Tasks

Introduction to structural equation modeling and mixed models in 

Day 9: SEM

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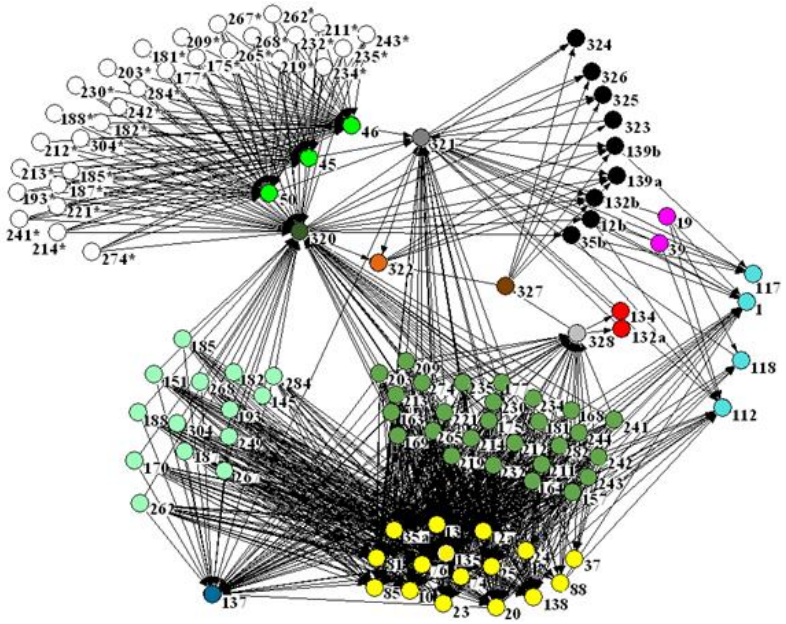
Day 9 Task 1

Effects of land use on arthropod food webs in grasslands



Food web length (1,2,3)

235 grasslands

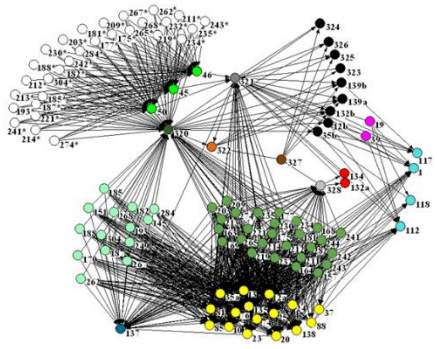
Grazing type
(“sheep”, “cattle”, or “mixed grazing”)

```
read.csv("Data/Food_web_data_2.csv")

'data.frame': 235 obs. of  5 variables:
 $ Gr_type    : chr  "sheep" "sheep" "sheep" ...
 $ soil_C     : num  1.336 1.631 1.577 ...
 $ plant_sr   : num  5.07 28.39 24.52 ...
 $ plant_biom: num  185 207 224 238 203 ...
 $ FW.length : int  1 1 1 1 1 1 1 1 1 1 ...
```

Day 9 Task 1

Effects of land use on food webs in grasslands



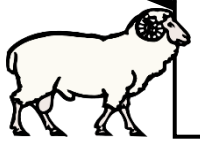
Food-web length
(1, 2, 3)

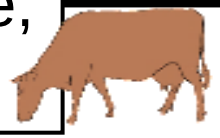
Plant
biomass

Plant species
richness

Soil
organic C

Grazing
(sheep, cattle,
mixed)





Day 9 Task 1

Effects of land use on food webs in grasslands

`Gr_type` (grazing type) is your exogenous nominal categorical variables. Test **`Gr_type`** (as a part of the SEM model on fig. 1) using marginal means in ***`piecewiseSEM`***.

