

INTRODUCTION TO INTELLIGENT SYSTEMS

FALL 2023

Sections: IIS 1010

Time: Tues/Thurs 11:20 pm - 12:45 pm

Place: 405 Fedex Institute of Technology

Instructor: Andrew Olney

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Office: FedEx Institute of Technology, Room 403e

Office Hours: Monday 3:00 pm -4:00 pm

Phone: 678-5032

Web: <https://olney.ai>

Description

Understand artificial and natural phenomena in fields like biology, psychology, neuroscience, economics, and engineering through computational concepts and practices.

The course has two phases:

- Understand how simple rules generate complex behavior
- Understand how to use data to infer these simple rules

The course is intended for students with little or no programming experience from any major. It is not a programming course but introduces some basic programming concepts. We will use a blocks-based “programming language” to create models and drive simulations.

Objectives

- Learn basic computing concepts like functions, recursion, and algorithms
- Explore simple computational models for biology, psychology, neuroscience, economics, and engineering topics
- Learn basic probability concepts like noise, measurement, and Baye’s rule
- Apply these simple concepts in models that learn from data

Methods and Activities

- Before class
 - Study readings and slides on elearn.memphis.edu
 - Prepare questions before class
- In class
 - Brief class lectures
 - In-class labs and activities

- Bring laptop or tablet with keyboard and WiFi for in-class activities
- After class
 - Mini-quizzes on elearn.memphis.edu
 - Discussion assignments on elearn.memphis.edu

Materials

Any reading materials will be distributed via <https://elearn.memphis.edu>. Reading materials will be a mixture of slides, course notes, and excerpts from books.

Grading

Grades will be on a +/- letter scale (e.g. A+/A/A-) and calculated according to the following percentages.

Quizzes (50%) After class quizzes on <https://elearn.memphis.edu>.

Class exercises (20%) In-class exercises, or labs, will be performed individually or in groups depending on the topic.
If you don't finish an exercise, try to finish it on your own before the next class.

Discussion posts (30%) Students will participate in online discussion threads at <https://elearn.memphis.edu>. An example discussion assignment might be "Describe different paths you explored in your model" or "Describe something that happened that surprised you."

Attendance & Make-up Policy

Since in-class exercises and daily quizzes a significant portion of your grade, tardiness and missing classes will negatively impact your grade.

Work is expected to be turned in on time unless arrangements have been made prior to the due date. No credit will be given for late work. Please plan ahead and arrange to be present for all classes (listed on course schedule below). Extensions are given only under extreme circumstances and with prior permission of instructor.

Communication

You are required to activate your university e-mail account in order to be a student at the University. The University considers this account to be your official university e-mail address and will use it to disseminate information. You must either check your university e-mail account regularly or forward your university e-mail to a personal e-mail account that you will check regularly. After you have established your university e-mail account, you can use iAM, the University's identity management service, to forward your university e-mail to a personal e-mail account.

Office Hours

If you have any difficulties during the course, let me know immediately. Office hours are the perfect opportunity to discuss teaching and research issues. Do you want to have more information on a certain topic? Do you have difficulties finding a research question or writing a paper? Do you feel uncomfortable about assignments? Are you looking for work in a research lab? Do you have suggestions or comments? See me during office hours or send me an email.

Respecting Diversity

We aspire to foster and maintain an atmosphere that is free from discrimination, harassment, exploitation, or intimidation. Academic courses will aim at providing opportunities for students to discuss issues of diversity including, but not limited to, ethnicity, gender, disability and sexual orientation as they can be related to course content. The University

of Memphis has adopted policies prohibiting discrimination based upon race, sex, disability, or sexual orientation. In addition, the American Psychological Association has explicit policies regarding the issues of and writing about race, gender, class, sexual orientation, disability, ethnicity, and religion. You may find information on these standards in the APA Publication Manual or on the APA webpage: <http://www.apa.org/pi/oema/>.

If you feel that you have experienced discrimination based on culture, disability, ethnicity, gender, generation, sexual orientation, national origin, privilege, race, and different views on religion, please contact the Office for Institutional Equity at the Administration Building, Room 156 (901-678-2713). To make a report, you may fill out an online form at <http://www.memphis.edu/report>.

Students with Disabilities

If you have a disability that interferes with completion of any coursework (including tests) or difficulty in accessing any course materials, (1) notify the instructor privately during the first two weeks of the course and (2) contact Disability Resources for Students (DRS) located in 110 Wilder Tower and at 678-2880 or via email (drs@memphis.edu). DRS offers a comprehensive program of services and academic accommodations designed to provide access and opportunity to students with disabilities. The instructor will work with you and DRS to determine how best to adapt course materials or instruction. DRS also offers volunteer opportunities for students to provide copies of notes to students who have that as an approved accommodation. Scholarship, community service, and volunteer hours can be validated for this service by DRS.

