SYLLABUS

Statistical Software Packages for Applied Data Analytics II

DATA 5080

Section OL / CRN

Credit Hours = 3

Instructor: Douglas A. MacDonald, Ph.D.

Office: McNichols Campus

Briggs Building, Room 308

Phone: 313-993-1094

Email: macdonda@udmercy.edu

Class Time & Location: Online through Blackboard Knowledge (student access through Titan Connect Account)

Office Hours:
Instructor is generally available during regular business hours Monday through Thursday and after 3pm on Fridays. Students are encouraged to email the instructor with any questions or requests and he will respond promptly (usually within a few hours).

Prerequisites

None.

Note— Even though this is not a statistics course, some prior knowledge of statistics will be a definite asset for students.

Required Texts

None. A list of recommended texts and online resources is provided in an appendix to this syllabus. Additional resources will be provided to students by the instructor.

There are a variety of required software packages that students will need to acquire. Information on how to obtain these programs is provided later in the syllabus.

Course Description

This course is designed to familiarize students with statistical software packages developed for specific forms of analysis. Statistical programs include both proprietary and open source packages.

Course Objectives

- ✓ To facilitate the development of critical thinking skills with particular attention given to the cultivation and application of scientific reasoning to data analysis.

- ✓ To instill an understanding of ethics concerning the responsible analysis, interpretation, and utilization of information related to data analysis projects.

- ✓ To develop knowledge regarding how to evaluate the quality of data prior to analysis and how to engage in responsible and effective data cleaning practices.

- ✓ To develop knowledge of different forms of statistical analysis and how to execute them using different types of software.

- ✓ To develop communication skills to facilitate the sharing of information and findings in an efficient and practical manner.

Specific Learning Outcomes

- ▷ Knowledge and skill at critical thinking both as a general skill set and as a skill set related to completing different forms of data analysis.

- ▷ Familiarity with several different statistical programs with an understanding of some of their main uses, benefits, and weaknesses.

- ▷ An understanding of ethics as related to data management and analysis and the reporting of statistical results.

- ▷ Knowledge about the relationship of statistics to data and research methodologies.

- ▷ Knowledge of how to manage data sets in several software programs.

- ▷ Knowledge of how to use software to evaluate data quality.

- ▷ Knowledge and skill at using several software programs to run different forms of statistical analysis.

- ▷ Knowledge and skill at using software programs to create tables, graphs, and figures.

- ▷ Skill at practical interpretation of statistical results for developing decisive insights and to inform decision-making and innovation.

- ▷ Skill at effective and responsible communication of outcomes of data analysis projects to diverse audiences.

- ▷ Comprehension and practice of ethical methods of communication to avoid plagiarism and infringements of copyright regulations.

Course Requirements

✓ Course Calibration and Student Interests Essay (worth 5% of final grade)

✓ Completion of CITI Research Ethics Program (worth 20% of the final grade)

✓ Weekly Homework Assignments (worth 25% of final grade)

✓ Weekly Discussion Board Posts (worth 10% of final grade)

✓ Term Project Involving Critical Analysis of a Data Analysis Project (worth 40% of final grade)

Data Analysis Assignments

Using data supplied by the instructor, students are required to complete five data analysis assignments using one or more of the statistical software programs covered in weekly online presentations and demonstrations. The assignments will focus on power analysis, introductory level structural equation and multilevel modeling, neural network analysis, graph theory analysis, data mining, and qualitative textual analysis.

Specific details regarding each assignment will be provided on the Blackboard course site.

Assignments will be due on weeks 3, 6, 9, 12, and 15, respectively.

