Georgia Tech

Course Syllabus

ISYE 6501

Introduction to Analytics Modeling

Professor: Dr. Joel Sokol

Course Description

An introduction to important and commonly used models in Analytics, as well as aspects of the modeling process.

Prerequisites

- Probability and statistics
- Basic programming proficiency
- Linear algebra
- Basic calculus
- A little background in R can be useful, but isn't necessary if you're willing to learn on the fly.

Course Goals

The most important thing you can learn from this course is not the memorization of any specific bit of material. Instead, I would like you to learn these skills:

- Given a business (or other) question, select an appropriate analytics model to answer it, specify the data you will need to solve it, and understand what the model's solution will and will not provide as an answer.
- Given someone else's use of analytics to address a specific business (or other) question, evaluate whether they have used an appropriate model (and appropriate data) and whether their conclusion is reasonable.

Another goal of this course is for you to learn how to think though descriptions and usage of new models, so you can continue to learn throughout your career; new techniques will certainly be developed after you graduate, and we want you to be able to pick them up quickly.

We will not cover the mathematics and algorithms under the hood, or deeper mastery of the modeling needed to set up the use of the technique. You can acquire those deeper levels of knowledge in elective courses. (In fact, we could spend an entire semester on many of the topics you'll see in the course.)

Grading Policy

1. There will be two midterm quizzes and one final quiz that will be graded by faculty. Each will be worth 25% of the course grade.
2. There will be homework assignments most weeks of the semester. Your two lowest homework grades will be dropped, and the remaining ones will add up to 16% of the course grade. These will be peer-graded (based on the median score assigned by your peer graders). You will also need to peer-grade others' homeworks; you will not receive a final grade for your homework submission if you do not complete your peer assessments.
3. There will be one course project worth 9% of the course grade. The project will be peer-graded (based on the median score assigned by your peer graders). You will also need to peer-grade others' projects; you will not receive a final grade for your project submission if you do not complete your peer assessments.
4. Audit and Verified/MicroMasters learners must achieve an overall weighted average of 60% to pass the course. For OMS Analytics degree students, quizzes will be scaled to letter grades based on their difficulty, and combined with the homeworks and project to determine an overall letter grade scale at the end of the semester.

Homework and Quiz Due Dates

All homework and quizzes will be due at the times in the table at the end of this syllabus. These times are subject to change so please check back often. Please convert from UTC to your local time zone using a Time Zone Converter.

Timing Policy

- The Modules follow a logical sequence that includes knowledge-building and experience-building.
- Assignments should be completed by their due dates, in order for timely peer assessment. Peer assessments should also be completed by their due dates, to give timely feedback.
- Quizzes must be completed during the time allotted on the schedule.
- You will have access to the course content for the scheduled duration of the course.

Quiz Policy

- For Midterm Quiz 1 and Midterm Quiz 2, you are allowed to use one sheet of paper, either 8.5"x11" or A4, with handwritten notes (both sides of the sheet, 2 sides total).
- For Final Quiz, you are allowed to use two sheets of paper, either 8.5"x11" or A4, with handwritten notes (both sides of each sheet, 4 sides total).
- For all quizzes, you are allowed a blank sheet of paper for scratch work (Verified/MicroMasters learners and OMS Analytics degree students will be proctored; you will have to show the front and back of the blank sheet while you are being proctored. Audit learners will not be proctored).

Attendance Policy

- This is a fully online course.
- Log in on a regular basis to complete your work, so that you do not have to spend a lot of time reviewing and refreshing yourself regarding the content.

Plagiarism Policy

- Plagiarism is considered a serious offense. You are not allowed to copy and paste or submit materials created or published by others, as if you created the materials. All materials submitted and posted must be your own. Any background materials you use should be cited.

Student Honor Code

All Audit and Verified/MicroMasters learners are expected and required to abide by the letter and the spirit of the edX honor code. All OMS Analytics degree students are expected and required to abide by the letter and spirit of the Georgia Tech honor code. The teaching assistants and I will also abide by these honor codes. Please feel free to contact me if there is any way that I can help you in complying with the honor code.
- I'm very serious about this. Ethical behavior is extremely important in all facets of life.
- Review the honor code that is relevant to you: Audit and Verified/MicroMasters learners should review the edX Honor Code https://www.edx.org/edx-terms-service and OMS Analytics degree students should review the Georgia Tech Student Honor Code www.honor.gatech.edu.
- You are responsible for completing your own work.
- Any OMS Analytics degree student suspected of behavior in violation of the Georgia Tech Honor Code will be referred to Georgia Tech's Office of Student Integrity. Any Audit or Verified/MicroMasters learner found in violation of the edX Honor Code will be subject to any/all of the actions listed in the edX Honor Code.

