Quan_Techniques_Week_3

Auriel Fournier

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```
library(spatstat)
```

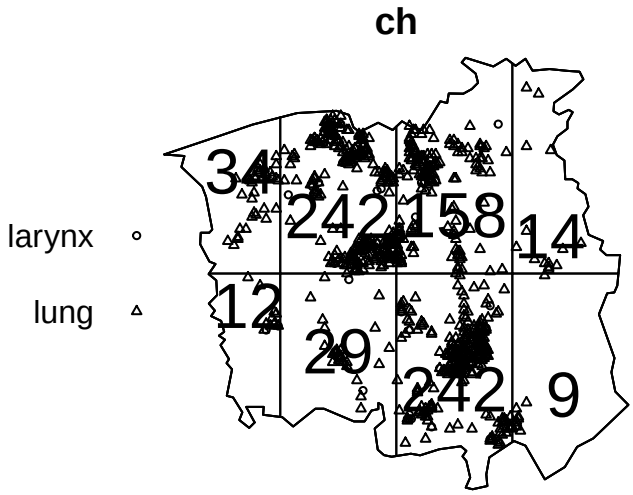
```
## Warning: package 'spatstat' was built under R version 3.0.3
```

```
##
## spatstat 1.38-1       (nickname: 'Le Hardi')
## For an introduction to spatstat, type 'beginner'
```

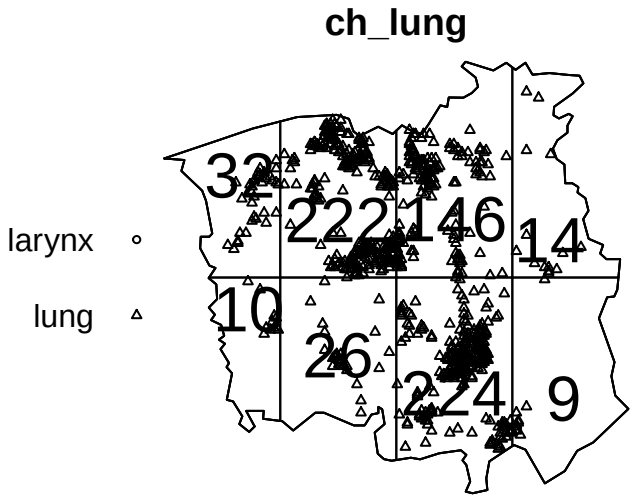
```
data(chorley)

ch <- unique.ppp(chorley)
ch_lung <- ch[ch$marks=="lung",]
ch_lar <- ch[ch$marks=="larynx",]

lambda <- summary(ch)$intensity
lambda
```

```
## [1] 2.348
```

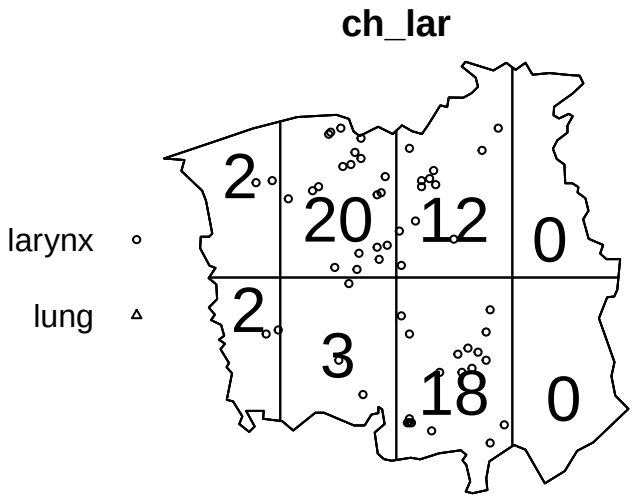
```
q <- quadratcount(ch, nx=4,ny=2)
q_lung <- quadratcount(ch_lung, nx=4,ny=2)
q_lar <- quadratcount(ch_lar, nx=4,ny=2)