Grading Schema and Miscellany

A	95.0 100
A-	90.0 94.9
B+	85.0 89.9
B	80.0 84.9
B-	75.0 79.9
C+	70.0 74.9
C	65.0 69.9
C-	60.0 64.9
D+	55.0 55.9
D	50.0 54.9
F	49.9 or lower

Course Evaluations:

Student course evaluations are a highly valued in the College of Liberal Arts and Education. Feedback from students serves as an important source of information that enables instructors to improve upon the quality of the course in terms of its content and delivery. Students are strongly encouraged to complete the online course evaluations for this course and all courses for which they are formally registered. The online evaluation form for this course will be made available during the week preceding final examinations each term. Students who are enrolled in the course will receive an email from the university near the end of the term that provides instructions on how to complete the evaluation.

Students who complete the evaluation and email the instructor with evidence of having done so will be given one extra credit point that will be added to their final mark in the course (e.g., if a student has a final mark of 78 out of 100 in the course, the completion of the evaluation will result in the mark being adjusted to 79 out of 100).

Notifications of Important Messages:

Any important messages regarding any aspect of the course will be communicated to students via Blackboard and/or Detroit Mercy email addresses. Please check your email and the course site often!

Subject-to-Change Statement:

The instructor reserves the right to change or modify any aspect of the course or class schedule at any time. Students will be notified of any changes by the instructor.

Questions, Complaints or Concerns about the Course:

If you have any questions, complains or concerns about the course, then please let the instructor know via email. If you are not satisfied with the instructor's response, then you are encouraged to contact the Associate Dean of the College of Liberal Arts & Education. Her name is Dr. Victoria Mantzopoulos. Her phone number is 313-993-3254 and her email address is armstrov@udmercy.edu. You are also welcome to contact the Dean of the College of Liberal Arts & Education. His name is Dean Mark Denham. His phone number is 313-993-3250 and his email address is denhamma@udmercy.edu

University of Detroit Mercy Policies Related to Student Behavior

Students at Detroit Mercy are expected to behave in accordance with all university and college policies and practices. A complete list of all policies can be found in the Detroit Mercy Student Handbook.

A specific policy with which all students are required to comply relates to academic dishonesty. Students are expected to demonstrate the highest levels of honesty with respect to their work. Cheating (on homework, quizzes, tests, examinations) and plagiarism (i.e., representing the work of another person as one's own) are unacceptable behaviors and will not be tolerated. If the instructor determines that a student has cheated on an examination or plagiarized the work of another person on an assignment, then the instructor will automatically assign a failing grade on that examination or assignment (i.e., the examination or assignment will be given a numerical grade of 0). In addition, the instructor will bring the behavior to the attention of university officials (e.g., Dean or Associate Dean) to determine if additional sanctions are warranted. Such sanctions could include the assignment of a failing grade for the course and even dismissal from the university.

Title IX:

University of Detroit Mercy is committed to fostering a safe and productive learning environment for all students. Detroit Mercy's Policy Prohibiting Sex and Gender-based Discrimination applies to sex and gender-based harassment, sexual exploitation, sexual assault, attempted sexual assault, intimate partner violence/dating violence, stalking, cyberstalking, and retaliation.

Concerns or complaints regarding potential sex and gender-based harassment, sexual exploitation, sexual assault or attempted sexual assault, intimate partner violence/dating violence, stalking, and retaliation may be conveyed or reported to Marjorie Lang, Title IX Coordinator, by contacting her at langma@udmercy.edu or 313.993.1802. Ms. Lang's office is located on the 5th floor of the Fisher Administration Center on the McNichols campus. You may view the University's Policy Prohibiting Sex and Gender-based Discrimination at http://www.udmercy.edu/academics/academic-affairs/titleix/.

Academic Support Services:

Detroit Mercy has a range of resources available to facilitate student academic success. These include Library and Media services, Academic Learning/Writing Center, and Computing Services, among others. Students are encouraged to consult with the instructor and/or their University Student Handbook, to learn how to access these services.

Susan Trudeau, Director, Student Success Center
McNichols Campus Library, Room 319
Email: trudeasm@udmercy.edu
Phone: 313-993-1143

Note. Free tutoring services for statistics are available at the Student Success Center for students who feel they need it. The Student Success Center (aka Learning Center) is located on the third floor of the Detroit Mercy McNichols Library.

