

**CSE 5301: Data Analysis & Modeling Techniques**  
Spring 2019

**Instructor:** [Vamsikrishna Gopikrishna](#)

**Office Number:** [ERB 553](#) (If I am not here then I am usually in [ERB 128](#))

**Email Address** [All email regarding the course must contain **CSE5301-001**, **CSE5301-002** at the beginning of the subject line]: [vamsikrishna.gopikrishna@uta.edu](mailto:vamsikrishna.gopikrishna@uta.edu)

**Faculty Information:**

- Website: <https://omega.uta.edu/~gopikrishnav/>
- Profile: <https://mentis.uta.edu/explore/profile/vamsikrishna-gopikrishna>

**Office Hours:**

- **Time:** Tuesday, Thursday: 5:30 PM – 7:00 PM
- If you cannot meet during this time, email me and we can try and set up meeting times

**Section Information:** CSE 5301-001, CSE 5301-002

**Time and Place of Class Meetings:**

- **Location:** [NH 110](#)
  - **Time (CSE 5301 – 001):** Tuesday, Thursday – 2:00 PM to 3:20 PM
- **Location:** [GACB 103](#)
  - **Time (CSE 5301 – 002):** Tuesday, Thursday – 3:30 PM to 4:50 PM

**Web Page:** <http://omega.uta.edu/~gopikrishnav/classes/2019/spring/5301/>.

**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 statistics 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's your responsibility to identify any differences in the editions.

<p><b>Emergency Phone Numbers:</b> In case of an on-campus emergency, call the UT Arlington Police Department at <b>817-272-3003</b> (non-campus phone), <b>2-3003</b> (campus phone). You may also dial <b>911</b>. Non-emergency number <b>817-272-3381</b>.</p>
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## Descriptions of major assignments and examinations:

There will be several homework assignments in this course. Some assignments may have programming tasks. The solution to programming tasks can be programmed in the language of your choice but **must** compile and run on the ACS machine omega (All students will have an account on the ACS machine omega). All homework submissions must be submitted via [Blackboard](#). 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.

**Late submission policy:** All assignments are graded out of 100 points. Assignments submitted late will be penalized, at a rate of **2 penalty points per hour**. The submission time will be the time shown on the Blackboard submission system. **Any assignment submitted more than 12 hours late will receive no credit.** Exceptions will only be made for documented emergencies, in strict adherence to UTA policy. Computer/Network crashes are **NOT** an acceptable excuse for late submissions. To avoid problems with such crashes and last-minute problems, students are encouraged to submit early. 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.

At random points during the course, there will be short quizzes (10 minutes) conducted. These quizzes will **NOT** be announced in advance. **If a student misses 3 or more quizzes without documented reasons (illness, critical family emergencies, military service obligations, observance of major religious holidays, and certain university service commitments) they will be given a F grade for the course due to non-attendance.** Car or transportation problems will **NOT** be considered a legitimate reason to miss a quiz. There will be no makeup quizzes conducted. The total score of your quizzes will be scaled to 100 and used as part of your exam score.

There are three exams. Each will cover 1/3<sup>rd</sup> of the course material. The exams are closed book. You will need a scientific calculator (non-graphing, non-programmable) for doing calculations. Formula sheets may be provided for the exam (will be provided beforehand in class for review). You are also allowed 2 pages of notes. No other material allowed. Violations will be considered cheating and penalized as such. No exam scores will be dropped. **No make-up exams will be offered.** 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. Car or transportation problems will **NOT** be considered a legitimate reason to miss an exam. Requests for excused absence, and documentation for such absences, must be provided as soon as possible. **Even if the reason for an absence is valid, a request for an excused absence will be rejected if provided unjustifiably late.**

**Attendance:** Students are expected to attend all classes and meetings. Any material that the student missed will not be covered again in class. If the student is unable to attend a class due to personal reasons, it is the student's responsibility to use the slides posted online or the lecture videos on blackboard and the textbook to learn the content and to meet with either the Instructor or the TA to clarify any doubts. If a student misses a quiz due to not attending a class, a makeup quiz will **NOT** be conducted. The dates for all the exams are subject to change (especially Exam 3 are tentative and subject to change by either me or the university). 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 making travel plans before the last day of finals week.

