College of Engineering and Computer Science
Department of Computer Science

CSC 180-01 Intelligent Systems

Fall 2022 Syllabus

Part 1: Course Information

Instructor Information

Instructor: Dr. Haiquan Chen
Office: Riverside Hall 5018
Office Telephone: (916)-278-6087
E-mail: haiquan.chen@csus.edu (**DO NOT use Canvas emails**)

Office Hours: R 9:00 am -12:00 pm OR by Appointment

Class Time: MWF 10:00 pm - 10:50 pm (see course structure for details)
Class Location: Online

Course Description

Theory and implementation of a variety of techniques used to simulate intelligent behavior. Expert systems, fuzzy logic, neural networks, evolutionary computation, and two-player game-tree search will be covered in depth. Knowledge representation, pattern recognition, hybrid approaches, and handling uncertainty will also be discussed

Prerequisite

- MATH 26B or MATH 31; STAT 50 or ENGR 115; CSC 130 and CSC 135.
- Prerequisite Proof: The Department of Computer Science has a policy that each instructor needs to verify the student transcript and ascertain that the student has the prerequisites. Once requested, you can log on to My Sac State go to "Student Center" and select "Unofficial Transcripts" to print. You also can select and print "Transfer Credit Report" if you have transferred from another institution. Any student who has completed one or more prerequisites at another school must provide similar verification to the instructor. Once requested, any student who has not submitted their transcript for verification by the end of the second week will be dropped from the class.

Textbook & Course Materials

Required Text

- No required textbook. Lecture slides and lab tutorials will be distributed.

Recommended Texts & Other Readings

- Lucci, S, Kopec, D. (2022) Artificial Intelligence in the 21st Century. 3rd edition. Publisher: Mercury Learning & Information. ISBN-10: 1683922239

Course Requirements

- **The final exam (90-minute) will be conducted synchronously on Canvas**. Students can access the test paper at the time when exam begins, hand-write responses on a blank paper (by correlating your answers to each question), and then scan/upload the paper as a single PDF for the instructor to view.
- **Quizzes will be delivered during the class time on the designated days on Canvas**.
- To finish exam/quizzes, students will have to use a scanner or use some scanning apps on smartphones, such as CamScanner, Abode Scan.
- **You can also directly write on your i-pad to finish quiz/exam but make sure your writing is clear and readable.**

Course Structure

This course will be delivered using a mix of synchronous and asynchronous delivery (remote hybrid). Specifically, **all lectures will be delivered entirely online through Canvas asynchronously**. In Canvas, you will access online lessons (videos), course slides, and programming labs. **At designated times throughout the semester, you will participate synchronously (via zoom) in a blend of live class sessions**, including the proposal meeting, the final project meeting, the final review, and the final project presentations. Please refer to the course schedule for details.

Important Note: This syllabus, along with course assignments and due dates, are subject to change. It is the student's responsibility to check Canvas for corrections or updates to the syllabus. Any changes will be posted in Canvas.

Part 2: Course Objectives

Students completing this course will be able to

- Implement, observe, and evaluate alternative approaches to intelligent systems
- Utilize algorithms, such as search techniques, by incorporating heuristics
- Use knowledge engineering to implement an expert system or fuzzy expert system
- Implement a two-player strategy game with optimized adversarial search
- Implement an artificial neural network, and apply a variety of learning strategies for training artificial neural networks
- Apply the underlying theory and practice of evolutionary computation, including genetic algorithms and genetic programming, for solving a variety of problems
- Cast application problems in ways suitable for solving with an intelligent system

Part 3: Topic Outline/Schedule

Important Dates

- First Day of Class: M, August 29, 2022
- Labor Day (Holiday, Campus Closed): M, September 5, 2022
- Veteran's Day (Holiday, Campus Closed): F, November 11, 2022
- Thanksgiving (Holiday, Campus Closed): RF, November 24-25, 2022
- Last Day of Class: F, December 9, 2022
- **Quiz 1: 10:00 am - 10:50 am, M, October 10, 2022**
- **Final Exam: 8:00 am - 9:30 am, F, December 16, 2022**

Tentative Schedule (subject to change)

