NRRT 765 – Applied Multivariate Analysis

Semester: Fall – 2015

Course Instructor: Dr. Jerry J. Vaske 970-491-2360 work email: jerryv@colostate.edu
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Office Hours: TR 1:00 – 2:00
Feel free to arrange other times by appointment

Prerequisites: NRRT665 and ST312 (or equivalent)
Location: CNR lab
Time: Tuesday/Thursday 8:00 – 9:40

Course Description, Goal and Objectives

NRRT665 (Survey Research and Analysis) and NRRT765 (Applied Multivariate Analysis) are designed to prepare students for their masters and/or dissertation research. Both courses are predicated on the assumption that the best way to learn research methodology and statistics is to become directly involved in the conduct of scientific inquiry. Consequently, a considerable amount of time is devoted to analyzing data from actual research projects. The projects were selected from on-going research here at CSU, as well as other studies that have been conducted across the United States and internationally. Neither NRRT665 nor NRRT765 is intended to be substitutes for formal statistics courses. Rather, emphasis is placed on (a) understanding data manipulation techniques, (b) what statistics are appropriate for addressing specific methodological problems, (c) how to interpret computer printouts, and (d) explaining your results to technical and non-technical audiences.

In taking this applied approach, the goal is to achieve the following objectives:

1) To provide an overview of the major statistical techniques used by human dimensions researchers. The specific data analysis techniques include:
   - data manipulation
   - missing data
   - response patterns & outliers
   - weighting data
   - correlation and OLS regression
   - dummy variable regression
   - logistic regression
   - mediation models
   - moderation models
   - analysis of variance
   - cluster analysis
   - exploratory factor analysis (EFA)
   - confirmatory factor analysis (CFA)
   - structural equation modeling (SEM)

2) To provide guidelines for understanding what types of statistical techniques are appropriate for analyzing selected research questions (Vaske, 2008, p. 89).

3) To provide experience analyzing data and interpreting computer printouts from SPSS and LISREL.

4) To provide assistance and experience in critically evaluating statistical analyses presented in published articles in the human dimensions literature.

5) To provide experience in preparing presentations that address research questions using multivariate analysis techniques. This includes the use of computer printouts to construct data tables for use in journal articles.

6) To provide a reference list of related statistical literature for further study.

Readings

Selected chapters from:

Vaske, J. J. (2008). *Survey research and analysis: Applications in parks, recreation and human dimensions*. State College, Pennsylvania: Venture Publishing Inc.

Vaske, J. J. (in prep.). *Survey research and analysis: Applications in parks, recreation and human dimensions*. (2nd Edition) State College, Pennsylvania: Venture Publishing Inc.

Other required readings will be announced in class. Optional readings will also be provided in certain areas for those who want to learn more about a specific technique described in class.

All of the additional readings, my lecture notes (PowerPoint slides), and databases that will be used in this course can be found in the following directories:

N:\Classes\Fall-2015\NRRT765\1 – Lectures\
N:\Classes\Fall-2015\NRRT765\2 – Student articles\
N:\Classes\Fall-2015\NRRT765\3 – Sample presentations\

The lecture notes and the quizzes are also available in Canvas.

Course Policy

Attendance – This course is a 700 level graduate level seminar. Your participation in class is an essential element of the course. You are expected to do the required readings ahead of time and come to class prepared for discussion. If you need to miss a class, it is your responsibility to notify me and obtain information about announcements, quizzes, and course content covered during a missed class.

Course Requirements

1. **In-Class Exercises** – Throughout the semester, you will participate in in-class exercises that provide experience in the application of statistical techniques learned in this course. These exercises will not count toward your final grade but are intended to supplement in-class lectures and assist with your understanding of course content.
2. **Graded quizzes** – You will be evaluated on 18 graded quizzes. Some of the quizzes will be based on the questions at the end of each chapter in Vaske (2008) or material in the lectures. Other quizzes involve running SPSS or LISREL analyses and interpreting the results. The table on pages 5 – 6 of this syllabus outlines the points for each quiz. The quizzes are online multiple choice questions. Each quiz will be due at 11:59 p.m. on the day that the quiz is listed on the schedule. Answers to the quiz will be posted at 12:01 a.m. the following day. Each quiz can be taken twice. *Quizzes that are turned in late will not receive the allotted points.*
3. **Review of Research Articles** – For some statistical techniques covered in class, you will be asked to locate a human dimensions journal article that applies that technique. Articles you select cannot be among those I provide as required or optional readings. You will need to come to class prepared to share a verbal summary and critique of the statistical procedures and research questions / hypotheses addressed in the article. You should post a copy of the article in:

   N:\Classes\NRRT765\2 – Student articles\(appropriate subdirectory) [e.g., logistic regression]

   at least 24 hours before the due date. Specific due dates are listed in this syllabus on page 4.

