

CS 601: Data Science Programming II

G. Exoo

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E-mail: cs601@cs.indstate.edu

Office Hours: MWF 1:30-1:55

Office: A-179 Root Hall

Web: cs.indstate.edu/cs601

Class Hours: MWF 2:00-2:50pm

Zoom Meeting

Course Description

This course will survey several areas of Data Science. The emphasis will be on learning algorithms. We will review Probability, Statistics, Multi-dimensional Calculus, and Vector Geometry as need, throughout the semester. The topics will include the following.

- Deep Learning
 - Artificial Neural Networks (ANNs)
 - Building your own ANN
 - Using Python modules to build networks (PyTorch)
- Associative Learning
 - A priori
 - Eclat
 - Approximation algorithms
- Supervised Learning: Classifiers
 - Logistic Regression
 - k-Nearest Neighbor
 - Naive Bayes
 - Support Vector Machines
 - ANN's
 - Decision Trees
 - Random Forests
 - Bagging and Boosting

- Unsupervised Learning
 - k-Means Clustering
 - Hierarchical Clustering
 - Dimension Reduction
 - Principal Component Analysis
- Reinforcement Learning
 - Q-Learning
 - PID Controllers
 - Deep Q-learning

Learning Outcomes

Upon completion of the course the student will have:

- A high level understanding of topics and problem types dealt with in Data Science.
- The ability to manipulate and organize large data sets.
- The ability to use Computer Graphics to help visualize the scope and scale of a problem.
- The ability to determine the techniques appropriate for solving a given problem.
- The ability to explain and program important Machine Learning and Data Mining algorithms.
- The ability to use Python, Numpy, Pandas and various other graphics and statistical modules to solve real world problems.

Online Texts/References

There is a wealth of free material online. Links to the material will be provided on the class web page as the semester proceeds.

[Linux/Unix for Beginners](#)

Course Announcements

Announcements regarding the course will be made both during class, on the class web page, and in your `cs.indstate.edu` email (which you should learn how to use). Communications related to grades will be sent to your `@sycamores.indstate.edu` email address. You should regularly check all of these locations. If you wish to contact the instructor via email, use the email address given above.

Expected Amount of Work

If you take this class seriously and get what you should out of it, some weeks you will likely be spending an average of 15 hours/week or more on the class. The students who get A's in their CS courses and have an easy time finding jobs spend at least this much time. Not everyone will need to spend this much time and not all weeks will be the same, but you should plan on putting in whatever time it takes. Note - your classes should be more important than your part-time job.

Classroom Conduct

You may not use cell phones, iPods/music players, etc. during class. You should be civil and respectful to both the instructor and your classmates, and you should arrive to class a few minutes before the scheduled lecture so you are ready for lecture to begin on time. You may use the lab computers, and only the lab computers, during class if you are using them to follow along with the examples that are being discussed. You may not check email, Facebook, work on other courses, etc., during class.

Assignments

The students in this course have the following responsibilities: read assigned readings before lecture, attend lecture, complete homework assignments, take in-class quizzes, take exams, and complete all projects. In this class, your final grade will be based primarily on the projects, and the lesser extent on the exams and quizzes. The points you receive for doing programming assignments will be based on the number of assignments you do correctly and on time. CS Course Policies

CS Course Policies Note that this course follows all standard CS course policies. In particular check the CS course policies related to - cheating/plagiarism, attendance, missing exams. See <http://cs.indstate.edu/info/policies.html> for details.

All assignments are posted in a pdf file on the class web page. Each such file will indicate the number of points, the due date and time, and the location where your assignment should be saved. Failure to save your work in the correct location will be viewed as equivalent to not doing the work.

Late Assignments

As indicated above, *the points you receive for doing programming assignments will be based on the number of assignments you do correctly and on time.*

We suggest attempting a homework assignment the day it is given, or the day after, so that if you do not understand how to do the assignment, you will have time to seek help. You may need to ask for help more than once, and you should certainly plan on spending a lot of time in the CS lab (A-015 Root Hall). Many of the homework assignments require thought and creative problem solving. Do not expect to solve the problems the first time you attempt them.

