PSYC 6341 Multivariate Statistics

- Spring 2024
- **Section:** PSYC 6341.001 Online and asynchronous
- **Instructor**: Samantha Estrada PhD
- **Email**: sestrada@uttyler.edu
- **Office hours**: TBA

Office Hours

- **What are office hours?** These are times where I will be in my (virtual) office and you can come and ask me anything class related.
- My office hours are Wednesdays 2-5 via Zoom *by appointment.*
- You can find the Zoom link and passcode in the homepage of `Canvas`.

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 (2nd edition). Available here: https://r4ds.hadley.nz/
- 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

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

Grading Scale

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90 -  100%    A
80 -   89%    B
70 -   79%    C
60 -   69%    D
 0 -   59%    F
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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.
- These are individual assignments.

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 via the discussion board. Video should be 5-10 minutes long. More instructions in Canvas.
- **Tidyverse** presentation. Prepare a short 10 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.

Midterm Exam

- The midterm exam will have two parts: a open-ended section over conceptual material, and an applied section over the R skills.
- This midterm will cover the following topics
  - Data Screening and Assumptions
  - Matrix Algebra
  - Hotelling's T^2
  - MANOVA
  - MANCOVA

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, 01/16 Introduction to R.

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

Week 02, 01/23 Matrix Algebra

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

Week 03, 01/30 Multivariate Statistics Assumptions + Data Screening

- Chapter 2 Schumacker (2015)
- **Reading** Papageorgiou et al. (2018)
- **Homework:** Matrix Algebra project due Thursday, 01/30 at 11:59 pm

Week 04, 02/06 Hotelling's T^2: A Two-Group MANOVA

- Chapter 3 Schumacker (2015)
- **Homework:** Data Screening project due Thursday, 02/06 at 11:59 pm

Week 05, 02/13 Multivariate Analysis of Variance

- Chapter 4 Schumacker (2015)
- **Reading** MANOVA Huck (2011)
- **Homework:** Hotelling's Project due Thursday, 02/13 at 11:59 pm

Week 06, 02/20 Multivariate Analysis of Covariance

- Chapter 5 Schumacker (2015)
- **Homework:** MANOVA Project due Thursday, 02/20 at 11:59 pm

Week 07, 02/27 No Class APA visit

- It's formal, a top hat, a white tie and tails.

Week 08, 03/05 Dirty Data & Tidyverse

- Chapter 6 Schumacker (2015)
- **Reading** Nordmann et al. (2021)

- **Reading** Wickham (2014)
- **Homework:** MANCOVA Project due Thursday, 03/05 at 11:59 pm

Week 09, 03/12 Discriminant Analysis

- Chapter 7 Schumacker (2015)
- **Discussion Board** Post your Dirty Data/Tidyverse video in Canvas due Thursday, 03/12 at 11:59 pm
- Midterm OPENS 03/12 at 11:59pm

Week 10, 03/19 Midterm

- **Discussion Board** Dirty Data/Tidyverse Feedback to Classmates due Thursday, 03/19 at 11:59 pm.
- Midterm DUE 03/19 at 11:59pm

Week 11, 03/26 Spring Break

- No class. Spring Break!

Week 12, 04/02 Canonical Correlation
- Chapter 11 Schumacker (2015)
- **Homework:** Discriminant Analysis Project due Thursday, 03/26 at 11:59 pm

Week 13, 04/09 Principal Components Analysis

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

Week 14, 04/16 Introduction to Confirmatory Factor Analysis

- Chapter 12 Schumacker (2015)
- Structural Equation Modeling Huck (2011)
- **Homework:** PCA Project due Thursday, 04/09 at 11:59 pm
- **Discussion Board** Multivariate Paper Critique Video Due due Thursday, 04/16 at 11:59 pm.

Week 15, 04/23 Exploratory Factor Analysis

- Chapter 9 Schumacker (2015)
- Beaujean (2013)
- **Homework:** CFA Project due Thursday, 04/23 at 11:59 pm
- **Discussion Board** Multivariate Paper Critique Feedback to Classmates due Thursday, 04/23 at 11:59 pm.
- Final opens in Canvas.

Week 16, 04/30 Finals Week!
- Final due Thursday, 04/30 at 11:59 pm

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.