IDSN 599: Special Topics: Machine Intelligence
Units: 4
Fall 2021–Tuesdays and Thursdays–5:30pm-7:20pm PT

Location: Online

Instructor: Michael Crowley
Office Hours: Virtual, Mondays, 6:00pm - 8:00pm PT
Contact Info: crowley@usc.edu

IT Help: 2U Student Support
Hours of Service: Available 24/7, 365 days/year
Contact Info: studentsupport@online-iovine-young@usc.edu, 1-855-487-3504

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 labs most weeks. There will also be assignments – like bigger labs. There will be one midterm. There will also be a three-part final project.

Grading Breakdown

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>% Grade</th>
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</thead>
<tbody>
<tr>
<td>Midterm</td>
<td>100</td>
<td>25%</td>
</tr>
<tr>
<td>Labs (12 total)</td>
<td>180</td>
<td>20%</td>
</tr>
<tr>
<td>Assignments (5 total)</td>
<td>250</td>
<td>25%</td>
</tr>
<tr>
<td>Final Project (3 parts)</td>
<td>300</td>
<td>30%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>830</td>
<td>100%</td>
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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. Assignments are one week in duration. The 3 parts of the final project will have different length 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.

Course Schedule: A Weekly Breakdown
<table>
<thead>
<tr>
<th>Week</th>
<th>Topics/Daily Activities</th>
<th>Readings and Homework</th>
<th>Labs/Assignments Assigned</th>
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</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction to AI; Intelligent Agents;</td>
<td>Russell and Norvig chs1 – 2.3</td>
<td>Lab 1 – First Python program</td>
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<td></td>
<td>Introduction to Python; Programming with Numbers and Strings</td>
<td>Horstmann and Necaise, chs 1 – 2</td>
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<tr>
<td>Week 2</td>
<td>Decisions in Python; Introduction to Loops</td>
<td>Horstmann and Necaise, ch 3 – 4.5</td>
<td>Lab 2 – Decisions/Loops Assignment 1</td>
</tr>
<tr>
<td>Week 3</td>
<td>Structure of agents; Solving Problems by Searching</td>
<td>Russell and Norvig ch2.4 – 3.2</td>
<td>Lab 3</td>
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<tr>
<td></td>
<td>Loops; Lists in Python</td>
<td>Horstmann and Necaise, ch 4.6 – 4.9, 6</td>
<td>Assignment 2</td>
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<tr>
<td>Week 4</td>
<td>Searching for a Solution</td>
<td>Russell and Norvig ch3.3-3.6</td>
<td>Lab 4</td>
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<tr>
<td></td>
<td>Tuples and Dictionaries</td>
<td>Horstmann and Necaise, ch 8.2-8.3</td>
<td>Assignment 3</td>
</tr>
<tr>
<td>Week 5</td>
<td>Beyond Classical Search</td>
<td>Russell and Norvig ch4</td>
<td>Lab 5</td>
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<td>Functions in Python</td>
<td>Horstmann and Necaise, ch 5</td>
<td>Assignment 4</td>
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<td>Week 6</td>
<td>Python File Input</td>
<td>Horstmann and Necaise, ch 7.1 - 7.2</td>
<td>Lab 6</td>
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<td></td>
<td>Constraint Satisfaction Problems</td>
<td>Russell and Norvig ch 6</td>
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<td>Week 7</td>
<td>Files and Exceptions in Python</td>
<td>Horstmann and Necaise, ch 7</td>
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<td>Midterm Review</td>
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<td>Week 8</td>
<td>Knowledge Representation</td>
<td>Russell and Norvig ch12</td>
<td>Lab 7</td>
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<td>Midterm (on Thursday)</td>
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<tr>
<td>Week 9</td>
<td>Introduction to Machine Learning</td>
<td>Geron chs 1-2</td>
<td>Lab 8 – Install and test Sci-Kit</td>
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<td></td>
<td>Objects and Classes</td>
<td>Horstmann and Necaise, ch 9</td>
<td>Assignment 5</td>
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</table>
| Week 10 | Classification | Geron ch 3 | Lab 9 – Classification with Sci-Kit  
|         |                |           | Final Project Part 1 |
| Week 11 | Training Models | Geron ch 4 | Lab 10 – Training Models with Sci-Kit  
|         |                |           | Final Project Part 2 |
| Week 12 | Support Vector Machines | Geron ch 5 | Lab 11 – Support Vector Machines with Sci-Kit |
| Week 13 | Decision Trees | Geron ch 6 | Lab 12 – Decision Trees with Sci-Kit  
|         |                |           | Final Project Part 3 |
| Week 14 | Ensemble Learning and Random Forests | Geron chs 7 |        |
| Week 15 | Dimensionality Reduction; Introduction to Artificial Neural Networks | Geron ch 8 and 10 |        |
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).

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.