Introduction to Computer Science: Taming Big Data
CSCI 1070 Section 2 — Fall 2024

Class Time: **Tuesday/Thursday, 12:45 – 2:00 PM**
Location: **Ritter Hall - Room 115**

Instructor: Ryan Johnson
Office Hours: By appointment, Tuesday/Thursday, 2:00pm – 4:00pm
E-mail: thomas.johnson.1@slu.edu (please begin subject email with CSCI_1070!)

Course Description: This course is an introduction to data science and machine learning. Fundamentals of software engineering, data visualization, databases, and data analysis will also be covered. There will be a focus on mastering the basic concepts and algorithms in data science and applying them to real-world problems.

Course Prerequisites: None.

Course Objectives: After successfully completing this course, students will be able to:
- use flow control structures to process large datasets in a high-level programming language
- use git for version control
- apply basic concepts of Software Engineering in the implementation of a computer program that satisfies a set of requirements, including thorough testing and iteration until requirements are met
- select and apply appropriate machine learning algorithms to real-world datasets
- create database tables, define a database schema, and read and write data from a database
- formulate and solve real-world problems in data science, including an appropriate evaluation of the method chosen, and present results in both written and presentation form

Required Text: "Data Science from Scratch: First Principles with Python (2nd Edition)" by Joel Grus
https://a.co/d/03N8TYR

A Note about Instructor Communication

I care about you and your understanding of the material covered in this course. I will respond to your questions and email as quickly as possible, though this almost always means a response in the evening. I am available to meet you by appointment during my office hours after class. If you do not have an appointment but want to see me unscheduled, please ask me before or after class and I will do my best to make time for you. If those times do not work, then we can schedule an appointment over Zoom outside of normal office hours.

Assessment & Grading

Exams: There will be a **one-hour fifteen-minute-long midterm** and a **final project**. There will be no final exam. The final project will serve as confirmation you have learned all the material in the learning objectives for this course. The midterm will have a combination of conceptual questions and pseudo-coding.

Quizzes: There will be 12 quizzes (10 counted) throughout the course that will occur at the end of class. They are designed to be completed in class. Quiz questions will come from assigned readings and previous or current lectures. You will often be asked to pseudocode or provide an outline of the code you would write to solve the problem in the question. We will discuss this more in class. Several quiz questions will reappear on the midterm. If you miss a quiz, there will be no makeup.

Homework: You will have 13 homework assignments of which I will count the highest 12 grades. The first two homework assignments will not require you to use git, but after that, you should submit a direct GitHub link to your homework assignment through Canvas. If you submit your first two weeks of homework with a GitHub link you can earn a point of extra credit per assignment.

It is possible for everyone in the class to earn an A. No make-up will be allowed for any reason for the only exam in this course (the midterm), other than a verifiable, written doctor's note or permission granted by the instructor prior to the date of the exam. Be forewarned, it is HIGHLY UNLIKELY that I will grant that extension. In addition, I will make every attempt to have the midterm and quizzes graded within 1 week of the dates administered.

No late assignments will be accepted. All homework must be submitted online to the instructor. All assignments are due on the day indicated by 11:59 pm Central Time. You have one week to submit assigned homework, though I will make every attempt to post assignments early, so you have more than a week to work on them. Saint Louis University is in the Central Time Zone and all times noted are relative to that time zone, no matter the location of the student. Adjust your submission time accordingly. You will have to work on the assignments outside of class.

Saint Louis University uses the +/- system from A to C, with no plus or minus for grades of D or F. Plus and minus will be apportioned with a "+" assigned for the upper third of the letter grade range and a "-" for the lower third of the letter grade range.

Grade Composition: Grades will be made available on Canvas. I will push to post grades within two weeks of being turned in. Your grade will be calculated in the following manner:

Midterm Exam	1 x 75 pts each	75 pts
Quizzes*	10 x 5 pts each	50 pts
Homework Assignments*	12 x 25 pts each	300 pts
Final Project and Presentation	1 x 75 pts each	75 pts
Total		500 pts

*Although the above shows you will only be graded on 10 quizzes and 12 homework assignments; you will have 12 quizzes and 13 homework assignments in this course. I will drop the lowest two quiz grades and the lowest homework grade.

Grading Scale: I will apply the following grading scale:

Grade	Grade Points	0-100% Scale
A	4.0	≥93%
A-	3.7	≥90%
B+	3.3	≥87%
B	3.0	≥84%
B-	2.7	≥80%
C+	2.3	≥77%
C	2.0	≥74%
C-	1.7	≥70%
D	1.0	≥60%
F	0.0	Below 60%
FQ	0.0	Fail Due to Quit

Attendance: You are responsible for all the material and administrative announcements presented during class. Note that while attendance is not strictly mandatory, there is a quiz component of your grade that depends on being present to take it. Should you choose not to attend class, you will not earn points for the quiz, should it occur on that day.