Communication

- All learners should ask questions, and answer their fellow learners' questions, on the course discussion forums. Often, discussions with fellow learners are the sources of key pieces of learning.
- Verified/MicroMasters learners and OMS Analytics degree students can also ask questions of the instructor and teaching assistants via the course discussion forums. For special cases such as failed submissions due to system errors, missing grades, failed file uploads, emergencies that prevent you from submitting, personal issues, etc., a special email address will be provided in a discussion forum for you to directly contact the instructor and teaching assistants.
- Audit learners will be able to ask questions of each other and answer each other questions, but the instructor and teaching assistants will not answer questions in the Audit learner forums.

Netiquette

- Netiquette refers to etiquette that is used when communicating on the Internet. Review the Core Rules of Netiquette. When you are communicating via email, discussion forums or synchronously (real-time), please use correct spelling, punctuation and grammar consistent with the academic environment and scholarship[1].

- *In Georgia Tech's MS in Analytics program, we expect all participants (learners, faculty, teaching assistants, staff) to interact respectfully. Learners who do not adhere to this guideline may be removed from the course.*

1. Conner, P. (2006-2014). Ground Rules for Online Discussions, Retrieved 4/21/2014 from http://teaching.colostate.edu/tips/tip.cfm?tipid=128

Course Topics and Sample Pacing Schedule

- The tables below contain a course topic outline and assessment due dates.

Weeks	Course Topics	Release Dates
Week 1	Introduction, Classification	Aug 20 @13:00 UTC Aug 20 @ 9am ET Aug 20 @ 6am PT
Week 2	Validation, Clustering	Aug 25 @13:00 UTC Aug 25 @ 9am ET Aug 25 @ 6am PT
Week 3	Basic Data Preparation, Change Detection	Sep 1 @13:00 UTC Sep 1 @ 9am ET Sep 1 @ 6am PT
Week 4	Time Series Models	Sep 8 @13:00 UTC Sep 8 @ 9am ET Sep 8 @ 6am PT
Week 5	Basic Regression	Sep 15 @13:00 UTC Sep 15 @ 9am ET Sep 15 @ 6am PT
Week 6	Advanced Data Preparation	Sep 22 @13:00 UTC Sep 22 @ 9am ET Sep 22 @ 6am PT
Week 7	Advanced Regression, Tree-based Models	Sep 29 @13:00 UTC Sep 29 @ 9am ET Sep 29 @ 6am PT
Week 8	Variable Selection	Oct 6 @13:00 UTC Oct 6 @ 9am ET Oct 6 @ 6am PT
Week 9	Design of Experiments, Probability-based Models	Oct 13 @13:00 UTC Oct 13 @ 9am ET Oct 13 @ 6am PT
Week 10	Missing Data, Optimization	Oct 20 @13:00 UTC Oct 20 @ 9am ET Oct 20 @ 6am PT
Week 11	Optimization, Advanced Models	Oct 27 @13:00 UTC Oct 27 @ 9am ET Oct 27 @ 6am PT
Week 12	Discussion Cases – Case Format, Power Company Case	Nov 3 @13:00 UTC Nov 3 @ 9am ET Nov 3 @ 6am PT
Week 13	Discussion Cases – Retailer Case	Nov 10 @14:00 UTC Nov 10 @ 9am ET Nov 10 @ 6am PT

Week 14	Discussion Cases – Monetization Case	Nov 17 @14:00 UTC Nov 17 @ 9am ET Nov 17 @ 6am PT
Week 15	Course Summary	Nov 24 @14:00 UTC Nov 24 @ 9am ET Nov 24 @ 6am PT
Week 16	No new material	
Week 17	No new material	

