STA 5934-0004 Statistical Computing with Python
Spring 2020

Course Information
Class Meeting Time/Place: Tuesday/Thursday 5:15-6:30pm in HCB 307
Class URL: On Canvas

Instructor: Dr. Adrian Barbu
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Office: LOV 416
Office Hours: We 6:00-7:00pm, Tu/Th 6:30-7pm or by appointment

Teaching Assistant: Jing Zeng
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Phone: (850) 320-0208
Office: LOV 430
Office Hours: Tuesdays 3:15-5:15.

Textbook: No textbook required. About 50% of the course will follow material from: Problem Solving with Algorithms and Data Structures using Python by Brad Miller and David Ranum, https://runestone.academy/runestone/static/pythonds/index.html

Course Objectives: This course provides an introduction to the fundamental elements necessary for conducting research in Machine Learning, Data Science and Computer Vision. **This is not a Python class**, but a class to learn fundamental data structures, algorithms and numerical methods necessary for being a successful researcher. Upon successful completion, a student will be able to confidently write efficient and manageable experimental/research code in Python.

Prerequisite: One of STA 2122, 2171, 3032, 4322, 5126, 5354

Topics
- Data structures: stack, queue, list, vector, set, map, hash map
- Algorithms: recursion, greedy method
- Search and sort algorithms, computation complexity in big O notation
- Graph data structures: union-find, graph model, tree properties
- Graph algorithms: minimum spanning tree, min-cut max flow, Dijkstra's algorithm, all pairs shortest path, A* search
- Optimization: Gradient descent, SGD, momentum, Adam, Newton's method, BFGS
- Matrix algorithms: solving systems of equations, condition number, SVD, eigenvalues and eigenvectors, conjugate gradient for large matrices
- Sparse matrices and their algorithms
- Constrained optimization: Lagrange multipliers, KKT conditions, Lagrange duality, SVM
- Variational methods: Euler-Lagrange equation
- PyTorch for automatic differentiation
- Neural Networks using PyTorch

Grading: Homework projects: 90 points, quizzes: 14 points for a total of 104 points. There will be extra 5 bonus points given at the discretion of the instructor for students that have actively participated in the class discussions. The following scheme will be used to convert the percentage points to letter grades.

[90, 93)	A-	[93, 100]	A		
[80, 83)	B-	[83, 87)	B	[87, 90)	B+
[70, 73)	C-	[73, 77)	C	[77, 80)	C+
[60, 63)	D-	[63, 67)	D	[67, 70)	D+
[0, 60) F					

Course Policy
- **Individual study:** You are expected to read the course material beforehand and participate in the class discussion and ask questions in class.

- **Discussion sessions:** Every class will contain a discussion session where students are expected to participate, present what they understood and ask any questions that they might have about the class material or the homework.

- **Homework:** The homework problems will typically be announced on Thursday in class (and on the web site) and due by the following Wednesday. Late homework will be penalized. The homework must be neatly written, preferably typed and **must be submitted online**. Computer output should be kept to a minimum. The best 9 homeworks will form the course grade.

- **Quizzes:** There will be quizzes given every week to test whether students read and understood the material.

- **Classroom policies:** The classroom environment is an important factor for effective learning. In order to not distract other students' attention please follow these classroom policies. The first one of these is the university policy.
    - Remember that no food or drinks are allowed in the classroom.
    - Turn off all audible alarms (cell phones, pagers, calculators, watches etc.)
    - Do not use cell phones in the class.
    - Come to the class on time. Opening and closing the classroom door in the middle of a class cause distraction to the students and the teacher.
    - Do not talk to other students without permission while the professor is teaching. More than one conversation creates noise and makes it difficult for the students to pay attention to the lecture.

- **Class behavior.** It is important that the students keep quiet during class and foster an environment conducive to learning. Students that repeatedly disrupt the class will be penalized after two warnings with 5% of the course grade for each disruption.

- **Attendance:** You are required to attend all classes. The class activities will help you assimilate the lessons more easily, giving you an opportunity for active learning. Do not let this opportunity slip away. Any foreseen absence must be cleared with the instructor. If the absence is due to emergencies, it is the student's responsibility to notify the instructor at the earliest opportunity of the emergency.

- **Code:** It is acceptable to use code downloaded from the internet for the homework as long as a reference to the code website, package or the appropriate paper is added to the homework report.

- **Collecting returned homework:** It is the student's responsibility to check grades on the Canvas class page. If you notice any mistake in recording grades on the Canvas page, please inform the instructor about it as soon as possible.

- **Homework re-grade:** If you find errors in grading a homework, you have one week to request a re-grade from the date on which the graded homework is available to the students of the class. Submit an email request detailing the nature of the grading error to the instructor along with the relevant homework.

- **Contacting the instructor or TA outside the class:** You are strongly encouraged to come to the instructor or TA during their office hours. If your schedule conflicts with the office hours, you can make an appointment. You may ask the instructor brief questions by e-mail, but you may be asked to come to office hours if the instructor thinks that the questions are better answered in person.

- When you send e-mails remember the following:
    - Always e-mail from your FSU accounts. The e-mails from non-FSU accounts may not reach me due to filters.
    - Always write your full name at the end of each e-mail message you send.
    - Always write STA 5934 at the beginning of the subject line.

- **Academic honor policy:** The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at http://dof.fsu.edu/honorpolicy.htm).

- **Students with disabilities:** Students with disabilities in need of academic accommodation should:
  1. Register with and provide documentation to the Student Disability Resource Center;
  2. Bring a letter to the instructor indicating the type of accommodation needed.
  This should be done during the first week of class.
  For more information about services available to FSU students with disabilities, contact the:
  Student Disability Resource Center
  97 Woodward Avenue, South
  108 Student Services Building
  Florida State University
  Tallahassee, FL 32306-4167
  (850) 644-9566(voice)
  (850) 644-8504 (TDD)

sdrc@admin.fsu.edu
http://www.disabilitycenter.fsu.edu/