Lansing dataset

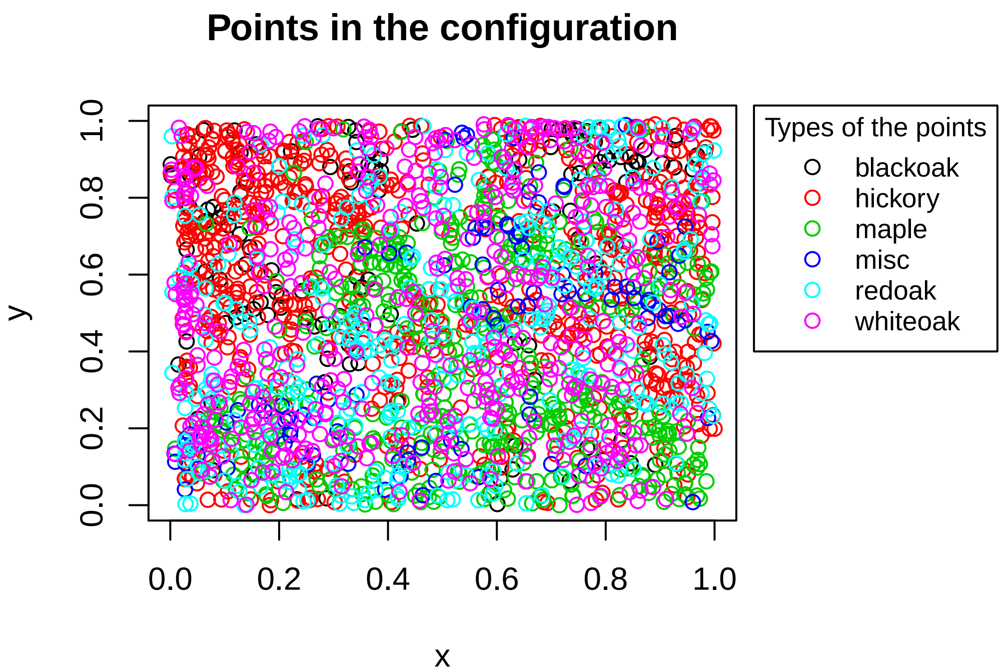
```r
library(ppjsdm)
#> Registered S3 method overwritten by 'spatstat':
#>   method     from
#>   print.boxx cli
library(spatstat)
#> Loading required package: spatstat.data
#> Loading required package: nlme
#> Loading required package: rpart
#>
#> spatstat 1.64-0       (nickname: 'Susana Distancia')
#> For an introduction to spatstat, type 'beginner'
library(plot.matrix)
remove(list = ls())

set.seed(1)
```

This vignette explains how to use the `ppjsdm` package with the Lansing dataset from `spatstat`. Locations and botanical classification of trees in Lansing Woods. The data come from an investigation of a 924 ft x 924 ft (19.6 acre) plot in Lansing Woods, Clinton County, Michigan USA by D.J. Gerrard. The data give the locations of 2251 trees and their botanical classification (into hickories, maples, red oaks, white oaks, black oaks and miscellaneous trees). The original plot size (924 x 924 feet) has been rescaled to the unit square. We begin by loading the data with all species.

```r
configuration <- as.Configuration(lansing)
window <- Rectangle_window(c(0, 1), c(0, 1))
```

The point configuration is plotted below.

```r
par(mar = c(5, 4, 4, 13) + 0.1)
plot(configuration, window = window)
```



We provide a series of ranges for the interaction radii, and let the fitting function calibrate the model.