plot(ch, cex=0.5)
plot(q, add=T, cex=2)
```



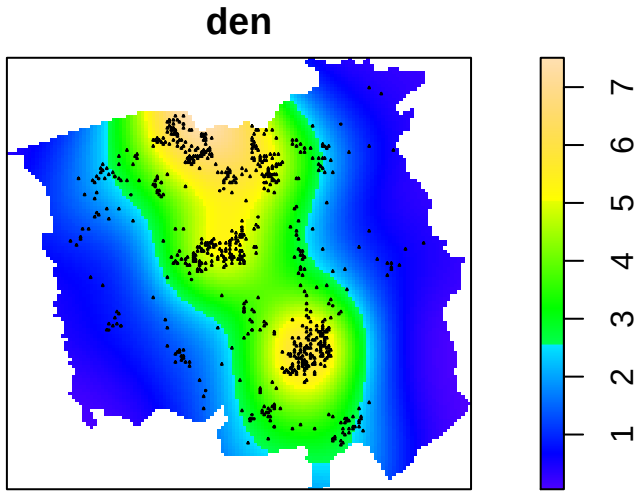

```
plot(ch_lung, cex=0.5)
plot(q_lung, add=T, cex=2)
```



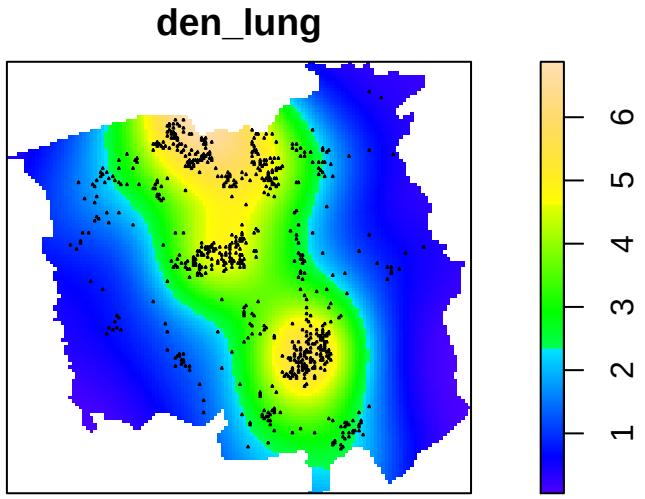

```
plot(ch_lar, cex=0.5)
plot(q_lar, add=T, cex=2)
```



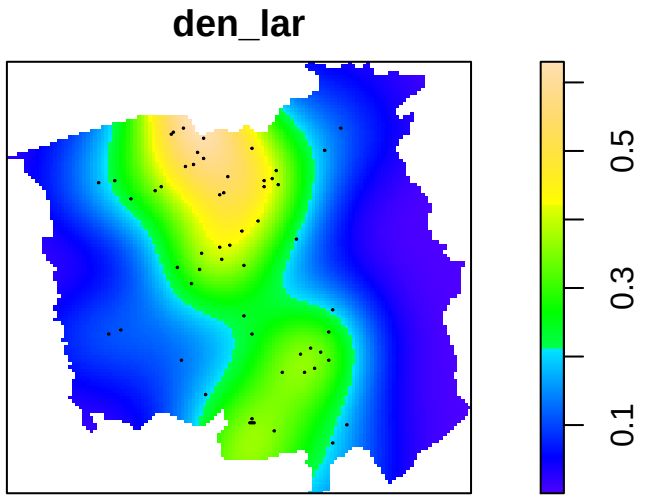