Collaboration Policy: Unless explicitly stated otherwise, all work that you submit should be the result of your own effort. For ALL course work, you ARE NOT permitted to consult the solutions from another student (former or current), copy/consult the provided solutions from previous years, or look online for exact problem solutions. We will monitor results from ChatGPT and other AIs, and if you produce an answer that is the same as or nearly the same as what is produced, you will get a zero for that assignment. AI is a useful tool but it is often wrong, and your ability to critically think through hard problems will always be valuable no matter how good AI gets.

When working on course materials, you may discuss approaches to solving the problems with your classmates. However, you must work out all details of any solutions discussed and write up the solution completely on your own. When working with a student on an assigned homework problem you should do so verbally -- nothing should be written down. This will keep your discussion at a high-level so that everyone can work out the details on their own.

Your final project may be completed in groups of two or it may be completed on your own. I will check git to see that both students contributed roughly evenly to the project. There will be additional requirements for the project if you choose to work on a team, but it is designed to be less work for each person if you decide to partner. In industry and academia, collaboration is critical, and I want to foster that where it makes sense in this course.

Changes to Course Policies: The standards and requirements set forth in this syllabus may be modified at any time by the course instructor. Notice of such changes will be announced in class, via email, or posted to the course website.

Course Content

Week	Date		Subject	Reading
0	Thursday	August 22	Jupyter Notebook and Python Fundamentals	
1	Tuesday	August 27	Flow Control, Functions, and Classes	Chap. 1-2
	Thursday	August 29	Flow Control, Functions, and Classes 2	
2	Tuesday	September 3	Getting Data	Chap. 9-10
	Thursday	September 5	Data Visualization	Chap. 3
3	Tuesday	September 10	Statistics and Probability	Chap. 5-7
	Thursday	September 12	Statistics and Probability 2	
4	Tuesday	September 17	Intro to Machine Learning	Chap. 8, 11, 25
	Thursday	September 19	Supervised Learning and Pre-processing Data	
5	Tuesday	September 24	KNN and Linear Regression	Chap. 12
	Thursday	September 26	Multiple Linear Regression	Chap. 14
6	Tuesday	October 1	Logistic Regression	Chap. 15-16
	Thursday	October 3	SQL	Chap. 24
7	Tuesday	October 8	SQL 2	Chap. 17
	Thursday	October 10	Decision Trees	
8	Tuesday	October 15	Review for Midterm	
	Thursday	October 17	Midterm	
9	Tuesday	October 22	Linear Algebra and PCA	Chap. 4 & 10
	Thursday	October 24	***Fall Break, No Class***	
10	Tuesday	October 29	Unsupervised Learning	Chap. 20
	Thursday	October 31	SVM, oversampling, and undersampling	
11	Tuesday	November 5	Neural Networks	Chap. 18-19
	Thursday	November 7	Neural Networks 2	
12	Tuesday	November 12	Network Analysis	Chap. 22
	Thursday	November 14	Recommendation Systems	Chap. 23
13	Tuesday	November 19	Natural Language Processing	Chap. 21
	Thursday	November 21	Natural Language Processing 2	
14	Tuesday	November 26	Prompt Engineering and AI	
	Thursday	November 28	***Thanksgiving, No Class***	
15	Tuesday	December 3	Project & Presentation	
	Thursday	December 5	Project & Presentation	

Note: Readings must be completed PRIOR to the class for which they are assigned. Some weeks require reading more in advance than others.

Title IX

Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of discrimination on the basis of sex, including sexual harassment, sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. Discrimination on the basis of sex includes discrimination on the basis of assigned sex at birth, sex characteristics, pregnancy and pregnancy related conditions, sexual orientation and gender identity. If you speak with a faculty member about an incident that involves a Title IX matter, **that faculty member must notify SLU's Title IX Coordinator that you shared an experience relating to Title IX.** This is true even if you ask the faculty member not to disclose the incident. The Title IX Coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you are pregnant or experiencing a pregnancy related condition, the Title IX Coordinator can assist you in understanding your rights and options as well as provide supportive measures.

Anna Kratky is the Title IX Coordinator at Saint Louis University (DuBourg Hall, room 36; anna.kratky@slu.edu; 314-977-3886). If you wish to speak with a confidential source, you may contact the counselors at the University Counseling Center at 314-977-TALK or make an anonymous report through SLU's Integrity Hotline by calling 1-877-525-5669 or online at http://www.lighthouse-services.com/slu. To view SLU's policies, and for resources, please visit the following web addresses: https://www.slu.edu/about/safety/sexual-assault-resources/index.php.

