

Course Syllabus

ISYE 6501 Introduction to Analytics Modeling

Summer 2020

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 through 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.

NOTE: I know that everyone has other obligations – family, work, etc. – that sometimes make it hard or impossible to meet weekly homework deadlines. That is why you are allowed to drop your lowest two homework grades: the drops allow you to not turn in the homework in whatever two week(s) the other obligations in your life might be too time-consuming. (Of course, I hope that you do the homework later to make sure you learn what you're supposed to know that week, but you can do it on your own time without the pressure of a deadline.) There are only two drops, so please use them judiciously.

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](#). Only OMS Analytics degree students and Verified/MicroMasters learners will have access to quizzes; quizzes are not available to Audit learners.

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

(OMS Analytics and Verified/MicroMasters only; quizzes are not available to Audit learners.)

- 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).
- Any student who misses a quiz for any reason will not be allowed to take it after the deadline; however, in appropriate situations the instructor may impute a score for the missed quiz, based on the student's other quiz scores.

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 Piazza. 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., the Piazza discussion forum also allows you to send private messages to the entire team of instructors (professors and TAs).
- 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. 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.
- *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.*

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, Validation	May 11 @13:00 UTC May 11 @ 9am EDT May 11 @ 6am PDT
Week 2	Clustering, Basic Data Preparation, Change Detection	May 16 @13:00 UTC May 16 @ 9am EDT May 16 @ 6am PDT
Week 3	Time Series Models, Basic Regression	May 23 @13:00 UTC May 23 @ 9am EDT May 23 @ 6am PDT
Week 4	Advanced Data Preparation, Advanced Regression, Tree-based Models	May 30 @13:00 UTC May 30 @ 9am EDT May 30 @ 6am PDT
Week 5	Variable Selection, Design of Experiments, Probability-based Models	Jun 6 @13:00 UTC Jun 6 @ 9am EDT Jun 6 @ 6am PDT
Week 6	Probability-based Models, Missing Data, Optimization	Jun 13 @13:00 UTC Jun 13 @ 9am EDT Jun 13 @ 6am PDT
Week 7	Optimization, Advanced Models	Jun 20 @13:00 UTC Jun 20 @ 9am EDT Jun 20 @ 6am PDT
Week 8	Discussion Cases – Case Format, Power Company Case	Jun 27 @13:00 UTC Jun 27 @ 9am EDT Jun 27 @ 6am PDT
Week 9	Discussion Cases – Retailer Case	Jul 4 @13:00 UTC Jul 4 @ 9am EDT Jul 4 @ 6am PDT
Week 10	Discussion Cases – Monetization Case	Jul 11 @13:00 UTC Jul 11 @ 9am EDT Jul 11 @ 6am PDT
Week 11	Course Summary	Jul 18 @13:00 UTC Jul 18 @ 9am EDT Jul 18 @ 6am PDT
Week 12	Final Quiz	See below

