UTRGV™

MATH 6333 90L: Statistical Learning - CRN: 34169
SYLLABUS
Fall 2021

COURSE INFORMATION:
Meeting times: MW 05:00 to 06:15 PM CT
Meeting location: through zoom link: LINK.
Course Modality: Online Synchronous Courses (OSYNC)
OneDrive folder: with all of the course material and recordings LINK.

INSTRUCTOR INFORMATION:

Instructor Name: Tamer Oraby, PhD
Phone: (956) 665-3536
E-Mail: tamer.oraby@utrgv.edu (better to contact me by email)
Office location: through zoom link: LINK.
Office hours: TR 12:00 - 01:00 PM CT

COURSE DESCRIPTION, PREREQUISITES & MODE OF LEARNING
This course introduces the statistical methods for supervised and unsupervised learning, including topics of regression and classification, such as linear regression, multiple regression, logistic regression, K-nearest neighbors, polynomial regression, splines regression, tree regression, random forests, ridge regression and the Lasso, linear and quadratic discriminant analysis, support vector machines, artificial neural networks regularization techniques, and boosting techniques. During the course, we will apply these techniques in several case studies. Prerequisite: Consent of instructor

COVID-19 RESOURCES:
Please visit the UTRGV COVID-19 protocols web page for the most up-to-date COVID-19 campus information and resources. The COVID-19 Frequently Asked Questions (FAQs) web page offers additional guidance to specific questions. To submit a question for the FAQ, please email WelcomeBack@utrgv.edu.

UTRGV VACCINE PORTAL
UTRGV Students are eligible to receive the COVID-19 Vaccine. Students may access and complete their vaccine profile via the UTRGV Vaccine Portal. For additional information on the COVID-19 Vaccine, please visit the UTRGV Vaccine web page.

MY TEACHING PHILOSOPHY
- Learning responsibility rests on the student.
- Doing your homework is not equivalent to learning; you must study the material first and do many exercises for learning before you start doing your homework.
- Better to study in groups like wolves hunting in packs, while they are individually strong.
- Cheating is like shoplifting.
- Talk to me as soon as possible if you find any difficulty in the course. Let me know also if you have any obstacle that hinders you from studying. The sooner, the better.

LEARNING OBJECTIVES/OUTCOMES FOR THE COURSE

Student Learning Outcomes	Program Student Learning Outcomes	Standards	Major Course Requirement/Major Assignment/Examination
Apply statistical learning methods to real-life problems	Empirical & Quantitative Skills	Perform the methods using R with high accuracy	Homework and projects
Apply supervised and unsupervised learning methods to real-life problems	Critical Thinking Empirical & Quantitative Skills	Use the appropriate methods using R for the right data and objective	Homework and projects
Apply regression analyses for statistical learning to real-life problems	Empirical & Quantitative Skills	Perform the methods using R with high accuracy	Homework and projects
Apply classicifaction analyses to real-life problems	Empirical & Quantitative Skills	Perform the methods using R with high accuracy	Homework and projects
Apply clustering analyses to real-life problems	Empirical & Quantitative Skills	Perform the methods using R with high accuracy	Homework and projects
Apply artificial neural network to real-life problems	Empirical & Quantitative Skills	Perform the methods using R with high accuracy	Homework and projects
Apply regularization and boosting techniques	Empirical & Quantitative Skills	Perform the methods using R with high accuracy	Homework and projects

LEARNING OBJECTIVES FOR CORE CURRICULUM REQUIREMENTS

Core Objectives	UTRGV Student Learning Outcome Statement	Core Area
Critical Thinking	Students will demonstrate comprehension of a variety of written texts and other information sources by analyzing and evaluating the logic, validity, and relevance of the information in them to solve challenging problems, to arrive at well-reasoned conclusions, and to develop and explore new questions.	All Core Areas
Communication Skills	Students will demonstrate the ability to adapt their communications to a particular context, audience, and purpose using language, genre conventions, and sources appropriate to a specific discipline and/or communication task.	All Core Areas
Empirical & Quantitative Skills	Students will be able to make and communicate informed conclusions and predictions based on the interpretation, manipulation, and analysis of empirical and quantitative data.	Math, Life & Physical Sciences, Social & Behavioral Sciences

