WK14

2025-10-01

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.2     v tibble    3.2.1
## v lubridate 1.9.4     v tidyr     1.3.1
## v purrr     1.0.4
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(readxl)
library(lubridate)
library(janitor)
```

```
##
## Attaching package: 'janitor'
##
## The following objects are masked from 'package:stats':
##
##     chisq.test, fisher.test
```

```
library(purrr)
library(readr)
library(ggthemes)
library(ggeffects)
library(lme4)
```

```
## Loading required package: Matrix
##
## Attaching package: 'Matrix'
##
## The following objects are masked from 'package:tidyr':
##
##     expand, pack, unpack
```

```
library(dplyr)
library(ggplot2)
```

mixed-effect model by including time as fixed-effect for 2022 to 2023

```r
pl_lt <- read.csv("Data/pl_lt.csv")%>% mutate(survey_date = as.Date(survey_date))
pl_lt <- pl_lt %>%
  arrange(survey_date) %>%
  mutate(
    week = as.integer((as.numeric(survey_date - min(survey_date)) %/% 7) + 1)
  )
pl_lt$week_f <- as.factor(pl_lt$week)
pl_lt_t.lmer <- lmer(
  daily_growth ~ mean_light_ly_day2 + week_f + (1 + mean_light_ly_day2 | pop),
  data = pl_lt, REML = TRUE
)
```

```
## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv, :
## Model failed to converge with max|grad| = 0.00386559 (tol = 0.002, component 1)
```

```r
summary  (pl_lt_t.lmer)
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula:
## daily_growth ~ mean_light_ly_day2 + week_f + (1 + mean_light_ly_day2 |
##     pop)
##    Data: pl_lt
##
## REML criterion at convergence: 1514
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.3992 -0.2904 -0.0344  0.1617  8.5293
##
## Random effects:
##  Groups   Name               Variance Std.Dev. Corr
##  pop      (Intercept)        0.021778 0.14757
##           mean_light_ly_day2 0.005514 0.07426  0.93
##  Residual                    0.104609 0.32343
## Number of obs: 2415, groups:  pop, 23
##
## Fixed effects:
##                    Estimate Std. Error t value
## (Intercept)        -1.58499    0.67842  -2.336
## mean_light_ly_day2 -0.97751    0.41948  -2.330
## week_f4             0.46153    0.20795   2.219
## week_f6             0.19899    0.07034   2.829
## week_f8             0.35664    0.12189   2.926
## week_f9             0.49926    0.16618   3.004
## week_f10            1.35911    0.55324   2.457
## week_f11            1.78597    0.65000   2.748
## week_f12            2.29228    0.86555   2.648
## week_f13            2.45306    0.95200   2.577
## week_f14            2.26076    0.85953   2.630
## week_f15            1.21908    0.46417   2.626
## week_f19            2.95864    1.10718   2.672
## week_f20            2.17889    0.88721   2.456
## week_f23            2.70139    1.17280   2.303
```

```
## week_f24            2.65765    1.19964   2.215
## week_f25            2.52601    1.15117   2.194
## week_f26            2.37249    1.11809   2.122

##
## Correlation matrix not shown by default, as p = 18 > 12.
## Use print(x, correlation=TRUE)  or
##     vcov(x)        if you need it

## optimizer (nloptwrap) convergence code: 0 (OK)
## Model failed to converge with max|grad| = 0.00386559 (tol = 0.002, component 1)
```

mixed-effect model for 2023

```
plant_with_light <- read.csv("Data/plant_with_light.csv")%>% mutate(survey_date = as.Date(survey_date))
plant_with_light <- plant_with_light %>%
  arrange(survey_date) %>%
  mutate(
    week = as.integer((as.numeric(survey_date - min(survey_date)) %/% 7) + 1)
  )
plant_with_light$week_f <- as.factor(plant_with_light$week)
growth_light_time.lmer <- lmer(
  daily_growth ~ weekly_avg_SlrW2 + week_f+ (1 + weekly_avg_SlrW2 | parent_pop),
  data = plant_with_light, REML = TRUE
)
```

```
## fixed-effect model matrix is rank deficient so dropping 1 column / coefficient
```

```
summary(growth_light_time.lmer)
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: daily_growth ~ weekly_avg_SlrW2 + week_f + (1 + weekly_avg_SlrW2 |
##     parent_pop)
##    Data: plant_with_light
##
## REML criterion at convergence: -6485.7
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.3260 -0.4646  0.0153  0.4323  8.3895
##
## Random effects:
##  Groups     Name             Variance  Std.Dev. Corr
##  parent_pop (Intercept)      0.0015546 0.03943
##             weekly_avg_SlrW2 0.0002439 0.01562  0.08
##  Residual                    0.0188483 0.13729
## Number of obs: 5870, groups:  parent_pop, 22
##
## Fixed effects:
##                   Estimate Std. Error t value
## (Intercept)       0.027737   0.009445   2.937
## weekly_avg_SlrW2  0.023057   0.004142   5.566
```

```
## week_f4          -0.036448   0.006790  -5.368
## week_f5          -0.015946   0.006879  -2.318
## week_f6           0.015386   0.006684   2.302
## week_f7          -0.030544   0.006592  -4.633
## week_f8          -0.010443   0.006706  -1.557
## week_f9          -0.018093   0.007002  -2.584
## week_f10          0.024039   0.010594   2.269
## week_f12         -0.004559   0.009789  -0.466
##
## Correlation of Fixed Effects:
##             (Intr) w__SW2 wek_f4 wek_f5 wek_f6 wek_f7 wek_f8 wek_f9 wk_f10
## wkly_vg_SW2 -0.043
## week_f4     -0.276  0.187
## week_f5     -0.275  0.192  0.412
## week_f6     -0.261  0.128  0.381  0.380
## week_f7     -0.248  0.082  0.357  0.354  0.347
## week_f8     -0.253  0.109  0.368  0.366  0.353  0.341
## week_f9     -0.261  0.164  0.389  0.389  0.362  0.341  0.351
## week_f10    -0.195  0.187  0.305  0.306  0.271  0.244  0.259  0.286
## week_f12    -0.236  0.276  0.376  0.378  0.324  0.283  0.306  0.349  0.307
## fit warnings:
## fixed-effect model matrix is rank deficient so dropping 1 column / coefficient
```