## Grading Policy:

All assignments are graded out of 100 points. Assignments submitted late will be penalized, at a rate of **2 penalty points per hour**. The submission time will be the time shown on the Blackboard submission system. **Any assignment submitted more than 12 hours late will receive no credit.** Exceptions will only be made for documented emergencies, in strict adherence to UTA policy. Computer/network crashes are NOT an acceptable excuse for late submissions. To avoid problems with such crashes and last-minute problems, students are encouraged to submit early. You can always revise your submission till the deadline.

You will be assigned a final numeric score based on your performance in both your assignments and your exams. The amount each of these contribute to your average is given by the following rubric.

Material	Contribution
Quizzes	15 %
Homework Assignments	25 %
Exam 1	20 %
Exam 2	20 %
Exam 3	20 %

Your average numeric score is then converted to a letter grade according to this rubric

Numerical Score	Grade
$\geq 85$	A
$\geq 70$	B
$\geq 55$	C
$\geq 40$	D
Otherwise	F

These percentages and cutoffs are tentative and may be changed based on the distribution of scores and the degree of difficulty of the assignments and exams.

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.**

**Drop Policy:** Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).

**Disability Accommodations:** UT Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including *The Americans with Disabilities Act (ADA)*, *The Americans with Disabilities Amendments Act (ADAAA)*, and *Section 504 of the Rehabilitation Act*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students

with disabilities, so as not to discriminate on the basis of disability. Students are responsible for providing the instructor with official notification in the form of a **letter certified** by the Office for Students with Disabilities (OSD).\_ Only those students who have officially documented a need for an accommodation will have their request honored. Students experiencing a range of conditions (Physical, Learning, Chronic Health, Mental Health, and Sensory) that may cause diminished academic performance or other barriers to learning may seek services and/or accommodations by contacting: **The Office for Students with Disabilities, (OSD)** <http://www.uta.edu/disability/> or calling 817-272-3364. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at [www.uta.edu/disability.](http://www.uta.edu/disability/)

**Counseling and Psychological Services (CAPS)** [www.uta.edu/caps/](http://www.uta.edu/caps/) or calling 817-272-3671 is also available to all students to help increase their understanding of personal issues, address mental and behavioral health problems and make positive changes in their lives.

**Non-Discrimination Policy:** The University of Texas at Arlington does not discriminate on the basis of race, color, national origin, religion, age, gender, sexual orientation, disabilities, genetic information, and/or veteran status in its educational programs or activities it operates. For more information, visit [uta.edu/eos](http://uta.edu/eos).

**Title IX Policy:** The University of Texas at Arlington (“University”) is committed to maintaining a learning and working environment that is free from discrimination based on sex in accordance with Title IX of the Higher Education Amendments of 1972 (Title IX), which prohibits discrimination on the basis of sex in educational programs or activities; Title VII of the Civil Rights Act of 1964 (Title VII), which prohibits sex discrimination in employment; and the Campus Sexual Violence Elimination Act (SaVE Act). Sexual misconduct is a form of sex discrimination and will not be tolerated. *For information regarding Title IX, visit [www.uta.edu/titleIX](http://www.uta.edu/titleIX) or contact Ms. Michelle Willbanks, Title IX Coordinator at (817) 272-4585 or [titleix@uta.edu](mailto:titleix@uta.edu)*

**Academic Integrity:** Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

*I pledge, on my honor, to uphold UT Arlington’s tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.*

*I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.*

UT Arlington faculty members may employ the Honor Code in their courses by having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents’ Rule* 50101, §2.2, suspected violations of university’s standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student’s suspension or expulsion from the University. Additional information is available at

<https://www.uta.edu/conduct/>. More information is available in the following library tutorials <http://libguides.uta.edu/copyright/plagiarism> and <http://library.uta.edu/plagiarism/>

If you are caught colluding or copying in the assignments:

- First Offence: You will be given a score of -100 points for that assignment and an academic dishonesty report will be filed
- Second Offence: You will be given an F for the course and an academic dishonesty report will be filed.