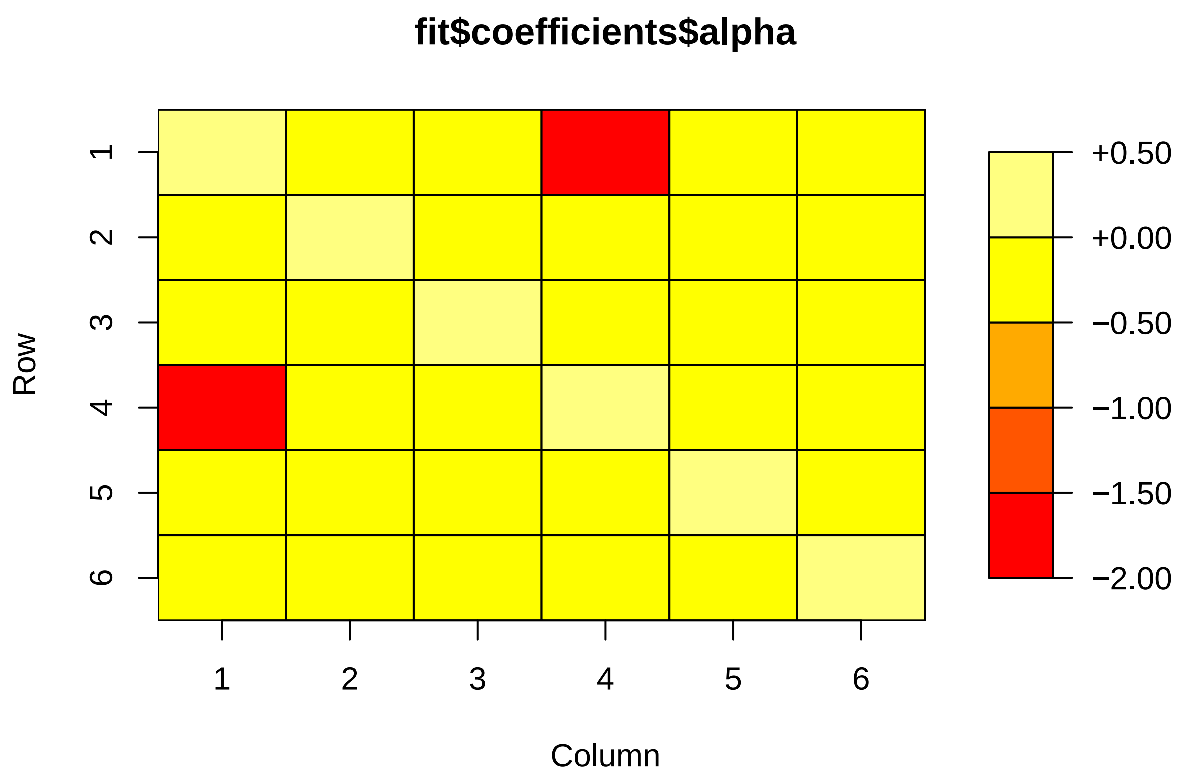
```
short_range <- c(0, 0.1)
medium_range <- c(0, 0.1)
long_range <- c(0, 0.1)
model <- "square_bump"
medium_range_model <- "square_exponential"
max_points <- 2300
saturation <- 2
```

We can now call the fitting function.

