# exploring 6 21

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## Paper LDA model and LDATS changepoint

Load Christensen 2018 data and source paper functions:

```
library(topicmodels)
source('previous-work/AIC_model_selection.R')
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
source('previous-work/LDA-distance.R')



dat <- read.csv('paper_dat.csv', stringsAsFactors = F)

dates <- dat[,1]
dat <- dat[,2:22]
```

Run paper LDA model:

```
seeds = 2*seq(200)

# repeat LDA model fit and AIC calculation with a bunch of different seeds to test robustness of the an
best_ntopic = repeat_VEM(dat,
                         seeds,
                         topic_min=2,
                         topic_max=6)
```

Note that `repeat_VEM` returns, for each seed, the number of topics that produces the lowest AIC.

Histogram of best # of topics:

```
# histogram of how many seeds chose how many topics
hist(best_ntopic$k,breaks=c(0.5,1.5,2.5,3.5,4.5,5.5,6.5,7.5,8.5,9.5),xlab='best # of topics', main='')
```

Four topics is overwhelmingly the best (it is the best for the most seeds).

```
ntopic = 4
# ======================================================================
# 2b. how different is species composition of 4 community-types when LDA is run with different seeds?
# ======================================================================
# get the best 100 seeds where 4 topics was the best LDA model
seeds_4topics = best_ntopic %>%
```

```
  filter(k == 4) %>%
  arrange(aic) %>%
  head(100) %>%
  pull(SEED)


# best seed for 4 is 206
# choose seed with highest log likelihood for all following analyses
#    (also produces plot of community composition for 'best' run compared to 'worst')
best_seed = calculate_LDA_distance(dat,seeds_4topics, k =4)
mean_dist = unlist(best_seed)[2]
max_dist = unlist(best_seed)[3]

best_seed
mean_dist
max_dist
```

Run the LDA model with the selected seed and number of topics.

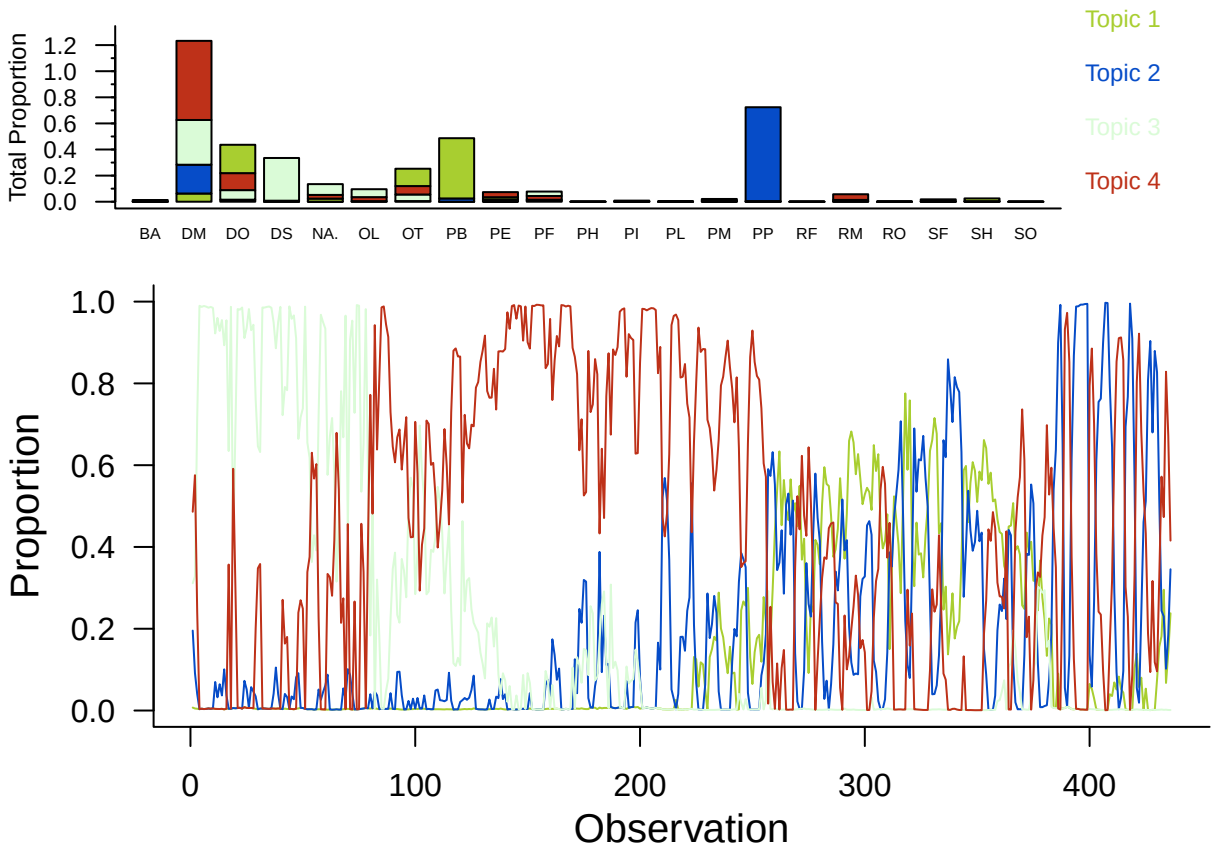
```
ldamodel= LDA(dat,ntopics, control = list(seed = SEED),method='VEM')
```

