Artificial Intelligence  
CSC 632  
Spring 2019  
Time: 06:30 PM-09:45 PM M, Location: FEC 303/TEC 202, Credit: 3 hrs

Contacting Your Instructor  
Instructor: Dr. Bo Li  
Office: Science Building, Room 105D  
Office hours:  
   Mondays: 9:00-12:00 AM, 2:30-4:30 PM  
   Tuesdays: 9:00-12:00 AM, 2:30-4:30 PM  
   or by appointment  
Email: bo.li@usm.edu  
Phone: 228-214-3306  
Homepage: https://sites.google.com/site/libohomepage/homepage

Catalog Description  
Credit Hours: 3 hrs.  
Prerequisites: CSC 412 - Introduction to Artificial Intelligence: Computer representation of knowledge, problem solving, automated deductive systems, computer learning, computer implementation of AI problems and expert systems.  
Catalog Description: Relatively unfocused, relatively focused, Heuristic, and probabilistic reasoning. Production rule systems. Knowledge-based and expert systems. Survey of current research.

Course Objectives and Description  
Objectives: The goal of Artificial Intelligence (AI) is the design of agents that can behave rationally in the real world by sensing their environment, planning their goals, and acting to maximally achieve these goals.

Description: This course provides an introductory survey to the currently most popular techniques and applications of modern AI. The course will cover a broad range of conceptual approaches, with a focus on problem-solving and learning, and a broad range of AI applications, from natural language understanding to robotics. Lectures will stress not only the technical concepts themselves, but also their implementations in modern libraries, especially Python AI-related packages.

Programming experience in Python, and Knowledge in the NumPy package for scientific computing, and Probability and Statistics are highly desirable. However, the course is self-contained by providing some reference books and tutorial materials for self-learning.
Course Materials

Required Textbook

Optional Textbooks
3. Aston Zhang, Zarchary C. Lipton, Mu Li, and Alex Smola. *Dive into Deep Learning*. Free book online: https://d2l.ai/ (optional, to cover the deep learning module). (Opt.2)

Reference books

Course Outcomes

Course outcome 1: The student will learn the basics of the theory and practice of Artificial Intelligence as a discipline about intelligent agents capable of deciding what to do, and how to do it.

Course outcome 2: The student will be introduced to Artificial Intelligence programming, by mainly utilizing Python AI-related packages.

Course outcome 3: The student will learn to apply knowledge representation techniques and problem-solving strategies to common AI applications.

Course outcome 4: The student will design simple software to experiment with various AI concepts and analyze results.

Course outcome 5: The student will build self-learning and research skills to be able to tackle a topic of interest on his/her own or as part of a team.
Course Workload Statement
Students are expected to invest considerable time outside of class in learning the material for this course. The expectation of the University of Southern Mississippi is that each week students should spend approximately 2-3 hours outside of class for every hour in class working on reading, assignments, studying, and other work for the course. We realize that most students work and have family or other obligations. Time management is thus critical for student success. All students should assess their personal circumstances and talk with their advisors about the appropriate number of credit hours to take each term. Resources for academic support can be found at https://www.usm.edu/success.

Grading Policies and Calculation
A list of possible grades at the University can be found in the Bulletin (http://catalog.usm.edu). Note that students will receive an “interim grade” at the six-week point to give them an indication of their performance at that point in the semester.

Students may drop a course with no penalty in the first week of the semester. If students wish to leave a course with a grade of “W” (for “withdrawal”), they may request to do so before April 4, 2019 (USM Spring 2019 calendar can be found here: https://www.usm.edu/registrar/spring-2019-full-academic-calendar).

Important note: Students who receive a grade of “W” do not receive any money back and that grade is permanently included on their transcripts.

Students should be aware that “Incompletes” can only be assigned in cases of “extraordinary circumstances” beyond the student’s control.

Grading Items and System

<table>
<thead>
<tr>
<th>Items</th>
<th>Score</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Attendance</td>
<td>5</td>
<td>Extra credits. Every class.</td>
</tr>
<tr>
<td>Class Performance</td>
<td>10</td>
<td>Overall “active learning” performance during all the classes.</td>
</tr>
<tr>
<td>Homework</td>
<td>15</td>
<td>Three times: one for each of the three modules (search, learning, applications).</td>
</tr>
<tr>
<td>Programming Assignments</td>
<td>75</td>
<td>Three assignments: one for each of the three modules (search, learning, applications).</td>
</tr>
</tbody>
</table>

Grade                  | Percentage
---                     | ---
A grade                 | >= 90%
B grade                 | 80%-89%
C grade                 | 70%-79%
D grade                 | 60-69%
F grade                 | < 60%
Important Class Policies

Class Attendance
Attendance will be taken every class period. Students who are excessively absent (30% of all the lectures) and/or tardy will be assigned a grade of NA (Not Attending) according to the University’s Class Attendance Policy. Coming to class unduly late and leaving class unduly early is treated the same as being absent.

