Instructor/TA Info

Instructor Information

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Course Information

Description

Winter 2016

TTh 9am to 10:30am

105 SWKT

IP&T 747 (Structural Equation Modeling) is an advanced statistics class focusing primarily on techniques of inferential analysis using Structural Equation Modeling with the program Mplus 7.3. We will cover: (a) confirmatory factor analysis, (b) SEM with latent variables, (c) Latent growth curve models for longitudinal data, (d) Multi-group modeling, (e) Mixture Modeling, and (f) Monte Carlo simulations in Mplus.

Required Software Mplus. This will be provided in the lab.

Required Book: Wang, J. & Wang, X. (2012) Structural equation modeling: Applications using Mplus. Wiley

To access the book free through BYU:

This link will take you to the page on the library's website. From here, you just have to click Online and then login with your BYU credentials to access the book online.

 $\underline{\text{https://onlinelibrary.wiley.com/doi/book/10.1002/9781118356258}} (\underline{\text{https://onlinelibrary.wiley.com/doi/book/10.1002/9781118356258}}) (\underline{\text{https://onlinelibrary.wiley.com/doi/book/10.1002/978118356258}}) (\underline{\text{https://onlinelibrary.wiley.com/doi/book/10.1002/97811$

It's also available from this link through the library:

https://ebookcentral.proquest.com/lib/byu/detail.action?docID=989223 (https://ebookcentral.proquest.com/lib/byu/detail.action?docID=989223)

Materials

No materials

Prerequisites

Multiple Regression Statistics or concurrent taking the course, Knowledge of Statistical Software such as SPSS

Learning Outcomes

Confirmatory Factor Analysis

Mastery over doing confirmatory factor analysis in a structural equation modeling context, using the computer program Mplus.

SEM with latent variables

Mastery over structural equation modeling in the presence of latent variables using the program Mplus.

Latent Growth Curve Modeling

Gain a familiarity with longitudinal data analysis in an SEM context. Using the program Mplus. **Multigroup Modeling**

Cain Mastery of mult

Gain Mastery of multigroup modeling in an SEM context. Using the program Mplus.

Mixture Modeling

Mastery over mixture modeling in an SEM context. Using the Mplus program.

Written report

Analyze a real dataset and professionally write up the results in a professional way.

Grading Scale

Grades	Percent
А	93%
A-	90%
B+	87%
В	83%
B-	80%
C+	77%
С	73%
C-	70%
D+	67%
D	63%
D-	60%
E	0%

Grading Policy

Because the course meets twice a week, with hands-on data analysis examples and quizzes conducted during each meeting absence from class will greatly interfere with students' ability to succeed in the class. For this reason, each student is expected to attend all classes, carefully complete all readings in advance of class, complete all assignments on time, and actively participate in class discussion.

Assignments

Assignment Descriptions

Chapter 1: Formative Reading Quiz

Chapter 2 (part 1): Formative Homework

May 09

Due: Wednesday, May 09 at 9:00 am

Chapter 2 (part 1): Formative Quiz



Due: Wednesday, May 09 at 12:59 pm

Chapter 1: Formative Reading Homework

May 10

Due: Thursday, May 10 at 9:00 am

Data Presentation



Due: Monday, May 14 at 11:59 pm

Please submit to learning suite.

Students present powerpoint slides on the data they have gathered and their research questions that may be answered with SEM.

- (2-3) slides on theory
- (1) Slide on Hypothesis or questions
- (1-2) slides on variables of interest

CFA Project presentation (your Data)



Due: Monday, May 14 at 11:59 pm

Please submit to Learning suite.

Students present the results of a CFA on their Data. .

- (2-3) slides on theory
- (1) slides on Questions of interest
- (2-3) slides on assumption checking
- (2-3) slides on Results
- (1-2) slides on Discussion

Chapter 2 (part 2, section 5, starts on page 78)



Due: Monday, May 14 at 11:59 pm

Chapter 2 (part 2) Formative Reading quiz



Due: Monday, May 14 at 11:59 pm

CFA article Presentation



Due: Monday, May 14 at 11:59 pm

Please submit to learning suite

Find an article that uses CFA in your area of interest.

Create powerpoints that contain the article reference

- (a) review the theory
- (b) check the assumptions
- (c) report the results
- (d) whether you believe you believe the results

About 5 slides.

SEM article presentations



Due: Monday, May 14 at 11:59 pm

Please submit to learning suite.