	Assignment		Peer Assessments	
	Release Date	Due Date	Release Date	Due Date
<i>Week 1 Homework</i>	May 11 @ 13:00 UTC May 11 @ 9am EDT May 11 @ 6am PDT	May 21@ 06:00 UTC May 21 @ 2am EDT May 20@ 11pm PDT	May 21@ 06:00 UTC May 21 @ 2am EDT May 20@ 11pm PDT	May 25@ 06:00 UTC May 25 @ 2am EDT May 24@ 11pm PDT
<i>Week 2 Homework</i>	May 21 @ 06:00 UTC May 21 @ 2am EDT May 20 @ 11pm PDT	May 28@ 06:00 UTC May 28 @ 2am EDT May 27@ 11pm PDT	May 28@ 06:00 UTC May 28 @ 2am EDT May 27@ 11pm PDT	Jun 1 @ 06:00 UTC Jun 1 @ 2am EDT May 31@ 11pm PDT
<i>Week 3 Homework</i>	May 28 @ 06:00 UTC May 28 @ 2am EDT May 27 @ 11pm PDT	Jun 4 @ 06:00 UTC Jun 4 @ 2am EDT Jun 3 @ 11pm PDT	Jun 4 @ 06:00 UTC Jun 4 @ 2am EDT Jun 3 @ 11pm PDT	Jun 8 @ 06:00 UTC Jun 8 @ 2am EDT Jun 7 @ 11pm PDT
<i>Week 4 Homework</i>	Jun 4 @ 06:00 UTC Jun 4 @ 2am EDT Jun 3 @ 11pm PDT	Jun 11 @ 06:00 UTC Jun 11 @ 2am EDT Jun 10 @ 11pm PDT	Jun 11 @ 06:00 UTC Jun 11 @ 2am EDT Jun 10 @ 11pm PDT	Jun 15 @ 06:00 UTC Jun 15 @ 2am EDT Jun 14 @ 11pm PDT
<i>Week 5 Homework</i>	Jun 11 @ 06:00 UTC Jun 11 @ 2am EDT Jun 10 @ 11pm PDT	Jun 18 @ 06:00 UTC Jun 18 @ 2am EDT Jun 17 @ 11pm PDT	Jun 18 @ 06:00 UTC Jun 18 @ 2am EDT Jun 17 @ 11pm PDT	Jun 22 @ 06:00 UTC Jun 22 @ 2am EDT Jun 21 @ 11pm PDT
<i>Week 6 Homework</i>	Jun 18 @ 06:00 UTC Jun 18 @ 2am EDT Jun 17 @ 11pm PDT	Jun 25 @ 06:00 UTC Jun 25 @ 2am EDT Jun 24 @ 11pm PDT	Jun 25 @ 06:00 UTC Jun 25 @ 2am EDT Jun 24 @ 11pm PDT	Jun 29 @ 06:00 UTC Jun 29 @ 2am EDT Jun 28 @ 11pm PDT
<i>Week 7 Homework</i>	Jun 25 @ 06:00 UTC Jun 25 @ 2am EDT Jun 24 @ 11pm PDT	Jul 2 @ 06:00 UTC Jul 2 @ 2am EDT Jul 1 @ 11pm PDT	Jul 2 @ 06:00 UTC Jul 2 @ 2am EDT Jul 1 @ 11pm PDT	Jul 8 @ 06:00 UTC Jul 8 @ 2am EDT Jul 7 @ 11pm PDT
<i>Week 8 Homework</i>	Jul 2 @ 06:00 UTC Jul 2 @ 2am EDT Jul 1 @ 11pm PDT	Jul 9 @ 06:00 UTC Jul 9 @ 2am EDT Jul 8 @ 11pm PDT	Jul 9 @ 06:00 UTC Jul 9 @ 2am EDT Jul 8 @ 11pm PDT	Jul 13 @ 06:00 UTC Jul 13 @ 2am EDT Jul 12 @ 11pm PDT
<i>Week 9 Homework</i>	Jul 9 @ 06:00 UTC Jul 9 @ 2am EDT Jul 8 @ 11pm PDT	Jul 16 @ 06:00 UTC Jul 16 @ 2am EDT Jul 15 @ 11pm PDT	Jul 16 @ 06:00 UTC Jul 16 @ 2am EDT Jul 15 @ 11pm PDT	Jul 20 @ 06:00 UTC Jul 20 @ 2am EDT Jul 19 @ 11pm PDT
<i>Week 10 Homework</i>	Jul 16 @ 06:00 UTC Jul 16 @ 2am EDT Jul 15 @ 11pm PDT	Jul 23@ 06:00 UTC Jul 23 @ 2am EDT Jul 22@ 11pm PDT	Jul 23@ 06:00 UTC Jul 23 @ 2am EDT Jul 22@ 11pm PDT	Jul 27 @ 06:00 UTC Jul 27 @ 2am EST Jul 26 @ 11pm PST
<i>Course Project</i>	Jun 20 @ 06:00 UTC Jun 20 @ 2am EDT Jun 19 @ 11pm PDT	Jul 16 @ 06:00 UTC Jul 16 @ 2am EST Jul 15 @ 11pm PST	Jul 16 @ 06:00 UTC Jul 16 @ 2am EST Jul 15 @ 11pm PST	Jul 20 @ 06:00 UTC Jul 20 @ 2am EST Jul 19 @ 11pm PST
<i>Midterm Quiz 1</i>	Jun 4 @ 06:00 UTC Jun 4 @ 2am EDT Jun 3 @ 11pm PDT	Jun 15 @ 06:00 UTC Jun 15 @ 2am EDT Jun 14 @ 11pm PDT		
<i>Midterm Quiz 2</i>	Jun 25 @ 06:00 UTC Jun 25 @ 2am EST Jun 24 @ 11pm PST	Jul 8 @ 06:00 UTC Jul 8 @ 2am EDT Jul 7 @ 11pm PDT		
<i>Final Quiz</i>	Jul 17 @ 06:00 UTC Jul 17 @ 2am EST Jul 16 @ 11pm PST	Jul 30 @ 06:00 UTC Jul 30 @ 2am EST Jul 29 @ 11pm PST		

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/>)