WEEK	TOPICS	References	Notes
1	**Syllabus Review** Intro to Artificial Intelligence	Lec 1	
	Data Preprocessing	Lec 2	
	Hands-on: Anaconda/Jupyter notebook setup, Python **Assign Mini-Project 0**	Lab 0	
2			Labor Day
	Hands-on: Numpy	Lab 1	
	Hands-on: Pandas	Lab 2	
3	Hands-on: Supervised Learning and NLP using Sklearn	Lab 3, 4	
	Neural Networks	Lec 3	
	Hands-on: TensorFlow	Lab 5, 6	Project 0 due
4	Hands-on: TensorFlow **Assign Mini-Project 1**	Lab 7, 8	
	Deep Learning	Lec 4	
	Deep Learning	Lec 4	
5	Hands-on: Convolutional Neural Networks	Lab 9	
	Hands-on: Regularization and Feature Importance	Lab 10	
	Demo of Mini-Project 1		Project 1 due

6	**Assign Mini-Project 2** Hands-on: Image Processing using Autoencoder	Lab 11	
	Assign Final Project		
	Transfer Learning and GAN **Special Lecture:** Building more complex AI models using TF functional API	Lec 5 special lab	
7	**Quiz 1 (October 10)**		
	Intro to Search Strategies	Lec 6	
	Demo of Mini-Project 2		Project 2 due
8	**Assign Mini-Project 3** Informed Search	Lec 7	
	Uninformed Search	Lec 8	
	Adversarial Search	Lec 9	
9	Adversarial Search	Lec 9	
	Genetic Algorithm	Lec 10	
	Demo of Mini-Project 3		Project 3 due
10	**Proposal Meeting (Live Zoom Session)**		Proposal due
	Genetic Algorithm	Lec 10	
	Hands-on: Genetic Optimization using DEAP **Assign Mini-Project 4**	Lab 12	
11	**Quiz 1 Review**		
	Bayesian Inference	Lec 11	
			Veteran's Day
12	Fuzzy Logic and Expert System	Lec 12	
	Fuzzy Logic and Expert System Hands-on: Fuzzy Logic Inference using Skfuzzy	Lec 12 Lab 13	
	Demo of Mini-Project 4		Project 4 due

13	**Final Project Meeting (Live Zoom Session)**		
	Final Review (Live Zoom Session)		
			Thanksgiving
14	**Final Project Presentation (Live Zoom Session)**		Final project due
15	**Final Project Presentation (Live Zoom Session)**		
16	**Final Exam**		

Part 4: Grading Policy

Grading Breakdown

Visit the **Assignments/Discussions** link in Canvas for details about each assignment listed below. Click on **Quizzes** to access quizzes and exams.

Ice-Breaker project	Four Project Reports	Four Project Presentations	Final Project	Final Exam	Quizzes
2%	20%	8%	20%	40%	10%

A student's final letter grade is based on the total weighted numeric score, on a 0-100 scale, obtained by the students, and rounded to the nearest integer to match the scale below. The letter grade is assigned according to the following policy:

A = 93-100	C = 73-76
A- = 90-92	C- = 70-72
B+ = 87-89	D+ = 67-69
B = 83-86	D = 63-66
B- = 80-82	D- = 60-62
C+ = 77-79	F = 59 or below

Please note that final score is not negotiable. Students are required to keep backup copies of all submitted work, and all graded work (if returned), until after final grades are posted.

Viewing Grades in Canvas

When any grades are returned to you on Canvas, unless otherwise instructed, you have 7 days to email/meet with the instructor for grade changes if there is a disagreement on your grades. Issues and/or disagreements concerning your grade must be resolved in such 7 days window. After 7 days, the grades are written in stone and can't be changed after that point, for whatever reason.

Part 5: Course Policies

Participation

Students are expected to participate in all online activities. Class participation is very important to the organization of the course. Exams will be based upon lectures and class discussions.

Instructor Announcements

The instructor will post announcements on the "Instructor Announcements" page in Canvas throughout the semester. Students are expected to read ALL instructor announcements and will be held responsible for the content of those announcements.