   File naming conventions: *FirstName_Lastname_Statistical_technique.pdf*
   (e.g., Garcie_Gadoite_Logistic_regresssion.pdf)

4. **Final Project** – The final project for this course involves the analysis and interpretation of data using SPSS and/or LISREL. Although you may and should discuss your ideas about this project with your fellow students and myself, group projects are ***not*** allowed (Note: A group is defined as 2 or more people). For the final project, you may use:
   - One of my data sets. All available data sets can be found in the directory:
     N:\Classes\Fall-2015\NRRT376_Vaske\4 – Final Project Data\
     The grading criteria that will be used to evaluate projects are also included in this directory.
   - A data set of your own choosing.

Overview of the Final Project – In the final project you will be asked to:

a) Select a data set for analysis.

b) Generate specific hypotheses regarding variable relationships in that data set. These hypotheses should be based on past research (a minimum of 10 citations). When you turn in your hypotheses, and references, you should show the connection between the existing work and your hypotheses in writing; for example:

> When users perceive a setting to be crowded, they have likely compared conditions they experienced (e.g., encounters) with their normative tolerances for thoses conditions (Manning, 2011; Shelby et al., 1996). A meta analysis by Vaske and Donnelly (2002) found people who reported fewer encounters than their norm felt not at all crowded, whereas those encountering more than their norm felt slightly or moderately crowded. This pattern was evident in all 13 studies in the meta analysis and statistically significant ($p < .05$) in 67 of 72 contexts. These findings have been replicated in other recent studies (Bell et al., 2011; Needham, 2013). The consistency of these findings suggests that this relationship will generalize to other locations and activities. Based on this research, we hypothesized:
>
> H_1: Users who encounter more people than their normative tolerance will feel more crowded compared to those encountering fewer people than their norm.

The directory: "N:\Classes\HD Reference Articles" contains over 15,000 articles to get you started.

c) Test those hypotheses using one or more of the analysis strategies discussed in class (e.g., Regression, Logistic, ANOVA, Cluster analysis, Factor analysis, SEM).

d) Prepare a 10–15 minute presentation summarizing your project.

f) You should turn in (on December 10th):
   - the presentation.
   - the SPSS / LISREL syntax used to generate the final numbers in the presentation.
   - the SPSS / LISREL data file if you are using one of your own data sets.
   - *File naming conventions: FirstName_Lastname_presentation & FirstName_Lastname_syntax* (e.g., Farquart_Farmsneader_presentation.pptx & Farquart_Farmsneader_syntax.sps)

g) To facilitate your efforts on the final project, you should complete the following tasks by each due date. You are ***strongly encouraged*** to discuss your final project with me and show me drafts of your work. ***Final project tasks that are turned in late will not receive the allotted points***.

Final Project Tasks	Due Date	Points
1. Select data base	Sept. 24	10
2. Identify hypotheses, explain connection between past research and your hypotheses, and list citations (APA format)	Oct. 20	90
3. Give presentation to class	Dec. 3 - 10	100

Course Content

Date	Day	Topic	Reading	Pages	Quiz
Aug. 25	T	Class Outline Review			
Aug. 27	R	Level of measurement: Once over again Selecting an approporiate analysis strategy	Chapter 5 Chapter 5	79–88 89–94	1 2
Sept. 1	T	Reintroduction to SPSS Understanding SPSS variables	Chapter 9 Chapter 10	223–240 242–246	3 4
Sept. 3	R	Data manipulation techniques	Chapter 12		5
Sept. 8	T	Missing data	Chapter 19	533–552	6
Sept. 10	R	Response patterns & outliers	Chapter 19	553–573	
Sept. 15	T	Weighting data	Chapter 8 Chapter 17	213–221 495–499	7
Sept. 17	R	Correlation & OLS regression	Chapter 16	409–436	8
Sept. 22	T	Reliability	Chapter 18	501–530	9
Sept. 24	R	OLS–Reliability article – Student *Select data set*			Article Final Proj.
Sept. 29	T	Dummy variable regression	Chapter 16	439–447	10
Oct 1	R	Mediation models	Chapter 20	575–584	11
Oct. 6	T	Moderation models	Chapter 20	585–592	12
Oct. 8	R	Mediation & Moderation article – Student			Article
Oct. 13	T	Logistic regression	Chapter 17		13
Oct. 15	R	Logistic regression article – Student			Article
Oct. 20	T	1-way Analysis of Variance (ANOVA) *Hypotheses, text & supporting references*	Chapter 15	375–393	 Final proj.
Oct. 22	R	n-way Analysis of Variance	Chapter 15	394–401	14
Oct. 27	T	ANOVA article – Student			Article
Oct. 29	R	Cluster Analysis – Introduction	Handout		
Nov. 3	T	Cluster Analysis in SPSS			15
Nov. 5	R	Cluster Analysis article – Student			Article
Nov. 10	T	Principle Components Analysis (PCA) Exploratory Factor Analysis (EFA)	Handout		16
Nov. 12	R	PCA / EFA Article – Student			Article
Nov. 17	T	Introduction to Structural Equation Modeling	Handout		17
Nov. 19	R	CFA and SEM	Handout		18
Nov. 24–26		Thanksgiving			
Dec. 1	T	CFA / SEM Article – Student			Article
Dec. 3	R	Student Presentations			Final Proj
Dec. 8	T	Student Presentations			Final Proj.
Dec. 10	R	Student Presentations			Final Proj