Run the LDATS changepoint model with this LDA model.

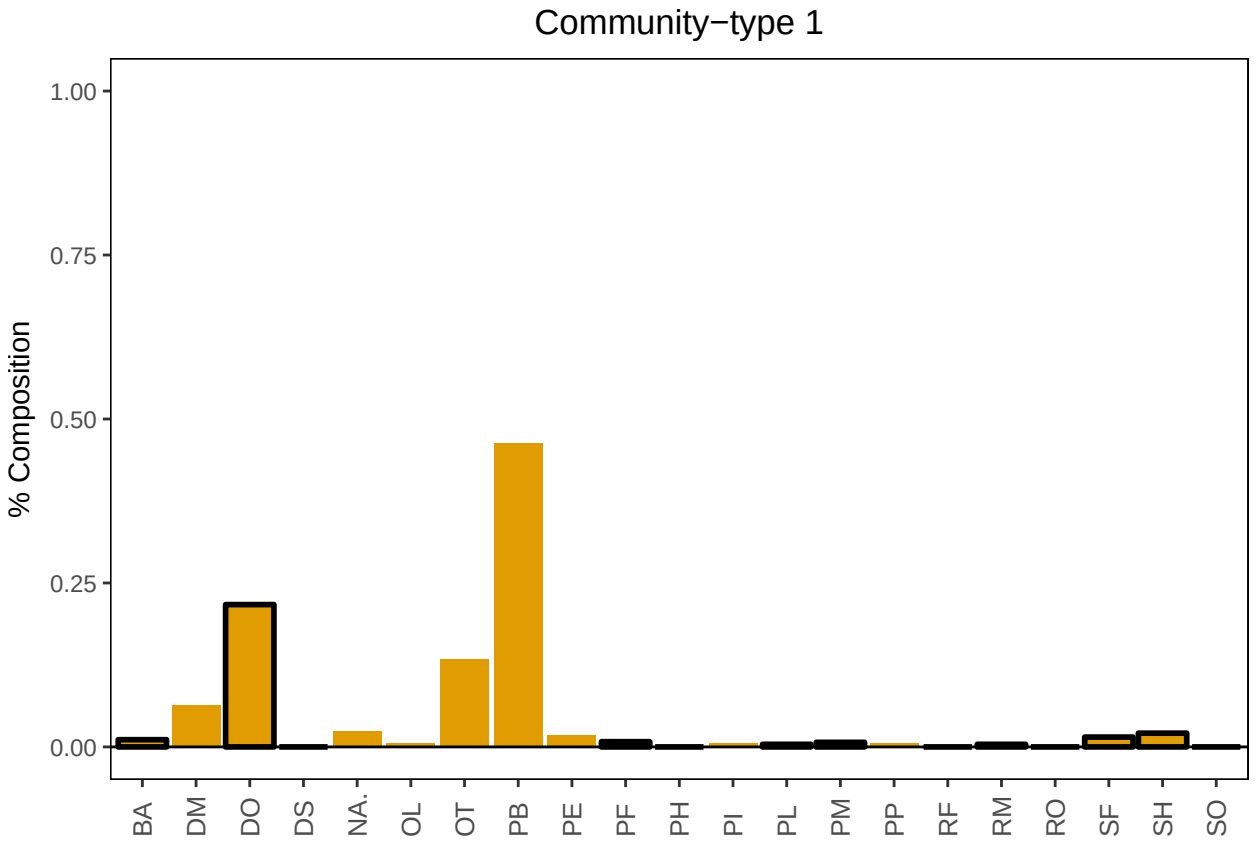
Don't actually run this because it is time-consuming. Save and reload the changepoint model to look at it.

```
library(LDATS)
source('functions/run_changepoint_model.R')
dat$date <- as.Date(dates)

changepoint = run_rodent_cpt(rodent_data = dat, selected = ldamodel,
                             changepoints_vector = c(2, 3, 4, 5, 6))

save(dat, ldamodel, changepoint, file = 'models/paperLDA_LDATScpt.Rdata')
```