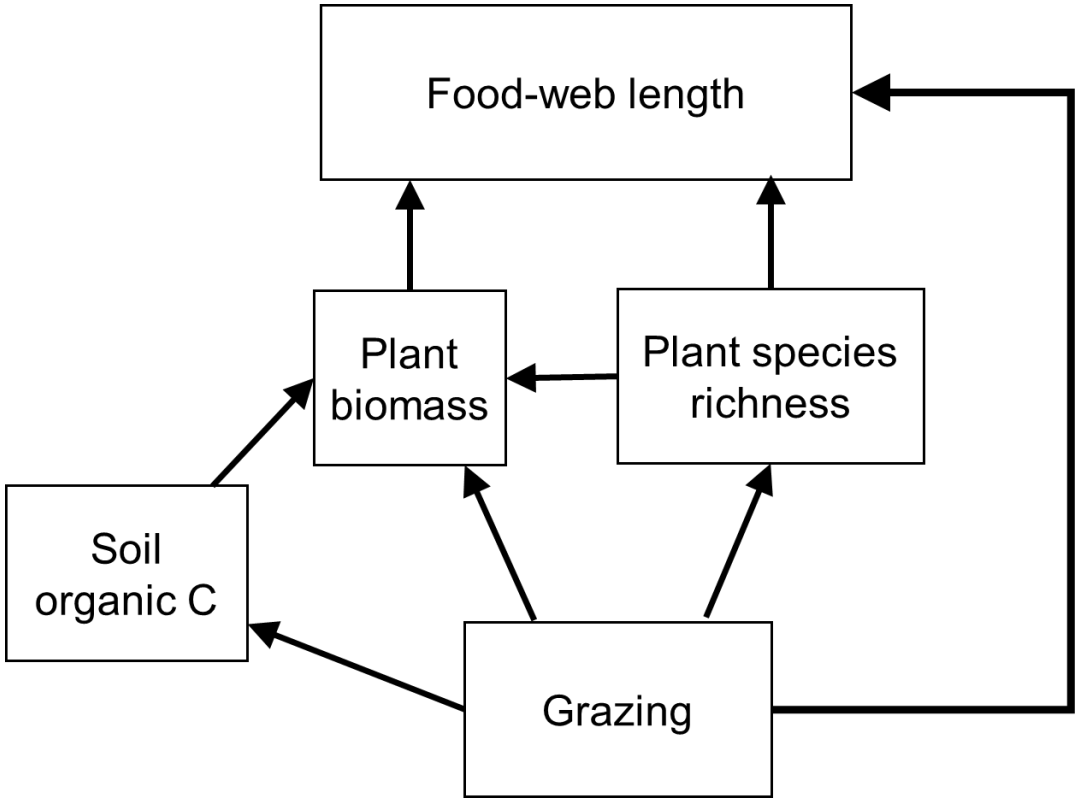


fig. 1

Day 9 Task 2

The Effects of Grazing on Finnish Coastal Meadows

Photo: Jorma Pessa

```
# meadow data
library(piecewiseSEM)
data(meadows)

> str(meadows)
'data.frame': 354 obs. of  4 variables:
 $ grazed: int  1 1 1 1 1 1 1 1 1 1 ...
 $ mass  : num  461.6 704.8 1278.8 76.4 ...
 $ elev  : num  19.2 18.8 12.5 38.2 37.4 ...
 $ rich  : int  6 2 1 6 14 12 6 10 10 17 ...
```

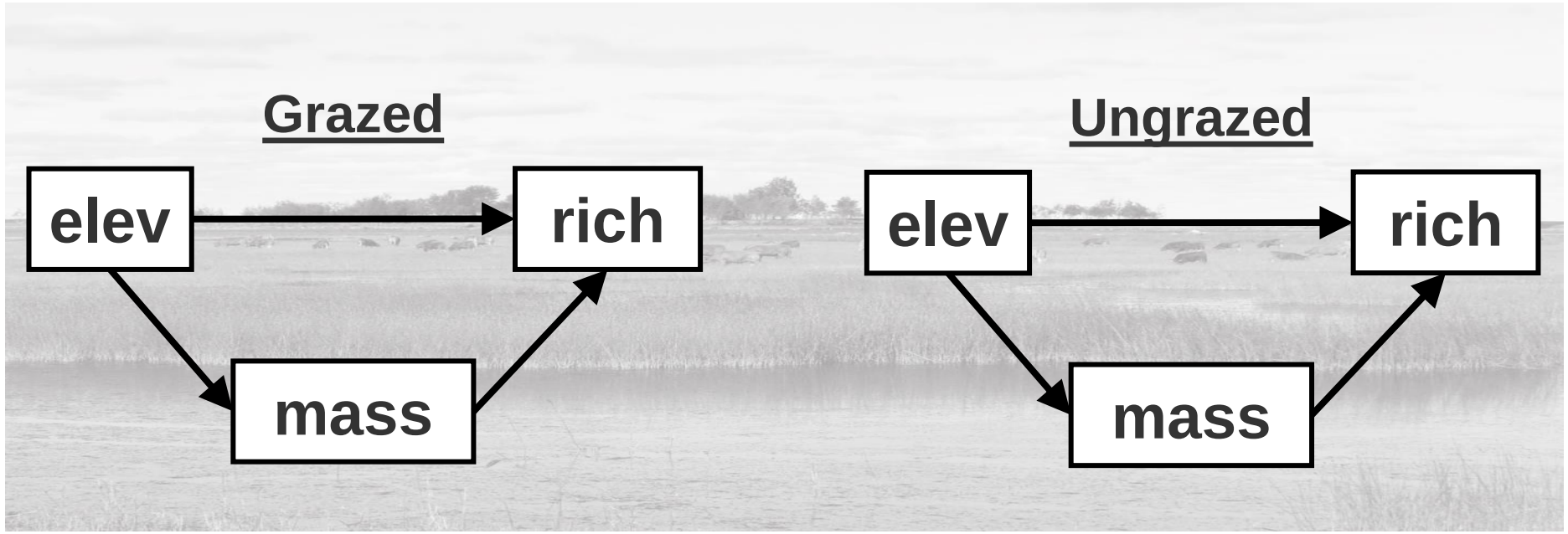
grazed is our grouping variable

Data:

Jutila, H. (1997) Vascular plant species richness in grazed and ungrazed coastal meadows, SW Finland. - Ann. Bot. Fenn. 34:245-263.