Disability Accommodations

Students with a documented disability who wish to request academic accommodations must formally register their disability with the University. Once successfully registered, students also must notify their course instructor that they wish to use their approved accommodations in the course.

Please contact the Center for Accessibility and Disability Resources (CADR) to schedule an appointment to discuss accommodation requests and eligibility requirements. Most students on the St. Louis campus will contact CADR, located in the Student Success Center and available by email at accessibility_disability@slu.edu or by phone at 314.977.3484. Once approved, information about a student's eligibility for academic accommodations will be shared with course instructors by email from CADR and within the instructor's official course roster. Students who do not have a documented disability but who think they may have one also are encouraged to contact to CADR. Confidentiality will be observed in all inquiries.

University Counseling Center

The University Counseling Center (UCC) offers free, short-term, solution-focused counseling to Saint Louis University undergraduate and graduate students. UCC counselors are highly trained clinicians who can assist with a variety of issues, such as adjustment to college life, troubling changes in mood, and chronic psychological conditions. To make an appointment for a wellness consultation, call 314-977-8255 (TALK), or visit the clinic on the second floor of Wuller Hall. For after-hours needs, please press #9 after dialing the clinic number.

Wellness

All students experience stressors and challenges at some point, and seeking support is both normal and beneficial. Such challenges may be the result of academic concerns (such as those related to assignments or content in a course), or they may be more personal in nature (such as concerns related to relationships, mental health, medical issues, loss, identities, alcohol or drugs, housing or food security, finances, or local/world events, among other things). If you experience these or other difficulties that are impacting your well-being and/or academic work, please consider seeking support from the resources available to you.

- For questions or concerns related to this course, please contact me. I am invested in your success and will support your success in the ways I can.
- Additionally, you have access to the many resources SLU provides in support of your personal wellness. You will find a list of available resources on the Well-being page of the SLU website.

If you or someone you know is experiencing a crisis: please consult Crisis Support and Warning Signs on the University Counseling Center website or call the University Counseling Center at 314-977-TALK (8255) and press #9 to be connected to a behavioral health nurse 24/7.

Basic Needs Security

Students in personal or academic distress and/or who may be specifically experiencing challenges such as securing food or difficulty navigating campus resources, and who believe this may affect their performance in the course, are encouraged to contact the Dean of Students Office (deanofstudents@slu.edu or 314-977-9378) for support. Furthermore, please notify the instructor if you are comfortable in doing so, as this will enable them to assist you with finding the resources you may need.

Academic Integrity

Academic integrity is the commitment to and demonstration of honest and moral behavior in an academic setting. Since the mission of the University is "the pursuit of truth for the greater glory of God and for the service of humanity," acts of integrity are essential to its very reason for existence. Thus, the University regards academic integrity as a matter of serious importance. Academic integrity is the foundation of the academic assessment process, which in turn sustains the ability of the University to certify to the outside world the skills and attainments of its graduates. Adhering to the standards of academic integrity allows all members of the University to contribute to a just and equitable learning environment that cultivates moral character and self-respect. The full University-level Academic Integrity Policy can be found on the Provost's Office website at: https://www.slu.edu/provost/policies/academic-and-course/academic-integrity-policy.pdf.

Additionally, each SLU College, School, and Center has its own academic integrity policies, available on their respective websites.

Generative AI

Generative AI, including but not limited to ChatGPT, Gemini, Microsoft Copilot, Midjourney, DALL-E or GitHub Copilot may not be used for work in this class. The use of such generative AI tools may compromise your learning by undermining your responsibility to explain your process of analysis in your own language. You may not use generative AI as the foundation for any work you submit for this class, whether for written exposition or for code. You may not use generative AI in any way to augment your original work. For example, asking an AI to add comments to code is not allowed. Please review item three in the section labeled Plagiarism in the Saint Louis University Academic Integrity Policy.

University Writing Services

Students are encouraged to take advantage of University Writing Services in the Student Success Center, getting feedback benefits writers at all skill levels. Trained writing consultants can help with writing projects, multimedia projects, and oral presentations. University Writing Services offers one-on-one consultations that address everything from brainstorming and developing ideas to crafting strong sentences and documenting sources. For more information, visit https://www.slu.edu/life-at-slu/student-success-center/ or call the Student Success Center at 314-977-3484.

Student Success Center

In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. The Student Success Center assists students with academic-related services and is located in the Busch Student Center (Suite, 331). Students can visit https://www.slu.edu/life-at-slu/student-success-center/ to learn more about tutoring services, university writing services, disability services, and academic coaching.