CSCI/CMPE/4350.01, CSCI6350.01 Artificial Intelligence, Fall 2019

Department of Computer Science
University of Texas Rio Grande Valley

Syllabus

Instructor
Name: Liyu Zhang
Office: SETB 1.522, Brownsville Campus
Tel: (956) 882-6631
E-mail: liyu.zhang@utrgv.edu
Webpage: http://faculty.utrgv.edu/liyu.zhang/
Office hours: MW 10-12, TR 11-12, and by appointment.

Course Information
Credit hours: 3
Class times: TR 930am -1045am, BLHSB 1.402.
WWW: https://mycourses utrgv.edu, login and click on the link for
CSCI/CMPE4350.01/ 6350.01 Spring, 2019.
Required textbook and resources:

- S. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach, 3e,* Pearson, Dec 11, 2009, ISBN 978-0136042594.
- Subscription of website: www.packback.co (See Packback Participation section)

Recommended references and resources:

- http://aima.cs.berkeley.edu/index.html.
- W. Ertel, *Introduction to Artificial Intelligence, 2e*, Springer, 2017, ISBN 978-3-319-58487-4 (eBook: 978-3-319-58486-7)
- https://www.lsf.hs-weingarten.de/qisserver/servlet/de.his.servlet.RequestDispatcherServlet?state=wsearchv&search=2&veranstaltung.veranstid=12011&language=en

Course Description (Catalog) Study of intelligent machines and machine learning. Includes problem-solving and heuristic search, natural language understanding, game playing, database and expert systems. Artificial Intelligence (AI) projects will be implemented using an AI language such as Lisp, Prolog, C++, and Java.

Course Topics Covered History of AI, Uninformed (blind) search, Heuristic search: Local search, Optimization algorithms, Simulated annealing, Particle swarm optimization, Ant colony optimization, Evolutionary computation, Genetic algorithms, Artificial life, Introduction to machine, learning theory, Supervised learning, Regression, Neural networks, Unsupervised learning, Clustering, Reinforcement learning, Q-learning, Bayesian systems, Naïve Bayes, and Rules-based Systems.

Prerequisites You must have a C or higher in CSCI3333 or CMPE3333 (Algorithms and Data Structures). You must have the instructor's approval to take this course if you have not satisfied the prerequisites. In general, you are expected to be proficient in advanced programming, using principles of software engineering, common data structures including arrays, stacks, queues, linked lists, trees and graphs, and fundamental algorithms in computer science such as sorting, binary search, and various graph algorithms.

Course Objectives The purpose of this course is to provide the student with an understanding of traditional and current artificial intelligence approaches and research areas.

Course Learning Outcomes:

General

1. Evaluate AI techniques and synthesize solutions to practical examples.
2. Develop a range of typical applications using artificial intelligence methods.
3. Demonstrate problem-solving skills.

History and philosophy of artificial intelligence

1. Define weak and strong AI and provide some arguments for and against each hypothesis.
2. Discuss accomplishments of artificial intelligence research in historical context.
3. Discuss the concept of rationality.

Problem solving in artificial intelligence

1. Explain classical search algorithms, including breadth-first, depth-first, A*, and heuristic search.
2. Implement classical search algorithms.
3. Discuss local search algorithms and their applications to finding goals and in optimization problems.

Knowledge and reasoning

1. Understand key concepts related to knowledge representation.

Uncertain knowledge and reasoning

1. Discuss the influence of uncertainty on decision-making.
2. Understand and apply the terminology and notation of basic probability.
3. Understand and apply Bayes' rule.

4. Solve simple probability problems.

Machine learning

1. Define supervised and unsupervised learning.
2. Discuss learning decision trees.
3. Understand the principles of neural networks, including single-layer (perceptron) and multi-layer networks.
4. Understand statistical learning methods, including Naïve Bayes.
5. Understand reinforcement learning methods and selected algorithms.
6. Discuss the applications of machine learning to domains such as game playing.
7. Implement selected machine learning algorithms.

Evolutionary computation

1. Discuss the key elements of evolutionary computation methods.
2. Compare and contrast different evolutionary methods, such as genetic algorithms and digital evolution.

ABET Learning Outcomes The course supports the following ABET Learning Outcomes:

(1) An ability to analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
(2) An ability to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

Course Organization The class meet for lecture twice a week. Students must study the material assigned by the instructor and complete assignments. There is one mid-term exam during the semester, which will be held in class on **Thursday, Oct 10th, 2019**. There is also a final exam at the end of the semester. Both exams will be based on materials covered in lectures and assignments. Please do not plan to travel at the end of semester until the final exam is over.