Find an article that uses SEM in your area of interest.

Create powerpoints that contain the reference

- (a) review the theory
- (b) check the assumptions
- (c) report the results
- (d) whether you believe you believe the results

About 5 slides.

EFA book. Formative Quiz



Due: Wednesday, May 16 at 11:59 pm

Mav 16

Due: Wednesday, May 16 at 11:59 pm

Getting started with Mplus

May 16

Due: Wednesday, May 16 at 11:59 pm

DBL demo

May 22

Due: Tuesday, May 22 at 11:59 pm

Multigroup article presentations

May

Due: Wednesday, May 23 at 11:59 pm 23

Please submit to Learning Suite.

Find an article that uses Multigroup modeling in your area of interest.

Create powerpoints that

(a) review the theory

(b) check the assumptions

(c) report the results

(d) whether you believe you believe the results

About 5 slides.

Chapter 3: SEM part 2 formative quiz

May 23

Due: Wednesday, May 23 at 11:59 pm

Chapter 3: SEM part 2 formative homework

May

28

Due: Monday, May 28 at 11:59 pm

Pp. 119-130 of the book

SEM Simulated Project

28

Due: Monday, May 28 at 11:59 pm

 $Here is part 1. SEM start.csv \\ \underline{Download (plugins/Upload/fileDownload.php?fileId=5e4bfd2a-piRe-wknC-MNgG-mathematical plugins/Upload/fileDownload.php?fileId=5e4bfd2a-piRe-wknC-MNgG-mathematical plugins/Upload/fileDownload.php.fileDownload.php.fileDownload/fileDownload.php.fileDownload/fileDownload/fileDownload/fileDownload/fileDownload/fileDownload/fileDownload/fileDownload/fileDownload/fileDownload/fileDownload/fileDownload/fileDownload/file$ $\underline{pQf8965755ba\&pubhash=gN27ftezdrpAXsFJTYCC_CA3Cp4635gpnhXEPtqvbfDQctldFNnK7T5QF6ticB0h4oGO1jJ-HmN-PXr7SdoDlQ==)}$

Chapter 3: SEM part 1 formative Quiz

May 28

Due: Monday, May 28 at 11:59 pm

All the material from Chapter 3 up to page 100 in the Wang & Wang.

Chapter 5 part 1(207-212) formative quiz

May 30

Due: Wednesday, May 30 at 12:00 pm

Chapter 5 part 1(207-212) formative homework

May 30

Due: Wednesday, May 30 at 11:59 pm

MIMIC practice

May 31

Due: Thursday, May 31 at 11:59 pm

Indirect Effects practice

31

Due: Thursday, May 31 at 11:59 pm

Mini Project Part II

Jun 04

Due: Monday, Jun 04 at 9:00 am

Mini Project Part II

Is the reduced measure invariant across genders?

Create a 5 slide presentation succinctly defending your decision. You may want to use the following resources.

10010010

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 $\label{local_model} \begin{tabular}{ll} Miniproject Part II_reduced 16. inp $$\underline{Download.plugins/Upload/fileDownload.php?fileld=4620f1a3-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90\&pubhash=qz88Dk2-viGg-ljSU-D7A2-CZ2afae9cb90&pubhash=qz88Dk2-viGg-ljSU-D7A2-cZ2afae9cb90&pubhash=qz88Dk2-viGg-ljSU-D7A2-cZ2afae9cb90&pubhash=qz88Dk2-viGg-ljSU-D7A2-cZ2afae9cb90&pubhash=qz88Dk2-qz90&pubhash=qz88Dk2-qz90&pubhash=qz80Dk2-qz90&pubhash=qz80$

T_8J2vHl0Cl4lFuTi_h5TR8Zsyc1kAeT95pD7dSwoLVl1Bl7dYKDttMHkDd8iKdxpyaBoT6nHVYpbA==)

Chen (http://sfx.lib.byu.edu/sfxlcl3?

sid=google&auinit=FF&aulast=Chen&atitle=Sensitivity+of+goodness+of+fit+indexes+to+lack+of+measurement+invariance&id=doi:10.1080/10705510701301834&title=Structural+equation+modeling&volume: 5511) (has the cutoffs)

Wang and Wang

- pg. 222 (configural code)
- pg. 231 (metric code)
- pg. 236 (scalar code)

For extra points towards your house in the race for the house cup (click here to discover your house (#)) run it again to see if it is invariant across year in school (sophomore, freshman, etc.).

