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Economics 300 Data Science for Economists, Spring 2023

University of Tennessee, Knoxville

Course Section: Econ 421-001

Meeting Time and Place: Tues, Thurs 11:20-12:35 in SMC 701

Course Credit Hours: 3 hours

Faculty Contact Information

Professor: Scott Holladay

Office: Stokely Management Center (SMC) 515

Email: jhollad3@utk.edu

Office Hours: Thursday 1-2 and by appointment

Course Description/Information:

This is a course for students with no previous programming experience. By the end of the semester students will be able write programs that collect data from the web, use machine learning algorithms to evaluate that data and then visualize the results

Prerequisite: ECON 201 or ECON 207, or ECON 211 (or honors equivalent) and ECON 213 (or honors equivalent)

Value Proposition:

The ability to solve problems algorithmically and program those solutions is incredibly valuable in today's workplace. Successful students will develop a toolkit that allows them to solve real world problems and more importantly understand the steps needed to continue to improve their programming skills after the course has ended.

Student Learning Outcomes/Objectives:

By the end of the semester students will be able to:

1. Solve problems algorithmically
2. Implement solutions in Python
3. Assemble large datasets
4. Use machine learning to study those datasets
5. Visualize the results of that analysis

Learning Environment:

We will utilize a variety of instructional methods. The best way to learn to program is hands on, so there will be many in-class programming exercises. I will provide video lectures and screen capture recordings of program development. Those videos will be assigned prior to class and include small assignments. Students will complete online quizzes prior to class to ensure everyone has reviewed the material before we meet. I will start each topic with a short lecture and then we will open our laptops and start coding.

Course Communications:

We will use Canvas for all classroom communications. I can be reached by email at jhollad3@utk.edu or you can stop by my office hours in SMC 515. If you need to see me outside office hours just let me know.

How to Be Successful in This Course:

There will be an average of around one hour of pre-work each week to prepare for that week's topic. That will allow us to spend in-class time programming. Successful students will come to class having done the pre-work and ready to code. Weekly projects that are not completed in class will be due before the start of the next topic. The amount of time required to complete those projects will vary across students and topics.

I will post the pre-work a week in advance. I will answer any questions about that material at the start of class. I will grade all submitted work quickly and fairly. I will share job advertisements with the class to give you a sense of the possibilities for students who master these skills.

Texts/Resources/Materials:

There is no print textbook, but there are several online resources that provide free instruction in Python. I will be assigning optional practice from [Socratica Python Programming Tutorials](#) and the [CodeAcademy](#) website.

General Python Materials:

1. [Official Python 3 Documentation](#): technical details of what every command in Python does with examples of how to use them.
2. [Introduction to Computation and Programming using Python. A text book with learning to program basics](#), John Guttag.

Material for economists:

1. [Quantitative Economics](#) by Thomas J. Sargent and John Stachurski.
2. [Python for Economists](#) by Alex Bell.

Required Equipment:

Each student will need to bring a laptop capable of running Python scripts to class. This includes all PCs, Macs and some Chromebooks. We will be programming in [Jupyter](#) notebooks that run through your web browser. Your computer should have a substantial (at least 3GB) amount of free memory after installing Python, Jupyter and all the necessary libraries to load large datasets.

Course Resources:

I will share video lectures and screen captures that run through programming basics on Canvas. We will have a course message board on Canvas that you can use to ask and answer programming questions.

Course Requirements, Assessments, and Evaluations:**Major Assignments and Exams**

- Online quizzes (15%): Before each topic we will have a short (3-5 question) online quiz to make sure everyone has completed the pre-work. Quizzes will be due before class starts. No late quizzes will be accepted. You may drop your lowest quiz grade.
- Coding Challenges (20%): We will have two in class coding challenges. You will be given several specific coding assignments and asked to complete them during class time. You are free to use class materials or the internet, but you must work alone.
- Assignments (30%): At the end of each topic each student will complete a program that illustrates mastery of that content. Students may work in teams, but each student should submit their own program and indicate which students they work with. Programs will be due on Friday with a one letter grade a day late penalty through Sunday after which no further submissions will be accepted. You may drop your lowest assignment grade.
- Final Project (30%): Students will complete a project on a topic of their choosing. The project will require students to collect data, conduct an analysis using one or more of the techniques described in class and present the results. Students will submit their code and a polished presentation of their results. This project will be due on the Final Exam date.
- Participation (5%): Students are expected to attend class, participate and code diligently during class.

