PSYC 6341/5341 Multivariate Statistics

- Spring 2023
- **Section:** PSYC 6341.001 Online and asynchronous (selected dates we will meet Thursdays 9:30AM - 12:15AM)
- **Instructor**: Samantha Estrada PhD
- **Email**: sestrada@uttyler.edu
- **Office hours**: TBA

Office Hours

- Office hours will be held via Zoom. You can find the link in the `Canvas` homepage.

- If this doesn't work for you, you can also make an appointment for other times through my `calendly` link: https://calendly.com/sestrada

  - You don't have to email me, `calendly` will notify me. I only ask you to make an appointment through this app because it makes the sharing of zoom links easy plus it goes straight to my calendar so I don't forget!
  - You can also cancel if needed through the app.
  - If the available in `calendly` hours don't work for you then please email me we can work something out.

Requided Texts:

- *Using R With Multivariate Statistics* 1st Edition by Randall E. Schumacker ISBN-13: 978-1483377964 ISBN-10: 1483377962
- *R for Data Science* by Garrett Grolemund and Hadley Wickham Available here: https://r4ds.had.co.nz/
- Publication Manual of the American Psychological Association (7th Ed.).(2020).Washington, DC: American Psychological Association.

Recommended Text: Publication Manual of the American Psychological Association (7th Ed.).(2020).Washington, DC: American Psychological Association.

Required Software

We will be using free and open source software for this class:

- R (https://www.r-project.org)

- R Studio (https://rstudio.com/)
- jamovi (https://www.jamovi.org/)
- G*Power (https://www.psychologie.hhu.de/arbeitsgruppen/allgemeine-psychologie-und-arbeitspsychologie/gpower.html)

Course Catalog Description

Includes study and application of complex multivariate research designs and multivariate statistical analyses including MANOVA/MANCOVA, discriminant function analysis, canonical analysis, structural equation modeling and factor analysis.

Required Prerequisites: PSYC 6340.

Student Learning Outcomes: As a result of this course, successful students will be able to:

- Identify and articulate the theoretical underpinnings of multivariate statistical models and designs.
- Articulate advanced principles of multivariate statistical analyses, including multivariate distributions, hypotheses and analytic methods
- Accurately choose and conduct multivariate statistical data analyses, using SPSS statistical software, emphasizing the assumptions, appropriate uses, and the interpretation of each.
- Write about the results of multivariate statistical analyses in journal format
- Design multivariate research studies for use with clinical populations

Grading

50% - Class Projects
20% - Final Exam
30% - Critiques, Jigsaw & Tidyverse Presentations

Grading Scale

```
90  -   100%     A
80  -    89%     B
70  -    79%     C
60  -    69%     D
 0  -    59%     F
```

Data Projects

- There will be data assignment for each of the topics we cover. The due date will be one week after each topic is covered. You should have one week for each assighment.
- Your reports for these data projects need to be clearly labeled as LastName.FirstName.AssignmentName.docx (or .doc).
- All assignments MUST be turned in on time to receive full credit. I will deduct 2 points for everyday a submission is late (from a total of 10 points). You will get to drop one assignment no questions asked without it affecting your grade.

Critique, Jigsaws, Tidyverse presentation

- **Critique** You are to review one article, preferable in your field of study, which utilize multivariate statistics tools we have discussed in class. Your critique will be shared with the class. Think of this as a round-table presentation at a conference
- **Jigsaw** Sign up for each jigsaw on Canvas. See schedule for due dates.
    - *Article* Each of you will read an article relevant to the practice of statistics in research. You are to summarize the article for the class.
- **Tidyverse** presentation. Prepare a short 15 minute presentation on two topics/procedures on data visualization and data management. You may select these topics from Nordmann (2021),the author also has example datasets you can use for this presentation.

Final Exam

- The final exam will have two parts: a open-ended section over conceptual material, and an applied section over the R skills.

