IENG 493D/593D: Data Analysis for Industrial Engineers
Spring 2020

Course Information

IENG 493D/593D: Data Analysis for Industrial Engineers (Spring 2020)
Class Schedule: Tuesday/Thursday 5:30 – 6:45 PM
Class Location: Mineral Resources Building, Room 205
Final Exam: No final exam (Monday, May 4, 8 – 10 AM)

A hands-on study of data analysis using modern tools and approaches with applications in industrial engineering. The primary emphasis of this course will be collection, preparation, analysis, and visualization of data.

Instructor

Behrooz Kamali, Ph.D.
Email: b.kamali@mail.wvu.edu
Office: Engineering Sciences Building (ESB) 339
Office hours: Thursday 4:00 PM - 5:30 PM, or by appointment

References

There is no required textbook for this class. We use the following two resources throughout the course.

- How to think like a computer scientist, `http://openbookproject.net/thinkcs/python/english3e/`

- Python data science handbook: Essential tools for working with data. VanderPlas, Jake. O'Reilly Media, Inc., 2016.

Other useful resources:

- The python language reference, `https://docs.python.org/3/reference/index.html`

- Python crash course: a hands-on, project-based introduction to programming. Matthes, Eric. No Starch Press, 2015.

- Automate the boring stuff with Python: practical programming for total beginners. Sweigart, Al. No Starch Press, 2015. `https://automatetheboringstuff.com`

- Microsoft Excel data analysis and business modeling. Winston, Wayne. Microsoft press, 2016. APA

Prerequisites

IENG 331 - Computer Applications in Industrial Engineering

Course Objectives

Upon successful completion of this course, students will be able to:

1. Acquire, clean, preprocess, and store data

2. Develop and debug programs for automating analytical operations

3. Write high quality, maintainable computer programs

4. Produce effective visualizations of results and findings

5. Summarize, aggregate, pivot, and transform data

6. Perform numerical analysis tasks

Course Relationship to Program Educational Outcomes

Students will be able to understand and apply various number systems and data representation schemes used on digital computers. Students will be able to design, implement, and debug computer programs using one and two dimensional arrays, data structures and databases.

- Outcome 1: Learn and use a computer programming language

- Outcome 2: Analyze and interpret data using computational practices

Grading

There are 7 homework assignments (individual, 10 points each) and one final project (group, 30 points) for the class.

RANGE	GRADE	RANGE	GRADE
97 - 100	A+	73 - 76	C
93 - 96	A	70 - 72	C-
90 - 92	A-	67 - 69	D+
87 - 89	B+	63 - 66	D
83 - 86	B	60 - 62	D-
80 - 82	B-	0 - 59	F
77 - 79	C+		

Course Topics and Tentative Schedule

- <u>Python Essentials</u> (2 weeks): An overview of Python basics, including control flow, data structures, functions, object oriented programming, file operations, and standard library.

- <u>Acquisition and Storage</u> (3 week): Introduction to major data formats and types, how to load and save them, relational databases, and SQL.

- <u>Cleaning and Preparing</u> (2 weeks): Basics of data wrangling, cleaning data, merging, splitting, joining, concatenating data sources, and dealing with missing data.

- <u>Visualization</u> (4 weeks): Fundamentals of data visualization, various types of plots and charts, their use cases, exploratory data analysis (EDA) using visualization, and Tableau.

- <u>Analysis</u> (3 weeks): Analysis of data using summarization, aggregation, pivoting, and basics of time series analysis.

- <u>Machine Learning</u> (2 weeks): Basic machine learning algorithms including linear regression, logistics regression, and clustering.

Academic Integrity

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the West Virginia University Academic Catalog at `http://catalog.wvu.edu/undergraduate/coursecreditstermsclassification/#academicintegritytext`. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter.

Attendance

Student attendance is mandatory, unless excused by the instructor. The basis for an excused absence will follow the university policy. No credit will be given for attendance. However, class participation and attendance can affect the final grade in borderline cases.

Projects

Each mini-project should be completed in a group of 3 (undergraduate) or 2 (graduate) students. Mini-projects focus on individual learning topics, while the individual class project combines all the covered material to tackle a real-world data analysis problem in depth. For the individual class project, students are allowed to discuss ideas, but each student must work on the project individually. For both projects and homework assignments, students

are allowed to get ideas from the internet, but are not allowed to directly use solutions from the internet.

Homework

Homework is assigned as individual work unless specifically stated otherwise. Students are allowed to discuss assignments among themselves; however, each student must submit her/his own work. Assignments must be submitted on time, unless prior arrangements have been made with the course instructor. Late submission of the assignment will result in losing $\frac{1}{3}$ of the full assignment grade per day.

Regrade

Requests for regrades of assignments must be submitted to the course instructor, in writing, within SEVEN days of the date the work was returned to the student. The instructor reserves the right to regrade any other section of the work as deemed appropriate.

Communication

Course announcements, information, assignments, and documents will be posted on eCampus. Students are expected to check email and eCampus regularly.

Statement on Social Justice

West Virginia University is committed to social justice. I concur with that commitment. I expect to foster a nurturing learning environment that is based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, you must make appropriate arrangements through Disability Services (293-6700). They will identify the nature of the accommodation your disability requires.