Grace, J.B. and Jutila, H. (1999) The relationship between species density and community biomass in grazed and ungrazed coastal meadows. Oikos, 85:398-408.

Hypothetical model

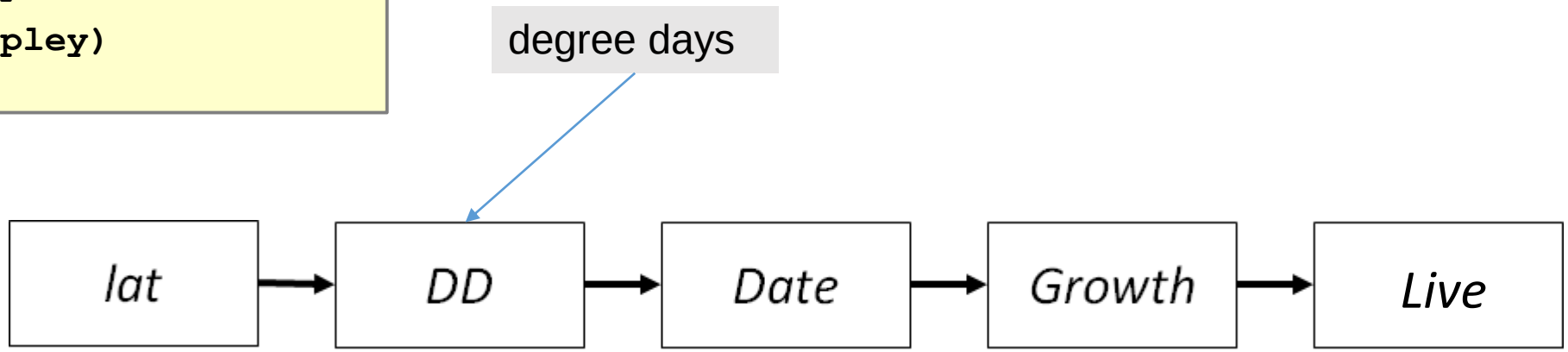


Task:

Perform the multigroup analysis for this hypothetical SEM model using *piecewiseSEM*

Day 9 Task 3


```
# Shipley data
library(piecewiseSEM)
data(shipley)
```



- Dataset: predicting latitude effect on survival of a tree species
- Repeated measures on 5 trees at 20 sites from 1970-2006
- Live (0/1) influenced by phenology (degree days until bud break, Julian days until bud break), size (stem diameter growth)

Day 9 Task 3


```
# Shipley data
library(piecewiseSEM)
data(shipley)
> str(shipley)
'data.frame': 1900 obs. of  9 variables:
 $ site    : int  1 1 1 1 1 1 1 1 1 1 ...
 $ tree    : int  1 2 3 4 5 1 2 3 4 5 ...
 $ lat     : num  40.4 40.4 40.4 40.4 40.4 ...
 $ year    : int  1970 1970 1970 1970 1970 1972 1972 1972 1972
1972 ...
 $ Date    : num  115 118 116 111 121 ...
 $ DD      : num  161 159 160 161 157 ...
 $ Growth  : num  61.4 43.8 44.7 48.2 50 ...
 $ Survival: num  1 0.843 0.944 0.957 0.976 ...
 $ Live    : int  1 1 1 1 1 1 1 1 1 1 ...
```

Day 9 Task 3

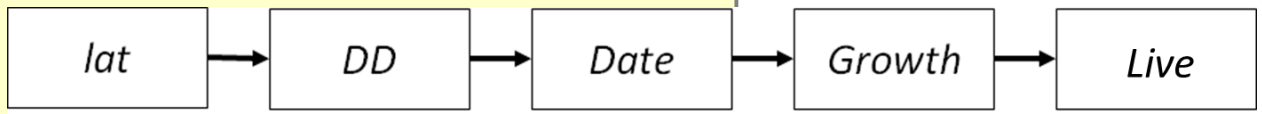

```
library(nlme)
library(lme4)

 lme(DD ~ lat, random = ~ 1 | site / tree, na.action = na.omit,
      data = shipley),

  lme(Date ~ DD, random = ~ 1 | site / tree, na.action = na.omit,
      data = shipley),

  lme(Growth ~ Date, random = ~ 1 | site / tree, na.action = na.omit,
      data = shipley),

  glmer(Live ~ Growth + (1 | site) + (1 | tree),
        family = binomial(link = "logit"), data = shipley)
```



Task: Use these sub-models in piecewiseSEM as a part of the SEM model shown above. Think about the study design and explain the results.