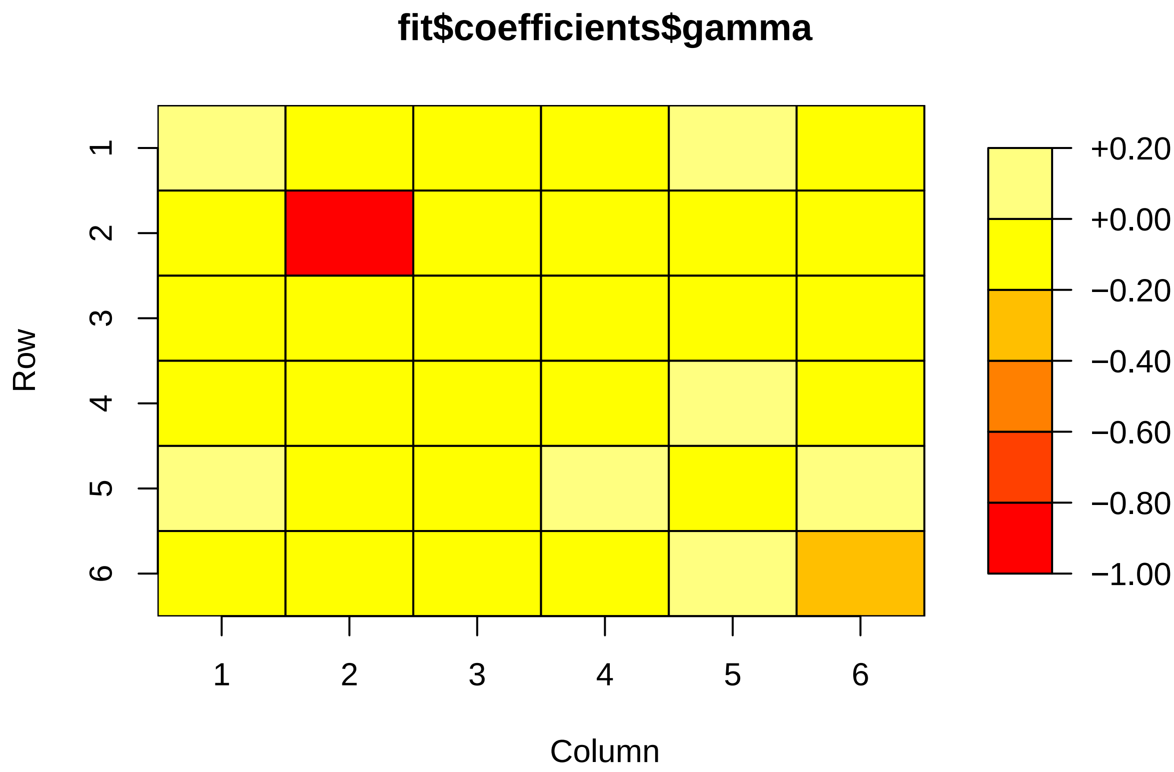
```
fit <- ppjsdm::gibbsm(configuration,
                      window = window,
                      model = model,
                      medium_range_model = medium_range_model,
                      short_range = short_range,
                      medium_range = medium_range,
                      long_range = long_range,
                      use_glmnet = FALSE,
                      saturation = saturation)
#> $beta0
#> [1] 5.346877 9.120945 7.698007 5.833715 6.131222 7.531548
#>
#> $alpha
#>             [,1]        [,2]        [,3]        [,4]        [,5]       [,6]
#> [1,]  0.44297585 -0.19536416 -0.05044836 -1.65627706 -0.11744448 -0.1251657
#> [2,] -0.19536416  0.28584512 -0.33102232 -0.06811803 -0.03519916 -0.2557920
#> [3,] -0.05044836 -0.33102232  0.17259538 -0.08599776 -0.16804401 -0.2996821
#> [4,] -1.65627706 -0.06811803 -0.08599776  0.40507482 -0.08827118 -0.2336651
```

```
#> [5,] -0.11744448 -0.03519916 -0.16804401 -0.08827118  0.37010398 -0.1631700
#> [6,] -0.12516574 -0.25579196 -0.29968206 -0.23366510 -0.16317004  0.1115005
#>
#> $gamma
#>             [,1]        [,2]        [,3]        [,4]        [,5]        [,6]
#> [1,]  0.18515997 -0.03362409 -0.08204719 -0.01915029  0.02311876 -0.01967370
#> [2,] -0.03362409 -0.84426130 -0.12670347 -0.12412923 -0.09729594 -0.13969351
#> [3,] -0.08204719 -0.12670347 -0.08267535 -0.01917978 -0.09529191 -0.01601843
#> [4,] -0.01915029 -0.12412923 -0.01917978 -0.08746171  0.08039983 -0.01227676
#> [5,]  0.02311876 -0.09729594 -0.09529191  0.08039983 -0.08426499  0.07191265
#> [6,] -0.01967370 -0.13969351 -0.01601843 -0.01227676  0.07191265 -0.23337036
#>
#> $beta
#>
#> [1,]
#> [2,]
#> [3,]
#> [4,]
#> [5,]
#> [6,]
# print(summary(fit))
print(fit$coefficients)
#> $beta0
#> [1] 5.346877 9.120945 7.698007 5.833715 6.131222 7.531548
#>
#> $alpha
#>             [,1]        [,2]        [,3]        [,4]        [,5]       [,6]
#> [1,]  0.44297585 -0.19536416 -0.05044836 -1.65627706 -0.11744448 -0.1251657
#> [2,] -0.19536416  0.28584512 -0.33102232 -0.06811803 -0.03519916 -0.2557920
#> [3,] -0.05044836 -0.33102232  0.17259538 -0.08599776 -0.16804401 -0.2996821
#> [4,] -1.65627706 -0.06811803 -0.08599776  0.40507482 -0.08827118 -0.2336651
#> [5,] -0.11744448 -0.03519916 -0.16804401 -0.08827118  0.37010398 -0.1631700
#> [6,] -0.12516574 -0.25579196 -0.29968206 -0.23366510 -0.16317004  0.1115005
#>
#> $gamma
#>             [,1]        [,2]        [,3]        [,4]        [,5]        [,6]
#> [1,]  0.18515997 -0.03362409 -0.08204719 -0.01915029  0.02311876 -0.01967370
#> [2,] -0.03362409 -0.84426130 -0.12670347 -0.12412923 -0.09729594 -0.13969351
#> [3,] -0.08204719 -0.12670347 -0.08267535 -0.01917978 -0.09529191 -0.01601843
#> [4,] -0.01915029 -0.12412923 -0.01917978 -0.08746171  0.08039983 -0.01227676
