

```

1  ## Set up
2  library(sp)
3  library(INLA)
4  library(inlabru)
5  library(raster)
6  library(dplyr)
7
8  ## Note that spatial objects "pts", "boundary", "mesh", and "comcov_pal",
9  ## and function for covariate "f.comcov" are as defined in the previous
10 ## section on Models 1-8.
11
12 bru_options_set(bru_verbose=3,
13 ## info printed while model is running...
14 control.compute=list(dic=TRUE,waic=TRUE,po=TRUE,cpo=TRUE))
15 ## compute scores for model assessment...
16
17 ## SPDE priors
18 point_matern <- inla.spde2.pcmatern(mesh,
19                                     prior.range=c(0.2,0.01),
20                                     prior.sigma=c(1,0.01))
21
22 mark_matern_4A <- inla.spde2.pcmatern(mesh,
23                                     prior.range=c(0.2,0.01),
24                                     prior.sigma=c(1,0.01))
25
26 mark_matern_4B <- inla.spde2.pcmatern(mesh,
27                                     prior.range=c(0.2,0.01),
28                                     prior.sigma=c(1.693147,0.01))
29
30 mark_matern_4C <- inla.spde2.pcmatern(mesh,
31                                     prior.range=c(0.2,0.01),
32                                     prior.sigma=c(0.3068529,0.01))
33
34 mark_matern_4D <- inla.spde2.pcmatern(mesh,
35                                     prior.range=c(0.4,0.01),
36                                     prior.sigma=c(1,0.01))
37
38 mark_matern_4E <- inla.spde2.pcmatern(mesh,
39                                     prior.range=c(0.4,0.01),
40                                     prior.sigma=c(1.693147,0.01))
41
42 mark_matern_4F <- inla.spde2.pcmatern(mesh,
43                                     prior.range=c(0.4,0.01),
44                                     prior.sigma=c(0.3068529,0.01))
45
46 mark_matern_4G <- inla.spde2.pcmatern(mesh,
47                                     prior.range=c(0.1,0.01),
48                                     prior.sigma=c(1,0.01))
49
50 mark_matern_4H <- inla.spde2.pcmatern(mesh,
51                                     prior.range=c(0.1,0.01),

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52         prior.sigma=c(1.693147,0.01))
53
54 mark_matern_4I <- inla.spde2.pcmatern(mesh,
55         prior.range=c(0.1,0.01),
56         prior.sigma=c(0.3068529,0.01))
57
58 ## Model 4A
59 cmp_4A <-
60   ~ -1 +
61   ## remove intercept; there are individual intercepts for each likelihood
62   point_field(coordinates,model=point_matern) +
63   ## field capturing spatial structure in point distribution
64   mark_field(coordinates,
65   ## field capturing spatiotemporal structure in mark distribution
66     group=ti,
67   ## group by temporal index
68     group_mapper=bru_mapper_index(3),
69   ## 3 months of data
70     model=mark_matern_4A,
71   ## using SPDE priors specified above
72     control.group=list(model="ar1")) +
73   ## AR1 temporal correlation structure
74   Inter_point(1) + Inter_mark(1) +
75   ## intercepts for each likelihood
76   scaling_latent() +
77   ## scaling parameter = interaction between point field and mark response
78   count_per_pop(f.comcov(x,y,ti),model="linear")
79   ## community covariate
80 point_lik_4A <- like("cp",
81   ## likelihood for point model
82     formula=coordinates ~ point_field + Inter_point,
83     include=c("point_field","Inter_point"),
84     data=pts,
85     domain=list(coordinates=mesh),
86     samplers=boundary)
87 mark_lik_4A <- like("poisson",
88   ## likelihood for mark model
89     formula=count ~ Inter_mark +
90     point_field*scaling_latent + mark_field +
91     count_per_pop,
92     include=c("Inter_mark","point_field","mark_field",
93       "count_per_pop","scaling_latent"),
94     data=pts)
95 fit_4A <- bru(cmp_4A,
96   point_lik_4A,
97   mark_lik_4A,
98   ## fit the model with both likelihoods
99     options=list(verbose=TRUE,
100   ## print info as model is running
101     E=pts$total_rooms))
102   ## sampling effort provided by no. of rooms in hall
103
104   ## Repeat, substituting in 4B-4I for 4A.

```