Assignments Assignments in this course will contain two types of problems: homework exercises and programming projects. Homework exercises are pencil-and-paper problems that will help you practice and learn the concepts and algorithms used in AI. Programming projects will help you learn and understand how AI systems of moderate complexity can be implemented using (a) high-level programming language(s) such as Java and/or C++. Learning both aspects of AI can be achieved only through working at their respective assignment problems. Therefore, it is very important for you to do each assignment seriously. Most homework exercise problems will be essay questions while programming projects will be implementing (part of) an AI system and/or algorithms

used. Both types of assignment problems will be given on a weekly/bi-weekly basis throughout the semester. Please note the following assignment submission requirements:

- Homework exercises: Typed submissions are preferred although handwritten solutions are acceptable as long as they're written clearly and completely readable. The instructor cannot grade your solutions if they're unreadable. You must staple your submission if it is more than one page and write/type clearly your name, student ID number and due date on the first page. Homework assignments are usually due on Wednesdays at the beginning of lectures.
- Programming projects: You will need to document your programs well and include a readme file containing instructions of running your program for each project submission. Please submit your projects through the project submission link provided in the BB portal for the course. You must follow the instructions provided at the submission link. No programming assignment will be graded if the submitted program does not run.

No more than two assignment submissions, homework or project, that are late or do not meet any other submission requirements as described above will be accepted for each student. In addition, no assignment submissions will be accepted regardless if the grading of those assignments has been completed or the solutions to those assignments have been already posted or given in class. All submitted assignments, homework exercises or projects, are subject to oral defenses, where students are required to explain to the instructor key steps and details of the submitted assignment solutions satisfactorily and demonstrate complete understanding of the submitted work. Unsatisfactory assignment defenses might lead to grades of relevant assignment problems or whole assignments voided at the instructor's discretion.

Attendance Attendance of lectures is taken and counts towards your final grade for this course. No excuse will be accepted for absences with the only exceptions given to officially documented cases allowable by the university policies, which are usually only for family or extreme health emergencies. You are not required to attend class on days listed in the university calendar as major religious holy days (although I assume that you practice at most one religion). In addition, you're allowed two absences without excuses or grade penalties. Students have the option to be exempted from attendance of lectures, in which case the percentage weight of attendance will be distributed proportionally among other grading components. To activate this option, however, students must notify the instructor no later than **September 9, 2019**.

Packback Participation Participation in an online learning community for this course at Packback (packback.co) is required and count towards your overall score for the course. The purpose of incorporating Packback service into this course is to promote active learning and critical thinking – the web site provides a good platform to not only learn to answer questions well but also ask good questions. For each of the 10 selected weeks (TBA) during the semester, a topic related to or covered by the course will be posted in the online community at Packback on which you are required to ask one question and/or answer two questions. You are also required to ask 5 questions and answer 10 questions

in total for the semester, respectively. Detailed requirements for those questions and answers will be posted by the second week of the semester. Please follow the instructions below to register for Packback asap if you haven't.

1. *Navigate to https://questions.packback.co and click "Register as a new student". Note: If you already have an account on Packback you can login with your credentials.*
2. *Make sure to register with your SCHOOL email address and real first name and last name. Enter our class community's Community Lookup Key 9814abf9-0f2f-4d3b-b378-48468204577f into the "Join a new Community" module on your dashboard. Please note, the Community Lookup Key is only for locating the community; it is NOT a coupon code or access code.*
3. *Follow the instructions on your screen to finish your registration*
4. *Contact the customer support team at holla@packback.co if you have ANY questions or concerns regarding Packback throughout the semester.*

Once you are registered, you can unsubscribe from Packback by midnight on **Monday, September 9, 2019** and get a full refund in case you need to withdraw from the course by then.

Grading The assignments and exams will be graded on the correctness of both the answers to the questions and the process you show to obtain the answers. Your final grades for this course will be based on your attendance if not exempted, assignments and exams. A breakdown of weights for each grading component is as follows.

Attendance 10%, Packback Participation 10%, Assignments 40%, Midterm Exam 20%, Final Exam 20%.

I will <u>not</u> make changes in final grades unless the student can document an <u>error</u> on his grade records in a timely manner (See Regrading).