Submission rules

All submission must be submitted through Canvas unless otherwise instructed. It is the student's responsibility to ensure the assignment submission has gone through successfully. **Submissions in the ways other than Canvas, such as by email, will NOT be graded and will get a ZERO**. Double check the correctness and the format of files before your submission. For the each submission, on the first page, state your name, your id, course title, assignment id, and date clearly. Email attachments with a new version with an explanation such as "I forgot to include file xxx in my submission, please do grading based on this attachment" or "please grade this attachment because I accidentally attached a wrong file format in my submission" will NOT be accepted.

Make-up assignments

There will be no make-up assignments. All assignments must be completed and submitted before the due date. Late submissions are unacceptable. However, if a student cannot submit an assignment within the due date due to some unforeseen incident, he/she must provide a written documentation stating the proper reason of missing it. Otherwise a 0 will be assigned.

Exams

Final exam (90-minutes) will be delivered synchronously on Canvas. You can access the test paper at the time when exam begins, hand-write your responses on a blank paper (by correlating your answers to each question), and then scan/upload your paper as a single PDF for the instructor to view. Some scanning apps on smartphones

you can use include CamScanner, Abode Scan. **You will be given additional 15 minutes after the exam to finish file uploading.**

Taking photos of your answer sheets using smartphones <u>does NOT</u> work due to its resulting poor readability, which will affect your grade negatively. So please use a scanner or the scanning apps.

Quizzes

Quizzes will be delivered synchronously during the class time on the designated days on Canvas. **Please refer to the course schedule for the quiz days.** You can access the quiz paper at the time when quiz begins, hand-write your responses on a blank paper (by correlating your answers to each question), and then scan/upload your paper as a single PDF for the instructor to view. Some scanning apps on smartphones you can use include CamScanner, Abode Scan. **You will be given additional 15 minutes after each quiz to finish file uploading.**

Taking photos of your answer sheets using smartphones <u>does NOT</u> work due to its resulting poor readability, which will affect your grade negatively. So please use a scanner or the scanning apps.

Make-up exams/quizzes.

There will be no make-up exams, except under EXTREME circumstances. In case of medical emergency, 1) the student must inform the instructor BEFORE the exam by email (haiquan.chen@csus.edu), 2) the student must bring a doctor's note that excuses the student from the activity of taking an exam in the given day; and 3) the notes must be submitted to the instructor's department mailbox within the same week that the exam is scheduled. The instructor reserves the right to reject make-up requests. **There will be no make-up for any quizzes** under any circumstances.

Ethics/Academic Honesty

Absolutely no plagiarism and cheating. The instructor reserves the right to compare work **using both automated and manual methods**. **Students must be able to defend overly-similar work. Cheating and plagiarism will result in F grade in the course.**

Any work submitted is a contractual obligation that the work is the student's and for which he/she could be quizzed in detail. Discussion among students in assignments and projects is part of the educational process and is encouraged. No discussion among students is allowed in

any exams/quizzes. However, each student must make an effort to do his/her own work in all assignments and exams. No type of plagiarism will be tolerated except in the case of group work. In that case each student should indicate the part of the work, which was their major responsibility in their final joint submission. Nevertheless, I emphasize any work submitted is a contractual obligation that the work is the student's and for which he/she could be quizzed in detail. **The minimum penalty for even a single incident of cheating brought to the attention of the instructor in this course is automatic failure of the course**; additional more severe penalties may also be applied. Note that cheating is grounds for dismissal from the University.

Please refer to the Computer Science Dept. document entitled "Policy on Academic Integrity" and to the University Policy Manual section on Academic Honesty for additional information. It is the responsibility of each student to be familiar with, and to comply with, the policies stated in these documents. In addition, unless otherwise stated, the use of the following devices during exams/quizzes is prohibited: cell phones, pagers, laptops, and PDAs.

Any form of academic dishonesty, including cheating and plagiarism, may be reported to the office of student affairs.

University or Department Policies

Repeat Policy*:* The department has a policy specifying that students may not repeat a computer science course more than once. Any student who wishes to repeat a course more than once (that is, take a course for a third time) must submit a petition requesting the permission to do so. Student records will be reviewed to determine whether a student is taking this course for three or more times. Any such student must return an approved petition to the instructor within the first two weeks of class. Any student who does not submit an approved petition will be dropped from the class. Petitions are available in the department office (RVR 3018) and require the signature of both the instructor and the department chair.

Drop Policy: If you plan to drop this course, please make sure you understand the following information.