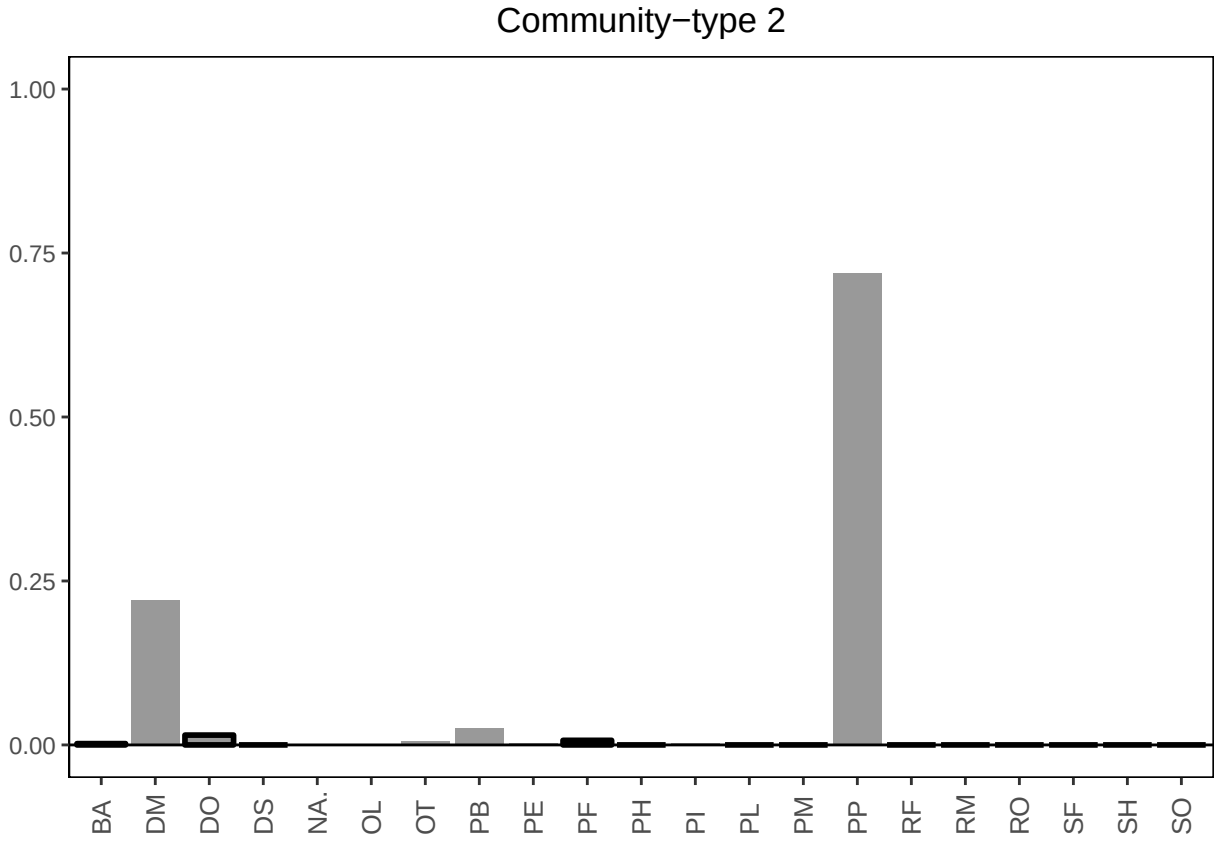
Look at results.


