ACAD 222 Introduction to Machine Intelligence

Units: 4
Term: Spring 2025
Day/Time: MW 2:00–3:50pm
Location: IYH 111
Instructor: Michael Crowley
Office Hours: By appointment – or after class
Contact Info: crowley@usc.edu

IT Help: https://iovine-young.usc.edu/ait/index.html
Hours of Service: 8:30am - 5:00pm
Contact Info: iyhelp@usc.edu, 213-821-6917

USC Technology Support Links
Zoom information for students
Software available to USC Campus

Course Description

This course covers the concepts of artificial intelligence and machine learning. Students will learn "traditional" AI topics such as agents and search as a basis for machine learning. Machine learning topics will include classification systems, training models with several methodologies, support vector machines, decision trees, and ensemble learning and random forests. Students will also learn about artificial neural networks. Lastly, students will learn the Python programming language as a basis for all labs and assignments.

Learning Objectives

Students will learn the following material:

- Understand the structure and use of intelligent agents
- Understand how to program in Python to solve machine intelligence problems
- Understand how classification systems are built and used
- Understand how machine intelligent models are trained
- Understand support vector machines as a machine learning model
- Understand decision trees as a machine learning model
- Understand ensemble learning and random forests as a machine learning model
- Understand artificial neural networks and how to use them to solve ML problems

Prerequisite(s): none
Co-Requisite(s): none
Concurrent Enrollment: none
Recommended Preparation: none

Course Notes

The course is for a letter grade. All labs, assignments, and lecture notes will be posted to Brightspace. In addition, all work in this class is individual work.

Required Readings

Géron, Aurélien. *Hands-On Machine Learning with Scikit-Learn and TensorFlow. Concepts, Tools, and Techniques to Build Intelligent Systems*. 3rd ed. Sebastopol, CA: O'Reilly Media, 2022. ISBN 978-1-098-12597-4.

Raschka, Sebastian, Yuxi (Hayden) Liu, and Vahid Mirjalili. *Machine Learning with PyTorch and Scikit-Learn*. 1st ed., Packt Publishing, 2022. ISBN 978-1-80181-931-2.

Optional Readings and Supplementary Materials

Horstmann, Cay S., and Rance D. Necaise. *Python for Everyone*. 2nd ed., Wiley, 2016. ISBN 978-1-119-05655-3.

Description and Assessment of Assignments

Labs are to have you practice fundamental skills in this class. Labs are assigned in class on Wednesdays and due the following Sunday.

Assignments are like "big" labs. They build on the skills you gain from the labs. Early assignments are usually one week in length. Later assignments are larger and you have two weeks to complete them. Assignments are assigned on Wednesdays and due 11:59 pm on the Tuesday.

The final project has three parts. Each part has about two weeks to complete.

Participation

There are no points for in-class participation.

Grading Breakdown

Assignment	Points	% Grade
Labs (8 total)	180	25%
Assignments (5 total)	220	25%
Final Project (3 parts)	400	50%
TOTAL	800	100%

Grading Scale

Course final grades will be determined using the following scale:

A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	59 and below

Assignment Submission Policy
Labs: Labs are to be completed by Sunday 11:59 pm the week they are assigned.

Assignments and Final Project: Assignments are due at 11:59 pm on the due date included in the assignment. The 3 parts of the final project will have different length and due dates but will also be due at 11:59 pm on their due date.

Grading Timeline
It is anticipated that most grading will be completed within one week of the due date.

Late work
Assignments submitted up to 24 hours late will receive a 20% deduction. Assignments between 24 and 48 hours will receive a 50% deduction. Assignments more than 48 hours late will receive a grade of 0.

Any exceptions to this late grading policy must be requested and approved in advance.

Attendance
The Academy maintains rigorous academic standards for its students and on-time attendance at all class meetings is expected. Each student will be allowed two absences over the course of the semester for which no explanation is required. Students are admonished to not waste excused absences on non-critical issues, and to use them carefully for illness or other issues that may arise unexpectedly. Except in the case of prolonged illness or other serious issue (see below), no additional absences will be excused. Each unexcused absence will result in the lowering of the final grade by ⅓ of a grade (e.g., an A will be lowered to A-, and A- will be lowered to a B+, etc.). In addition, being tardy to class will count as one-third of an absence. Three tardies will equal a full course absence.

Students remain responsible for any missed work from excused or unexcused absences. Immediately following an absence, students should contact the instructor to obtain missed assignments or lecture notes and to confirm new deadlines or due dates. Extensions or other accommodations are at the discretion of the instructor.

Automatically excused absences normally may not be used for quiz, exam or presentation days. Using an excused absence for a quiz, exam or presentation, such as in the case of sudden illness or other emergency, is at the discretion of the instructor.

In the case of prolonged illness, family emergencies, or other unforeseen serious issues, the student should contact the instructor to arrange for accommodation. Accommodation may also be made for essential professional or career-related events or opportunities. Additionally, students who need accommodations for religious observations should provide advanced notice to instructors and student athletes should provide Travel Request Letters. All accommodations remain at the discretion of the instructor, and appropriate documentation may be required.

[Unless students provide an accommodation letter from USC's Office of Student Accessibility Services (OSAS)](#) or a letter from IYA Student Services detailing visa or travel restrictions, attendance and active participation is expected in the classroom. Any student with such accommodations should submit their accommodation document to the instructor as soon as possible to discuss appropriate accommodations.

Students who are experiencing illness should not attend class in person. Please inform the instructor in advance of any class sessions that you can't attend for medical reasons, and accommodations will be arranged to view recorded lectures and submit alternatives to any missed class participation. Students will not be penalized for not attending class in person under these circumstances.

