BUSI 6220 – Applied Regression Analysis
Fall 2023

CLASS (DAY/TIME):   M 2:00 – 4:50 pm, BLB 065
INSTRUCTOR :   Dr. Arunachalam Narayanan (Chalam)
OFFICE: BLB 379J
OFFICE HRS: Monday: 1-2pm
        Wednesday (Zoom) 10 – noon (by appointment)
        Thursday – 1-2 pm
        or by appointment
 Zoom link (When needed):   https://unt.zoom.us/my/chalamunt
 E-MAIL (preferred):   **Arunachalam.Narayanan@unt.edu**

Textbooks:
1. Kutner, Nachtsheim, & Neter, *Applied Linear Regression Models*, 4th Ed., McGraw-Hill, ISBN 978-0073014661 *(recommended textbook)*
2. Pardoe, *Applied Regression Modeling*, 2nd Ed., Wiley, ISBN 978-1118097281 *(OPTIONAL – good to have)*
3. Mendenhall and Sincich, A second course in statistics and regression analysis, Pearson Education, ISBN 9780321691699 *(OPTIONAL)*

Software
    Preferred: Excel, JMP, IBM SPSS, MINITAB (but needs to purchased if you want to use it)
    Good to have: STATA, R, SAS all available at CoB.

Learning Management System (Canvas)
The course is on Canvas. Please check frequently for updates.
Exams: May require respondus lock down browser. Make sure you have a system with web camera for interaction.

Course Description
BUSI 6220 Applied Regression Analysis. 3 hours. Applications of multivariate regression analysis, analysis of variance procedures, canonical correlation analysis and nonparametric statistical procedures to issues in business research involving multivariate data. Topics include building, evaluating, and validating a regression model; analyzing models using hierarchical regression, contrast coding, partial correlations and path analysis; logistic regression; and comparing parametric and corresponding nonparametric tests. Prerequisite(s): DSCI 5180 or equivalent and BUSI 6450 (may be taken concurrently with BUSI 6220).

Learning Goals
At the end of the course, you should:
1. Understand the problems and opportunities when dealing with Regression Analysis.
2. Understand the role of regression analysis in decision making:
3. Understand how Regression models can be used to analyze research data and test research hypotheses.
4. Understand how regression coefficients establish testable relationships between

variables.

5. Become familiar with some major statistical packages, such as Excel, JMP, IBM SPSS, STATA, SAS, and R, and Minitab be able to use them and perform regression analysis.

Class Attendance
Regular class attendance and informed participation are expected at a PhD level seminar.

Exams
Three exams are scheduled for the semester: two midterms and a comprehensive final exam. A basic test on statistical tools ("diagnostic test") will be administered in the second week of class . Midterms will be administered on the days indicated in the course schedule. The final exam is comprehensive and will take place as scheduled officially by UNT. The exams will mostly consist of problem-oriented questions and will typically be closed books & notes. Some of it may require using computer (software) to solve. In addition, I may assign part of the exams as a "take-home" portion.

Quizzes
A number of short, in-class quizzes will be given. These will typically refer to the lecture material, homework problems, and case studies, presented in the current and in the previous class period.

Homework Assignments
Homework problems and exercises will be assigned throughout the semester. I expect everyone to complete the assignments on time. Assignment reports will be turned in electronically, by uploading them on Canvas. You may be asked to present your solution to the class. I strongly encourage you to work the solutions to these problems on your own. However, I also want you to feel free to exchange ideas with other students in the course (except during the exams!) Keep in mind that homework problems, appropriately modified, may re-appear as exam problems.

Case Studies and Published Papers
Case studies and papers will be discussed throughout the semester. Each one of them is trying to make an important point, which you need to understand very well, and remember throughout the semester (and, hopefully, the rest of your career as a researcher or an academic!) In the research papers, which are sampled from business journals, the focus will be on the methods/research design, and results/statistical analysis sections. You are not asked to turn in any reports on case studies or published paper readings, and there will be no grade component directly assigned to the case studies or the published papers. However, keep in mind that the main points discussed in the case studies and the papers may appear on quizzes and exams.

Project
The course has a term project.
The project should involve data you collected personally, including survey data, company data, personal data, or archival data from any source (public and private) – proper acknowledgement must be given for the source. You are encouraged to work in groups (of 2 members). You may expand on work you started in your Research Methods class (BUSI 6450) or other equivalent class, as long as you perform some original data analysis. Project status updates will take place throughout the semester. Results of your analysis will be

presented to class in a brief (10 min or less) presentation, during the last week of classes.