	Assignment		Peer Assessments	
	Release Date	**Due Date**	**Release Date**	**Due Date**
Week 1 Homework	Aug 20 @ 13:00 UTC Aug 20 @ 9am ET Aug 20 @ 6am PT	Aug 30 @ 06:00 UTC Aug 30 @ 2am ET Aug 29 @ 11pm PT	Aug 30 @ 06:00 UTC Aug 30 @ 2am ET Aug 29 @ 11pm PT	Sep 3 @ 06:00 UTC Sep 3 @ 2am ET Sep 2 @ 11pm PT
Week 2 Homework	Aug 30 @ 06:00 UTC Aug 30 @ 2am ET Aug 29 @ 11pm PT	Sep 6 @ 06:00 UTC Sep 6 @ 2am ET Sep 5 @ 11pm PT	Sep 6 @ 06:00 UTC Sep 6 @ 2am ET Sep 5 @ 11pm PT	Sep 10 @ 06:00 UTC Sep 10 @ 2am ET Sep 9 @ 11pm PT
Week 3 Homework	Sep 6 @ 06:00 UTC Sep 6 @ 2am ET Sep 5 @ 11pm PT	Sep 13 @ 06:00 UTC Sep 13 @ 2am ET Sep 12 @ 11pm PT	Sep 13 @ 06:00 UTC Sep 13 @ 2am ET Sep 12 @ 11pm PT	Sep 17 @ 06:00 UTC Sep 17 @ 2am ET Sep 16 @ 11pm PT
Week 4 Homework	Sep 13 @ 06:00 UTC Sep 13 @ 2am ET Sep 12 @ 11pm PT	Sep 20 @ 06:00 UTC Sep 20 @ 2am ET Sep 19 @ 11pm PT	Sep 20 @ 06:00 UTC Sep 20 @ 2am ET Sep 19 @ 11pm PT	Sep 24 @ 06:00 UTC Sep 24 @ 2am ET Sep 23 @ 11pm PT
Week 5 Homework	Sep 20 @ 06:00 UTC Sep 20 @ 2am ET Sep 19 @ 11pm PT	Sep 27 @ 06:00 UTC Sep 27 @ 2am ET Sep 26 @ 11pm PT	Sep 27 @ 06:00 UTC Sep 27 @ 2am ET Sep 26 @ 11pm PT	Oct 1 @ 06:00 UTC Oct 1 @ 2am ET Sep 30 @ 11pm PT
Week 6 Homework	Sep 27 @ 06:00 UTC Sep 27 @ 2am ET Sep 26 @ 11pm PT	Oct 4 @ 06:00 UTC Oct 4 @ 2am ET Oct 3 @ 11pm PT	Oct 4 @ 06:00 UTC Oct 4 @ 2am ET Oct 3 @ 11pm PT	Oct 8 @ 06:00 UTC Oct 8 @ 2am ET Oct 7 @ 11pm PT
Week 7 Homework	Oct 4 @ 06:00 UTC Oct 4 @ 2am ET Oct 3 @ 11pm PT	Oct 11 @ 06:00 UTC Oct 11 @ 2am ET Oct 10 @ 11pm PT	Oct 11 @ 06:00 UTC Oct 11 @ 2am ET Oct 10 @ 11pm PT	Oct 15 @ 06:00 UTC Oct 15 @ 2am ET Oct 14 @ 11pm PT
Week 8 Homework	Oct 11 @ 06:00 UTC Oct 11 @ 2am ET Oct 10 @ 11pm PT	Oct 18 @ 06:00 UTC Oct 18 @ 2am ET Oct 17 @ 11pm PT	Oct 18 @ 06:00 UTC Oct 18 @ 2am ET Oct 17 @ 11pm PT	Oct 22 @ 06:00 UTC Oct 22 @ 2am ET Oct 21 @ 11pm PT
Week 9 Homework	Oct 18 @ 06:00 UTC Oct 18 @ 2am ET Oct 17 @ 11pm PT	Oct 25 @ 06:00 UTC Oct 25 @ 2am ET Oct 24 @ 11pm PT	Oct 25 @ 06:00 UTC Oct 25 @ 2am ET Oct 24 @ 11pm PT	Oct 29 @ 06:00 UTC Oct 29 @ 2am ET Oct 28 @ 11pm PT
Week 10 Homework	Oct 25 @ 06:00 UTC Oct 25 @ 2am ET Oct 24 @ 11pm PT	Nov 1 @ 06:00 UTC Nov 1 @ 2am ET Oct 31 @ 11pm PT	Nov 1 @ 06:00 UTC Nov 1 @ 2am ET Oct 31 @ 11pm PT	Nov 5 @ 07:00 UTC Nov 5 @ 2am ET Nov 4 @ 11pm PT
Week 11 Homework	Nov 1 @ 06:00 UTC Nov 1 @ 2am ET Oct 31 @ 11pm PT	Nov 8 @ 07:00 UTC Nov 8 @ 2am ET Nov 7 @ 11pm PT	Nov 8 @ 07:00 UTC Nov 8 @ 2am ET Nov 7 @ 11pm PT	Nov 12 @ 07:00 UTC Nov 12 @ 2am ET Nov 11 @ 11pm PT
Week 12 Homework	Nov 8 @ 07:00 UTC Nov 8 @ 2am ET	Nov 15 @ 07:00 UTC Nov 15 @ 2am ET	Nov 15 @ 07:00 UTC Nov 15 @ 2am ET	Nov 19 @ 07:00 UTC Nov 19 @ 2am ET