Ch. 5 practice

Jun 09

Due: Saturday, Jun 09 at 11:59 pm

Practice measurement invariance with continuous and categorical indicators.

Final Presentation

Jun 13

Due: Wednesday, Jun 13 at 11:59 pm

Please submit to learning suite.

Students will prepare a short Powerpoint presentation which they share on the last day of class.

Chapter 3: SEM part 1 formative homework

Jun 13

Due: Wednesday, Jun 13 at 11:59 pm

This formative homework covers all Chapter 3 up to page 100 up to the differential item functioning section

In Class CFA/EFA Practice--Continuous Data

Jun **17**

Due: Sunday, Jun 17 at 9:00 am

Homework CFA/EFA Practice--Censored Data

Jun 17

Due: Sunday, Jun 17 at 11:59 pm

Symbols and Shapes

Jun 17

Due: Sunday, Jun 17 at 11:59 pm

Final Project

Jun 18

Due: Monday, Jun 18 at 11:59 pm

The individual project will consist of a write-up of a hypothesis the student has come up with and data analysis of a secondary dataset to confirm or deny that hypothesis. The project will consists of a paper (15-20pages) double-spaced, APA style where:

- (a) student will state hypothesis,
- (b) check assumptions for SEM,
- (e) run SEM, and
- (f) write a short conclusion.

University Policies

Honor Code

In keeping with the principles of the BYU Honor Code, students are expected to be honest in all of their academic work. Academic honesty means, most fundamentally, that any work you present as your own must in fact be your own work and not that of another. Violations of this principle may result in a failing grade in the course and additional disciplinary action by the university. Students are also expected to adhere to the Dress and Grooming Standards. Adherence demonstrates respect for yourself and others and ensures an effective learning and working environment. It is the university's expectation, and every instructor's expectation in class, that each student will abide by all Honor Code standards. Please call the Honor Code Office at 422-2847 if you have questions about those standards.

Sexual Misconduct

In accordance with Title IX of the Education Amendments of 1972, Brigham Young University prohibits unlawful sex discrimination against any participant in its education programs or activities. The university also prohibits sexual harassment-including sexual violence-committed by or against students, university employees, and visitors to campus. As outlined in university policy, sexual harassment, dating violence, domestic violence, sexual assault, and stalking are considered forms of "Sexual Misconduct" prohibited by the university.

University policy requires all university employees in a teaching, managerial, or supervisory role to report all incidents of Sexual Misconduct that come to their attention in any way, including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Incidents of Sexual Misconduct should be reported to the Title IX Coordinator at text-organizationg-byu.edu or (801) 422-8692. Reports may also be submitted through EthicsPoint at https://titleix.byu.edu/report (https://titleix.byu.edu/report) or 1-888-238-1062 (24-hours a day).

BYOLD STATE OF STATE be helpful. Additional information about Title IX, the university's Sexual Misconduct Policy, reporting requirements, and resources can be found at http://titleix.byu.edu (http://titleix.byu.edu) or by contacting the university's Title IX Coordinator.

Student Disability

Brigham Young University is committed to providing a working and learning atmosphere that reasonably accommodates qualified persons with disabilities. If you have any disability which may impair your ability to complete this course successfully, please contact the University Accessibility Center (UAC), 2170 WSC or 422-2767. Reasonable academic accommodations are reviewed for all students who have qualified, documented disabilities. The UAC can also assess students for learning, attention, and emotional concerns. Services are coordinated with the student and instructor by the UAC. If you need assistance or if you feel you have been unlawfully discriminated against on the basis of disability, you may seek resolution through established grievance policy and procedures by contacting the Equal Employment Office at 422-5895, D-285 ASB.

Academic Honesty

The first injunction of the Honor Code is the call to "be honest." Students come to the university not only to improve their minds, gain knowledge, and develop skills that will assist them in their life's work, but also to build character. "President David O. McKay taught that character is the highest aim of education" (The Aims of a BYU Education, p.6). It is the purpose of the BYU Academic Honesty Policy to assist in fulfilling that aim. BYU students should seek to be totally honest in their dealings with others. They should complete their own work and be evaluated based upon that work. They should avoid academic dishonesty and misconduct in all its forms, including but not limited to plagiarism, fabrication or falsification, cheating, and other academic misconduct.

