Zooplankton

Exercise 2

Model seasonal variation of Zooplankton densities. The data is taken from the article Hierachical generalized additive models in ecology: an introduction with mgcv (https://peerj.com/preprints/27320/) (GitHub-Repo (https://github.com/eric-pedersen/mixed-effect-gams)) and was originally collected by Richard Lathrop approximately bi-weekly from 1976 to 1994 (Article (https://link.springer.com/chapter/10.1007/978-1-4612-4410-3_8).

Setup

```
require(mgcv)
```

```
## Loading required package: mgcv
```

```
## Loading required package: nlme
```

```
## This is mgcv 1.8-28. For overview type 'help("mgcv-package")'.
```

```
require(gratia)
```

```
## Loading required package: gratia
```

Data

```
prj = '/home/scharmueller/Projects/workshop-sefs11'
zop = read.csv(file.path(prj, '/data/zooplankton_example.csv'))
head(zop)
```

```
##   day year    lake              taxon density density_adj min_density
## 1  10 1980 Mendota       C. sphaericus   28000         2.9        1000
## 2  10 1980 Mendota   Calanoid copepods    5000         0.6        2000
## 3  10 1980 Mendota  Cyclopoid copepods       0         0.1        3000
## 4  10 1980 Mendota        D. mendotae    6000         0.7        1000
## 5  10 1980 Mendota        D. thomasi 1867000       186.8        2000
## 6  10 1980 Mendota       K. cochlearis  116000        11.7        2000
##   density_scaled
## 1    -0.27400738
## 2    -1.28909028
## 3    -2.41458699
## 4     0.24808375
## 5     1.30285978
## 6    -0.09197228
```

```
summary(zop)
```

```
##       day             year          lake                        taxon
##  Min.   : 10.0   Min.   :1976   Kegonsa: 656   D. mendotae       : 793
##  1st Qu.:130.0   1st Qu.:1980   Mendota:2079   L. siciloides     : 755
##  Median :194.0   Median :1983   Menona :2367   Calanoid copepods : 754
##  Mean   :191.3   Mean   :1984   Waubesa: 746   D. thomasi        : 754
##  3rd Qu.:258.0   3rd Qu.:1987                  C. sphaericus     : 752
##  Max.   :362.0   Max.   :1994                  Cyclopoid copepods: 750
##                                                (Other)           :1290
##     density        density_adj       min_density    density_scaled
##  Min.   :      0   Min.   :  0.10   Min.   :1000   Min.   :-3.55411
##  1st Qu.:   4000   1st Qu.:  0.50   1st Qu.:1000   1st Qu.:-0.77963
##  Median :  24000   Median :  2.50   Median :2000   Median : 0.03233
##  Mean   : 114562   Mean   : 11.56   Mean   :1864   Mean   : 0.00000
##  3rd Qu.:  86000   3rd Qu.:  8.70   3rd Qu.:2000   3rd Qu.: 0.74271
##  Max.   :7112000   Max.   :711.30   Max.   :3000   Max.   : 3.12516
##
```

Variables

day = day of the year year lake = name of the lake (categorical) taxon = zooplankton taxon density = zooplankton density (count) density_adj = zooplankton density adjusted density_scaled = zooplankton density scaled (to the area and volume of the net)

Task

Estimate seasonal variability of Cyclopoid copepods in different lakes

- use density_adj as a response
- Which distributional family would you pick?
- use the variable day to model possible seasonl patterns
- which smoothing basis wold you use for seasonal data?
- account for the different lakes in the model
- as random effects
- as factor-smooth interaction (using the `bs = 'fs'` argument)
- as factor-smooth interaction (using the `by =` argument)
- account for inter-year variability in each lake
- make year a factor

- Pick the best model