Deliverables include
(1) your **data set** in Excel format or csv format,
(2) your **presentation slides** in PowerPoint format, and (3) your **methods write-up** in Word format.

Statistical Software
You are expected to be able to use relevant software required for solving problems assigned as homework and for take-home portions of the exams. I will provide examples, or even step-by-step instructions from time to time, but there will still be a lot of self- learning involved. We will use IBM SPSS, JMP and Minitab in this course. We will introduce STATA and R to a smaller extent. However, you are free to use any of these statistical packages for your analysis of exam/homework questions.

Grading
Your total grade in the course is on a **600**-point grading scale. Each midterm exam is worth 100 points; the final exam is worth 150 points. Each one of 10 graded HW assignments is worth 10 points, for a total of 100 points. The term project is worth 100 points. Each one of 5 quizzes is worth 10 points, for a total of 50 points.

Exam 1	100	
Exam 2	100	
Final Exam	150	
HW assignments	100	(10 home works)
Project	100	
Quiz	50	(5 quizzes)
Additional Bonus opportunities	(Will be discussed in class- Max 25 points)	

Course grades will be assigned as follows:
> 90 % = A;   80 to 89 % = B;   70 to 79 % = C;   60 to 69% = D;   < 60 % = F

Academic Integrity
This course adheres to the UNT policy on academic integrity. The policy can be found at http://policy.unt.edu/sites/default/files/06.003.pdf. If you engage in academic dishonesty related to this class, you will receive a failing grade on the test or assignment, and a failing grade in the course. In addition, the case will be referred to the Dean of Students (for graduate courses, also the Dean of Toulouse Graduate School) for appropriate disciplinary action.
The term "cheating" includes, but is not limited to,
(1) use of any unauthorized assistance in taking quizzes, tests, or examinations;
(2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; (3) the usage, without permission, of tests or other academic material belonging to a faculty member or staff of the university; or
(4) dual submission of a paper or a project without express permission from the instructor. The term "plagiarism" includes, but is not limited to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full or clear

acknowledgment, or proper citation and reference. It also includes the unacknowledged use of materials prepared by another person or agency in the selling of term papers or other academic materials. (Source: Code of Conduct and Discipline at the University of North Texas; please check online for the most updated version and related definitions.)

Students with Disabilities
UNT complies with the Americans with Disabilities Act in making reasonable accommodations. Please see your instructor as soon as possible to discuss.

Deadlines
Dates of drop deadlines, final exams, etc., are published in the university catalog and the schedule of classes (https://registrar.unt.edu/registration/fall-registration-guide). Please be sure to stay informed about these dates.

Student Perceptions of Teaching (SPOT)
Student Perceptions of Teaching (SPOT) is a requirement for all organized classes at UNT. This short Web-based survey will be available to you at the end of the semester, providing you a chance to comment on how this class is taught. I am very interested in this feedback from my students, as I work to continually improve my teaching. I consider SPOT to be an important part of your class participation.

Campus Closures
Should UNT close campus, it is your responsibility to keep checking your official UNT e-mail account to learn if your instructor plans to modify class activities, and how.

Course Materials for Remote Instruction
Remote instruction may be necessary in some instances. Students will need access to a webcam, microphone and laptop with Office 365 and access to UNT VPN to participate in fully remote portions of the class. Additional required classroom materials for remote learning include: access to UNT VPN so that software like Minitab, SPSS and SAS could be accessed without interruptions. Information on how to be successful in a remote learning environment can be found at https://online.unt.edu/learn

Academic Integrity Policy
Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. For this course, the ITDS ethics statement clearly delineates what activities are considered as violation, including some examples. An academic integrity violation will lead to a "F" grade in this course.

ADA Policy
UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's

specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website (https://disability.unt.edu/).

The College of Business Administration complies with the Americans with Disabilities Act in making reasonable accommodations for qualified students with disability. If you have an established disability as defined in the "Act" and would like to request accommodation, please contact the ODA and your instructor (Dr. Chalam) as soon as possible: the instructor's office hours and phone number are in the syllabus.

