Data Science with Python

PHYS 5391
Unique Number: 93290
Fall 2019

Instructor:	Amir Shahmoradi
office:	SEIR 365
e-mail:	a.shahmoradi@uta.edu
e-mail:	shahmoradi@utexas.edu
e-mail:	a.shahmoradi@gmail.com
Office/Lab/Help hours:	**dataCAVE** (computer lab in the UTA Main Library) Monday/Wednesday 3 – 5:30 p.m. Thursday 10 – 11:59 a.m. Contact: Dr. Anya Williford Email: awillifo@uta.edu

Class start/end:	August 22, 2019 – December 4, 2019
Lecture meeting times:	Tuesdays – Thursdays 2:00 p.m. – 3:20 p.m.
Lecture meeting place:	Life Science (LS) 428

COURSE OBJECTIVES / ACADEMIC LEARNING GOALS

This is a new course offered in the College of Science at The University of Texas at Arlington. The course was originally intended for the STEM undergraduate students. However, the great interest shown by the graduate students in taking this course led us to offer it as a more advanced graduate-level course.

The course providing the necessary foundations in scientific computing for STEM majors at the graduate level. It introduces operating systems, programming concepts, and tools using examples and contexts from Data Science.

Prerequisite: None (some level of familiarity with programming is highly desired).

The primary objective of this course is to learn basic computer programming concepts and apply them to Data Science related problems. By the end of the course, you should have a good understanding of general programming foundations and practices, and be able to analyze Data Science problems and develop computational solutions for them, collaboratively within a team. We will achieve this by learning how to program in popular operating system environments such as Linux using popular high-level programming languages such as Python or high-performance programming languages such as modern Fortran/C/C++ as deemed necessary throughout the course. Although not essential, some prior familiarity with programming concepts is desirable for this course.

COURSE SCHEDULE

The following is a tentative outline of topics to be covered:

- Version Control Systems (VCS): Principles of professional project management and collaborative programming with the use of Git.
- Programming History – Operating Systems – Round-off and Truncation Errors – Number Systems – Introduction to Cloud Computing Resources.
- Brief Introduction to Principles of Programming using Python as the main language: Python development environment – general installation guidance – available editors – syntax rules – variables and data types – conditionals – looping – input/output – functions – Exception Handling – Object Oriented Programming – Array Computing and Performance Optimization – Wrappers, and Cross-language Interoperability.
- Select topics from Linear Algebra (Matrix Operations)
- Optimization techniques and foundations
- Linear and Nonlinear Regression
- Probability Theory
- Mathematical modeling
- Stochastic Processes
- Monte Carlo sampling techniques
- Foundations of Machine Learning
- Classification
- Clustering
- Neural Networks

COURSE TEXTBOOKS

No textbook is required for this course. Online class lecture notes will be used as reference. However, a list of textbooks for those who are interested to self-educate themselves or go beyond class syllabus will be provided on the first day of the class.

COURSE LOGISTICS

Grading:
Weekly Homework: 32% (Assignments might not be weighted equally)
Weekly Quizzes: 32%
Final Project: 36%

Homework Policy:
There will be approximately one homework per week. Assignments will be due before lecture begins, and should be added to an online repository determined by the instructor. No late assignments will be accepted. No exceptions to the homework policy will be made without prior instructor approval.

Examinations:
There will be no midterm exam, and no final exam. Students will have to complete a project in place of the final exam, either individually or in collaboration with teammates who are determined randomly after the midterm.

Attendance:
Regular attendance is expected. Any absence requires prior approval from the instructor, or compelling evidence of illness or an official letter from the university administration. Student attendance will be randomly checked.

Scholastic dishonesty: All students are responsible for upholding the University rules on scholastic dishonesty. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced.

Other matters: The University of Texas at Arlington provides, upon request, appropriate academic adjustments for qualified students with disabilities. Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the UTA's Office for Students with Disabilities as soon as possible to request an official letter outlining authorized accommodations. For visit https://www.uta.edu/disability/.