I will use the following number-to-letter grade mapping as dictated by UTRGV to assign final letter grades at the end of the course. I reserve the right to curve up (but not curve down) grades when and if I feel necessary.

$$100\% >= A >= 90\% > B >= 80\% > C >= 70\% > D >= 60\% > F$$

Re-grading If you have a question about the grading of any piece of work, you should consult with the instructor of the course within one week of the date that the work was returned. In other words, if you do not pick up your work in a timely fashion, you may forfeit your right to question the grading of your work.

Office Hours Office hours offer you the opportunity to ask more individual questions about the course. Office hours are held on a first-come first-served drop-in basis. No appointment is necessary to attend office hours. Be aware that office hours become increasingly busy when it is close to a homework/project deadline and/or exam date. Plan

your use of office hours accordingly. Individual appointments may be arranged, if needed, as schedules allow.

Study Outside of Class In this course, as in any course, you are expected to put in additional time beyond the scheduled class times. Professors generally expect that for each credit hour a class carries a typical student will put in 2 – 3 hours of time each week outside of class. Since this is a 3 credit course that translates into 6 – 9 hours of time outside of lecture times, each week. During this time you should read the material before coming to class and then again in greater detail after class. You should also attend office hours as needed and digest course materials thoroughly by doing assignments.

Incompletes and Course Withdrawal I will not give incomplete grades except for the rare cases dictated by the University and Department policy. It is the student's responsibility, not the instructor's, to withdraw from the course in a timely manner if doing poorly. No incomplete grades will be granted because of a wrong withdrawal process. Please obtain due dates to withdraw from the course and also please read and be aware of the formal procedures to withdraw. This information is available in the course schedule and the student affairs office.

Online Blackboard We will use UTRGV online Blackboard as the place for making announcements and posting course materials/information such as course calendar, lecture notes, assignments and grades etc. So please check Blackboard regularly and at least once every 24 hours. You can also post your questions there so that I, or even your fellow classmates can answer them. It is YOUR responsibility to keep updated with class through online Blackboard.

General Notes If you don't understand something covered in class, ask about it right away. The only silly question is the one that is not asked. If you get a poor mark on an assignment, or exam, find out why right away. Don't wait a month before asking. I will be happy to answer your questions. Don't be afraid to ask questions, or to approach the instructor in class, during office hours, in the hallways, or through e-mail.

Student Integrity Cheating of any kind will not be tolerated. Any assignment or exam that is handed in must be your own work. However, talking with one another to understand the material better is strongly encouraged. Recognizing the distinction between cheating and cooperation is very important. If you copy someone else's solution, you are cheating. If you let someone else copy your solution, you are cheating. We will not distinguish between the person who copied a solution and the person whose solution was copied. Both people will be treated as cheaters. If someone dictates a solution to you, you are cheating. Everything you hand in must be in your own words, based on your own understanding of the solution. If someone helps you understand the problem during a high-level discussion, you are not cheating. We strongly encourage students to help one another understand the material presented in class, in the book, and general issues relevant to the assignments. When taking an exam, you must work independently. Any collaboration during an exam will be considered cheating. When a cheating is caught,

zero marks will be given the cheated work, and the case will be forwarded to the Department chair and beyond if necessary.

Tentative Course Calendar By Week

Week Of	Lecture Topics	Homework and Exams
8/26/2019	Chapter 1: Introduction	Homework 1
9/2/2019	Chapter 2: Intelligent Agents	Homework 2
9/9/2019	Chapter 3: Problem Solving and Search	Homework 3
9/16/2019	Chapter 4: Local Search	Homework 4
9/23/2019	Chapter 7: Logical Agents	Homework 5
9/30/2019	TBA	Homework 6
10/7/2019	Midterm Review	Midterm Exam
10/14/2019	Chapter 8: First-order Logic	Homework 7
10/21/2019	Chapter 9: Inference in First-order Logic	Homework 8
10/28/2019	Chapter 18, part I: Learning from Examples	Homework 9
11/4/2019	Chapter 18, part II: Neural Networks	Homework 10
11/11/2019	Chapter 20: Learning Probabilistic Models	Homework 11
11/18/2019	Chapter 23: Natural Language for Communication	Homework 12
11/25/2019	TBA	Homework 13
12/2/2019	Final Review	

UTRGV Policy Statements

The UTRGV disability accommodation, mandatory course evaluation statement and sexual misconduct statement are required on all syllabi. Additional policy statements are optional, such as those covering attendance, academic integrity, and course drop policies.