Schedule

Date	Column 1	Column 2	Column 3
Week 1			
W May 02 Wednesday	Model Formulation (Chapter 1)	Yearning for home (selves and others) Joseph	Chapter 1: F
	Other places to get data		
	https://www.data.gov/		
	computer use, math, gender sem.txt Download		
	Confirmatory Factor Analysis (Chapter 2)		
	Chapter 2 CFA .pptx <u>Download</u>		
	Required Readings		
	Worthington, R. L., & Whittaker, T. A. (2006). Scale development research a content analysis and recommendations for		
	best practices. The Counseling Psychologist, 34(6), 806-838.		
	Model Formulation (Chapter 1)		
	Chapter 1.pptx <u>Download</u>		
	ELS		
	data_Raw_MPLUS_Export.csv <u>Download</u> Course Introduction		
	<u>Devotional Yearning for Home</u> (ourselves and others)		
	Mplus and You (Introduction) .pptx <u>Download</u>		
	How to access Mplus through the remote server		
	Instructions on how to access SPSS through the remote		
	server.docx <u>Download</u> ELS data_Raw.sav <u>Download</u>		
	ELS data_Raw_Mplus_Export.csv_Download		
	Get an individual Dataset assignment:		
	Distant Learning Dataset Training		
	(DLDT) • Education Data Analysis Tool (EDAT)		
	EDAT User's Guide		
	Decision Based Learning		
	IPT 747 DBL Model -		
	2018.01.05b.pdf <u>Download</u>		

M May 07 Monday		DVIII comica Ocite Ocite	Getting st
	Confirmatory Factor Analysis (Chapter 2)	Devotional Seeking Revelation (Rachel)	Chapter 1 Chapter 2
	CFA Examples from the book		
	BSI dataset (Chapter 2) (2).sav <u>Download</u> BSI-18 Complete categorical 2nd		
	order.inp <u>Download</u> Model comparisons.xlsx <u>Download</u>		
	Confirmatory Factor Analysis (Chapter 2) Chapter 2 CFA part two .pptx <u>Download</u>		
	EFA:		
	Dataset for classn=1000,stud & par_3.sav <u>Download</u>		
	Annotated <u>Output for SPSS</u>		
	NELS EFA SPSS.sps <u>Download</u> NELS EFA Output.spv <u>Download</u>		
	Exporting data to MPLUS NELS MPLUS EXPORT.sps <u>Download</u> NELS Mplus export.csv <u>Download</u> NELS EFA Mplus.inp <u>Download</u> nels efa mplus.txt <u>Download</u>		
	Parallel Analysis NELS EFA Mplus Parallel		
	Analysis.inp <u>Download</u> nels efa mplus parallel analysis.txt <u>Download</u> nels efa mplus parallel		
	analysis.gh5 <u>Download</u> nels efa mplus parallel analysis ouput.pdf <u>Download</u>		
T May 08 Tuesday			
W May 09 Wednesday	Data Presentations Aschliman Project Draft.docx <u>Download</u>	Devotional Seeking Revelation (Chunyue)	Yearnin
	ASI paper for stats (1).docx <u>Download</u> HeidiVogeler-FinalPaper- SAQandEDI.docx <u>Download</u>		Yearnin Chapter 2 Chapter 2
	nels bootstrap example.txt <u>Download</u>		
	CFA		
Th May 10 Thursday			Chapter 1
Week 3			
M May 14 Monday	Missing Data	Devotional Seeking Revelation (Lisa)	CFA Proj
	Missing Data.pptx <u>Download</u>	Devolutial Georging Nevolution (Elea)	CFA artic Data Pres SEM artic Chapter 2 Chapter 2
W May 16 Wednesday	Missing Data Missing Data.pptx <u>Download</u> Missing Data Missing Data paty Daysland	Devotional Seeking Revelation (Alex)	Getting s EFA bool EFA bool
	Missing Data.pptx <u>Download</u>		