Prohibition of Discrimination, Harassment, and Retaliation (Policy 16.004)
The University of North Texas (UNT) prohibits discrimination and harassment because of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law in its application and admission processes; educational programs and activities; employment policies, procedures, and processes; and university facilities. The University takes active measures to prevent such conduct and investigates and takes remedial action when appropriate.

Retention of Student Records
Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student's records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University's policy. See UNT Policy 10.10, Records Management and Retention for additional information.

Acceptable Student Behavior
Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT's Code of Student Conduct (https://policy.unt.edu/policy/07-012) to learn more.

BUSI 6220 TENTATIVE TIME SCHEDULE – Fall 2023

The schedule below is a tentative outline for the semester. It is meant to be a guide and several items are subject to change. Certain topics may be stressed more or less than indicated.
TEXTBOOK LEGEND: P=Pardoe, KNN (recommended text)= Kutner, Nachtsheim, Neter.

Week (Monday)	Topics Covered	Readings and Exercises
1 (Aug 21)	Syllabus Lecture 1: Introduction to Simple Linear Regression, estimation of parameters • Analytical solution to LS estimation • Use of Excel, SPSS, JMP, MINITAB, and STATA	P 2.1-2.3, **KNN 1** HW0 (Diagnostic Test prep), HW1 Case 1: When test scores seem too good
2(Aug 28)	**Diagnostic Test (1-hour duration)** Remaining discussions from Week 1	
Sep 4	Labor Day Holiday	
3 (Sep 11)	Lecture 2: Inference in Regression Analysis, Model assumptions, analysis of residuals • Measures of Strength of Association • ANOVA approach to Simple Regression • Model assumptions	P 2.3, **KNN 1, KNN 2** HW2 Case 2: The Market Model and investment portfolio selection
4 (Sep 18)	Lecture 3: Diagnostics and remedial measures, Box-Cox transformation and Yeo-Johnson Transformations	P 2.4, **KNN 2, KNN 3** HW3, Q1
5 (Sep 25)	Lecture 4: Simultaneous inference, Confidence Intervals, Prediction Intervals	P 2.6, **KNN 3, KNN 4** HW 4, **Q2** Project Update: Topic, group members
6 (Oct 2)	**October 2, Exam 1**	
7 (Oct 9)	Lecture 5: Matrix approach to Simple Linear Regression and Multiple Regression Analysis • Matrix approach • Interpretation of coefficients • Model assumptions & residual analysis • Partial regression	**KNN 5, KNN6** HW5 Project Update: Research Questions, Survey Items

8 (Oct 16)	Lecture 6: Multiple Regression contd.
	  • Multicollinearity
	  • Remedial measures for Multicollinearity
	  Nominal and Qualitative Scales
	  • Dummy Coding
		P 3.1-3.4, **KNN 6, KNN 7** HW6
		Case 3: The red car paradox

9 (Oct 23)	Lecture 7: Interactions, construct reliability How to develop scales	P 4.1-4.3, **KNN 8**, Q3 HW 7 Case 4: Survey analysis/part 1 Case 5: Can regression make a case for causality?

10 (Oct 30)	Lecture 8: Building the Regression Model
	  • Model Selection
	  • Model Validation
	  • Diagnostics
		P 5.3, **KNN 9**
		HW 8, Q4, Paper1

11 (Nov 6)	**November 6, Exam 2**	

12 (Nov 13)	Lecture 9: Regression Model Diagnostics, and Autocorrelation in Time Series Data
	  • Outliers
	  • Influential observations
	  • Autoregressive techniques
	  • ACF and PACF plots
		P 5.1, **KNN 10, 11, 12**
		HW 9
		Project Update: data collection status

(Nov 20) <u>(Thanksgiving Wednesday)</u>	*No class (A lecture could be posted online)*	*No class*

14 (Nov 27)	Lecture 11: Additional topics of interest
	  • Mediation effects
	  • Logistics Regression
	  • Endogeneity
	  • Papers assigned for reading in Week 12
		KNN 14
		HW 10, Q5
		Project Update: status
		
		Case 6: survey analysis/part 2
		Three papers on endogeneity and empirical research, challenges and solutions

15 (Dec 4)	Term project presentations Review for the final exam	Final Exam take-home portion assigned Term Project presentation

16 (Dec 11)	FINAL EXAM
	  • Take-home portion due on Friday, Dec 8 noon
	  • In-class comprehensive final exam (remote using respondus lockdown browser)
	    Monday, Dec 11, (1:30 – 3:30pm)	