DSCI 5240/Data Mining and Machine Learning for Business

Section 501

Instructor Contact

Name: Javier Rubio-Herrero, Ph.D.
Office Location: 357 E - BLB
Phone Number: (940) 565 – 3345
Class Format: face-to-face
Class Meetings: Wednesdays 6:30 pm – 9:20 pm @ FRLD 266
Office Hours: Thursdays 2:30 pm – 5:30 pm in my office. Eventually, I might offer them via Zoom.
E-mail: javier.rubioherrero@unt.edu
Communication Expectations: The instructor will communicate with students via, in-class announcements, e-mails, Canvas, and office hours. The students will communicate with the instructor via e-mails and office hours.

It is the instructor's aim to answer e-mails within 48 hours of their receipt during business days. Please, be courteous and professional when communicating with your instructor and follow the provided Online Communication Tips. The instructor may not answer e-mails that do not abide to these tips.

Course Description

This course deals with the problem of extracting information from large databases and designing data-based decision support systems. The extracted knowledge is subsequently used to support human decision-making in the areas of summarization, prediction, and the explanation of observed phenomena (e.g. patterns, trends, and customer behavior).

Techniques such as visualization, statistical analysis, decision trees, and neural networks can be used to discover relationships and patterns that shed light on business problems. This course will examine methods for transforming massive amounts of data into new and useful information, uncovering factors that affect purchasing patterns, and identifying potential profitable investments and opportunities.

Course Structure

This course will be delivered in face-to-face format and will take place between the weeks of January 17th, 2023 and May 12th, 2023[*]. The course structure is detailed below:

---

[*] Course structure subject to change in order to accommodate specific circumstances that may appear throughout the semester.

Week no.	Topics/Cases	Notes
1	Introduction to Data Mining	Read Sarma Chapter 1-2
2	Data Preparation	Read Sarma Chapter 3 **Form teams**
3	Linear Regression Regression in SAS Enterprise Miner	
4	Linear Regression	**Assignment 1 due**
5	Dimensionality Reduction	
6	Cluster Analysis Cluster Analysis in SAS Enterprise Miner	
7	Hierarchical Cluster Analysis	**Assignment 2 due**
8	Midterm exam	No class meeting
9	Spring Break	No class meeting
10	Introduction to Classification Naïve Bayes	
11	Logistic Regression Logistic Regression in SAS Enterprise Miner	Read Sarma Chapter 6
12	Decision Trees and Random Forests	Read Sarma Chapter 4 **Assignment 3 due** **Project status report due**
13	Neural Networks	Read Sarma Chapter 5
14	Classification in SAS Enterprise Miner	**Assignment 4 due**
15	Evaluating Classifiers	Read Sarma Chapter 5
16	Finish projects	No class meeting **Project report due**
17	Final Exam: May 10th @6:30 pm	

Course Prerequisites or Other Restrictions

DSCI 5180.

Course Objectives

1. Students will be able to articulate basic data mining and machine learning concepts and their application in the business context.
2. Students will be able to use analytical software to identify and interpret complex patterns in multidimensional data.
3. Students will be able to describe and use common descriptive and predictive algorithms.
4. Students will be able to describe all phases of decision making, including data discovery and capture, data analysis and confirmation, presentation of results, and implementation of results.

Textbooks and Materials

1. **Textbooks:** Kattamuri S. Sarma, *Predictive Modeling with SAS Enterprise Miner: Practical Solutions for Business Applications*, 3rd Edition, SAS Institute 2017, ISBN: 978-1629602646.

RECOMMENDED, NOT REQUIRED. Useful if you are seeking the SAS Predictive Modeler Certification.

2. **Software:** SAS Enterprise Miner – Available at the CoB lab or via the cloud.
3. **Computer:** Access to a computer with an operational webcam and microphone is required. More details will follow in the section Technical Requirements & Skills.
4. **Calculator:** A simple scientific calculator will be required for exams. No programmable or graphing calculators are permitted. No sharing of calculators during exams will be allowed.

Technical Requirements & Skills

All students are responsible satisfying the requirements below and they must make sure that they comply with them when they perform the tasks that are needed for the successful completion of this course.