TEXTBOOK, TECHNOLOGY, AND/OR RESOURCE MATERIAL

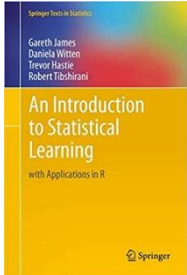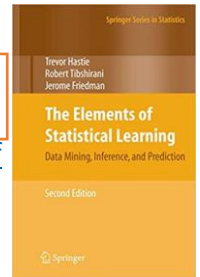**Primary Textbook:** "The Elements of Statistical Learning: Data Mining, Inference and Prediction"
by Trevor Hastie, Robert Tibshirani and Jerome Friedman. Second Edition.
Springer Series in Statistics. ISBN-13: 978-0387848570. (~ $ 50 on Amazon)
The book's website is: https://web.stanford.edu/~hastie/ElemStatLearn/printings/ESLII_print12.pdf
To download book datasets: https://web.stanford.edu/~hastie/ElemStatLearn/

ESL

ISL

Textbook for SL with R: "An Introduction to Statistical Learning with Applications in R" by James,
Witten, Hastie, and Tibshirani. Second Edition. Available at
https://web.stanford.edu/~hastie/ISLRv2_website.pdf
(We will use this book to assign some Homework as well)

Additional reading:
1. Pattern Recognition and Machine Learning by Christopher Bishop Publisher: Springer (October 1, 2007)
2. An Introduction to R by Venables and Smith

Software: the main software is R and it is free to download from

https://www.r-project.org/

and then you are advised to download the free interface R-Studio from

https://www.rstudio.com/products/rstudio/download/

Additionally, **install** the ISLR2 package by typing and running the following line in RStudio's Console
install.packages("ISLR2")
Which is the second edition required datasets and functions of the second edition of the R software textbook.

https://cran.r-project.org/web/packages/ISLR2/index.html

Course files will be posted on: Blackboard and OneDrive folder that will be shared with you. The OneDrive folder is

accessible through this LINK.

Other Resources Needed:
Students are expected to have access to a computer or a laptop every day during the course time. This course will need frequent use of the statistical software R. Students are also expected to be familiar with Blackboard and Zoom.

Course Format is Online Synchronous Courses: These courses will be delivered fully online. There will be a designated class meeting time for real-time instructor/student interaction, which will be conducted remotely via online platforms from the safety of your home. This real-time interaction may be supplemented by asynchronous video lectures and the digital presentation of course content. If this is the case it may mean a proportional reduction in number of synchronous class meetings. Your instructor will provide the details in the course syllabus. Your instructors will provide you with feedback on assigned work, communicate with you electronically, and be available to meet with you as defined on this syllabus.

HOMEWORK
Homework will be assigned regularly through blackboard. Homework will be posted and collected as scanned (legible) copies under the folder "Homework and Exams" on blackboard. An announcement and an email will be sent everytime a homework will be assigned. Do not copy from solution manuals or seek online assistance from outside UTRGV. I consider that cheating and is no different than shoplifting. Rather work on it as groups but at the end submit your own solution and don't copy from your group partners. I can catch it and it is going to be reported to the university.

CASE STUDIES
Two case studies will be assigned during the semester. In each study, you are expected to complete a statistical analysis appropriate for the given problem using R (any other software is also fine). The deliverables of the case studies is a 5 pages report with R code attached at the end of the report.

MIDTERM EXAM
There will be one TAKE-HOME midterm exam. Exam will be assigned and collected through blackboard. Exam will be posted and collected as scanned (legible) copies under the folder "Homework and Exams" on blackboard. No make-up exams or retests will be given. Missing an exam will result in a grade of zero.

FINAL EXAM
 A final project will be due by the end of the semester. Exam will be posted and collected as scanned (legible) copies under the folder "Homework and Exams" on blackboard. There are no make-up or retests for the final exam. Missing the final exam will result in a grade of zero.

GRADING POLICY
The course grade will be computed as follows:

Homework	20%
Two case studies	**2 x 15%**
Midterm Exam	*25%*
Final Project	*25%*

The course grade will be assigned according to the following scale:
A (90-100%) B(80-89%) C(70-79%) F(below 69%)

BLACKBOARD SUPPORT
If you need assistance with course technology at any time, please contact the Center for Online Learning and Teaching Technology (COLTT).

Campus:	Brownsville	Edinburg
Location:	Casa Bella (BCASA) 613	Education Complex (EEDUC) 2.202

Campus:	Brownsville	Edinburg
Phone:	956-882-6792	956-665-5327

Toll Free: 1-866-654-4555

Office Hours: Monday - Friday, 7:30 a.m. - 6:00 p.m.

Support Tickets Submit a Support Case via our Ask COLTT Portal

24/7 Blackboard Support
Need Blackboard assistance after hours? You can call our main office numbers, 956-882-6792 or 956-665-5327, to speak with a support representative.