```
#so the quadrats are not the same size, so we need to correct for that

den <- density.ppp(ch, sigma=2, kernel='gaussian')
den_lung <- density.ppp(ch_lung, sigma=2, kernel='gaussian')
den_lar <- density.ppp(ch_lar, sigma=2, kernel='gaussian')

plot(den)
plot(ch, add=T, cex=.1)
```



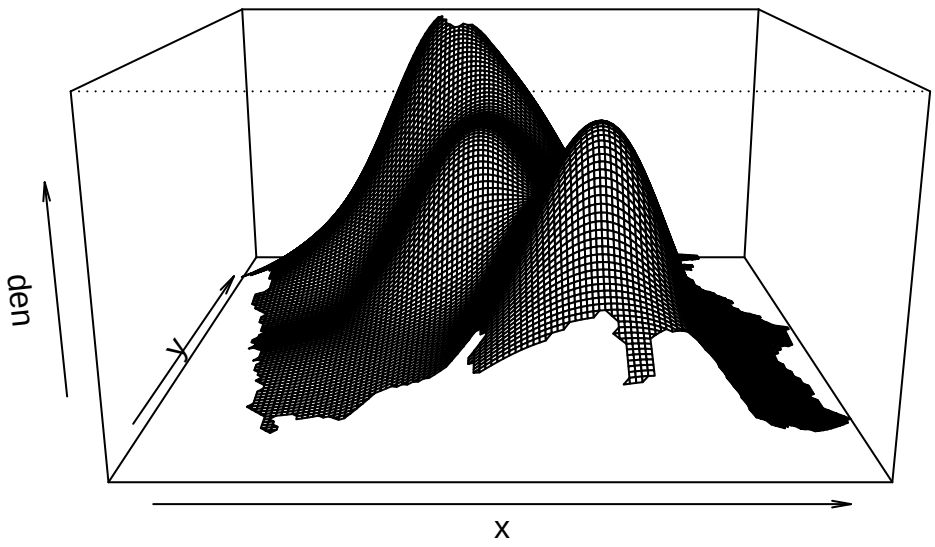

```
plot(den_lung)
plot(ch_lung, add=T, cex=.1)
```



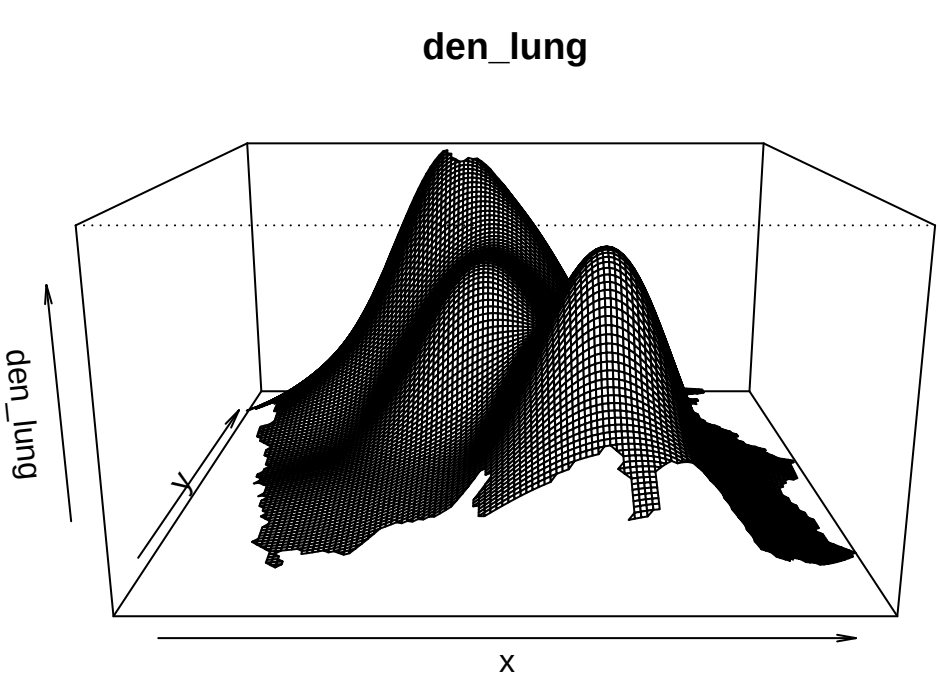