- Computer with Webcam
- Reliable internet access
- Speakers
- Microphone
- Microsoft Office Suite
- Canvas Technical Requirements
- LockDown Browser and Respondus Monitor
- Scientific calculator. **Only these calculators will be allowed in quizzes and exams. Calculators from phones, tablets or other electronic devices will not be allowed.**

Teaching Philosophy

To make the class more dynamic, I will opt for combining slides and hand-written notes. I will write notes on-the-go in class as I explain concepts and exercises. This course has a clear mathematical background and mathematics require work and patience to be understood. I believe that this understanding cannot be attained without writing things down by yourselves and, for this reason, I expect you to be active in taking notes.

Grading

Grades measure the performance of a student in individual courses. Students will be evaluated based on their performance and command of the course materials.

The grades for the homework assignments and the project will be assigned as a group. However, I might assign different grades to different students within the same group. **That is, I reserve the right to modify individual grades according to the student's individual performance**. This performance will be assessed via the peer evaluation forms that I will circulate after your deliverables. In these forms students will be asked to rate the contributions/effort of each of their teammates on a scale of 1-5:

- Team members averaging 3 or above will receive no penalty.

- Team members averaging between 2 and 3 will receive a penalty equivalent to 15% of the possible grade.
- Team members averaging between 1 and 2 will receive a penalty equivalent to 30% of the possible grade.

Professionalism will measure the students' involvement, participation in class, responsiveness, work ethic, quality of deliverables specifically asked from them, and other intangibles. Therefore, it is a grade that is assigned individually.

Final grades are broken down as follows[†]:

Course Requirement	Points	Percentage of Final Grade
Participation/ Professionalism	50	5%
Homework assignments	200	20%
Exam 1	250	25%
Exam 2	250	25%
Group Project[‡]	250	25%
Total	**1000**	**100%**

A student's final grade will be determined following the grading scale[§] below:

A = 900 – 1000 points

B = 800 – 899 points

C = 700 – 799 points

D = 600 – 699 points

F = 0 – 599 points

After all grades have been released, **I kindly ask that you refrain from sending any e-mails requesting a change in your final grades based on scholarships, GPA, visa status, etc.** You must know that I will not entertain these requests and, if I receive any, two things will happen:

1. I will ignore your request.
2. If you received any curving in any of your graded deliverables, I will revert the effect of those curves in all those deliverables. As a result, your final grade, if it was ever impacted positively by the effect of those curves, will be reduced.

[†] The breakdown below is contingent upon acceptance of this syllabus and its addenda. Each student submission will receive a 0 until such acceptance is received by the instructor.

[‡] PhD students should form groups together and are encouraged to select a project that could result in a conference proceeding or a journal publication.

[§] This grading scale is tentative and may be adjusted at the end of the semester based on overall class performance.

Course Policies

Attendance

I expect, but do not enforce, that students attend each class session. Take into account that there will be quizzes and midterm exams during regular class hours. Visit the University of North Texas' Attendance Policy to learn more.

While I do not enforce attendance, if you finally attend a session, I expect you to be on time. I reserve the right to forbid access to class to students that arrive late to a session. Entering the classroom after the class has started is disruptive for both your colleagues and the professor.

Students are responsible for learning the contents, meet the deadlines, and follow the directions explained in class regardless of their attendance.

Announcements Policy

In addition to in class announcements, important messages may be communicated via Canvas (http://canvas.unt.edu). You are responsible for actively monitoring Canvas for announcements which, among other things, may be related to changes in schedule, syllabus, or other key aspects of the course.

Group Participation Policy

This course requires considerable group work. I hope that participation issues do not arise in any team. However, to monitor this, I will circulate a peer evaluation form after your deliverables. Please, bear in mind that:

1. These forms are **mandatory** to submit. **Students who do not submit their peer evaluation forms on time will receive a zero in the deliverable in question**. Your peer evaluation form is, therefore, an essential part of your deliverable.
2. As mentioned in the Grading section, I reserve the right to modify individual grades according to how your peers evaluate your work and contribution to the team.

Assignment Policy

Homework assignments will be announced via Canvas. The due date for each homework will be announced on the posting date along with extra instructions (if needed). As a rule of thumb, homework has to be completed professionally and therefore it needs to be well presented, clean, readable, and easy to follow. The instructor and the grader may reduce your grade at their discretion if these general guidelines are not correctly followed.