- There is no such thing as an "automatic drop". The instructor can drop you from the course, but this does not happen automatically. If you plan to drop the course, make sure to use MySacState.
- After 2nd week, you cannot drop the course through MySacState. At this point, you must provide written verification of a compelling reason. Both the instructor and the Department Chair must approve.

- After the 4th week, you must fill out a "Petition to Drop after Deadline" form and collect all the necessary signatures. This must be turned into Admission and Records in Lassen Hall.

Students with Disabilities

If you have a documented disability and verification from the Office of Services for Students with Disabilities (SSWD), and wish to discuss academic accommodations, please contact your instructor as soon as possible. It is the student's responsibility to provide documentation of disability to SSWD and meet with a SSWD counselor to request special accommodation *before* classes start.

Sacramento State is committed to ensuring an accessible learning environment where course or instructional content are usable by all students and faculty. If you believe that you require disability-related academic adjustments for this class (including pregnancy-related disabilities), please immediately contact Services for Students with Disabilities (SSWD) to discuss eligibility. A current accommodation letter from SSWD is required before any modifications, above and beyond what is otherwise available for all other students in this class will be provided. Please be advised that disability-related academic adjustments are not retroactive. SSWD is located on the first floor of Lassen Hall 1008. Phone is 916-278-6955 and e-mail is sswd@csus.edu. For a complete listing of services and current business hours visit https://www.csus.edu/student-affairs/centers-programs/services-students-disabilities/

Title IX Statement

The California State University does not discriminate on the basis of sex, gender, or sexual orientation in its education programs or activities. Title IX of the Education Amendments of 1972, and certain other federal and state laws, prohibit discrimination on the basis of sex in all education programs and activities operated by the university (both on and off campus). Title IX protects all people regardless of their gender or gender identity from sex discrimination, which includes sexual harassment and violence.

Part 6: Others

Seeking Help

- **Virtual (Zoom) Office Hours: Thur 9:00 am - 12:00 pm**

  (by appointment only to minimize waiting time):

  https://csus.zoom.us/j/98756973141

  I will admit students one at a time, which allows individual students to have privacy when speaking with me. Therefore, **you must email me in advance (at least on the same day) to reserve a time slot (by default 15 minutes) during office hours to be admitted.**

- For help outside the office hours, please email me first. I will respond to your e-mail as quickly as I can, often within a few hours. However, please allow up to 48 hours for me to respond.

- **All emails should go to haiquan.chen@csus.edu** and
  - **have a subject like this: CSCXXX-SecX – your subject**
  - **be signed with your full name in the body of the message**

- **(Important) DO NOT use the emails within Canvas!**

Hands-on Components

- **This course will be programming-intensive.** Four mini-projects and one semester project will be assigned throughout the semester. You will gain a solid understanding of theoretical and applied topics on AI.

- This course will fully embrace **Python** data science ecosystem and **Google TensorFlow** platform, the most popular AI framework used in Silicon Valley today.

- You will learn how to use a few today's most popular Python data science libraries, such as Numpy, Pandas, Scikit-Learn, Keras/TensorFlow, and Pillow/Scikit-Image, and **cloud-based deep learning development** platforms (such as Google Colab with GPU support).

- For Python syntax, there are excellent online courses on Coursera and Udacity for Python beginners. If you look for online tutorials, check these out:
  - https://www.learnpython.org/
  - https://www.tutorialspoint.com/python/python_basic_syntax.htm
  - https://docs.python.org/3/tutorial/

Part 7: COVID-19 Related

- In the event a faculty member is not available during the semester for whatever reason, students will be contacted and advised how the course will proceed. This may include a change in instructor and/or modality.
- For students who receive a positive COVID-19 test result, assignment due dates may be adjusted.
- If you are sick, please self-diagnose if you are experiencing any COVID-like symptoms (fever, cough, sore throat, muscle aches, loss of smell or taste, nausea, diarrhea, or headache) or have had exposure to someone who has tested positive for COVID.
- For students who receive a positive COVID-19 test result, contact Student Health & Counseling Services (SHCS) at 916-278-6461 to receive guidance and/or medical care. You are asked to report any possible COVID related illnesses/exposures to SHCS. Expect a call from SHCS within 24 hours.