Plagiarism
Plagiarism or cheating of any type will not be tolerated. This includes, but is not limited to, copying programs, projects, assignments, abstracts, documentation, turning in previously submitted homework or projects (in whole or part), using other person's USM computer accounts to do projects, programs, etc., getting other people to do your assignments, etc. Feel free to incorporate code or tips you find on the Web, provided this doesn’t make the assignment trivial and you explicitly acknowledge your sources in the corresponding locations in your report.

Plagiarism or cheating Penalty Policy. If significant and apparent overlapping between any two submissions (projects and homework) or between one submission and online resources has been identified without doubt and valid excuses from the involved students, each of the two submissions will have a 50% penalty applied on their originally obtained scores. If the case repeats for the involved student, a zero score will be assigned to each submission for that student.

"Do Not Copy Others' Code or Homework"

Cell Phones/Beepers/Pagers/etc.
Please make sure you switch off all cell phones/beepers/pagers while you are in class. I may ask you to leave the class under such circumstances.

Turning in Work
Homework Assignments not turned on time will not receive full credit. A 10% penalty will be assigned for each hour late. All assignments as well as the course project will be submitted via Canvas, due on 11:59 PM of the submission day.

E-mail Addresses
I may contact you during the whole semester and will use the email address provided on SOAR.

Academic Integrity Statement
All students at the University of Southern Mississippi are expected to demonstrate the highest levels of academic integrity in all that they do. Forms of academic dishonesty include (but are not limited to):

- Cheating (including copying from others’ work)
- Plagiarism (representing another person’s words or ideas as your own; failure to properly cite the source of your information, argument, or concepts)
• Falsification of documents
• Disclosure of test or other assignment content to another student
• Submission of the same paper or other assignment to more than one class without the explicit approval of all faculty members involved
• Unauthorized academic collaboration with others
• Conspiracy to engage in academic misconduct

Engaging in any of these behaviors or supporting others who do so will result in academic penalties and/or other sanctions. If a faculty member determines that a student has violated our Academic Integrity Policy, sanctions ranging from resubmission of work to course failure may occur, including the possibility of receiving a grade of “XF” for the course, which will be on the student’s transcript with the notation “Failure due to academic misconduct.” For more details, please see the University’s Academic Integrity Policy: https://www.usm.edu/institutional-policies/policy-acaf-pro-012

Note that repeated acts of academic misconduct will lead to expulsion from the University.

**Academic Support Resources**
Please see our Student Success Website: http://www.usm.edu/success for information on where you can find tutoring and other academic assistance, as well as the location of key resources on campus.

If a student has a disability that qualifies under the Americans with Disabilities Act (ADA) and requires accommodations, he/she should contact the Office for Disability Accommodations (ODA) for information on appropriate policies and procedures. Disabilities covered by ADA may include learning, psychiatric, physical disabilities, or chronic health disorders. Students can contact ODA if they are not certain whether a medical condition/disability qualifies.

**Address:**
The University of Southern Mississippi
Office for Disability Accommodations
118 College Drive # 8586
Hattiesburg, MS 39406-0001
Gulf Coast: 228-214-3232
Voice Telephone: 601.266.5024 or 228.214.3232 Fax: 601.266.6035
Individuals with hearing impairments can contact ODA using the Mississippi Relay Service at 1.800.582.2233 (TTY) or email ODA at oda@usm.edu.

**The Academic Success Center at Gulf Park**
The Academic Success Center is located on the first floor of the Gulf Coast Library on the Gulf Park campus in Long Beach. Through peer tutors and professional support staff, the Academic Success Center offers a broad range of services including:
• Academic Coaching
• Learning materials and electronic resources
• Individual and small group tutoring
• Whole class support
• Workshops and seminars
• Technology and multi-media support
• Media labs for individual and group projects
• Online and in person tutoring sessions in a variety of subjects

For more information, visit us as www.usm.edu/asc. To make an appointment, please visit www.usm.mywconline.com. If you have questions about our services, call us at 228.214.3346 or email us at academic.success@usm.edu.

Mental Well-Being Statement
USM recognizes that students sometimes experience challenges that make learning difficult. If you find that life stressors such as anxiety, depression, relationship problems, difficulty concentrating, alcohol/drug problems, or other stressful experiences are interfering with your academic or personal success, consider contacting Student Counseling Services on campus at 601-266-4829. More information is also available at https://www.usm.edu/student-counseling-services. All students are eligible for free, confidential individual or group counseling services. In the event of emergency, please call 911 or contact the counselor on call at 601-606-HELP (4357).

