CSE 5301: Data Analysis & Modeling Techniques
Fall 2021

Instructor Information

Instructor
Vamsikrishna Gopikrishna, Ph.D.

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Office Hours
Tuesday/Thursday 10:30 AM – 12:00 PM in my office or via TEAMS chat room (Link in Canvas)
If you are unable to meet during this time, please email instructor to setup an alternate meeting time.

Course Information

Section Information
- CSE 5301 002
- CSE 5301 007

Time and Place of Class Meetings
Class meetings for all sections will be On Campus
- **CSE 5301 002**: NH 109 – **Tuesday/Thursday 5:30 PM – 6:50 PM**
- **CSE 5301 007**: NH 229 – **Tuesday/Thursday 7:00 PM – 8:20 PM**

Course Webpage
- TA information will be posted on: http://crystal.uta.edu/~gopikrishnav/classes/2021/fall/5301/
- Notes, Supplementary material, Assignments, and other material will be posted on: Canvas

Description of Course Content
The objective of this course is to provide students the basic data analysis and modeling concepts and methodologies using probability theory. Basic statics concepts and probability concepts will be covered. Fundamental data analysis and hypothesis techniques will be covered. Further data modeling methodologies such as Hidden Markov Models and Bayesian networks will be introduced.

Student Learning Outcomes
Students successfully completing this course will have gained a solid understanding of probabilistic data modeling, interpretation, and analysis and thus have formed an important basis solve practical statistics and data analysis related problems arising in broad computer science and engineering, and daily life

Required Textbooks and Other Course Materials
Probability and Statistics for Computer Scientists (2nd Edition) by Michael Baron, Chapman and Chapman and Hall/CRC (ISBN: 978-1-4398-7590-2). Note that if you choose to use an earlier edition, it is your responsibility to identify any differences in the editions. In addition, notes will be posted on Canvas.

Description of Assignments
There will be several homework assignments in this course. Most of the tasks will require handwritten or typed solutions. Some assignments may have programming tasks. The solution to programming tasks can be programmed in base versions of C, C++, Java, Python2 or Python3 only. All homework submissions must be submitted via Canvas. No other method of submission accepted. If you find yourself in an emergency and cannot deliver homework on time, immediately inform the instructor. Also, while working with other persons on non-graded example problems from the textbook is a good way to help you develop your understanding and insight into the techniques of problem solving, homework solutions must be your work only. Violations of this will not be tolerated and result in severe penalties for all parties involved, in strict compliance to official UTA policy.
If any tasks were graded incorrectly (a correct answer given less than full credit) or if there is a totaling error, please contact either the TA or the instructor ASAP. Any partial credit obtained for incorrect tasks is not up for discussion/negotiation.

Late Submission policy for Assignments
The points each assignment graded out of will be provided as part of its description. Assignments submitted late will be automatically penalized, at a rate of **5% of assignment max points per hour late**. **Note that for some assignments, Late submissions may not be accepted** (such assignments will be announced in class beforehand). The submission due time (and the time the link will be available till) will be shown in Canvas. Exceptions will only be made for documented emergencies, in strict adherence to UTA policy. Computer/Network crashes, Submission of Incomplete files, Submission of Incorrect Files, Submitting at Incorrect Link are NOT acceptable excuses for late submissions. **No exceptions will be made**. To avoid problems with such crashes and last-minute problems, students are encouraged to submit as early as possible. They are also advised to ensure that their file was uploaded correctly before submitting it. You can always revise your submission till the deadline. If you are unable to work on/submit an assignment due to a valid documented reason (illness, critical family emergencies, military service obligations, observance of major religious holidays, and certain university service commitments) one makeup assignment may be provided that will be due during finals week

Description of Examinations
There are three exams. Each will cover all material covered in the class until that point (weighted more towards material not covered in previous exams). The exams are closed book. You will need a scientific calculator (non-graphing, non-programmable) for doing calculations. Formula sheets will be provided for the exam (will be provided beforehand in class for review) You are also allowed 2 pages of notes (These notes will have to be submitted along with your exam). No other material allowed. No exam scores will be dropped. The exams will be held on campus as in-person exams barring any new developments in the COVID-19 pandemic. If the university requires exams to be moved online, then they will be held online via the Lockdown browser with Respondus monitoring system.
If any questions were graded incorrectly (a correct answer given less than full credit) or if there is a totaling error, please contact either the TA or the instructor ASAP. Any partial credit obtained for incorrect answers is not up for discussion/negotiation.

