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library(sp)
library(ggplot2)
library(dplyr)

##
## Attaching package: 'dplyr'
##
## The following object is masked from 'package:stats':
##
##   filter
##
## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union

devtools::load_all("~/Wollongong/pkgs/FRK",
                    export_all = FALSE)

## Loading FRK

opts_FRK$set("progress",FALSE)
set.seed(1)

## Get data
data(meuse)
meuse$fs <- 1
coordinates(meuse) = ~x+y # change into an sp object

## Set up BAUs
data(meuse.grid)
gridded(meuse.grid) = ~x + y
HexPts <- spsample(meuse.grid,
                   type = "hexagonal",
                   cellsize = 50)

HexPols <- HexPoints2SpatialPolygons(HexPts)
HexPols_df <- SpatialPolygonsDataFrame(HexPols,
                                       cbind(over(HexPols,meuse.grid),
                                             coordinates(HexPts)))

HexPols_df$fs <- 1
#HexPols_df <- subset(HexPols_df,!is.na(dist))

# Generate observations with large spatial support
HexPts2 <- spsample(meuse.grid,
                   type = "hexagonal",
                   cellsize = 100)

HexPols2 <- HexPoints2SpatialPolygons(HexPts2)
HexPols_df2 <- SpatialPolygonsDataFrame(HexPols2,

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                                over(HexPols2,meuse) %>%
                                select(zinc)) %>%

subset(!is.na(zinc))

## Generate basis functions
G <- auto_basis(m = plane(),data=meuse,nres = 2,
               prune=10,type = "Gaussian")

## Loading required package: splancs
##
## Spatial Point Pattern Analysis Code in S-Plus
##
## Version 2 - Spatial and Space-Time analysis

## [1] "Number of basis at resolution 1 = 6"
## [1] "Number of basis at resolution 2 = 27"

## Setup SRE model
f <- log(zinc) ~ 1
S <- SRE(f,list(meuse,HexPols_df2),BAUs = HexPols_df, G,est_error=T)

## [1] "Binned data in 1.258 seconds"

## Warning in map_data_to_BAUs(data[[i]], BAUs, av_var = av_var, variogram.formula
= f, : Not accounting for multiple data in the same grid box during
variogram estimation. Need to see how to do this with gstat

## [1] "sigma2e estimate = 0.0152413306239711"

## Warning in map_data_to_BAUs(data[[i]], BAUs, av_var = av_var, variogram.formula
= f, : Not accounting for multiple data in the same grid box during
variogram estimation. Need to see how to do this with gstat

## [1] "sigma2e estimate = 0.00784995366538696"
## [1] "Averaging over polygons"

S <- SRE.fit(S,n_EM = 10,print_lik=T)

## [1] "Maximum EM iterations reached"

## Warning in SRE.fit(S, n_EM = 10, print.lik = T): Ignoring constants
in log-likelihood computation

## Point predict
HexPols_df <- SRE.predict(S,use_centroid = T)

X <- SpatialPolygonsDataFrame_to_df(sp_polys = HexPols_df,
                                   vars = c("mu","var"))

```

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## Joining by: "id"

g1 <- EmptyTheme() +
  geom_polygon(data=X,aes(x,y,fill=mu,group=id),
    colour="light grey") +
  scale_fill_distiller(palette="Spectral",trans="reverse") +
  geom_point(data=data.frame(meuse),
    aes(x,y,fill=log(zinc)),
    colour="black",
    pch=21, size=3) +
  coord_fixed()

g2 <- EmptyTheme() +
  geom_polygon(data=X,aes(x,y,fill=sqrt(var),group=id),
    colour="light grey") +
  scale_fill_distiller(palette="Spectral",trans="reverse") +
  #geom_point(data=data.frame(meuse),
  #  aes(x,y,colour="black",pch=21, size=3) +
  coord_fixed()

print(g1)
print(g2)

```