#> [5,]  0.02311876 -0.09729594 -0.09529191  0.08039983 -0.08426499  0.07191265
#> [6,] -0.01967370 -0.13969351 -0.01601843 -0.01227676  0.07191265 -0.23337036
#>
#> $beta
#>
#> [1,]
#> [2,]
#> [3,]
#> [4,]
#> [5,]
#> [6,]
#>
#> $short_range
```

```
#>             [,1]       [,2]       [,3]       [,4]       [,5]       [,6]
#> [1,] 0.07444553 0.01848937 0.01848937 0.01848937 0.01848937 0.01848937
#> [2,] 0.01848937 0.05236264 0.01848937 0.01848937 0.01848937 0.01848937
#> [3,] 0.01848937 0.01848937 0.05300206 0.01848937 0.01848937 0.01848937
#> [4,] 0.01848937 0.01848937 0.01848937 0.05788318 0.01848937 0.01848937
#> [5,] 0.01848937 0.01848937 0.01848937 0.01848937 0.03711721 0.01848937
#> [6,] 0.01848937 0.01848937 0.01848937 0.01848937 0.01848937 0.05348590
#>
#> $medium_range
#>             [,1]       [,2]       [,3]       [,4]       [,5]       [,6]
#> [1,] 0.12150129 0.04616099 0.04616099 0.04616099 0.04616099 0.04616099
#> [2,] 0.04616099 0.10146591 0.04616099 0.04616099 0.04616099 0.04616099
#> [3,] 0.04616099 0.04616099 0.08164518 0.04616099 0.04616099 0.04616099
#> [4,] 0.04616099 0.04616099 0.04616099 0.09988675 0.04616099 0.04616099
#> [5,] 0.04616099 0.04616099 0.04616099 0.04616099 0.09664879 0.04616099
#> [6,] 0.04616099 0.04616099 0.04616099 0.04616099 0.04616099 0.09060254
#>
#> $long_range
#>             [,1]       [,2]       [,3]       [,4]       [,5]       [,6]
#> [1,] 0.17474748 0.07726485 0.07726485 0.07726485 0.07726485 0.07726485
#> [2,] 0.07726485 0.15110349 0.07726485 0.07726485 0.07726485 0.07726485
#> [3,] 0.07726485 0.07726485 0.12925319 0.07726485 0.07726485 0.07726485
#> [4,] 0.07726485 0.07726485 0.07726485 0.12810336 0.07726485 0.07726485
#> [5,] 0.07726485 0.07726485 0.07726485 0.07726485 0.13989240 0.07726485
#> [6,] 0.07726485 0.07726485 0.07726485 0.07726485 0.07726485 0.13563162
par(mar=c(5.1, 5.1, 4.1, 4.1))
plot(fit$coefficients$alpha)
```




```r
plot(fit$coefficients$gamma)
```




```r
print(fit$aic)
#> [1] 10451.88
print(fit$bic)
#> [1] 10803.99
```

We may then plot the corresponding Papangelou conditional intensity.

```r
# parameters <- fit$coefficients
# plot_papangelou(window = window,
#                 configuration = configuration,
#                 type = 1,
#                 model = model,
#                 medium_range_model = medium_range_model,
#                 alpha = parameters$alpha,
#                 lambda = parameters$lambda,
#                 beta = matrix(0, 6, 0),
#                 gamma = parameters$gamma,
#                 covariates = list(),
#                 short_range = parameters$short_range,
#                 medium_range = parameters$medium_range,
#                 long_range = parameters$long_range,
#                 saturation = saturation,
#                 max_points = max_points)
```