Hierarchical linear models exercise

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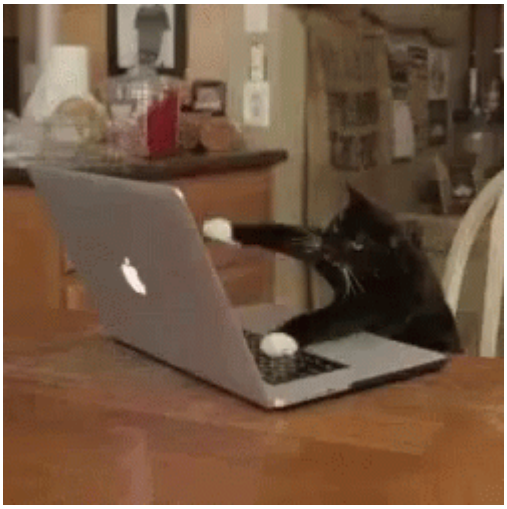
Exercise

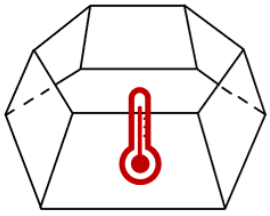
Now let's practice ...



ITEX

We will be using a dataset from the ITEX network.

- ITEX is a long-term warming experiment that uses standardized protocols to examine impacts of warming on Arctic ecosystems.
- Established in the 1990s - vegetation monitoring over three decades.
- Uses a simple method that is easy to establish in the field - open top chambers



ITEX

Let's look at the data

```
itex <- read_csv("Data/ITEX_diversity_data.csv")
```

```
New names:
Rows: 1303 Columns: 11
── Column specification
──────────────────────────────────────────────────────── Delimiter: "," chr
(4): SITE, SUBSITE, PLOT, TRTMT dbl (7): ...1, YEAR, Latitude, WarmQuarterTemp,
SppRich, row_number(), PlotTemp
ℹ Use `spec()` to retrieve the full column specification for this data. ℹ
Specify the column types or set `show_col_types = FALSE` to quiet this message.
• `` -> `...1`
```

```
head(itex)
```

```
# A tibble: 6 × 11
   ...1 SITE      SUBSITE     PLOT   YEAR TRTMT Latitude WarmQuarterTemp SppRich
  <dbl> <chr>     <chr>       <chr> <dbl> <chr>    <dbl>           <dbl>   <dbl>
1     1 ALEXFIORD ALEXFIORD:… Cas.…  2007 CTL       78.9            25.6       9
2     2 ALEXFIORD ALEXFIORD:… Cas.…  2007 CTL       78.9            25.6       9
3     3 ALEXFIORD ALEXFIORD:… Cas.…  2007 CTL       78.9            25.6       7
```

```
4     4 ALEXFIORD ALEXFIORD:… Cas.…  2007 CTL       78.9            25.6       8
5     5 ALEXFIORD ALEXFIORD:… Cas.…  2007 CTL       78.9            25.6       6
6     6 ALEXFIORD ALEXFIORD:… Cas.…  2007 CTL       78.9            25.6      10
# ℹ 2 more variables: `row_number()` <dbl>, PlotTemp <dbl>
```

```
length(unique(itex$SITE)) #this code tells you how many different samples we have within the SITE
```

```
[1] 24
```

```
unique(itex$SITE) #you can also do this and then it gives you the name of all samples within the S
```

```
 [1] "ALEXFIORD"    "ANWR"         "ATQASUK"      "AUDKULUHEIDI" "BARROW"
 [6] "BROOKS"       "BYLOT"        "DOVRE"        "ENDALEN"      "FAROE"
[11] "GAVIA"        "KLUANE"       "KYTALYK"      "LATNJA"       "NIWOT"
[16] "QHI"          "SADVENT"      "STEPSTONES"   "TAISETSU"     "THINGVELLIR"
[21] "TIBET"        "TOOLIK"       "TORNGATS"     "VALBERCLA"
```

Exercises

Ex. 1 - Using the ITEX diversity dataset, what is the relationship between diversity and temperature across sites?

- Think about what will be the response variable, what to include as fixed effects and what to include as a random effect.
- Does the summary output correspond to the structure of the data? Think about how the data was sampled and how you structured your model.

Ex. 2 - What is the relationship between diversity and temperature WITHIN sites?

- Think about how to restructure your model based on the new question.