All assignments and project deliverables will be completed in teams and must be submitted through Canvas. Alternative submission methods (e.g., paper, email, USB drive) are not acceptable unless prior permission of the instructor is obtained. Once a group is formed, the same group will have to work on all assignments and the project. **Any assignment or project that is submitted after the submission deadline will not be graded and will result in a zero on that assignment or project**. Consequently, make sure that you do not leave your submissions for the last minute. See the *Late Work* subsection for more details about late submissions. **Make sure that the names of all the students that participated in the homework are listed in the first page of your Word file. Students that participated in an assignment that are not listed will not receive any credit for this submission.**

Students are welcome to review both assignments and exams after grading to improve their understanding of course material and check for the presence of grading errors. This review must be conducted within a week after the grade of the deliverable has been posted. No changes to grades will be made after this time period.

Examination Policy

The following policies will apply to your exams:

- All exams be closed-book and closed-notes.
- You may need a laptop to complete your exams. If this is the case, make sure you connect it to the power grid. **I will not repeat any exam if your laptop runs out of battery**.
- In the event that you need to complete an exam out of class using LockDown Browser or other online proctoring tool, you will be asked to show a thorough 360-degree view of the room you choose to take your exam. By signing this syllabus, you are consenting to provide this view.
- In the event that you need to complete an exam using LockDown Browser, you are responsible for its correct operation during the exam. You are expected to install it prior to the exam and make sure that it runs in your computer. To that end, there is an ungraded practice quiz on Canvas that you can use to check that everything runs smoothly. I will not consider any request due to problems with LockDown Browser if this practice quiz has not been taken successfully beforehand.
- Phones, tablets, and other electronic devices will **not** be allowed.
- Students are responsible for their materials on an exam. Loaning or sharing any materials is strictly prohibited.
- It is **strictly forbidden** that students share information during an exam. Failure to comply with this will results in disciplinary actions as described in the *Academic Integrity Policy* subsection of this syllabus.
- Students who fail to bring their own required materials will take the exams without them and to the best of their ability.
- Exams are not cumulative and therefore I encourage you to take all exams. Exam information and marks will be posted on course website.
- Missed exams will receive zero marks unless a legitimate excuse is presented, as described in the *Late Work* subsection of this syllabus.
- In the case that you want to review a midterm exam that you took, this request must be done to the grader/instructor within two weeks since the grades were posted. Later reviews will not be accepted.
- If you want to review a final exam, this request must be done to the grader/instructor within 7 days after the grades are posted or before they are due at the Registrar's Office, whatever is shorter.
- Further instructions will be announced ahead of time, if needed.

Late Work

It **is highly recommended** that you work on your submissions well in advance to avoid last-minute issues. I will **not** accept any late submissions nor agree to make-up tests or exams except in the following cases:

- Medical emergency cases, in which case a doctor's note is required.

- Family emergency cases, in which case a written verifiable proof is required.
- Any other excused absence specified in Chapter 6 of Faculty Affairs document, *Student Attendance and Authorized Absences*.

Late submissions and make-up tests or exams must always be agreed **before the corresponding due date**. No makeup tests or exams will be offered due to poor performance in exams.

Academic Dishonesty and Associated Consequences

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. **In this course, engaging in academic dishonesty will result in an F in the course**. All incidents of academic dishonesty will be reported via departmental, college, and university channels as appropriate and may result in additional penalties.

In this class, unless otherwise stated, individual work should be completed alone and using only resources explicitly outlined in the instructions. Similarly, group work, should be completed only by the members of the group and should utilize only those resources specified in the instructions. While external research may be permitted in assignment instructions, utilizing resources such as Chegg, Course Hero, and similar websites is never appropriate and is expressly forbidden.

Academic dishonesty is an extremely serious issue. It will not be tolerated and will be prosecuted according to UNT Policy 06.003. You are responsible for knowing what those behaviors above (cheating, plagiarism, etc.) mean and when you might be incurring any of them.

Electronics Policy

Electronics will be used **strictly as needed** for class purposes. A student that engages in the use of these devices may be directed to leave the classroom according to UNT's policy on Acceptable Student Behavior.

If this behavior persists, I reserve the right to reduce the student's grade in this course at my discretion.