Topic 1
Topic 2
Topic 3
Topic 4
Total Proportion
1.2
1.0
0.8
0.6
0.4
0.2
0.0
BA DM DO DS NA. OL OT PB PE PF PH PI PL PM PP RF RM RO SF SH SO
Proportion
1.0
0.8
0.6
0.4
0.2
0.0
0 100 200 300 400
Observation

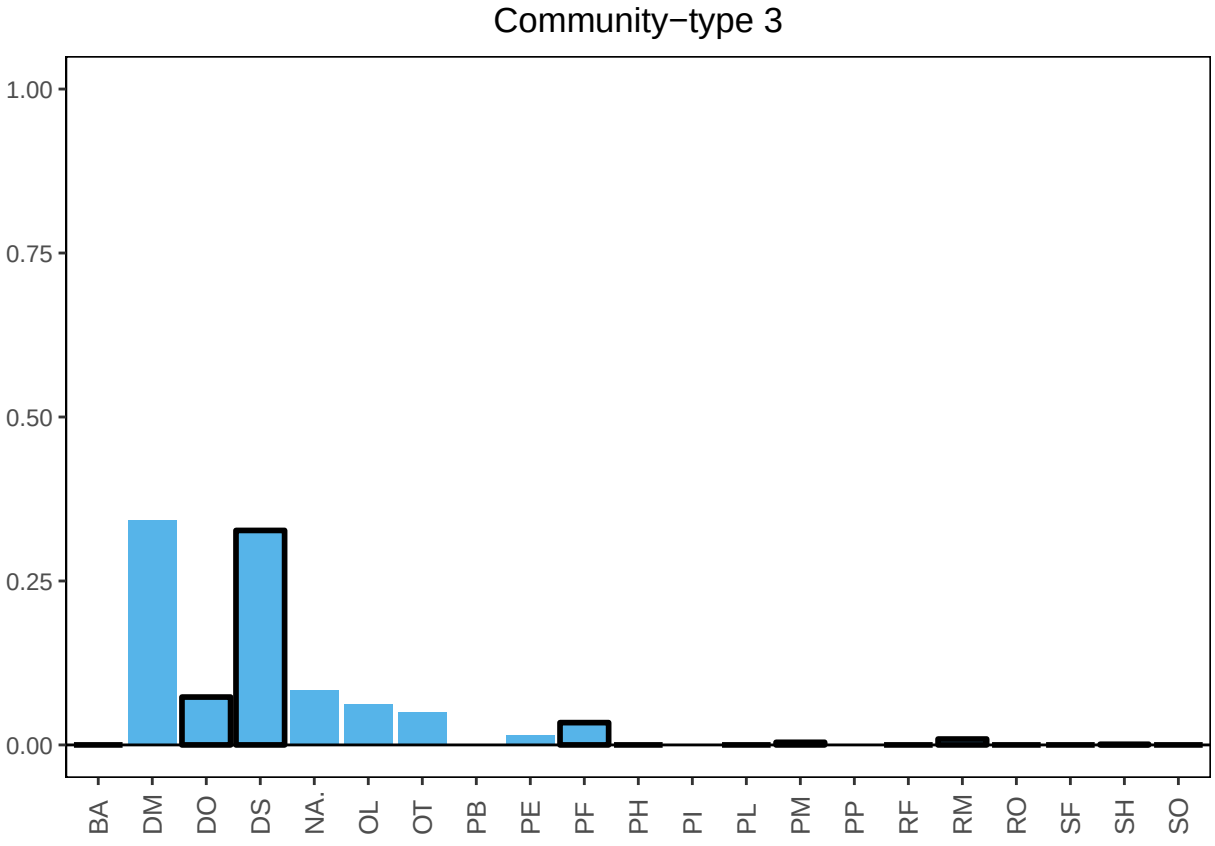
```
## [[1]]
```


Community−type 1
% Composition
1.00
0.75
0.50
0.25
0.00
BA
DM
DO
DS
NA.
OL
OT
PB
PE
PF
PH
PI
PL
PM
PP
RF
RM
RO
SF
SH
SO