Iovine and Young Hall Cleanout
The Academy is unable to store student projects and materials beyond the end of the semester. Students must remove all projects and personal materials from the Creators Studio, lockers/locker room, and other classrooms by the end of each semester. **All projects and**

materials left in Iovine and Young Hall will be discarded the day after final exams end. No exceptions.

Classroom norms/Zoom etiquette

Be on time: Just like in-person meetings, you should be on time for Zoom meetings. Arriving late can make others feel like you don't value their time.

Be respectful: Of the instructor and other students. Disagreements are okay, but personal attacks are not. If you are disruptive or disrespectful, the teacher may remove you from the meeting for a while.

Mute your microphone: Keep your microphone muted when you aren't speaking to avoid distracting others with background noise.

Be aware of your background: Consider your background, lighting, and noise. You can use a virtual background or turn your table so you're in a corner or facing a wall. You can also try tilting your camera up so your bed isn't visible.

Face the camera: When you're asked to answer a question or give a presentation, look into the camera.

Avoid multitasking: Try to give your full attention to the meeting and avoid multitasking. Multitasking can be counterproductive and make it harder to retain information.

Prepare: Come to class prepared to take notes or access course materials. You can also let your household members know when and where you'll be in class and ask them not to disturb you.

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the USC Student Handbook. All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

Academic dishonesty has a far-reaching impact and is considered a serious offense against the university. Violations will result in a grade penalty, such as a failing grade on the assignment or in the course, and disciplinary action from the university itself, such as suspension or even expulsion.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment or what information requires citation and/or attribution.

Use of AI Generators

You are not to use AI generated code for any lab, assignment, or final project. Any use of such tools will be considered cheating and will be reported to the University.

Course Content Distribution and Synchronous Session Recordings Policies
USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relation to the class, whether obtained in class, via email, on the internet, or via any other media. Distributing course material without the instructor's permission will be presumed to be an intentional act to facilitate or enable academic dishonestly and is strictly prohibited. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Course Evaluations
Course evaluations will be held the last day of classes. Course evaluations are a good way to let me know what you liked about the class – or did not like about the class. I read all my course evaluations and comments.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Readings and Homework	Labs/Assignments Assigned
Week 1	Introduction to course and AI; Print Variables; Arithmetic; Input and Output Booleans and Conditionals	Horstmann and Necaise, chs 1 – 2	Lab 1
Week 2	Modules and While Loops More Loops; Sequences; Strings	Horstmann and Necaise, ch 3 – 4.5	Lab 2 Assignment 1
Week 3	Lists, Tuples and Dictionaries Structure of Agents	Horstmann and Necaise, ch 4.6 – 4.9, 6	Lab 3 Assignment 2

Week 4	Functions and File Input Searching for a Solution	Horstmann and Necaise, ch 8.2-8.3	Lab 4 Assignment 3
Week 5	File Output and Exceptions Software Objects	Horstmann and Necaise, ch 5	Lab 5
Week 6	Introduction to Machine Learning; End-to-End ML Project Part 1 End-to-End ML Project Part 2	Geron chs 1-2	Lab 6 Assignment 4
Week 7	End-to-End ML Project Part 3 **No class on Thursday (Fall Recess)**	Geron ch 2 continued	Lab 7
Week 8	End-to-End ML Project Part 4 End-to-End ML Project Part 5	Geron ch 2 continued	Lab 8 Assignment 5
Week 9	Classification Part 1 Classification Part 2	Geron ch 3	
Week 10	Support Vector Machines Decision Trees; Ensemble Learning and Random Forests	Geron ch 5 Geron chs 6 and 7	Final Project Part 1
Week 11	Dimensionality Reduction Unsupervised Learning Techniques	Geron ch 8 Geron ch 9	
Week 12	Training Simple Machine Learning Algorithms for Classification	Raschka ch 2	Final Project Part 2

Week 13	A Tour of machine Learning Classifiers Using Scikit-Learn	Raschka ch 3	
Week 14	Learning Best Practices for Model Evaluation and Hyperparameter Tuning **No class on Thursday (Thanksgiving Break)**	Raschka ch 6	Final Project Part 3
Week 15	Combining Different Models for Ensemble Learning Applying Machine Learning to Sentiment Analysis	Raschka ch 7 Raschka ch 8	

Finals week, per the Schedule of Classes for the days/times of this course (Tuesday, 12/17): Presentation of Final Projects

Statement on University Academic and Support Systems

Students and Disability Accommodations:
USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Student Financial Aid and Satisfactory Academic Progress:
To be eligible for certain kinds of financial aid, students are required to maintain Satisfactory Academic Progress (SAP) toward their degree objectives. Visit the Financial Aid Office webpage for undergraduate- and graduate-level SAP eligibility requirements and the appeals process.

Support Systems:
Counseling and Mental Health - *(213) 740-9355 – 24/7 on call*
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

988 Suicide and Crisis Lifeline - *988 for both calls and text messages – 24/7 on call*
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential

emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline consists of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

Relationship and Sexual Violence Prevention Services (RSVP) - *(213) 740-9355(WELL) – 24/7 on call*
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - *(213) 740-5086*
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - *(213) 740-2500*
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - *(213) 740-0776*
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - *(213) 740-0411*
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - *(213) 740-2101*
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - *UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call*
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - *UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call*
Non-emergency assistance or information.

Office of the Ombuds - *(213) 821-9556 (UPC) / (323-442-0382 (HSC)*
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - *(323) 442-2850 or* otfp@med.usc.edu
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.