



ACAD 499 – Machine Intelligence

Units: 4

Term—Day—Time: Spring 2020, Tues/Thurs 9:00 am – 11:50 am

Location: TBD

Instructor: Michael Crowley

Office: HSH 101

Office Hours: Wed, 2:00 – 4:00 pm

Contact Info: crowley@usc.edu

Teaching Assistant: TBD

Office: TBD

Office Hours: TBD

Contact Info: TBD

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

Course Description

This course will cover the concepts of artificial intelligence and machine learning. Students will learn “traditional” AI topics such as agents, search, logic and knowledge representation as a basis for machine learning. Machine learning topics will be classification systems, training models with several methodologies, support vector machines, decision trees, and ensemble learning and random forests. Additionally, students will learn the Python programming language as a basis for all labs and assignments.

Learning Objectives and Outcomes

Students will learn the following material:

- Understand the structure and use of intelligent agents
- Understand how to solve problems by searching for a solution
- Understand the use and importance of constraint satisfaction problems
- Understand first-order logic and how to use it to solve problems
- Understand how to represent knowledge in AI-based systems
- 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

Prerequisite(s): none

Co-Requisite(s): none

Concurrent Enrollment: none

Recommended Preparation: One semester programming course or equivalent experience

Course Notes

The course is for a letter grade. All labs, assignments, and lecture notes will be posted to Blackboard.

Required Readings and Supplementary Materials

Artificial Intelligence: A Modern Approach, Russell and Norvig, 3rd edition

Hands-On Machine Learning with Scikit-Learn and TensorFlow, Aurelien Geron, 2017

Optional Readings and Supplementary Materials

Python for Everyone, Horstmann and Nicaise, 2nd edition

Description and Assessment of Assignments

There will be in-class labs most every week. There will also be assignments – like bigger labs – that are done outside of class. There will be one midterm. There will also be a final project.

Grading Breakdown

Assignment	Points	% of Grade
Midterm	100	25%
Labs (15 total)	15	15%
Assignments (10 total)	500	30%
Final Project	200	30%
TOTAL	815	100%

Grading Scale (Example)

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 in class, the day they are assigned. There is no makeup for labs. No labs can be submitted late without prior faculty approval.

Assignments and Final Project: Assignments are due at 11:59 pm on the due date included in the assignment. Most assignments are one week in duration.

Grading Timeline

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

Attendance Policy

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 excused 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 $\frac{1}{3}$ 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. All accommodations remain at the discretion of the instructor, and appropriate documentation may be required.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	Readings and Homework	Labs/Assignments
Week 1	Introduction to AI; Intelligent Agents; Introduction to Python; Programming with Numbers and Strings	Russell and Norvig chs 1 – 2 Horstmann and Necaise, chs 1 – 2	Lab 1 – First Python program
Week 2	Solving Problems by Searching Decisions in Python	Russell and Norvig ch 3 Horstmann and Necaise, ch 3	Lab 2 - Decisions Assignment 1
Week 3	Beyond Classical Search Loops in Python	Russell and Norvig ch 4 Horstmann and Necaise, ch 4	Lab 3 - Loops Assignment 2
Week 4	Adversarial Search Functions in Python	Russell and Norvig ch 5 Horstmann and Necaise, ch 5	Lab 4 - Functions Assignment 3
Week 5	Constraint Satisfaction Problems Lists in Python	Russell and Norvig ch 6 Horstmann and Necaise, ch 6	Lab 5 - Lists Assignment 4
Week 6	Knowledge and Reasoning Files and Exceptions In Python	Russell and Norvig 7.1 – 7.3, ch 8 Horstmann and Necaise, ch 6	Lab 6 – Files and Exceptions Assignment 5
Week 7	Inference in First- Order Logic Sets and Dictionaries in Python	Russell and Norvig ch 9 Horstmann and Necaise, ch 8	Lab 7 – Sets and Dictionaries Assignment 6
Week 8	Knowledge Representation Objects and Classes	Russell and Norvig ch 12 Horstmann and Necaise, ch 9	Lab 8 – Objects and Classes

Week 9	Introduction to Machine Learning	Geron chs 1-2	Lab 9 – Install and test Sci-Kit Assignment 7
Week 10	Classification	Geron ch 3	Lab 10 – Classification with Sci-Kit Assignment 8
Week 11	Training Models	Geron chs 4	Lab 11 – Training Models with Sci-Kit Assignment 9
Week 12	Support Vector Machines	Geron ch 5	Lab 12 – Support Vector Machines with Sci-Kit Assignment 10
Week 13	Decision Trees	Geron ch 6	Lab 13 – Decision Trees with Sci-Kit Assignment 11 – Final Project
Week 14	Ensemble Learning and Random Forests	Geron chs 7	Lab 14 – Ensemble Learning and Random Forests with Sci-Kit
Week 15	Dimensionality Reduction; Introduction to Artificial Neural Networks	Geron ch 8 and 10	Lab 15 – Dimensionality Reduction with Sci-Kit
FINAL	Final project will be due at the regularly scheduled final exam time		

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call
engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) 213-740-9355 (WELL) (new #)
<https://studenthealth.usc.edu/sexual-assault/>

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Relationship and Sexual Violence Prevention and Services provides immediate therapy services for situations related to gender- and power-based harm (e.g., sexual assault, domestic violence, stalking). (wording from the site)

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086
equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

USC Policy Reporting to Title IX (213) 740-5086
<https://policy.usc.edu/reporting-to-title-ix-student-misconduct/>

The university encourages individuals to report prohibited conduct to the *Title IX Office*. Individuals can report to the university *Title IX Coordinator* in the *Office of Equity and Diversity*.

Bias Assessment Response and Support - (213) 740-2421
studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776

dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

studentaffairs.usc.edu/ssa

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

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

dps.usc.edu, emergency.usc.edu

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) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.