Academic Integrity

Students are expected to behave in accordance with the University's Code of Student Rights and Responsibilities (https://www.memphis.edu/osa/pdfs/student_code.pdf). Students engaging in disruptive behaviors or conduct that violates the rules and regulations of the university may be removed from the course. The instructor may report misconduct to the chair of the department or the University's Office of Student Accountability. Likewise, plagiarism, cheating, and other forms of academic dishonesty will not be tolerated. Students engaging in academic dishonesty will receive a 0 on the associated assignment or exam and other possible disciplinary sanctions may also be imposed. Consistent with these regulations and policies, students are expected to behave in accordance with the American Psychological Association Code of Ethical Conduct (<https://www.apa.org/ethics/code/principles.pdf>).

Classroom Misconduct

Students are expected to behave in accordance with the university's Code of Student Rights and Responsibilities, found here: <http://www.memphis.edu/saos/pdfs/csrr.pdf>. Disruptive behavior, use of an electronic or other noise- or light-emitting device that disturbs others, and excessive use of electronic devices for text messaging, telephone, or video-based conversations during instructional time in the classroom will not be tolerated. Students engaging in disruptive behaviors or general conduct that violates the rules and regulations of the university may be removed or excluded from the classroom. The instructor may report classroom misconduct to the Department Chair or the University's Office of Student Accountability, Outreach, and Support.

University of Memphis Title IX Policy

The University of Memphis is committed to ensuring equity in its educational benefits, programs and activities. Sexual harassment includes but is not limited to sexual assault, dating violence, domestic violence, and stalking. If you or someone you know has been subjected to conduct that may be sexual harassment, you are encouraged to make a report to the Office for Institutional Equity via email (oiem@memphis.edu), by phone (901-678-2713), or you can fill out this online form (<https://www.memphis.edu/report/submit-a-report/title-ix.php>). Please note that while not all faculty are mandatory reporters, anyone in the following categories is required to report any sexual harassment they become aware of: faculty and staff who supervise employees, including student workers, student organization advisors, coaches, administrators, and any University employee who has significant responsibility for student and campus activities, included but not limited to student housing, student discipline and campus judicial

proceedings. Similarly, all administrators and supervisory faculty and staff are required to report discrimination on the basis of race, color, national origin, disability, age, religion/creed, veteran status. If you want to make a CONFIDENTIAL report, you can contact the University Counseling Center, 214 Wilder Tower (901-678-2713), the Student Health Center, 200 Hudson Health Center (901-678-2287), or the Office of Victim Services (901-678-4471).

Student Health

As a student, you may experience a range of issues that can cause barriers to learning, such as physical health problems, strained relationships, increased anxiety, alcohol and drug problems, feeling down, difficulty concentrating, and lack of motivation. These mental and physical health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. The University of Memphis has a range of confidential mental and physical health services available on campus to assist you, including the Psychological Services Center in the Psychology Building, Room 126 (901-678-2147); The University Counseling Center at 214 Wilder Tower (901-678-2068); and The University Student Health Center at 200 Hudson Health Center (901-678-2287).

Campus Closure

If you receive a notification that the University of Memphis is closed due to weather or for some other reason, **on-campus classes scheduled during the closure will not meet**. If you experience a situation that prevents you from attending on-campus classes and/or completing coursework on time, please contact your instructor to work out possible alternative arrangements.

Syllabus Changes

The instructor reserves the right to make changes as necessary to this syllabus. If changes are necessitated during the term of the course, the instructor will immediately notify students of such changes both by individual email communication and posting both notification and nature of change(s) on the course website.

Course Schedule

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Class	Topic
1	Codes & Functions
2	Fractals & Recursion
3	Automata & Computation
4	Animats: Vehicles
5	Animats: Flocking
6	Game theory & Cooperation
7	Predator/Prey dynamics
8	Neural networks as Logic
9	Evolution
10	Turing Test & Chatbots
11	Probability, Distributions, & Code-Breaking
12	Measurement to Fractals
13	Learning an Automata
14	Bayes rule
15	Naive Bayes Classification
16	KNN
17	Regression
18	Multiple regression
19	Neural networks as Regression
20	Neural networks with backprop
21	Vector spaces and embeddings
22	Reinforcement learning
23	Breeder systems
24	Ngrams
25	Bayes nets
26	Structural causal models
27	All questions answered