Syllabus Change Policy

The contents of this syllabus might be changed to the instructor's discretion in order to adjust the course to the specific circumstances of each semester.

Rules of Engagement

Rules of engagement refer to the way students are expected to interact with each other and with their instructors online. Here are some general guidelines:

- Treat your instructor and classmates with respect in any communication online or face-to-face, even when their opinion differs from your own.
- Always use your professors' proper title: Dr. or Prof., or if in doubt use Mr. or Ms.

- Unless specifically invited, don't refer to your instructor by first name.
- Use clear and concise language.
- Remember that all college level communication should have correct spelling and grammar (this includes discussion boards).
- Avoid using "text-talk" unless explicitly permitted by your instructor.
- Avoid using all caps while communicating digitally. This may be interpreted as "YELLING!"
- Be careful with personal information (both yours and other's) and avoid sending confidential information via e-mail.
- Be cautious when using humor or sarcasm in emails or discussion posts as tone can be difficult to interpret digitally.
- Keep in mind that online posts can be permanent, so think first before you type.

See these [Engagement Guidelines](https://clear.unt.edu/online-communication-tips) (https://clear.unt.edu/online-communication-tips) for more information.

Course Evaluation

The Student Perceptions of Teaching (SPOT) is the student evaluation system for UNT and allows students the ability to confidentially provide constructive feedback to their instructor and department to improve the quality of student experiences in the course. At some stage during this course, students will be given access to this evaluation. I would certainly appreciate your constructive feedback when the time comes.

Getting Help

Technical Assistance

Part of working in the online environment involves dealing with the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UIT Help Desk: [UIT Student Help Desk site](http://www.unt.edu/helpdesk/index.htm) (http://www.unt.edu/helpdesk/index.htm)
Email: helpdesk@unt.edu
Phone: 940-565-2324
In Person: Sage Hall, Room 130
Walk-In Availability: 8am-9pm
Telephone Availability:
- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm
- Saturday: 9am-5pm
Laptop Checkout: 8am-7pm

For additional support, visit [Canvas Technical Help](https://community.canvaslms.com/docs/DOC-10554-4212710328) (https://community.canvaslms.com/docs/DOC-10554-4212710328)

Computer Labs

The BLB computer labs on the first floor will open with reduced hours and reduced seating to comply with social distancing guidelines. The will not be BLB laptop checkouts due to potential contamination issues. The library has computers to check out for up to 24 hours and the RCOB virtual computer labs will be open for business continuously.

UNT and College of Business Policies and Notices

RCOB Statement on Academic Honesty

The G. Brint Ryan College of Business takes academic honesty seriously. Ethics and integrity are important business values, essential to building trust and adhering to both professional and legal standards. Academic dishonesty destroys trust, damages the reputation and the value of the degree and is unacceptable.

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 from admonition (a warning) to expulsion from the University.

Some of the most common examples of academic integrity violations include plagiarism or cheating, such as unauthorized assistance on examinations, homework, research papers or case analyses. Your work must be entirely your own. When working on assignments, you should not discuss your work with others unless approved by the course instructor. Group assignments should only be discussed with members assigned to your group, and all group members may be held accountable in some way for known academic integrity violations in a group assignment.

Another example of academic dishonesty relates to improper attribution. When preparing your assignments, you must cite all outside sources in the manner requested by your instructor. Copying or using material from any source prepared by or previously submitted by others, at UNT or other institutions, or downloaded from the Internet, is plagiarism. Unless directed otherwise in an assignment, large scale "cutting and pasting" from other sources, even if properly footnoted, is not appropriate. You should synthesize this material in your own words and provide a footnote.

Your instructor will specify what materials, if any, may be used on the tests and exams. Using materials other than those permitted, talking with other individuals during the exam, individuals exchanging information about an exam when one has taken the exam and the other has not, or copying or using material from another individual's exam is academic dishonesty and will result in a meeting to discuss academic integrity violations and potentially issue sanctions mentioned above, and may result in ineligibility for academic scholarships. The use of online assistance, such as sites commonly used for finding homework solutions, group chat, cell phones, smart watches, and similar tools during exams is not allowed for any reason unless specifically permitted. No portion of an exam may be copied or photographed without permission.

