

QTM 530: COMPUTING I FALL 2024

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COURSE OBJECTIVES

This class is the first in a sequence of the two computing courses connecting to QTM 530 Computing I. This course will focus on gaining building blocks for programming related to data analysis and machine learning. In addition, the class will introduce practical concepts about how to code, deploy models, and communicate results. By the end of the course, students are expected to (1) be fluent in reshaping data into the most convenient form for analysis, (2) know how to implement methods related to data analysis, (3) know how to implement algorithms in machine learning, (4) know how to make reproducible code by understanding from the development and source control to the deployment. Students would primarily write code in Jupyter/IPython notebooks. Most of the computing exercises will be based on Python, with a brief introduction to SQL.

LECTURES

The class will be entirely based off of lectures provided by the instructor for each class and stored in the following Github repository:

<https://github.com/alejandrosanchezbecerra/qtm530fall2024>

REQUIRED TEXTBOOK

- [IML] Introduction to Machine Learning with Python, by Andreas C. Müller and Sarah Guido, O'Reilly
- [PD] Python for Data Analysis, by Wes McKinney, O'Reilly
- [IPBS] Introduction to Python Programming for Business and Social Science Applications, by Frederick Kaefer and Paul Kaefer

OPTIONAL MATERIAL

[FPP] Foundations of Python Programming -----

<https://runestone.academy/runestone/books/published/fopp/index.html>

[PE] Python for Everybody, by Charles R. Severance,

http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf

[GLM] statsmodels.org – GLM notebook ----- FUNCTION REFERENCE
<https://www.statsmodels.org/stable/examples/notebooks/generated/glm.html>
[HDS] How to think like a Data Scientist,
<https://runestone.academy/runestone/books/published/htlads/index.html>
[BB] Bash for Beginners [BB], by Machtelt Garrels,
<https://www.tldp.org/LDP/Bash-Beginners-Guide/Bash-Beginners-Guide.pdf>
[IL] Introduction to Linux [IL], by Machtelt Garrels,
<https://www.tldp.org/LDP/intro-linux/html/>
[ACP] AWS Cloud Practitioner Essentials [ACP], 2nd Ed,
<https://www.aws.training/Details/Curriculum?id=27076&scr=path-cp>

CLASS REQUIREMENTS

Grades will be based on

- homework assignments (60%)
 - 6 homeworks, worth 10% each
- self-directed projects 30%)
 - Three written deliverables, worth 10% each
- in-class workshop (10%)

LATE ASSIGNMENT POLICY

Any assignment submitted after the due date/time will be considered for half points. To accommodate unexpected circumstances, your lowest homework grade will be automatically dropped at the end of the semester. Working together on the homework assignments is encouraged, but you must write your own answers. It is highly recommended that you make your solo effort on all the problems before consulting others.

GRADING

Your final grade will be assigned based on this grading scale: Grades will generally follow the standard scale, but the professor may curve up:

A	A-	B+	B	B-	C+	C	C-	D	F
93+	87-92	83-86	80-82	75-79	70-74	65-69	60-64	55-59	0-54

Throughout the semester, I will keep the Canvas gradebook up to date so that you have an ongoing understanding of where your grades fall in this scale.

HONOR CODE

All students enrolled at Emory are expected to abide by the Emory College Honor Code. Any type of academic misconduct is not allowed which includes 1) receiving or giving information about the content or conduct of an examination knowing that the release of such information is not allowed and 2) plagiarizing, whether intentionally or unintentionally, in any assignment. For the activities that are considered to be academically dishonest, refer to the Honor Code:

<http://catalog.college.emory.edu/academic/policies-regulations/honor-code.html>.

DISABILITY ACCOMMODATIONS

If you are seeking classroom accommodations or academic adjustments under the Americans with Disabilities Act, you are required to register with Office of Accessibility Services (OAS), <http://accessibility.emory.edu/>. Once registration is finalized, students must request accommodation needs to be communicated or facilitated. Students are expected to give two weeks' notice of the need for accommodations for any class activities including the exams. For more information, please see <http://accessibility.emory.edu/students/new-to-oas/registering.html>. Please make sure to contact me with the relevant letter at the beginning of the semester.

COURSE SCHEDULE

Week	Date	#	Topic
Module 1: Programming Essentials in Python			
Week 1	29-Aug	0	Introduction to version control
Week 2	3-Sep	1	Pandas, Mathematical Operations, Variables, and Lists.
	5-Sep	2	Boolean Types, Ifelse, Data Subsetting
Week 3	9-Sep		Assignment 1 due (10 p.m.)
	10-Sep	3	Recoding, and aggregating variables
	12-Sep	4	Merging, Codebooks, and Chaining
Module 2: Process Automation			
Week 4	17-Sep	5	Scraping 1: HTML, JSON, Dictionaries
	18-Sep		Assignment 2 due (10 p.m.)
	19-Sep	6	Scraping 2: Retrieving and Processing
Week 5	24-Sep	7	Flow Control / Loops
	26-Sep	8	Functions and Parallel Computing
Week 6	1-Oct	9	Time Series, Pivoting, and Panel Data
	2-Oct		Assignment 3 due (10 p.m.)
	3-Oct	10	Regular Expressions and Text Wrangling
Module 3: Model Deployment			
Week 7	8-Oct	11	Data analysis with OLS estimator
	9-Oct		Assignment 4 due (10 p.m.)
	10-Oct	12	Data analysis with randomized experiment
Week 8	14-Oct		FALL BREAK (No Class, No Office Hours)
	16-Oct	13	Logit model

	17-Oct		Project 1 due (10 p.m.)
Week 9	22-Oct	14	Example 1: Regression Trees and Random Forests
	24-Oct	15	Cross-validation
Week 10	29-Oct	16	Classification Metrics
	30-Oct		Project 2 due (10 p.m.)
	31-Oct	17	Example 2: Neural Networks
Week 11	5-Nov	18	Example 3: PCA and K-means clustering
	7-Nov	19	Machine Learning Pipelines
	8-Nov		Assignment 5 due (10 p.m.)
Week 12	12-Nov	20	Text Analysis (CLASS ON ZOOM)
	14-Nov	21	Advanced Github (SELF STUDY – No Class, No Office Hours)
Module 4: Databases and Production Environment			
Week 13	18-Nov	22	Introduction to SQL
	19-Nov		Assignment 6 due (10 p.m.)
	20-Nov	23	Running SQL from Python
Week 14	26-Nov	24	Python Classes + Deployment (CLASS ON ZOOM)
	28-Nov		THANKSGIVING BREAK (No Class, No Office Hours)
Week 15	3-Dec	25	Managing virtual environments: Conda, Dockers and containers
	4-Dec		Project 3 due (10 p.m.)
	5-Dec	25	In-class workshop
Week 16	10-Dec	26	In-class workshop