Introduction to Generalized Linear Models
General course information

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About me

- I'm a **post-doc researcher** at the Department of Developmental Psychology and Socialization
- I did a **PhD in Experimental Psychology** studying the unconscious working memory processing
- I work with Professor Gianmarco Altoè on data analysis in Psychology, especially **meta-analysis**

Office hours

I do not have official office hours but we can schedule an appointment. you can write me at **filippo.gambarota@unipd.it**:

- my office is the 027, first floor Psico 1 building (pink building)
- we can also schedule on Zoom

Lectures

We are going to spend the following hours together:

Day	Date	Time	Room
Wednesday	26/04/2023	10:30-12:30	3L
Thursday	27/04/2023	10:30-12:30	3L
Tuesday	02/05/2023	10:30-12:30	3L
Wednesday	03/05/2023	10:30-12:30	3L
Thursday	04/05/2023	10:30-12:30	3L
Tuesday	09/05/2023	10:30-12:30	3L
Wednesday	10/05/2023	10:30-12:30	3L
Thursday	11/05/2023	10:30-12:30	3L
Tuesday	16/05/2023	10:30-12:30	3L
Wednesday	17/05/2023	10:30-12:30	3L
Thursday	18/05/2023	10:30-12:30	3L

Materials

The slides will be structured intermixing:

- R code
- Theory and Formulas (not a lot :))
- Plots (a lot!)
- Examples and exercises

R Materials

All the slides and extra materials are available on Moodle. During the course and for the exercises we will use some **custom functions** that I wrote for the course. To download and use the function you can download the utils-glm.R file from Moodle or from here
https://stat-teaching.github.io/SMDA-2023/R/utils-glm.R

Materials

- slides with the #extra tag are very specific but useful topics that will be eventually covered but are not part of the core course/exam

R

The course materials are created using R (4.3.0). To organize the materials I used **R Projects**, a feature available with R Studio. I highly suggest you to use R Projects that significantly improves your workflow. A brief tutorial is available here https://r4ds.had.co.nz/workflow-projects.html.

R code

I mainly use R for my daily work but a deep understanding of R is not necessary.

Slides are created with R Markdown (`.rmd` files) and distributed in pdf and all source scripts are available.

I wrote several custom functions that are used in the slide and maybe during the exercizes.

R Packages

We will use, directly or indirectly (for custom functions), several R packages. You can easily install all packages using:

```r
pksg <- c("effects", "tidyverse", "MASS",
          "broom", "reshape2", "ggeffects",
          "performance", "see", "car", "devtools")
install.packages(pkgs)
```

Pipes

Sometimes in my code you will see a symbol like this |>, this is called
pipe. Sometimes it is also written as %>% that is a different pipe coming
from the magrittr package. The pipe is a very simple way to write R
code when you need to apply multiple functions in succession. Practically,
the pipe apply a function to an element, for example:

```
# these two are the same
mean(x)

# to x apply the mean function
x |> mean()
```

Pipes

Beyond this silly example, when we need to use multiple nested functions the pipe makes the code more readable:

```r
x <- runif(10)

# without pipe
exp(min(round(x, 2)))
```

```
## [1] 1.173511
```
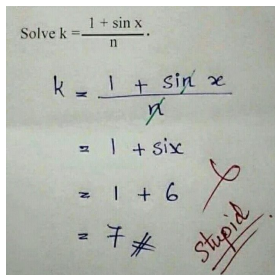
```r
# with pipe
x |>
    round(2) |>
    min() |>
    exp()
```

```
## [1] 1.173511
```

Theory and Formulas

I tried to reduce the amount of formulas. I prefer to make practical examples and showing the R code.

The probability of making an error or typo is close to 1 (Shepard, 2023), if you find something strange raise the hand or write me an email :)

Solve $k = \frac{1 + \sin x}{n}$.

$$k = \frac{1 + \sin x}{n}$$

$$= 1 + six$$

$$= 1 + 6$$

$$= 7 \neq \quad \text{Stupid}.$$

Examples and exercises

I tried to make practical examples whenever possible and relevant.
Furthermore we will see some exercises and case studies.

Rules of the game

1. **Participate!** If you have questions, doubts, comments, etc. please ask
2. If something is **not clear or is discordant** with other information from previous courses, tell me.
3. **Participate!**
4. Try do to **exercises and case studies**
5. **Participate!**
6. If you can, **bring your laptop with R**

Prepare the course folder `#optional`

- Install the packages of slide *R Packages*
- Download and extract the **template course folder** from here
  github.com/stat-teaching/SMDA-2023.
- Open the `SMDA-2023.Rproj` file
- Use the command `devtools::load_all()` will load each function within
  the `R/` folder. You can consider this folder as an R Package
- Run the `init_project()` function and the relevant folders and files will be
  created
- From now, you can open the `SMDA-2023.Rproj` and organize data and
  exercises within that folder

Final note

This is my first teaching experience with this course. Suggestions and critique are welcome.

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⯂ github.com/filippogambarota