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

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

LGCP with priors given by quantiles

gamma priors.

```
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'))

if(!is.null(resG$parameters)) {
  knitr::kable(resG$parameters$summary, digits=3)
}

```

	mean	sd	0.025quant	0.5quant	0.975quant	mode	kld	meanExp
(Intercept)	-4.310	3.542	-11.262	-4.312	2.654	-4.312	0	7.781
inc	-1.265	0.327	-1.908	-1.264	-0.623	-1.264	0	0.293
range/1000	1.690	0.298	1.194	1.660	2.364	1.593	NA	NA
sd	0.834	-0.016	0.688	0.802	0.943	0.809	NA	NA

LGCP with penalised complexity prior

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

```

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')
)

if(!is.null(resP$parameters)) {
  knitr::kable(resP$parameters$summary, digits=3)
}

```

	mean	sd	0.025quant	0.5quant	0.975quant	mode	kld	meanExp
(Intercept)	-4.428	3.527	-11.351	-4.430	2.507	-4.430	0	6.595
inc	-1.253	0.326	-1.894	-1.253	-0.614	-1.253	0	0.297
range/1000	1.723	0.306	1.215	1.692	2.414	1.623	NA	NA
sd	0.826	-0.015	0.679	0.794	0.937	0.801	NA	NA

LGCP with table priors

```

sdSeq = seq(0,4,len=501)
rangeSeq = seq(0,15*1000, len=501)

```

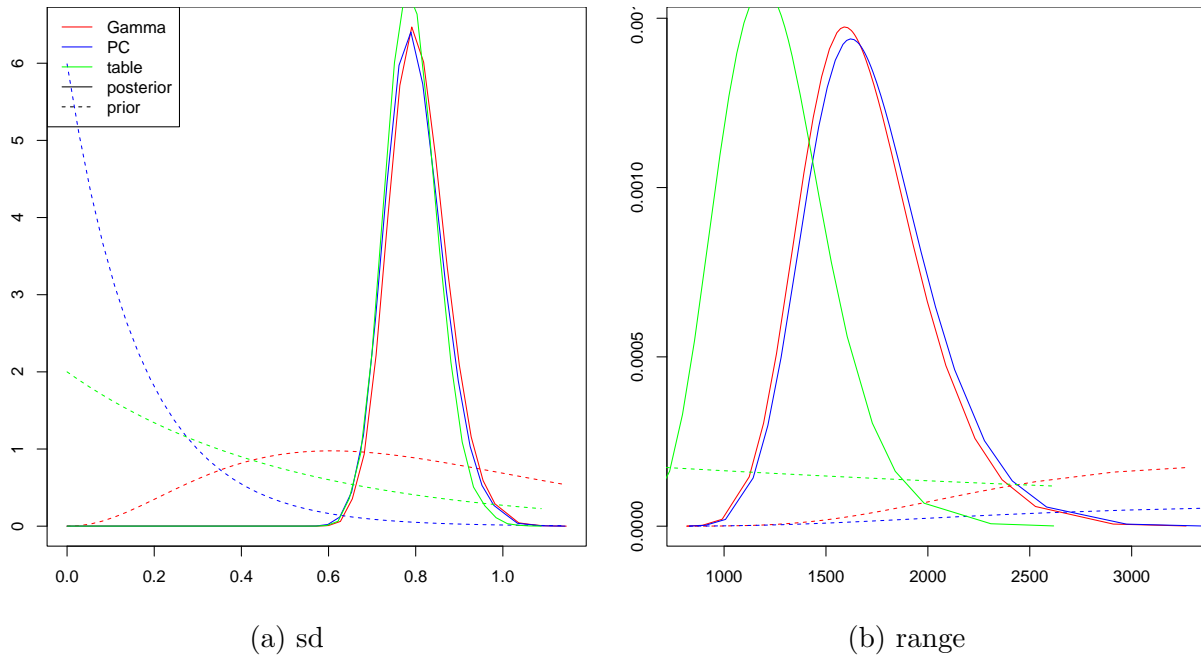


Figure 1: Priors and posteriors

```

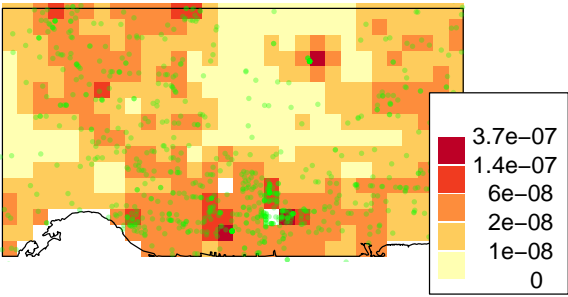
resT=lgcp(formulaHere,
  data=murderT,
  grid=squareRaster(borderC, 30),
  covariates=covList,
  border=borderC, buffer=2000,
  prior = list(
    sd = cbind(sdSeq, dexp(sdSeq, 2)),
    range = cbind(rangeSeq, dexp(rangeSeq, 1/5000))),
  control.inla = list(strategy='gaussian')
)

if(!is.null(resT$parameters)) {
  knitr::kable(resT$parameters$summary, digits=3)
}

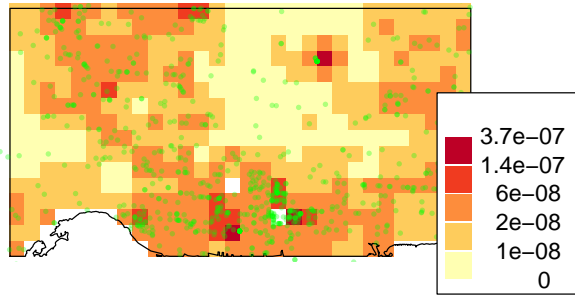
```

	mean	sd	0.025quant	0.5quant	0.975quant	mode	kld	meanExp
(Intercept)	-3.622	3.332	-10.186	-3.616	2.905	-3.615	0	7.151
inc	-1.328	0.308	-1.932	-1.328	-0.721	-1.328	0	0.274
range/1000	1.253	0.267	0.796	1.230	1.840	1.193	NA	NA
sd	0.818	-0.016	0.681	0.788	0.914	0.796	NA	NA

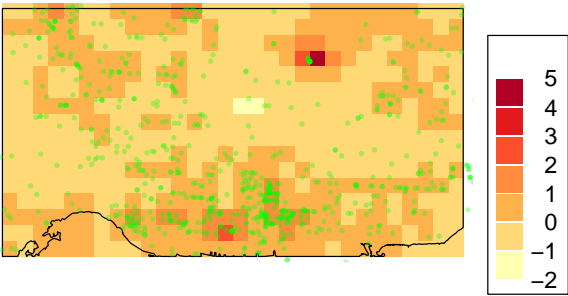
Maps



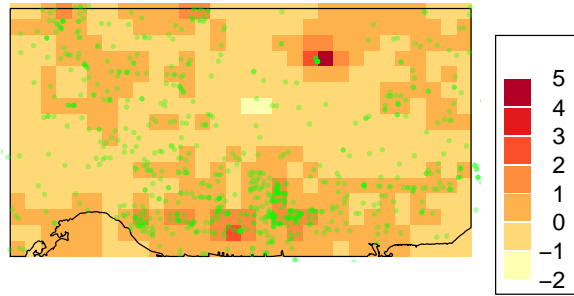
(a) gamma, fitted



(b) pc fitted



(c) gamma random



(d) pc random

Figure 2: Random effects and fitted values