Exam Absence policy
Absence from exams may be excused, with appropriate documentation, for illness, critical family emergencies, military service obligations, observance of major religious holidays, and certain university service commitments. Requests for excused absence, and documentation for such absences, must be provided as soon as possible. In case of excused absence, a makeup exam will be setup and conducted by the instructor at a date before the last day of finals week. **Even if the**

reason for an absence/non-attendance is valid, a request for an excused absence/re-attempt will be rejected if provided later than the day of the exam. The dates for all the exams are subject to change. Any changes will be announced in class atleast a week in advance. Students are expected to be available till the last day of finals week. No accommodations will be made if the student will miss an exam due to being unavailable before the last day of finals week.

Academic Dishonesty Policy
If you are caught colluding or copying in the assignments (or exams):
- **First Offence**: You will be given a score of -50 points for that assignment (or exam) and an academic dishonesty report will be filed.
- **Second Offence**: You will be given a grade of F for the course and another academic dishonesty report will be filed.

This policy is not up for negotiation

Technology Requirements
Students will need to know how to scan and upload their written assignments as PDF files. They will need to know how to do calculations using a Scientific Calculator. They may also need to know how to program in C, C++, Java or Python for any programming tasks that may be given. They will need to be able to use Canvas to view supplementary material provided by the instructor, view any video material posted by the instructor and to submit assignments. They are also strongly recommended to get used to TEAMS as an alternative way to get in touch with the instructor. If due to the COVID-19 pandemic, any exams have to be moved online, students will have to use the Lockdown browser with the Respondus monitoring system for the exams in which case they will need a computer with a webcam to take their exam.

Grading Information

Grading
You will be assigned a numerical score based on your performance in your assignments and in your exams.

Material	Contribution to Final score
Assignments	30%
Exam 1	15%
Exam 2	20%
Exam 3	25%
Attendance	5%
In Class Quizzes	5%

This numeric score is converted to a letter grade according to the following rubric.

Numerical Score	Grade
>= 85	A
>= 70 & < 85	B
>= 55 & < 70	C
>= 40 & < 55	D
Otherwise	F

Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels. **No makeup exams or assignments will be provided for the purpose of bumping up your grade under any circumstances**.

Grade Grievances
Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current University Catalog.

Course Schedule

Date	Lec.	Topic	Chapter
8/26/2021	1	Introduction	
8/31/2021	2	RV, Probability, CDF, PDF, Statistics	2
9/2/2021	3	Joint Distributions, Conditional Distributions, Bayesian Networks	3.1, 3.2, 3.3, 4.1
9/7/2021	4	Probability and Statistics in Vector space, Linear combination of RVS	
9/9/2021	5	Information Theory	
9/14/2021	6	Families of Discrete/Continuous Distributions	3.4,4.2
9/16/2021	7	Chebyshev's Inequality, Central Limit Theorem	3.3, 4.3
9/21/2021	8	Statistics, Parameter Estimation	8.1, 8.2
9/23/2021	9	Graphical Statistics	8.3
9/28/2021	10	Methods of Moments, Methods of Maximum Likelihood Estimation	9.1
9/30/2021		Exam 1 Review Session	
10/5/2021		EXAM 1	
10/7/2021	11	Confidence Intervals	9.2, 9.3
10/12/2021	12	Confidence Intervals (contd.)	
10/14/2021	13	Hypothesis Testing	9.4
10/19/2021	14	Hypothesis Testing (Contd.)	
10/21/2021	15	Inference about Variances	9.5
10/26/2021	16	Bayesian Inference	10.4
10/28/2021	17	Simulation of Random Variables	5.1, 5.2
11/2/2021	18	Monte Carlo Methods	5.3
11/4/2021		Exam 2 Review Session	
11/9/2021		EXAM 2	
11/11/2021	19	Stochastic Processes, Markov Processes	6.1, 6.2
11/16/2021	20	Counting Processes	6.3, 6.4
11/18/2021	21	Queuing Systems	7.1, 7.2, 7.3
11/23/2021	22	M/M/1 Queuing Systems	7.4
11/25/2021		Thanksgiving - NO CLASS	
11/30/2021	23	Multi-server Queuing Systems	7.5
12/2/2021	24	Hidden Markov Models	
12/7/2021		Exam 3 Review Session	
12/9/2021		EXAM 3 - 5301 002	
12/14/2021		EXAM 3 - 5301 007	