```
plot(den_lar)
plot(ch_lar, add=T, cex=.1)
```



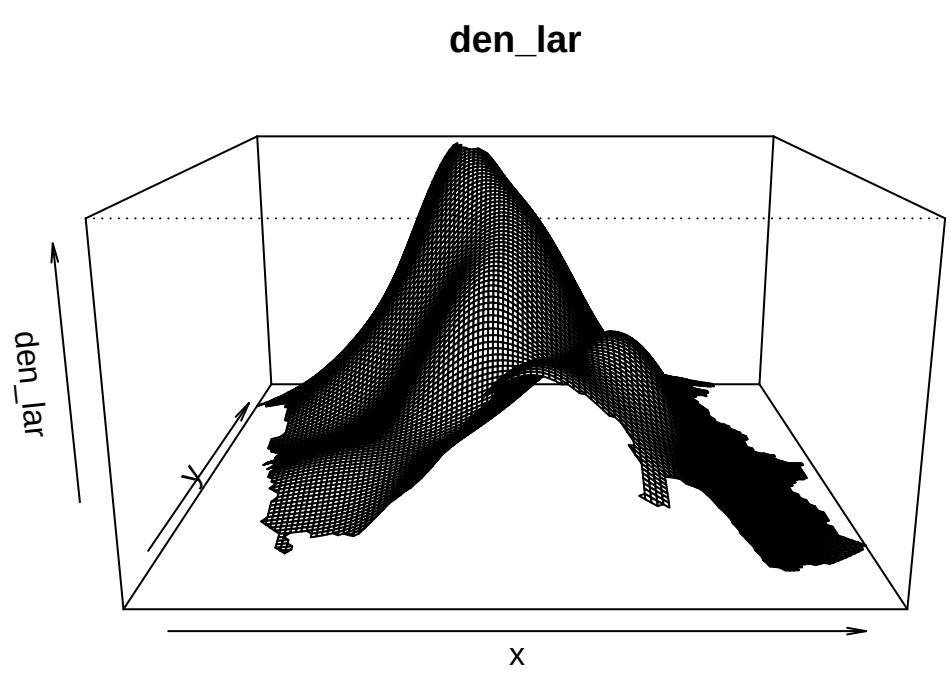