M May 21 Monday		DV/III	
W Way 21 Worlday	SEM with latent variables (Chapter 3)	Devotional Seeking Revelation (Anthony)	Dream/cheerin
			take the forma
	Chapter 3 SEM (1).pptx <u>Download</u> Chapter 3 part 2.pptx <u>Download</u>		Read the wikip
	Onapidi o part E.pput activities		https://en.wikip
	Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. Structural equation modeling,		Chapter 3: SE Chapter 3: SE
	14(3), 464-504.		
T May 22 Tuesday			DBL demo
W May 23 Wednesday	Mariki manan Mandalima (Obantas 5)	Mini Desired	Multigroup ar
,	Multi-group Modeling (Chapter 5)	Mini Project	Patience Close
	01 5 5 (0007) 0 11111 1	Devotional Seeking Revelation (MEgan)	Patience Close
	Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement		Chapter 3: SE
	invariance. <i>Structural equation modeling</i> , 14(3), 464-504.		Chapter 5 par
	Crack_BDI.sav <u>Download</u>		
	cross lag model with free cross- lags.out <u>Download</u>		
	Multigroup Modeling (Chapter 5)		
Week 5			
M May 28 Monday	Memorial Day		Dationas Class
	Latent Growth Curve Models (Chapter 4)		Patience Close
	Chapter 4 part 1 pptx Download		Chapter 3: SE
	Chapter 4 part 2.pptx <u>Download</u>		Chapter 3: SE SEM Simulate
Latent Growth Curv	Latent Growth Curve Models (Chapter 4)		
W May 30 Wednesday			Holy Ghost N
			Chapter 5 part
Th May 31 Thursday			Indirect Effect
Week 6			
M Jun 04 Monday	Crack BDI (1).csv <u>Download</u>	Measurement Invariance Comparisons.xlsx <u>Download</u>	Holy Ghost A
	Mixture Modeling (Chapter 6)		Mini Project P
		LGM Data	
5 point cra categorica Chen, F. F of fit index invariance	Crack_BDI.dat <u>Download</u> 5 point crack scores Invariance test	https://www.google.com/url? hl=en&q=https://drive.google.com/drive/folders/13dJeDQizoPrtcdM3GLbY5n8rZRs52MNt?	
	categorical fscores export.inp <u>Download</u>	usp%3Dsharing&source=gmail&ust=1521649199864000&usg=AFQjCNGROumMjrDvINLK25wg4bmkPrVewA	
	Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement	Mplus Language Addendum (Invariance short-cut)	
	invariance. Structural equation modeling,	https://www.statmodel.com/download/Version7.1xLanguage.pdf	
	14(3), 464-504.	Here is the LGM data in one place.	
	multigroup analysis of crack and male scalar invariance shortcut.out <u>Download</u>	semMini_pt3_all.sav Download	

W Jun 06 Wednesday	Mixture Modeling (Chapter 6)	3/22/2018 Mini project in class:	Holy Ghost Ra
	Wixture Wodeling (Chapter 0)	Start with Slide 78:	Holy Gliost Ne
	Fan, W., & Hancock, G. R. (2012). Robust	https://www.statmodel.com/download/Topic%204new.pdf	
	means modeling: An alternative for	Pbworks:	
	hypothesis testing of independent means under variance heterogeneity and	https://my.pbworks.com/	
	nonnormality. Journal of Educational and		
	Behavioral Statistics, 37(1), 137-156.		
	LCA.dat <u>Download</u> <u>Download</u>	Robust Means Modeling Syntax	
		rmm doi1t1 gender.out <u>Download</u>	
	Mixture Modeling (Chapter 6)		
		LGM Output:	
		configural multiwave.out <u>Download</u>	
		investigating growth of the first indicator.out <u>Download</u> metric multiwave.out <u>Download</u>	
		scalar multiwave.out <u>Download</u>	
		Igm of doi with plot.out Download	
Sa Jun 09 Saturday			Ch. 5 practice
Week 7			
M Jun 11 Monday	Latent Crowth Curve Modele (Chapter 4)	U in a man data that can be used for latent along analysis	Liely Choet Al
1	Latent Growth Curve Models (Chapter 4)	Here is some data that can be used for latent class analysis. LCAdata.csv Download	Holy Ghost Ale
	LCA in class practice	LCAdata.csv Download	
	LCA in class practice		
W Jun 13 Wednesday	Student Final Presentations	Chunyue and Lisa presenting	Chapter 3: SEM
			Holy Ghost- Chu
	Student Final Presentations		
Su Jun 17 Sunday			
Week 8			
M Jun 18 Monday	T		T
W our to me	Student Final Presentations		Holy Ghost Ac
	Final Exam:		
	105 SWKT		
	7:00am - 10:00am		
W Jun 20 Wednesday	First Day of Spring Final Exams (06/20/2018 - 06/21/2018)		