Quiz	Topic	Points
1	Levels of measurement: Once over again	15
2	Selecting the appropriate analysis strategy	50
3	Reintroduction to SPSS	20
4	Understanding SPSS variables	20
	Data manipulation techniques	
	Columbia Icefield norms (Not graded)	
	Long's Peak norm experiment (Not graded)	
	Hiker – Mountain Biker Conflict (Not graded)	
5	Mt Evans Conflict	20
	Missing data	
	Sexual harassment (Not graded)	
6	Missing data quiz	15
	Response patterns & outliers	
	Deheaping program exercise	
	Weighting data	
	CWD regional study – Arizona (Not graded)	
	CWD Wisconsin (Not graded)	
7	Weighting data quiz	10
	Correlation and OLS Regression	
	Satisfaction with DIA (Not graded)	
8	Colorado tourism development	30
	Reliability	
	Consistent-Inconsistent respondents (Not graded)	
9	Colorado skier - snowboarders	25
	Dummy variable regression	
	Wolf reintroduction (Not graded)	
10	National skier data	20
	Mediation	
	Colorado tourism development (Not graded)	
11	Desert Tortoise	30
	Moderation	
	Wolves – Italy (Not graded)	
12	Desert tortoise	25
	Logistic regression	
	CWD and Wisconsin deer hunters (Not graded)	
13	Community versus Property rights	30
	Analysis of Variance	
	Endangered fish experiment (Not graded)	
14	Colorado tourism impacts	30
	Cluster Analysis	
	Skier conflict with snowmobilers (Not graded)	
15	Hiker conflict with bikers	35

Quiz	Topic	Points
	Exploratory Factor Analysis	
	Motivations for deer hunting (Not graded)	
16	Motivations for visiting Gwaii Haanas Archipelago	25
	Introduction to Structural Equation Modeling (SEM)	
17	Intro to SEM quiz	25
	Confirmatory Factor Analysis & Structural Equation Modeling	
	Desert tortoise (Norm activation model) (Not graded)	
18	Desert tortoise (WVO → Attitude → Behavior)	25

Course Grading

Grading Summary	Percent of Grade	Total Points
Quizzes	60%	450
Review of research articles (7 @ 15 points each)	14%	105
Final project	26%	200
	100%	755

Grades will be based on the total points accumulated from requirements listed above. Grades will be assigned as follows.

Letter Grade	Percentage %	Points
A+	100 – 97	755 – 732
A	96 – 93	731 – 702
A-	92 – 90	701 – 680
B+	89 – 87	679 – 657
B	86 – 83	656 – 627
B-	82 – 80	626 – 604
C+	79 – 77	603 – 581
C	76 – 73	580 – 551
C-	72 – 70	550 – 529
D	69 – 60	528 – 453
F	Less than 60	< 452

Supplemental Readings

The supplemental course readings contain information that I believe useful for understanding methodology and statistics. These readings (approximately 3,500) can be found in the following directories:

N:\Classes\HD Reference Articles\34 – Methodology\
N:\Classes\HD Reference Articles\35 – Sampling\
N:\Classes\HD Reference Articles\36 – Monitoring Use\
N:\Classes\HD Reference Articles\37 – Measurement\
N:\Classes\HD Reference Articles\39 – Statistics – General\
N:\Classes\HD Reference Articles\40 – Statistics – Software
N:\Classes\HD Reference Articles\41 – Statistics – Techniques\
N:\Classes\HD Reference Articles\42 – Significance\