	Nov 7 @ 11pm PT	Nov 14 @ 11pm PT	Nov 14 @ 11pm PT	Nov 18 @ 11pm PT
Week 13 Homework	Nov 15 @ 07:00 UTC Nov 15 @ 2am ET Nov 14 @ 11pm PT	Nov 22 @ 07:00 UTC Nov 22 @ 2am ET Nov 21 @ 11pm PT	Nov 22 @ 07:00 UTC Nov 22 @ 2am ET Nov 21 @ 11pm PT	Nov 26 @ 07:00 UTC Nov 26 @ 2am ET Nov 25 @ 11pm PT
Week 14 Homework	Nov 22 @ 07:00 UTC Nov 22 @ 2am ET Nov 21 @ 11pm PT	Nov 29 @ 07:00 UTC Nov 29 @ 2am ET Nov 28 @ 11pm PT	Nov 29 @ 07:00 UTC Nov 29 @ 2am ET Nov 28 @ 11pm PT	Dec 3 @ 07:00 UTC Dec 3 @ 2am ET Dec 2 @ 11pm PT
Week 15 Homework	NO	NEW	HOMEWORK	
Week 16 Homework	NO	NEW	HOMEWORK	
Course Project	Nov 1 @ 06:00 UTC Nov 1 @ 2am ET Oct 31 @ 11pm PT	Nov 29 @ 07:00 UTC Nov 29 @ 2am ET Nov 28 @ 11pm PT	Nov 29 @ 07:00 UTC Nov 29 @ 2am ET Nov 28 @ 11pm PT	Dec 3 @ 07:00 UTC Dec 3 @ 2am ET Dec 2 @ 11pm PT
Midterm Quiz 1	Oct 4 @ 06:00 UTC Oct 4 @ 2am ET Oct 3 @ 11pm PT	Oct 15 @ 06:00 UTC Oct 15 @ 2am ET Oct 14 @ 11pm PT		
Midterm Quiz 2	Nov 1 @ 06:00 UTC Nov 1 @ 2am ET Nov 1 @ 11pm PT	Nov 12 @ 07:00 UTC Nov 12 @ 2am ET Nov 11 @ 11pm PT		
Final Quiz	Dec 1 @ 07:00 UTC Dec 1 @ 2am ET Nov 30 @ 11pm PT	Dec 10 @ 07:00 UTC Dec 10 @ 2am ET Dec 9 @ 11pm PT		

Course Materials

- All content and course materials can be accessed online
- There is no textbook for this course

Technology/Software Requirements

- Internet connection (DSL, LAN, or cable connection desirable)
- R statistical software (free download; see cran.r-project.org)
- Arena simulation software (free student download; see www.arenasimulation.com/academic/students) for Windows, *or* SimPy (free download; see https://pypi.python.org/pypi/simpy) for Windows/Mac)
- PuLP optimization software (free download; see www.coin-or.org/PuLP/ -- Windows version and (for Mac users) a Linux version)
- Python (required for PuLP and SimPy) programming language (free download; see www.python.org/)
- Adobe Acrobat PDF reader (free download; see https://get.adobe.com/reader/