Class Schedule

Tentative syllabus

• **Introduction** of AI (1 class)
  o Concepts
  o History
  o Agents

• **Adversarial Search** (2 classes)
  o Search and game introduction
  o Minimax principle
  o Stochastic games
  o Application: Generative Adversarial Networks (GANs)

• **Learning** (4 classes)
  o Learning introduction
  o Learning techniques:
    • Decision trees
    • Neural networks
    • Deep neural networks
    • Convolutional Neural Networks (CNNs)
    • GANs revisited
  o Probabilistic Model (Bayes’ Nets)
  o Reinforcement learning

• **Applications** of AI (4 classes)
  o Natural Language Processing
  o Natural Language Understanding
Perception
- Perception
- Robotics

Tentative schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings and assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 28</td>
<td>Introduction of AI</td>
<td>Reading: Ch. 1 &amp; 2</td>
</tr>
<tr>
<td></td>
<td>Search introduction</td>
<td></td>
</tr>
<tr>
<td>February 4</td>
<td><strong>Adversarial search</strong></td>
<td><strong>Reading:</strong> Ch. 3</td>
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<tr>
<td></td>
<td>• Game introduction</td>
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<tr>
<td></td>
<td>• Minimax principle</td>
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<tr>
<td></td>
<td>• Stochastic games</td>
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<tr>
<td>February 11</td>
<td><strong>Adversarial search</strong></td>
<td><strong>Reading:</strong> Ch. 5</td>
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<tr>
<td></td>
<td>• Stochastic games</td>
<td></td>
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<td></td>
<td>• Application: Generative Adversarial</td>
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<tr>
<td></td>
<td>Networks (GANs)</td>
<td>Reading: Ch. 5, <strong>Ref.1, Ref. 2</strong></td>
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<tr>
<td></td>
<td>• Python/numpy tutorial</td>
<td><strong>Homework 1</strong></td>
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<td><strong>Assignment 1</strong></td>
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<tr>
<td>February 18</td>
<td><strong>Learning</strong></td>
<td><strong>Reading:</strong> Sec. 18.1-18.2</td>
</tr>
<tr>
<td></td>
<td>• Introduction</td>
<td><strong>Reading:</strong> Sec. 18.3</td>
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<tr>
<td></td>
<td>• Decision trees</td>
<td><strong>Reading:</strong> Sec. 18.7, Opt.1. Ch. 11</td>
</tr>
<tr>
<td>February 25</td>
<td><strong>Learning</strong></td>
<td><strong>Reading:</strong> Opt.2, Opt.3, Ref. 3</td>
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<tr>
<td></td>
<td>• Deep neural networks</td>
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<td></td>
<td>• Convolutional Neural Networks (CNNs)</td>
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<tr>
<td></td>
<td>• GANs revisited</td>
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<td></td>
<td>• TensorFlow, Keras tutorials</td>
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<tr>
<td>March 4</td>
<td><strong>MARDI GRAS HOLIDAY</strong></td>
<td>(day and night classes do not meet)</td>
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<tr>
<td>March 11</td>
<td><strong>SPRING BREAK HOLIDAY</strong></td>
<td>(day and night classes do not meet)</td>
</tr>
<tr>
<td>March 18</td>
<td><strong>Learning</strong></td>
<td><strong>Reading:</strong> Ch. 20</td>
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<tr>
<td></td>
<td>• Probabilistic Model (Bayes’ Nets)</td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Reading:</td>
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<tr>
<td>March 25</td>
<td><strong>Learning</strong></td>
<td><strong>Ch. 21, Opt.4</strong></td>
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<td></td>
<td>• Reinforcement</td>
<td>• <strong>Homework 2</strong></td>
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<tr>
<td></td>
<td>learning</td>
<td>• <strong>Assignment 2</strong></td>
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<tr>
<td>April 1</td>
<td><strong>Applications</strong></td>
<td><strong>Ch. 22, Opt.5</strong></td>
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<td></td>
<td>• Natural Language</td>
<td>• <strong>PA</strong></td>
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<tr>
<td></td>
<td>Processing</td>
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<tr>
<td>April 8</td>
<td><strong>Applications</strong></td>
<td><strong>Ch. 23, Opt.5</strong></td>
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<tr>
<td></td>
<td>• Natural Language</td>
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<td></td>
<td>Understanding</td>
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<tr>
<td>April 15</td>
<td>Applications</td>
<td><strong>Ch. 24</strong></td>
</tr>
<tr>
<td></td>
<td>• Perception</td>
<td>• <strong>Assignment 3</strong></td>
</tr>
<tr>
<td>April 22</td>
<td><strong>EASTER HOLIDAY</strong></td>
<td><em>(day and night classes do not meet; university remains open)</em></td>
</tr>
<tr>
<td>April 29</td>
<td>Applications</td>
<td><strong>Ch. 25</strong></td>
</tr>
<tr>
<td></td>
<td>• Robotics</td>
<td>• <strong>Homework 3</strong></td>
</tr>
</tbody>
</table>

Notes: 1) each homework is due in **one** week;
2) each programming assignment is due in **three** weeks.