ATTENDANCE:
Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences (please denote the specific number of unexcused absences which will trigger a "drop-by-instructor" in your class.) UTRGV's attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; have been provided such an accommodation by Student Accessibility Services (SAS); for observance of religious holy days; or for military service. Accommodations related to COVID-19 should also go through SAS. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

ABSENCE/SICK POLICY:
When setting your attendance policy for the Fall semesters, please consider COVID-19-related extenuating circumstances. For instance, you may encounter students who cannot attend class at the scheduled time of a face-to-face, hybrid or synchronous course because they have been advised by the UTRGV COVID-19 response team based on their exposure. It will be important to consider how you will accommodate students in these and similar situations and share your approach with students in the syllabus. Based on the student reporting protocol on the UTRGV COVID-19 protocol web page the student will be able to provide you documentation from the UTRGV COVID-19 response team.

Makeup Work: *Additionally, if work can be made up, what mechanisms have you set up to help students keep up with coursework in the event they have to miss class? Will you have recordings of all class meetings available? Will on-line quizzes/examinations be available?*

Should you elect to record your instruction, sample syllabus language is included here:

> The use of classroom recordings is governed by the Federal Educational Rights and Privacy Act (FERPA), UTRGV's acceptable-use policy, and UTRGV HOP Policy STU 02-100 Student Conduct and Discipline. A recording of class sessions will be kept and stored by UTRGV, in accordance with FERPA and UTRGV policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. **You may not share recordings outside of this course.** Doing so may result in disciplinary action under UTRGV HOP Policy STU 02-100 Student Conduct and Discipline.

ACADEMIC INTEGRITY:

Members of the UTRGV community uphold the Vaquero Honor Code's shared values of honesty, integrity and mutual respect in our interactions and relationships. In this regard, academic integrity is fundamental in our actions, as any act of dishonesty conflicts as much with academic achievement as with the values of honesty and integrity. Violations of academic integrity include, but are not limited to: cheating, plagiarism (including self-plagiarism), and collusion;

submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts (Board of Regents Rules and Regulations, STU 02-100, and UTRGV Academic Integrity Guidelines). **All violations of Academic Integrity will be reported to Student Rights and Responsibilities through Vaqueros Report It.**

OTHER COURSE INFORMATION
In this section, please provide any other information that is pertinent to your course and your expectations for students.

UTRGV POLICY STATEMENTS

STUDENTS WITH DISABILITIES:

Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive reasonable academic accommodations should contact **Student Accessibility Services (SAS)** for additional information. In order for accommodation requests to be considered for approval, the student must apply using the *mySAS* portal. and is responsible for providing sufficient documentation of the disability to SAS. Students are required to participate in an interactive discussion, or an intake appointment, with SAS staff. Accommodations may be requested at any time but are not retroactive, meaning they are valid once approved by SAS. Please contact SAS early in the semester/module for guidance. Students who experience a broken bone, severe injury, or undergo surgery may also be eligible for temporary accommodations.

Pregnancy, Pregnancy-related, and Parenting Accommodations

Title IX of the Education Amendments of 1972 prohibits sex discrimination, which includes discrimination based on pregnancy, marital status, or parental status. Students seeking accommodations related to pregnancy, pregnancy-related condition, or parenting (reasonably immediate postpartum period) should submit the request using the form found at https://www.utrgv.edu/pregnancyandparenting for review by **Student Accessibility Services.**

Student Accessibility Services:
Brownsville Campus: Student Accessibility Services is located in 1.107 in the Music and Learning Center building (BMSLC) and can be contacted by phone at (956) 882-7374 or via email at ability@utrgv.edu.

Edinburg Campus: Student Accessibility Services is located in 108 University Center (EUCTR) and can be contacted by phone at (956) 665-7005 or via email at ability@utrgv.edu.

MANDATORY COURSE EVALUATION PERIOD:
Students are encouraged to complete an ONLINE evaluation of this course, accessed through your UTRGV account (http://my.utrgv.edu); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available on or about:

Fall Module 1 (7 weeks)	October 6-12, 2021
Fall Regular Term 2021	November 12- December 1, 2021
Fall Module 2 (7 weeks)	December 1-7, 2021

SEXUAL MISCONDUCT and MANDATORY REPORTING:
In accordance with UT System regulations, your instructor is a "Responsible Employee" for reporting purposes under Title IX regulations and so must report to the Office of Institutional Equity & Diversity (OIED@utrgv.edu) any instance, occurring during a student's time in college, of sexual misconduct, which includes sexual assault, stalking, dating violence, domestic violence, and sexual harassment, about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect that is free from sexual misconduct, discrimination, and all forms of violence. If students, faculty, or staff would like confidential assistance, or have

questions, they can contact OVAVP (Office for Victim Advocacy & Violence Prevention) at (956) 665-8287, (956) 882-8282, or OVAVP@utrgv.edu.