If you are caught colluding or copying in the exams:

- First Offence: You will be given a score of -50 points for that exam and an academic dishonesty report will be filed
- Second Offence: You will be given a F in the course and an academic dishonesty report will be filed

**Electronic Communication:** UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

**Campus Carry:** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. Under the new law, openly carrying handguns is not allowed on college campuses. For more information, visit <http://www.uta.edu/news/info/campus-carry/>

**Student Feedback Survey:** At the end of each term, students enrolled in face-to-face and online classes categorized as “lecture,” “seminar,” or “laboratory” are directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student’s feedback via the SFS database is aggregated with that of other students enrolled in the course. Students’ anonymity will be protected to the extent that the law allows. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback is required by state law and aggregate results are posted online. Data from SFS is also used for faculty and program evaluations. For more information, visit <http://www.uta.edu/sfs>.

**Final Review Week:** for semester-long courses, a period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

**Emergency Exit Procedures:** Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit, marked by the exit signs. When exiting the building during an emergency, one should never take an elevator but should use the

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

**Student Support Services for Undergraduate students:** UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring](#), [major-based learning centers](#), developmental education, [advising and mentoring](#), personal counseling, and [federally funded programs](#). For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to [resources@uta.edu](mailto:resources@uta.edu), or view the information at <http://www.uta.edu/studentsuccess/success-programs/programs/resource-hotline.php>

**The IDEAS Center** (2<sup>nd</sup> Floor of Central Library) offers **FREE tutoring** 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](http://www.uta.edu/IDEAS), or call (817) 272-6593

**Course Schedule (Tentative):**

Week	Date	Topic	Chapter
1	1/15/2019	Introduction	
	1/17/2019	RV, Probability, CDF, PDF, Statistics	2
2	1/22/2019	Joint Distributions, Conditional Distributions, Vector Spaces	3.1, 3.2, 3.3, 4.1
	1/24/2019	Chebyshev's Inequality, Central Limit Theorem	3.3, 4.3
3	1/29/2019	Families of Discrete Distributions	3.4
	1/31/2019	Families of Continuous Distributions	4.2
4	2/5/2019	Statistics, Parameter Estimation, Graphical Statistics	8.1, 8.2, 8.3
	2/7/2019	Methods of Moments, Methods of Maximum Likelihood Estimation	9.1
5	2/12/2019	Information Theory	
	2/14/2019	Exam 1 Review	
6	2/19/2019	EXAM 1	
	2/21/2019	Exam 1 Discussion	
7	2/26/2019	Confidence Intervals	9.2, 9.3
	2/28/2019	Hypothesis Testing	9.4
8	3/5/2019	Hypothesis Testing (Contd.)	
	3/7/2019	Hypothesis Testing (Contd.)	
9	3/12/2019	SPRING BREAK - NO CLASS	
	3/14/2019	SPRING BREAK - NO CLASS	
10	3/19/2019	Inference about variance	9.5
	3/21/2019	Exam 2 Review	
11	3/26/2019	EXAM 2	
	3/28/2019	Exam 2 Discussion	
12	4/2/2019	Chi-square Tests	10.1
	4/4/2019	Bayesian Inference	10.4
13	4/9/2019	Simulation of Random Variables	5.1, 5.2
	4/11/2019	Monte Carlo Methods	5.3
14	4/16/2019	Stochastic Process	6.1, 6.2
	4/18/2019	Markov Process	6.2
15	4/23/2019	Stochastic Process	6.3, 6.4
	4/25/2019	Hidden Markov Models	
16	4/30/2019	HMM (Contd.)	
	5/2/2019	Exam 3 Review, Final Q & A	
17	5/7/2019	EXAM 3 - CSE 5301 001 (2:00 PM to 4:30 PM)	
	5/9/2019	EXAM 3 - CSE 5301 002 (2:00 PM to 4:30 PM)	

This schedule is tentative and subject to change at instructor's discretion (This includes topics covered and the number of assignments). Changes will be announced in class and posted in the schedule on the course page. 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 3 date is subject to change by the University. Students should be available till the last day of Finals Week.