Lesson Plan

Lesson plan

This document contains:

1. The lesson plan (dates and topic)
2. Instructions on the exam
3. The reading list for each lecture and class and link to slides

W1. Why this course? September 3

- A1 - Practical Exercise - Remember R? (KCE)

W2. Linear Mixed Effects models September 10

- A2 - Practical Exercise - Language development in ASD. Part I (RF)

W3. Explanation vs. Prediction September 17

- A2 - Practical Exercise - Language development in ASD. Part II (RF)

W4. Power and simulations September 24

- A2 - Practical Exercise - Language development in ASD. Part III (KCE)

W5. Generalized linear mixed effects models October 1st

- A3 - Practical Exercise - Is it possible to diagnose psychiatric condition from voice? (KCE)

W6. Prediction and feature selection October 8th

- A3 - Practical Exercise - Is it possible to diagnose psychiatric condition from voice? (KCE)

W7. Classification problems + mid-way evaluation October 22nd

- A3 - Practical Exercise - Is it possible to diagnose psychiatric condition from voice? (KCE)

W8. Analysing Physiological data I - Data collection activity October 29-30

- A4 - Lecture and practical exercise are replaced by the data collection

W9. Analysing Physiological data II - Heart and respiration rhythms Nov 5

- A4 - Practical Exercise– Analysing physiological coordination: data pre-processing (KCE)

W10. Analysing Physiological data III – Modelling coordination Nov 12

- A4 - Practical Exercise – Analysing physiological coordination: data modelling (RF)

W11. Analysing Physiological data IV – (More) modelling coordination Nov 19

- A5 - Practical Exercise – Analysing physiological coordination: data modelling II (RF)

W12. Towards a cumulative science - Nov 26

- A5 - Practical Exercise – Meta-analysis (RF)

W13. No class – December 3rd

- Practical exercise: Open lab for final issues to be solved (KCE)

Information about the exam

The exam consists in 5 portfolio assignments (indicated as A1-A5 in the lesson plan): each assignment consists of a github repository with all the code, and a document with an answer to the questions and a link to the repository. The separation is mandated to help practice reporting skills (which were harmed by just commenting through the code). You are strongly recommended to submit the assignments during the course, so you can get **collective** feedback. You have to (re)submit the full portfolio – revised according to the feedback - for the final exam. You can submit the full portfolio even if you haven't managed to submit each assignment during the class.

The exam is pass or fail. You cannot pass unless all assignments are submitted and all questions have an answer. Answers do not need to be fully correct for passing, but they need to show you made an effort and took feedback into account. Incomplete portfolios will fail by default.

If you take the B-exam, there is an additional assignment to be solved. In other words, the B-exam consists of 6 assignments: 5 from the normal portfolio, and an additional one I'll provide.

Reading list

W1 - Why this course? September 3

- Slides: https://www.dropbox.com/s/zjgo6dn7vqbpwuz/m3_2019_module1_intro.pptx?dl=0
- Questions for discussion: https://docs.google.com/document/d/1cwoNOoA_LhZ9ku7jC6bKjm1iUJ-dmDtkTQZ0A5jKuMI/edit?usp=sharing
- Readings:
    - Mandatory: Dienes - Understanding Psychology as a Science - Chapter 3
    - Highly recommended reference (technical!): Vasishth & Nicemboim (2016) Statistical methods for linguistic research: Foundational ideas - part I (https://arxiv.org/pdf/1601.01126.pdf)
    - Optional: Open Science Collaboration. (2015). Estimating the reproducibility of psychological science. Science, 349 (6251).
- A1 - Practical Exercise. Remember R?
    - Mandatory: setup GitHub/GitLab in RStudio: https://happygitwithr.com/
        - Alternatively: https://support.rstudio.com/hc/en-us/articles/200532077-Version-Control-with-Git-and-SVN
        - Alternatively: https://docs.google.com/document/d/1WvApy4ayQcZaLRpD6bvAqhWncUaPmmRimT016-PrLBk/mobilebasic
        - Alternatively, Anita (instructor in experimental methods I) made a Github tutorial for experimental methods I: (https://www.dropbox.com/s/fm6surokx9k67ob/Github_Tutorial_exp1.pdf?dl=0)
    - Recommended: Pre-class exercises for getting back into R and making sure you remember the tidyverse package: https://www.dropbox.com/s/4nc4rj3nl73wbz7/pre_class_1_exercises.Rmd?dl=0