COURSE DROPS:
According to UTRGV policy, students may drop any class without penalty earning a grade of DR (drop) until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the "3-peat rule" and the "6-drop" rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

STUDENT SERVICES:
Students who demonstrate financial need have a variety of options when it comes to paying for college costs, such as scholarships, grants, loans and work-study. Students should visit the Student Services Center (U Central) for additional information. U Central is located in BMAIN 1.100 (Brownsville) or ESSBL 1.145 (Edinburg) or can be reached by email (ucentral@utrgv.edu) or telephone: (956) 882-4026. In addition to financial aid, U Central can assist students with registration and admissions.

Students seeking academic help in their studies can use university resources in addition to an instructor's office hours. University Resources include the Advising Center, Career Center, Counseling Center, Learning Center, and Writing Center. The centers provide services such as tutoring, writing help, counseling services, critical thinking, study skills, degree planning, and student employment. In addition, services such as the Food Pantry are also provided. Locations are listed below.

Center Name	Brownsville Campus	Edinburg Campus
Advising Center AcademicAdvising@utrgv.edu	BMAIN 1.400 (956) 665-7120	EITTB 1.000 (956) 665-7120
Career Center CareerCenter@utrgv.edu	BINAB 1.105 (956) 882-5627	ESTAC 2.101 (956) 665-2243
Counseling Center Counseling@utrgv.edu Mental Health Counseling and Related Services List	BSTUN 2.10 (956) 882-3897	EUCTR 109 (956) 665-2574
Food Pantry FoodPantry@utrgv.edu	BCAVL 101 & 102 (956) 882-7126	EUCTR 114 (956) 665-3663
Learning Center LearningCenter@utrgv.edu	BMSLC 2.118 (956) 882-8208	ELCTR 100 (956) 665-2585
Writing Center WC@utrgv.edu	BLIBR 3.206 (956) 882-7065	ESTAC 3.119 (956) 665-2538

CALENDAR OF ACTIVITIES:
Tentative (aka subject to change) schedule

	Topic	Assignments
Week 1	Ch 1 Introduction Ch 2 Overview of supervised learning	
Week 2	Ch 2 Overview of supervised learning (Cont'd)	Homework 1
Week 3	Ch 3 Linear Methods for Regression	
Week 4	Ch 3 Linear Methods for Regression (Cont'd)	Homework 2

	Topic	Assignments
Week 5	Ch 4 Linear Methods for Classification	Case study 1
Week 6	Ch 6 Kernel Smoothing Methods	
Week 7	Ch 7 Model Assessment and Selection Ch 8 Model Inference and Averaging	Homework 3
Week 8	Ch 11 Neural Networks	
Week 9	Ch 11 Neural Networks (Cont'd)	Midterm
Week 10	Ch 12 Support vector Machines	
Week 11	Ch 12 Support vector Machines (Cont'd)	Homework 4
Week 12	Ch 14 Unspuervised learning	
Week 13	Ch 14 Unspuervised learning (Cont'd)	Case study 2
Week 14	Ch 15 Random Forests	Homework 5
Week 15	Ch 15 Random Forests (Cont'd)	Final project report

Be sure to include important dates relative to the academic calendar. The UTRGV academic calendar can be found on My.UTRGV at the bottom of the screen prior to login. Some important dates for Fall 2021 include:

Fall Regular Term
August 23   First day of classes.
August 26   Last day to add a class or register for Fall 2021 classes.
September 6   Labor Day Holiday. NO classes.
November 10   Last day to drop a class or withdraw.
December 2   Study Day – NO classes.
December 3-9   Final Exams.
December 13   Grades Due at 3 p.m.

DEAN OF STUDENTS RESOURCES:
The Dean of Students office assists students when they experience a challenge with an administrative process, unexpected situation such as an illness, accident, or family situation, and aids in resolving complaints. Additionally, the office facilitates student academic related requests for religious accommodations, support students formerly in foster care, helps to advocate on behalf of students and inform them about their rights and responsibilities, and serves as a resource and support for faculty and campus departments.

Vaqueros Report It allows students, staff and faculty a way to report concern about the well-being of a student, seek assistance in resolving a complaint, or report allegations of behaviors contrary to community standards or campus policies.

The Dean of Students can be reached by emailing dos@utrgv.edu, by logging into Virtual Office hours in which a representative is available Monday-Friday 9:00-11:00 a.m. and 1:00-4:00 p.m, or by visiting one of the following office locations: Cavalry (BCAVL) 204 or University Center (EUCTR 323). Phone: 956-665-2260.