```
persp(den)
```



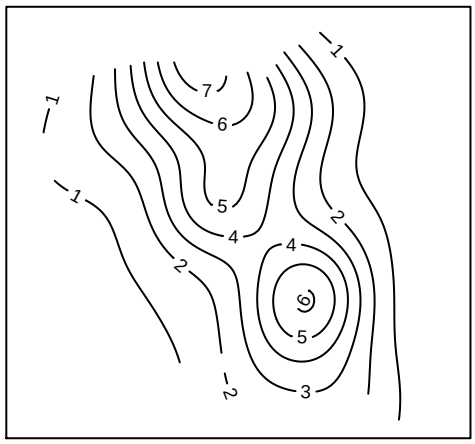

```
persp(den_lung)
```



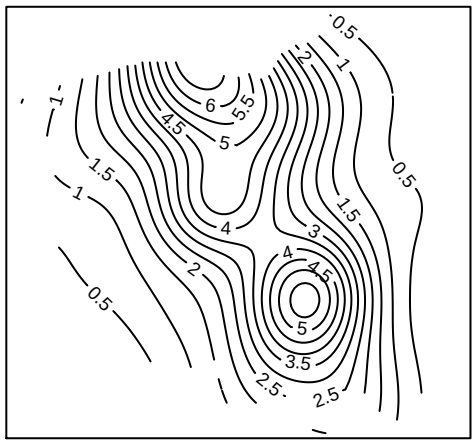

```
persp(den_lar)
```



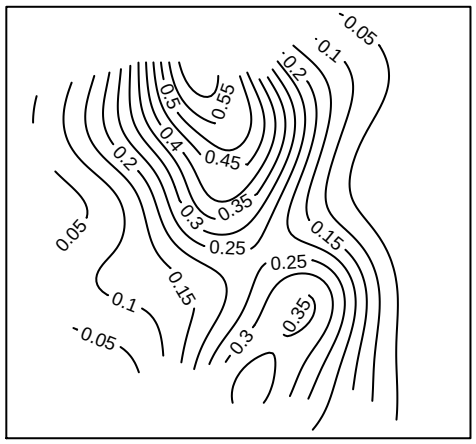

```
contour(den)
```




```
contour(den_lung)
```



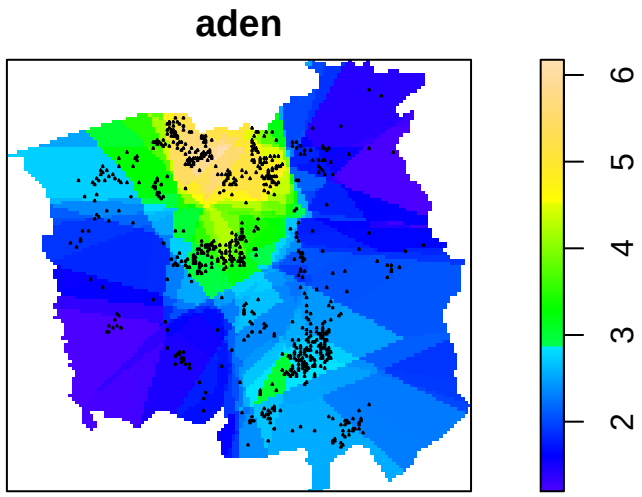

```
contour(den_lar)
```




```
aden <- adaptive.density(ch, f=0.01, nrep=10)
```

```
## Computing 10 intensity estimates...

##
##      PLEASE NOTE:  The components "delsgs" and "summary" of the
##  object returned by deldir() are now DATA FRAMES rather than
##  matrices (as they were prior to release 0.0-18).
##  See help("deldir").
##
##      PLEASE NOTE: The process that deldir() uses for determining
##  duplicated points has changed from that used in version
##  0.0-9 of this package (and previously). See help("deldir").

## 1, 2, 3, 4, 5, 6, 7, 8, 9,  10.
## Done.
```

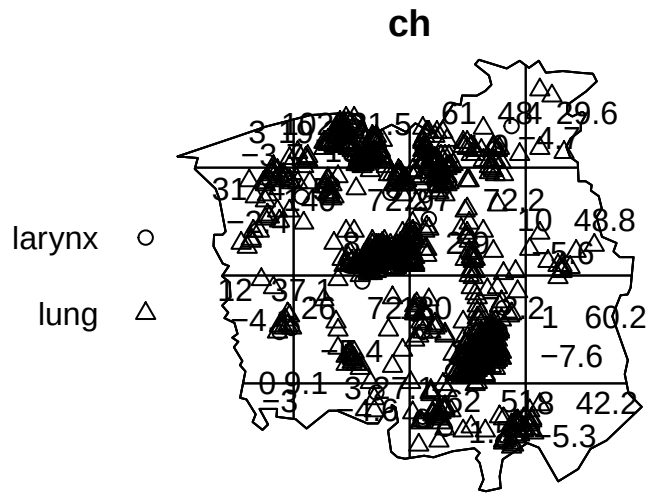
```
plot(aden)
plot(ch, add=T, cex=0.1)
```




```
this.window <- ch$window
csr.test <- quadrat.test(ch, nx=4, ny=4, method="Chisq")
csr.test
```

```
##
##  Chi-squared test of CSR using quadrat counts
##  Pearson X2 statistic
##
## data:  ch
## X2 = 633, df = 15, p-value < 2.2e-16
## alternative hypothesis: two.sided
##
## Quadrats: 16 tiles (irregular windows)
```

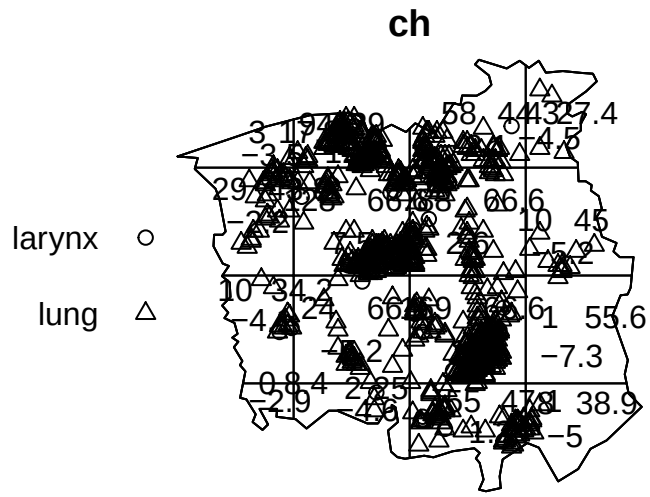
```
plot(ch, color='blue')
plot(csr.test, add=T, color="red")
```