- Reference book (highly recommended): R for Data Science http://r4ds.had.co.nz/

W2. Linear Mixed Effects models - September 10

- Slides: https://www.dropbox.com/s/0gom1nhu7fya5hz/m3_2019_module2_glm.pptx?dl=0
- Readings
  - Mandatory (but check differences with lecture!): Winter, B. (2013) Linear models and linear mixed effects models in R with linguistic applications (https://arxiv.org/abs/1308.5499)
  - Highly recommended reference (technical!): Harrison XA, Donaldson L, Correa-Cano ME, Evans J, Fisher DN, Goodwin CED, Robinson BS, Hodgson DJ, Inger R. 2018. A brief introduction to mixed effects modelling and multi-model inference in ecology. PeerJ 6:e4794 https://doi.org/10.7717/peerj.4794
  - List of additional resources on mixed effects models: https://socialbyselection.wordpress.com/2015/07/14/mixed-effect-models/
- A2 - Practical Exercise - Language development in ASD. Part I
  - Background article: Fusaroli, R., Weed, E., Fein, D., & Naigles, L. (2019). Hearing me hearing you: Reciprocal effects between child and parent language in autism and typical development. *Cognition*, *183*, 1-18.

W3. Explanation vs. Prediction - September 17

- Slides: https://www.dropbox.com/s/1ey400a87sujv7x/m3_2019_module3_predictions.pptx?dl=0
- Readings
  - Mandatory: Yarkoni, T., & Westfall, J. (2017). Choosing prediction over explanation in psychology: Lessons from machine learning. *Perspectives on Psychological Science*, *12*(6), 1100-1122.
  - Mandatory: Kuhn, M., & Johnson, K. (2019). Feature Engineering and Selection: A Practical Approach for Predictive Models. CRC Press. Chapter 3
  - Highly recommended: Breiman, L. (2001). Statistical modeling: The two cultures (with comments and a rejoinder by the author). Statistical science, 16(3), 199-231.
  - Highly recommended (short!): Chekroud, A. M., & Koutsouleris, N. (2018). The perilous path from publication to practice. *Molecular psychiatry*, *23*(1), 24.
  - Highly recommended (short!): Chekroud, A. (2018). T107. Why Validation Matters: A Demonstration Predicting Antipsychotic Response Using 5 Rcts. *Schizophrenia bulletin*, *44*(Suppl 1), S157.
  - Useful: Kuhn, M., & Johnson, K. (2019). Feature Engineering and Selection: A Practical Approach for Predictive Models. CRC Press. Chapter 2
  - Reference book: Kuhn, M., & Johnson, K. (2013). Applied predictive modeling (Vol. 26). New York: Springer.
- A2 - Practical Exercise - Language development in ASD. Part II
  - Useful alternative package + reference tutorial: https://github.com/LudvigOlsen/cvms

W4. Power and simulations September 24

- Slides: https://www.dropbox.com/s/owmktmvh4qmnm07/m3_2019_module4_power.pptx?dl=0
- Readings

- Mandatory (less technical alternative): R Johnson, P. C., Barry, S. J., Ferguson, H. M., & Müller, P. (2015). Power analysis for generalized linear mixed models in ecology and evolution. Methods in ecology and evolution, 6(2), 133-142.
- Mandatory (more technical alternative, but worth it): deBruine & Barr (under review): Understanding mixed effects models through data simulation https://psyarxiv.com/xp5cy/.
- Recommended (technical): Schönbrodt, F. D., & Perugini, M. (2013). At what sample size do correlations stabilize? Journal of Research in Personality, 47, 609-612. doi:10.1016/j.jrp.2013.05.009
- Simplistic (if you are having issues with the mandatory readings, first go through this): Brysbaert, M., & Stevens, M. (2018). Power analysis and effect size in mixed effects models: A tutorial Journal of Cognition, 1(1) - https://osf.io/ucvdw/

- A2 - Practical Exercise - Language development in ASD. Part III
  - Mandatory (Detailed tutorial to do power analysis with SimR): Green, P., & MacLeod, C. J. (2016). SIMR: an R package for power analysis of generalized linear mixed models by simulation. *Methods in Ecology and Evolution*, *7*(4), 493-498.