Grading Policy

We try to design homework assignments and exams so that a standard cutoff for grades will be close to what you deserve. After the first exam a grade will be created in Blackboard called **Letter Grade** that is intend to be your current grade in the class. The grades are generally based on the following table.

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

Grades are intended to indicate your mastery of the course material. The following are offered as guidelines.

A

You can do all the assignments on your own.

B+/A-

The student understands almost everything, and should be able to use this knowledge in other courses or in a job.

B-/B

The student understands most, but not all, topics well.

C/C+

Learned enough and have the minimum skills to move on in the subject.

D+/C-

The student made some effort in, and understands some things at a high level, but hasn't mastered the details well enough to be able to use this knowledge in the future.

D-

Students will normally not get an F if - they attend 80% of the lectures, complete some of the assignments up through the end of the course, and get nearly half of the problems on the final exam correct.

F

Normally, students that get an F simply stopped doing the required work at some point.

Blackboard

The course has a blackboard site. You should see this course listed under your courses for the current term. The blackboard site is used only for giving you your grades (go to the course in blackboard, then click *My Tools*, and then *My Grades*).

Academic Integrity

Read CS course policies in terms of what is and is not allowed on assignments: <http://cs.indstate.edu/info/policies.html>. Please ask the instructor if you have doubts about what is considered cheating in this course.

Special Needs / Student Disabilities

Indiana State University recognizes that students with disabilities may have special needs that must be met to give them equal access to college programs and facilities. If you need course adaptations or accommodations because of a disability, please contact us as soon as possible in a confidential setting either after class or in my office. All conversations regarding your disability will be kept in strict confidence. Indiana State University's Student Support Services (SSS) office coordinates services for students with disabilities: documentation of a disability needs to be on file in that office before any accommodations can be provided. Student Support Services is located on the lower level of Normal Hall in the Center for Student Success and can be contacted at 812-237-2700, or you can visit the ISU website under A-Z, Disability Student Services and submit a Contact Form. Appointments

to discuss accommodations with SSS staff members are encouraged. Once a faculty member is notified by Student Support Services that a student is qualified to receive academic accommodations, a faculty member is obligated to provide or allow a reasonable classroom accommodation under ADA.

Disclosures Regarding Sexual Misconduct

Indiana State University fosters a campus free of sexual misconduct including sexual harassment, sexual violence, intimate partner violence, and stalking and/or any form of sex or gender discrimination. If you disclose a potential violation of the sexual misconduct policy I will need to notify the Title IX Coordinator. Students who have experienced sexual misconduct are encouraged to contact confidential resources listed below. To make a report or the Title IX Coordinator, visit the Equal Opportunity and Title IX website: <http://www.indstate.edu/equalopportunity-titleix/titleix>.

The ISU Student Counseling Center

HMSU 7th Floor, 812-237-3939, www.indstate.edu/cns.

The ISU Victim Advocate

Trista Gibbons trista.gibbons@indstate.edu. HMSU 7th Floor, 812-237-3939 (office), 812-230-3803 (cell).

United Campus Ministries

321 N 7th St., Terre Haute, IN 47807 812-232-0186,

<http://www2.indstate.edu/sao/campusministries.htm>

<http://www.unitedcampusministries.org>

<mailto:ucmminister2@gmail.com>.

For more information on your rights and available resources:

<http://www.indstate.edu/equalopportunity-titleix/titleix>.

Covid-19

Illness: Students who are ill, under quarantine or isolation for COVID-19, or suspect they are ill will report that to the Indiana State University Office of the Dean of Students' Contact Tracing Team via the Sycamore Symptom Assessment, which each member of the ISU community receives daily by email. The Contact Tracing Team will work with the student to verify and gather necessary information. Students are required to respond to and comply

with the Contact Tracing Team. The Office of the Dean of Students will supply documentation for faculty. Once notification is made, all faculty will make every reasonable effort to accommodate the student's absence and will communicate that accommodation directly to the student. Students who need to report an illness or a change in their COVID-19 status (either positive test result or a close-contact exposure) must complete the Sycamore Symptom Assessment and may contact Office of the Dean of Student with questions by calling 812-237-3829.