- The final exam will be *cumulative.*

- **University Policies** You can read the university policies here: https://www.uttyler.edu/links/

Topics & Tentative Schedule

Week 01, 01/12 Introduction to R

- Chapter 1: R Installation and Usage Schumacker (2015)
- Watch recorded lecture

Week 02, 01/19 Matrix Algebra

- Appendix A: A Skimpy Introduction to Matrix Algebra Tabachnick & Fidell (2019)

Week 03, 01/26 Multivariate Statistics Assumptions + Data Screening

- Chapter 2 Schumacker (2015)
- **Reading** Papageorgiou et al. (2018)
- **Homework:** Matrix Algebra project

Week 04, 02/02 Hotelling's T^2: A Two-Group MANOVA

- Chapter 3 Schumacker (2015)
- **Homework:** Data Screening project

Week 05, 02/09 Multivariate Analysis of Variance

- Chapter 4 Schumacker (2015)
- **Reading** MANOVA Huck (2011)
- **Homework:** Hotelling's Project

Week 06, 02/16 Multivariate Analysis of Covariance

- Chapter 5 Schumacker (2015)
- **Homework:** MANOVA Project

Week 07, 02/23 Dirty Data & Tidyverse

- Chapter 6 Schumacker (2015)
- **Reading** Nordmann et al. (2021)
- **Reading** Wickham (2014)
- **Homework:** MANCOVA Project

Week 08, 03/02 Discriminant Analysis

- Chapter 7 Schumacker (2015)

Week 09, 03/09 Jigsaw Presentation

Week 10, 03/16 Spring Break

- No class. Spring Break!

Week 11, 03/23 Canonical Correlation

- Chapter 11 Schumacker (2015)
- **Homework:** Discriminant Analysis Project

Week 12, 03/30 Principal Components Analysis

- Chapter 10 Schumacker (2015)
- **Homework:** Canonical Correlation Project

Week 13, 04/06 Structural Equation Modeling: Confirmatory Factor Analysis

- Chapter 12 Schumacker (2015)
- Structural Equation Modeling Huck (2011)
- **Homework:** PCA Project

Week 14, 04/13 Exploratory Factor Analysis

- Chapter 9 Schumacker (2015)
- Beaujean (2013)
- **Homework:** CFA Project

Week 15, 04/20 Structural Equation Modeling: Path Analysis

- (Tentative Topic) Path Analysis
- Final opens in Canvas.
- Multivariate Paper Critique Presentations.

Week 16, 04/27 Finals Week!

- Final DUE Wednesday April 26 at 11:59pm

University Policies

- UT Tyler Policies can be found here: https://www.uttyler.edu/links/

*I RESERVE THE RIGHT TO MODIFY THIS SYLLABUS AT ANY TIME. THEREFORE, YOUR AT-
TENDANCE AND ATTENTION TO THE ANNOUNCEMENTS IN CANVAS ARE CRUCIAL BECAUSE
IT WILL ASSIST YOU REMAIN CURRENT ON THE MATERIAL AND KNOW WHEN THE SYL-
LABUS MAY BE MODIFIED.*

Readings

Beaujean, A. A. (2013). Factor analysis using r. *Practical Assessment, Research, and Evaluation*, *18*(1), 4.

Huck, S. (2011). *Reading statistics and research. 6th.* Pearson/Allyn & Bacon. Boston, 566p.

Nordmann, E., Mcaleer, P., Toivo, W., Paterson, H., & Debruine, L. M. (2021). *Data visualisation using r, for researchers who dont use r.* https://doi.org/10.31234/osf.io/4huvw

Papageorgiou, G., Grant, S. W., Takkenberg, J. J., & Mokhles, M. M. (2018). Statistical primer: How to deal with missing data in scientific research? *Interactive Cardiovascular and Thoracic Surgery*, *27*(2), 153–158.

Schumacker, R. E. (2015). *Using r with multivariate statistics.* Sage Publications.

Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics.* Pearson.

Wickham, H. (2014). Tidy data. *Journal of Statistical Software*, *59*(10), 1–23.