```
csr.test_lung <- quadrat.test(ch_lung, nx=4, ny=4, method="Chisq")
csr.test_lung
```

```
##
##  Chi-squared test of CSR using quadrat counts
##  Pearson X2 statistic
##
## data:  ch_lung
## X2 = 588.5, df = 15, p-value < 2.2e-16
## alternative hypothesis: two.sided
##
## Quadrats: 16 tiles (irregular windows)
```

```
plot(ch, color='blue')
plot(csr.test_lung, add=T, color="red")
```



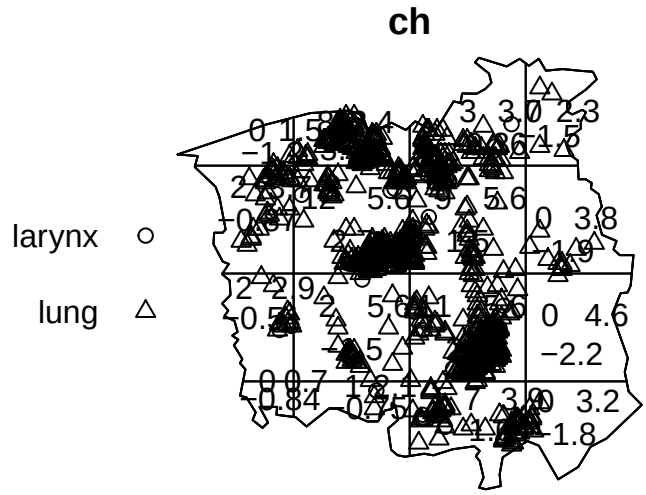

```
csr.test_lar <- quadrat.test(ch_lar, nx=4, ny=4, method="Chisq")
```

```
## Warning: Some expected counts are small; chi^2 approximation may be
## inaccurate
```

```
csr.test_lar
```

```
##
##  Chi-squared test of CSR using quadrat counts
##  Pearson X2 statistic
##
## data:  ch_lar
## X2 = 50.26, df = 15, p-value = 2.181e-05
## alternative hypothesis: two.sided
##
## Quadrats: 16 tiles (irregular windows)
```

```
plot(ch, color='blue')
plot(csr.test_lar, add=T, color="red")
```




```
csr.test
```

```
##
##  Chi-squared test of CSR using quadrat counts
##  Pearson X2 statistic
##
## data:  ch
## X2 = 633, df = 15, p-value < 2.2e-16
## alternative hypothesis: two.sided
##
## Quadrats: 16 tiles (irregular windows)
```

```
csr.test_lung
```

```
##
##  Chi-squared test of CSR using quadrat counts
##  Pearson X2 statistic
##
## data:  ch_lung
## X2 = 588.5, df = 15, p-value < 2.2e-16
## alternative hypothesis: two.sided
##
## Quadrats: 16 tiles (irregular windows)
```

```
csr.test_lar
```

```
##
##  Chi-squared test of CSR using quadrat counts
##  Pearson X2 statistic
##
## data:  ch_lar
## X2 = 50.26, df = 15, p-value = 2.181e-05
## alternative hypothesis: two.sided
##
## Quadrats: 16 tiles (irregular windows)
```

based on these results we reject the null hypothesis that these points exhibit complete spatial randomness, but this doesn't tell us what is driving the distribution of the points, just that they aren't CSR.

first order interactions

second order interactions