Disability Support Services and Accommodations:

If you need an accommodation because of a disability, have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please contact:

Laura Bagdady, Assistant Director, Student Disability & Accessibility Support Services
Student Success Center, McNichols Campus Library, Room 319
Email: bagdadlm@udmercy.edu
Phone: 313-993-1158

It is very important for students to be proactive with regard to requesting their disability accommodations every semester. While it is never required that you disclose your disability to your professors, all students at the university are encouraged to talk to their professors to discuss their needs and concerns. However, you must be registered with Disability Support Services, and your faculty must receive official notification from the DSS office before they can make arrangements for your accommodations.

Religious Observances:

It is the policy of the University of Detroit Mercy to respect the faith and religious obligations of each student. Students with exams and classes that conflict with their religious observances should notify the instructor at the beginning of the semester in order to work out a mutually agreeable alternative. Please note that, regardless of whether an absence is "excused" or "unexcused," the student is responsible for all missed course content and activities.

TOPIC and ASSIGNMENT SCHEDULE

Week	Topics and Assignments
1	**Welcome to the Course!!** Course overview
2	**Power Analysis Software**
3	**Structural Equation Modeling Software** *Data Analysis Assignment 1 Due*
4	**Structural Equation Modeling Software Continued**
5	**Structural Equation Modeling Software Continued**
6	**Structural Equation Modeling Software Continued** *Data Analysis Assignment 2 Due*
7	**Data Mining and Qualitative Analysis Software**
8	**Data Mining and Qualitative Analysis Software Continued**
9	**Data Mining and Qualitative Analysis Software Continued** *Data Analysis Assignment 3 Due*
10	**Neural Network/Machine Learning Software**

TOPIC and ASSIGNMENT SCHEDULE

Week	Topics and Assignments
11	**Neural Network/Machine Learning Software Continued**
12	**Neural Network/Machine Learning Software Continued** *Data Analysis Assignment 4 Due*
13	**Graph Theory Software**
14	**Graph Theory Software Continued**
15	**Overview/demonstration of other specialized software packages** *Data Analysis Assignment 5 Due*
16	**FINAL EXAM WEEK** No lectures or topics covered and no assignments due

Appendix A: Obtaining Copies of Required Software

(a) G*Power—This is a free power analysis and sample size calculator program. It can be downloaded from the following website: http://www.gpower.hhu.de/

(b) IBM AMOS Version 26—The purchase of a 12 month rental license can be made for $40 at the following website: https://onthehub.com//spss/

(c) Latent Variable Analysis (Lavaan)—This is a free open source software package used as part of the R software environment for statistical computing and graphics. Information about the program and downloads can be found at the following website: http://lavaan.ugent.be/

(d) MPlus—A free demonstration version of the program can be downloaded at the following website: https://www.statmodel.com/demo.shtml

(e) Onyx—This is a free program with graphical interface used for structural equation modeling. The program can be downloaded from the following website: http://onyx.brandmaier.de/

(f) QDA Miner Lite—This is free qualitative text analysis software. It can be downloaded from the following website: http://provalisresearch.com/products/qualitative-data-analysis-software/freeware/

(g) JustNN—This is free neural network software. It can be downloaded from the following website: http://www.justnn.com/

(h) GraphTea—This is free graph theory software. It can be downloaded from the following website: http://www.graphtheorysoftware.com/

(i) Gephi—This is free visualization and exploration software for graphs and networks. It can be downloaded from the following website: https://gephi.org/

Any/all other software covered in the course will be illustrated for students by the instructor. Students interested in purchasing the software are encouraged to ask the instructor.

Appendix B: Non-Exhaustive List of Texts, Articles and Online Resources

There are a wide number of excellent published and online resources related to data science and to the software covered in this course. Below are a number of selected recommendations that students will find useful in augmenting what is covered in the course and in assisting in the completion of course assignments. Many of the scholarly publications can be found online in their entirety. Where a publication is made available open access, the link to the publication is provided. Students are strongly encouraged to explore these resources and to contact the instructor if there are any questions or issues with finding any of them. Students are also encouraged to inform the instructor of the existence of any useful publications or websites that may be beneficial to add to this list.