This schedule is tentative and subject to change at instructor's discretion. Changes will be announced in class. The instructor reserves the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. EXAM 1 and EXAM 2 will be held at regular class timing in the same location as lectures. EXAM 3 location, date and time is subject to change by the University. Please visit: https://www.uta.edu/records/calendars/final-exams.php to get the updated date, time, and location information (unless otherwise mentioned, location is the same as lectures). Students should be prepared to be available till the end of Finals Week in case of any changes to EXAM 3 scheduling.

Institutional Information

UTA students are encouraged to review the below institutional policies and informational sections and reach out to the specific office with any questions. To view this institutional information, please visit the Institutional Information page (https://resources.uta.edu/provost/course-related-info/institutional-policies.php) which includes the following policies among others:
- Drop Policy
- Disability Accommodations
- Title IX Policy
- Academic Integrity
- Student Feedback Survey
- Final Exam Schedule

Additional Information

Face Covering Policy
While the use of face coverings on campus is no longer mandatory, all students and instructional staff are strongly encouraged to wear face coverings while they are on campus. This is particularly true inside buildings and within classrooms and labs where social distancing is not possible due to limited space. If a student needs accommodation to ensure social distancing in the classroom due to being at high risk, they are encouraged to work directly with the Student Access and Resource Center to assist in these accommodations. If students need masks, they may obtain them at the Central Library, the E.H. Hereford University Center's front desk or in their department.

Attendance
Students are expected to attend all lectures. Attendance will be taken during every lecture that occurs after census date and will be part of your final grade. Any material that the student missed will not be covered again in class. At random points during the lectures, I will conduct in class quizzes. The scores of these quizzes will be used as part of your final grade. Absence from classes may be excused, with appropriate documentation, for illness, critical family emergencies, military service obligations, observance of major religious holidays, and certain university service commitments. Documentation regarding any reasons for absence must be provided to the instructor by the end of the week of the missed lecture. If the student is unable to attend a class due to approved or personal reasons, it is the student's responsibility to use the slides/videos posted online or the lecture archives on canvas and the textbook to learn the content and to contact either the Instructor or the TA to clarify any doubts

At the University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator of student success. Each faculty member is free to develop his or her own methods of evaluating students' academic performance, which includes establishing course-specific policies on attendance. As the instructor of this section, I will be following the attendance policy described above. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients "begin attendance in a course." UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student, a grade of F, faculty report must the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Canvas. This date is reported to the Department of Education for federal financial aid recipients.

Emergency Exit Procedures
Should we experience an emergency event that requires evacuation of the building, students should exit the room and move toward the nearest exit, which is given in the Evacuation Route Maps given below. When exiting the building during an emergency, do not take an elevator but use the stairwells

instead. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

Evacuation Route Maps:

- NH 109: Front
- NH 229: Front

Students are also encouraged to subscribe to the MavAlert system that will send information in case of an emergency to their cell phones or email accounts. Anyone can subscribe at Emergency Communication System.

The IDEAS Center (https://www.uta.edu/ideas/) **(**2nd Floor of Central Library) offers **FREE** tutoring and mentoring to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. Students can drop in or check the schedule of available peer tutors at www.uta.edu/IDEAS, or call (817) 272-6593.

The English Writing Center (411LIBR)
The Writing Center offers **FREE** tutoring in 15-, 30-, 45-, and 60-minute face-to-face and online sessions to all UTA students on any phase of their UTA coursework. Register and make appointments online at the Writing Center (https://uta.mywconline.com). Classroom visits, workshops, and specialized services for graduate students and faculty are also available. Please see Writing Center: OWL for detailed information on all our programs and services.

The Library's 2nd floor Academic Plaza (http://library.uta.edu/academic-plaza) offers students a central hub of support services, including IDEAS Center, University Advising Services, Transfer UTA and various college/school advising hours. Services are available during the library's hours of operation.

Librarian to Contact
Each academic unit has access to Librarians by Academic Subject that can assist students with research projects, tutorials on plagiarism and citation references as well as support with databases and course reserves.

Emergency Phone Numbers

In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381

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