Students are expected to conduct themselves in a manner consistent with the University's status as an institution of higher education. A student is responsible for responding to a request to discuss suspected academic dishonesty when issued by an instructor or other University official. If a student fails to respond

after a proper attempt at notification has been made, the University may take appropriate academic actions in the absence of the student's participation.

ADA Policy

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time, however, ODA notices of reasonable 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 reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the Office of Disability Access website (http://www.unt.edu/oda). You may also contact ODA by phone at (940) 565-4323.

Emergency Notification & Procedures

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.

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://deanofstudents.unt.edu/conduct) to learn more.

Access to Information - Eagle Connect

Students' access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail Eagle Connect (https://it.unt.edu/eagleconnect).

Sexual Assault Prevention

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT's Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim's compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565- 2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oeo@unt.edu or at (940) 565 2759.

Important Notice for F-1 Students Taking Online Courses

Federal Regulation

To read detailed Immigration and Customs Enforcement regulations for F-1 students taking online courses, please go to the Electronic Code of Federal Regulations website (http://www.ecfr.gov/). The specific portion concerning distance education courses is located at Title 8 CFR 214.2 Paragraph (f)(6)(i)(G).

The paragraph reads:

(G) For F-1 students enrolled in classes for credit or classroom hours, no more than the equivalent of one class or three credits per session, term, semester, trimester, or quarter may be counted toward the full course of study requirement if the class is taken on-line or through distance education and does not require the student's physical attendance for classes, examination or other purposes integral to completion of the class. An on-line or distance education course is a course that is offered principally through the use of television, audio, or computer transmission including open broadcast, closed circuit, cable, microwave, or satellite, audio conferencing, or computer conferencing. If the F-1 student's course of study is in a language study program, no on-line or distance education classes may be considered to count toward a student's full course of study requirement.

University of North Texas Compliance

To comply with immigration regulations, an F-1 visa holder within the United States may need to engage in an on-campus experiential component for this course. This component (which must be approved in advance by the instructor) can include activities such as taking an on-campus exam, participating in an on-campus lecture or lab activity, or other on-campus experience integral to the completion of this course.

If such an on-campus activity is required, it is the student's responsibility to do the following:

1. Submit a written request to the instructor for an on-campus experiential component within one week of the start of the course.
2. Ensure that the activity on campus takes place and the instructor documents it in writing with a notice sent to the International Student and Scholar Services Office. ISSS has a form available that you may use for this purpose.

Because the decision may have serious immigration consequences, if an F-1 student is unsure about his or her need to participate in an on-campus experiential component for this course, s/he should contact the UNT International Student and Scholar Services Office (telephone 940-565-2195 or email internationaladvising@unt.edu) to get clarification before the one-week deadline.

Use of Student Work

A student owns the copyright for all work (e.g. software, photographs, reports, presentations, and email postings) he or she creates within a class and the University is not entitled to use any student work without the student's permission unless all of the following criteria are met:

- The work is used only once.
- The work is not used in its entirety.
- Use of the work does not affect any potential profits from the work.
- The student is not identified.
- The work is identified as student work.

If the use of the work does not meet all of the above criteria, then the University office or department using the work must obtain the student's written permission.

Emergency Evacuation Procedures for Business Leadership Building

Severe Weather

In the event of severe weather, all building occupants should immediately seek shelter in the designated shelter-in-place area in the building. If unable to safely move to the designated shelter-in-place area, seek shelter in a windowless interior room or hallway on the lowest floor of the building.   All building occupants should take shelter in rooms 055, 077, 090, and the restrooms on the basement level. In rooms 170, 155, and the restrooms on the first floor.

Bomb Threat/Fire

In the event of a bomb threat or fire in the building, all building occupants should immediately evacuate the building using the nearest exit. Once outside, proceed to the designated assembly area. If unable to safely move to the designated assembly area, contact one or more members of your department or unit to let them know you are safe and inform them of your whereabouts. Persons with mobility impairments who are unable to safely exit the building should move to a designated area of refuge and await assistance from emergency responders. All building occupants should immediately evacuate the building and proceed to the south side of Crumley Hall in the grassy area, west of parking lot 24.

Syllabus Acceptance Form

By signing below, I acknowledge that I have read and understood the contents of this course's syllabus and its addenda and that I agree to abide to the terms exposed in these documents.

Student Name (Print) _____ Student ID No. _____

Student Signature _____ Date _____