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 Necaise, 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

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>% of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm</td>
<td>100</td>
<td>25%</td>
</tr>
<tr>
<td>Labs (15 total)</td>
<td>15</td>
<td>15%</td>
</tr>
<tr>
<td>Assignments (10 total)</td>
<td>500</td>
<td>30%</td>
</tr>
<tr>
<td>Final Project</td>
<td>200</td>
<td>30%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>815</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

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 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. All accommodations remain at the discretion of the instructor, and appropriate documentation may be required.
## Course Schedule: A Weekly Breakdown

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics/Daily Activities</th>
<th>Readings and Homework</th>
<th>Labs/Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to AI; Intelligent Agents; Introduction to Python; Programming with Numbers and Strings</td>
<td>Russell and Norvig chs 1 – 2</td>
<td>Lab 1 – First Python program</td>
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<td></td>
<td></td>
<td>Horstmann and Necaise, chs 1 – 2</td>
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</tr>
<tr>
<td>2</td>
<td>Solving Problems by Searching</td>
<td>Russell and Norvig ch 3</td>
<td>Lab 2 - Decisions</td>
</tr>
<tr>
<td></td>
<td>Decisions in Python</td>
<td>Horstmann and Necaise, ch 3</td>
<td>Assignment 1</td>
</tr>
<tr>
<td>3</td>
<td>Beyond Classical Search</td>
<td>Russell and Norvig ch 4</td>
<td>Lab 3 - Loops</td>
</tr>
<tr>
<td></td>
<td>Loops in Python</td>
<td>Horstmann and Necaise, ch 4</td>
<td>Assignment 2</td>
</tr>
<tr>
<td>4</td>
<td>Adversarial Search</td>
<td>Russell and Norvig ch 5</td>
<td>Lab 4 - Functions</td>
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<tr>
<td></td>
<td>Functions in Python</td>
<td>Horstmann and Necaise, ch 5</td>
<td>Assignment 3</td>
</tr>
<tr>
<td>5</td>
<td>Constraint Satisfaction Problems</td>
<td>Russell and Norvig ch 6</td>
<td>Lab 5 - Lists</td>
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<tr>
<td></td>
<td>Lists in Python</td>
<td>Horstmann and Necaise, ch 6</td>
<td>Assignment 4</td>
</tr>
<tr>
<td>6</td>
<td>Knowledge and Reasoning</td>
<td>Russell and Norvig 7.1 – 7.3, ch 8</td>
<td>Lab 6 – Files and Exceptions</td>
</tr>
<tr>
<td></td>
<td>Files and Exceptions In Python</td>
<td>Horstmann and Necaise, ch 6</td>
<td>Assignment 5</td>
</tr>
<tr>
<td>7</td>
<td>Inference in First-Order Logic</td>
<td>Russell and Norvig ch 9</td>
<td>Lab 7 – Sets and Dictionaries</td>
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<tr>
<td></td>
<td>Sets and Dictionaries in Python</td>
<td>Horstmann and Necaise, ch 8</td>
<td>Assignment 6</td>
</tr>
<tr>
<td>8</td>
<td>Knowledge Representation</td>
<td>Russell and Norvig ch 12</td>
<td>Lab 8 – Objects and Classes</td>
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<tr>
<td></td>
<td>Objects and Classes</td>
<td>Horstmann and Necaise, ch 9</td>
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<tr>
<td>Week 9</td>
<td>Introduction to Machine Learning</td>
<td>Geron chs 1-2</td>
<td>Lab 9 – Install and test Sci-Kit Assignment 7</td>
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<tr>
<td>Week 10</td>
<td>Classification</td>
<td>Geron ch 3</td>
<td>Lab 10 – Classification with Sci-Kit Assignment 8</td>
</tr>
<tr>
<td>Week 11</td>
<td>Training Models</td>
<td>Geron chs 4</td>
<td>Lab 11 – Training Models with Sci-Kit Assignment 9</td>
</tr>
<tr>
<td>Week 12</td>
<td>Support Vector Machines</td>
<td>Geron ch 5</td>
<td>Lab 12 – Support Vector Machines with Sci-Kit Assignment 10</td>
</tr>
<tr>
<td>Week 13</td>
<td>Decision Trees</td>
<td>Geron ch 6</td>
<td>Lab 13 – Decision Trees with Sci-Kit Assignment 11 – Final Project</td>
</tr>
<tr>
<td>Week 14</td>
<td>Ensemble Learning and Random Forests</td>
<td>Geron chs 7</td>
<td>Lab 14 – Ensemble Learning and Random Forests with Sci-Kit</td>
</tr>
<tr>
<td>Week 15</td>
<td>Dimensionality Reduction; Introduction to Artificial Neural Networks</td>
<td>Geron ch 8 and 10</td>
<td>Lab 15 – Dimensionality Reduction with Sci-Kit</td>
</tr>
<tr>
<td>FINAL</td>
<td>Final project will be due at the regularly scheduled final exam time</td>
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</tbody>
</table>
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.
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.