STUDENTS WITH DISABILITIES: *Required on all syllabi.* Do not modify.

Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive academic accommodations should contact **Student Accessibility Services (SAS)** as soon as possible to schedule an appointment to initiate services. Accommodations can be arranged through SAS at any time, but are not retroactive. Students who experience a broken bone, severe injury, or undergo surgery during the semester are eligible for temporary services.

Pregnancy, Pregnancy-related, and Parenting Accommodations
Title IX of the Education Amendments of 1972 prohibits sex discrimination, which includes discrimination based on pregnancy, marital status, or parental status. Students seeking accommodations related to pregnancy, pregnancy-related condition, or parenting (reasonably immediate postpartum period) are encouraged to contact Student Accessibility Services for additional information and to request accommodations.

Student Accessibility Services:
Brownsville Campus: Student Accessibility Services is located in 1.107 in the Music and Learning Center building (BMSLC) and can be contacted by phone at (956) 882-7374 or via email at ability@utrgv.edu.

Edinburg Campus: Student Accessibility Services is located in 108 University Center (EUCTR) and can be contacted by phone at (956) 665-7005 or via email at ability@utrgv.edu.

MANDATORY COURSE EVALUATION PERIOD: *Required on all syllabi.* Do not modify.
Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (http://my.utrgv.edu); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available on or about:

Module 1	October 2nd – 8th
Module 2	November 27th – December 3rd
Full Fall Semester	November 14th – December 4th

ATTENDANCE: Recommended on all syllabi; may be modified by the instructor as long as it is not inconsistent with UTRGV policy.
Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV's attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

SCHOLASTIC DISHONESTY: Recommended on all syllabi.

As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism (including self-plagiarism), and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to Student Rights and Responsibilities.

SEXUAL MISCONDUCT and MANDATORY REPORTING: *Required on all syllabi.* Do not modify.

In accordance with UT System regulations, your instructor is a "Responsible Employee" for reporting purposes under Title IX regulations and so must report to the Office of Institutional Equity & Diversity (oie@utrgv.edu) any instance, occurring during a student's time in college, of sexual misconduct, which includes sexual assault, stalking, dating violence, domestic violence, and sexual harassment, about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect that is free from sexual misconduct, discrimination, and all forms of violence. If students, faculty, or staff would like confidential assistance, or have questions, they can contact OVAVP (Office for Victim Advocacy & Violence Prevention) at 665-8287, 882-8282, or OVAVP@utrgv.edu.

COURSE DROPS: Recommended on all syllabi; may be modified by the instructor as long as it is not inconsistent with UTRGV policy.

According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the "3-peat rule" and the "6-drop" rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

STUDENT SERVICES: Recommended on all syllabi.

Students who demonstrate financial need have a variety of options when it comes to paying for college costs, such as scholarships, grants, loans and work-study. Students should visit the Students Services Center (U Central) for additional information. U Central is located in BMAIN 1.100 (Brownsville) or ESSBL 1.145 (Edinburg) or can be

reached by email (ucentral@utrgv.edu) or telephone: (888) 882-4026. In addition to financial aid, U Central can assist students with registration and admissions.

Students seeking academic help in their studies can use university resources in addition to an instructor's office hours. University Resources include the Advising Center, Career Center, Counseling Center, Learning Center, and Writing Center. The centers provide services such as tutoring, writing help, critical thinking, study skills, degree planning, and student employment. Locations are:

Center Name	Brownsville Campus	Edinburg Campus
Advising Center AcademicAdvising@utrgv.edu	BMAIN 1.400 (956) 665-7120	ESWKH 101 (956) 665-7120
Career Center CareerCenter@utrgv.edu	BCRTZ 129 (956) 882-5627	ESSBL 2.101 (956) 665-2243
Counseling Center Counseling@utrgv.edu	EUCTR 109 (956) 665-2574	BSTUN 2.10 (956) 882-3897
Learning Center LearningCenter@utrgv.edu	BMSLC 2.118 (956) 882-8208	ELCTR 100 (956) 665-2585
Writing Center WC@utrgv.edu	BUBLB 3.206 (956) 882-7065	ESTAC 3.119 (956) 665-2538

Disclaimer This syllabus does not contain all regulations that relate to students. Contents in the syllabus may be changed by the instructor with advanced notice and/or agreement with the students. Any change will be kept to a minimum.