Byrne, B. M. (2012). Structural equation modeling with MPlus: Basic concepts, applications, and programming. New York, NY, USA: Routledge. ISBN: 978-1-84872-839-4

Byrne, B. M. (2016). Structural equation modeling with AMOS: Basic concepts, applications, and programming (3rd ed). New York, NY, USA: Routledge. ISBN: 9781138797024

Dolincar, S., Grun, B., & Leisch, F. (2016). Increasing sample size compensates for data problems in segmentation studies. Journal of Business Research, 69(2), 992-999.
Full text available at: https://www.sciencedirect.com/science/article/pii/S0148296315003926

Faber, J. & Fonseca, L. M. (2014). How sample size influences research outcomes. Dental Press Journal of Orthodontics, 19(4), 27-29. Full text available at
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4296634/

Kaplan, R. M., Chambers, D. A. & Glasgow, R. E. (2014). Big data and large sample size: A cautionary note on the potential for bias. Clinical and Translational Science, 7(4), 342-346.
Full text article available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5439816/

Lin, M., Lucas, H. C. & Shmueli, G. (2013). Research Commentary—Too Big to Fail: Large samples and the p-value problem. Information Systems Research, 24(4), 906-917.
Full text available at
https://pdfs.semanticscholar.org/262b/854628d8e2b073816935d82b5095e1703977.pdf

Osborne, J. W. (2013). Best Practices in Data Cleaning. Thousand Oaks, CA, USA: Sage.
ISBN: 978-1-4129-8801-8

Slater, S. Joksimovic´, S., Kovanovic, V., Baker, R. S., & Gasevic, D. (2017). Tools for educational data mining: A review. Journal of Educational and Behavioral Statistics, 42(1), 85-106.
Full text article available at http://journals.sagepub.com/doi/pdf/10.3102/1076998616666808

Turnitin (2012). White Paper: Plagiarism Spectrum (Version 0512).Oakland, CA, USA: iParadigms, LLC

Online Big Data Bibliography of guidelines, books, reports, and articles on ethics in big data
http://www.onlineethics.org/Resources/40348/39960.aspx

Websites that Provide Information on Data Science, Data Analysis Techniques and Statistical Software

https://openmx.ssri.psu.edu/sem-resources

http://www.u.arizona.edu/~cragin/fsQCA/software.shtml

https://www.predictiveanalyticstoday.com/top-free-data-mining-software/

https://www.softwaretestinghelp.com/data-mining-tools/

https://en.wikipedia.org/wiki/Computer-assisted_qualitative_data_analysis_software#Free_.2F_open_source_software_for_CAQDAS

http://intentex.com/free-sentiment-text-analysis-software/

https://www.predictiveanalyticstoday.com/top-free-software-for-text-analysis-text-mining-text-analytics/

https://gmdhsoftware.com/neural-network-software

https://www.tensorflow.org/

https://www.predictiveanalyticstoday.com/top-artificial-neural-network-software/

https://www.simbrain.net/

https://www.kdnuggets.com/software/clustering.html

http://www.free-graph-theory-software.org/

Appendix C: Statistics Websites

While there are no prerequisites for DATA 5080, having some knowledge of statistics will be of significant benefit for students wanting to be successful in this course. To aid students, below is a list of helpful websites that provide extensive information on statistics. Students are strongly encouraged to utilize these resources whenever needed.

http://statistics-help-for-students.com/

http://www.statsoft.com/Textbook

http://stattrek.com/

http://davidmlane.com/hyperstat/

http://www.businessbookmall.com/Statistics%20Internet%20Library.htm

http://www.statstutor.ac.uk/

http://www.talkstats.com/

http://www.stat-help.com/

http://www.statsmakemecry.com/

https://statistics.laerd.com/