Course Requirements, Assessments, and Evaluations:

Scores on each of the assignments described above will be averaged according to the weights in parentheses. Grades in the course will be assigned as follows:

A 93-100	B 83-87	C 72-77	D 62-67
A- 90-92	B- 80-82	C- 70-71	D- 60-61
B+ 88-89	C+ 78-79	D+ 68-69	F Below 60

Course Outline:

Class meeting #	Date	Topic
1	24-Jan	Course introduction
Programming basics		
2	26-Jan	Anaconda install and first program
3	31-Jan	Data types
4	2-Feb	Program control
5	7-Feb	Functions and packages
6	9-Feb	Project review
7	14-Feb	Coding Workshop
8	16-Feb	Coding Challenge
Data management		
9	21-Feb	Code and data management best practices
10	23-Feb	Exploratory data analysis
11	28-Feb	Visualizing data
12	2-Mar	Visualizing data (cont.)
13	7-Mar	Scraping data - Intro
14	9-Mar	Scraping data - API
	14-Mar	<i>Spring Break</i>
	16-Mar	<i>Spring Break</i>
15	21-Mar	Scraping data – FTP
16	23-Mar	Regression
Machine Learning		
17	28-Mar	Clustering
18	30-Mar	Clustering (cont.)
19	4-Apr	LASSO
20	6-Apr	<i>Spring Recess</i>
21	11-Apr	Regression trees
22	13-Apr	Regression trees (cont.)
23	18-Apr	LASSO (cont.)
24	20-Apr	Neural Net
25	25-Apr	Neural Net (cont.)
26	27-Apr	Coding Challenge
Simulation		
27	2-May	Job-Search (McCall Model)
28	4-May	Optimal Growth (Cass-Koopmans Model)
29	9-May	Sorting and Segregation (Schelling Model)

The instructor reserves the right to revise, alter or amend this syllabus as necessary. See the Canvas calendar for the latest schedule.

University Policies:

Academic Integrity:

“An essential feature of the University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.”

University Civility Statement:

Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, graciousness, cordiality, affability, amiability and courteousness. Civility enhances academic freedom and integrity and is a prerequisite to the free exchange of ideas and knowledge in the learning community. Our community consists of students, faculty, staff, alumni, and campus visitors. Community members affect each other’s well-being and have a shared interest in creating and sustaining an environment where all community members and their points of view are valued and respected. Affirming the value of each member of the university community, the campus asks that all its members adhere to the principles of civility and community adopted by the campus: <http://civility.utk.edu/>.

Disability Services:

“Any student who feels s/he may need an accommodation based on the impact of a disability should contact Student Disability Services in Dunford Hall, at 865-974-6087, or by video relay at, 865-622-6566, to coordinate reasonable academic accommodations.

Your Role in Improving Teaching and Learning Through Course Assessment:

At UT, it is our collective responsibility to improve the state of teaching and learning. During the semester, you may be requested to assess aspects of this course either during class or at the completion of the class. You are encouraged to respond to these various forms of assessment as a means of continuing to improve the quality of the UT learning experience.

Key Campus Resources for Students:

- [Center for Career Development](#) (Career counseling and resources; HIRE-A-VOL job search system)
- [Course Catalogs](#) (Listing of academic programs, courses, and policies)
- [Hilltopics](#) (Campus and academic policies, procedures and standards of conduct)
- [OIT HelpDesk](#) (865) 974-9900
- [Schedule of Classes/Timetable](#)
- [Student Health Center](#) (visit the site for a list of services)
- [Student Success Center](#) (Academic support resources)
- [Undergraduate Academic Advising](#) (Advising resources, course requirements, and major guides)
- [University Libraries](#) (Access to library resources, databases, course reserves, and services)