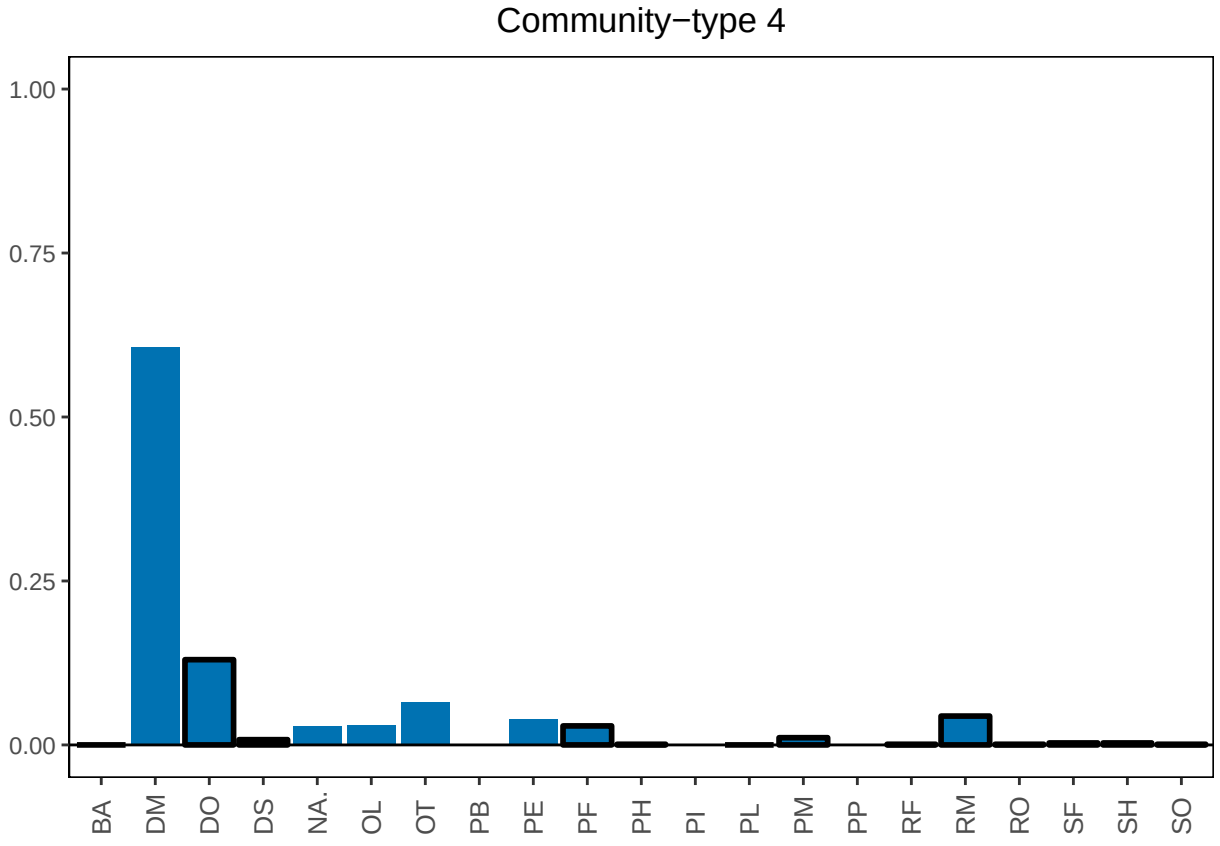
```
##
## [[2]]
```


Community−type 2
1.00
0.75
0.50
0.25
0.00
BA
DM
DO
DS
NA.
OL
OT
PB
PE
PF
PH
PI
PL
PM
PP
RF
RM
RO
SF
SH
SO

```
##
## [[3]]
```


Community−type 3
1.00
0.75
0.50
0.25
0.00
BA
DM
DO
DS
NA.
OL
OT
PB
PE
PF
PH
PI
PL
PM
PP
RF
RM
RO
SF
SH
SO

```
##
## [[4]]
```




```
##                  Mean Median Lower Upper    SD MCMCerr   AC10       ESS
## Changepoint_1 111.36    113    60   156 29.34  0.2949 0.2666  611.1389
## Changepoint_2 251.46    252   219   265 19.11  0.1921 0.0709 1398.7034
```

```
## $acceptance_rates
## [1] 0.6055556 0.8178788 0.9042424 0.9305051 0.9397980 0.9419192
##
## $swapping_rates
## [1] 0.3133333 0.5123232 0.7335354 0.8718182 0.9144444
##
## $trip_counts
## [1] 124 107 108 116 131 148
##
## $trip_rates
## [1] 0.01252525 0.01080808 0.01090909 0.01171717 0.01323232 0.01494949
```

### Looking at various chains in changepoint models

This will take more memory, because I need to fiddle around with the select_changepoint_model procedure.