W5. Generalized Mixed Effects Models - October 1st

- Slides: https://www.dropbox.com/s/9hf2u0cfkm075uz/m3_2019_modules5%266_classification.pptx?dl=0
- Readings: Parola, A., Simonsen, A., Bliksted, V., & Fusaroli, R. (2019). Voice patterns in schizophrenia: A systematic review and Bayesian meta-analysis. bioRxiv, 583815.
- A3 - Practical Exercise - Is it possible to diagnose psychiatric condition from voice?
  - Useful readings (albeit not using lme4):
    - https://rviews.rstudio.com/2019/06/19/a-gentle-intro-to-tidymodels/
    - https://www.r-bloggers.com/tidymodels/

W6. Prediction and feature selection - October 8th

- Slides: https://www.dropbox.com/s/8uu2kl0x989dyh5/m3_2019_modules6_predictiveclassification.pptx?dl=0
- Readings:
  a. Mandatory: Kuhn, M., & Johnson, K. (2019). Feature Engineering and Selection: A Practical Approach for Predictive Models. CRC Press. Chapter 10
  b. Reference book: Kuhn, M., & Johnson, K. (2019). Feature Engineering and Selection: A Practical Approach for Predictive Models. CRC Press.
  c. See references for W5
- A3 - Practical Exercise - Is it possible to diagnose psychiatric condition from voice?

W7. Classification problems + mid-way evaluation October 22nd

- Slides: https://www.dropbox.com/s/tat2z40chu77k28/M3_2019_Module7_ClassificationWorkflow.pptx?dl=0
- Readings:
  - Optional: Kuhn - Chapter 11 - Measuring performance in classification problems
- Practical Exercise VII: Is it possible to diagnose schizophrenia from voice?

W8. Analysing Physiological data I - Data collection activity October 29-30

- A4 - Lecture and practical exercise are replaced by the data collection

W9. Analysing Physiological data II - Heart and respiration rhythms Nov 5

- Slides: https://www.dropbox.com/s/yypde3aq8xr3kwt/M3_2019_Module8_Physiology%26Coordination.pptx?dl=0
- Readings:
    - Mandatory (the introduction): Fusaroli, R., Bjørndahl, J. S., Roepstorff, A., & Tylén, K. (2016). A heart for interaction: Shared physiological dynamics and behavioral coordination in a collective, creative construction task. Journal of Experimental Psychology: Human Perception and Performance, 42(9), 1297.
    - Kazi, S., Khaleghzadegan, S., Dinh, J. V., Shelhamer, M. J., Sapirstein, A., Goeddel, L. A., ... & Rosen, M. A. (2019). Team Physiological Dynamics: A Critical Review. *Human factors*, 0018720819874160.
    - Reference book: Martinez et al. (2017) Heart Rate Variability Analysis with the R package HRVR
        - On the physiology of HRV: Chapter 1
        - On artifact removal: Chapter 2
- A4 - Practical Exercise– Analysing physiological coordination: data pre-processing

W10. Analysing Physiological data III – Modelling coordination Nov 12

- Slides: https://www.dropbox.com/s/p7zkuuhglank3sw/m3_2019_module9_coordination.pptx?dl=0
- Readings:
    - Ferrer, E., & Helm, J. L. (2013). Dynamical systems modeling of physiological coregulation in dyadic interactions. International Journal of Psychophysiology, 88(3), 296-308.
    - Fusaroli, R., Konvalinka, I., & Wallot, S. (2014). Analyzing social interactions: the promises and challenges of using cross recurrence quantification analysis. In Translational recurrences (pp. 137-155). Springer, Cham.
    - Bonus reading: Coco, M. I., & Dale, R. (2014). Cross-recurrence quantification analysis of categorical and continuous time series: an R package. Frontiers in psychology, 5.
    - Bonus reading: Coco, M. I. (2014) Tutorial on crqa
- A4 - Practical Exercise – Analysing physiological coordination: data modelling

W11. Analysing Physiological data IV – (More) modelling coordination Nov 19

- Slides: https://www.dropbox.com/s/cphnop2c43h2au6/m3_2019_module10_cumulativescience.ppt?dl=0
- Readings: None
- A4 - Practical Exercise – Finish running the physiological data modeling

W12. towards a cumulative science

- Slides: https://www.dropbox.com/s/q036r0ezuv1330c/M3_2019_Module10_CumulativeScience_part2.pptx?dl=0
- Readings:
    - Quintana, D. S. (2015). From pre-registration to publication: a non-technical primer for conducting a meta-analysis to synthesize correlational data.

Frontiers in psychology, 6.

- A5 - Practical Exercise - Running a meta-analysis

W13. No class – December 3rd

- Practical exercise: Open lab for final issues to be solved (KCE)