Master Course Syllabus

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/

Semester: Spring
Year: 2025
Course Prefix: CS
Course and Section #: 6460-I01
Course Title: Artificial Intelligence
Credits: 3

Course Description

Presents foundational AI algorithms. Explores state space search, local search, adversarial search, constraint satisfaction problems, logic and reasoning, expert systems, Markov Models, Bayesian networks, particle filters, planning, reinforcement learning, and multilayer perceptrons. Studies practical implementations of AI algorithms.
Prerequisite(s): Acceptance into a graduate program

Course Attributes

This course has the following attributes:
☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
☒ Discipline Core Requirements in Program
☒ Elective Core Requirements in Program
☐ Open Elective
Other: *Click here to enter text.*

Instructor Information

Instructor Name: Dr. George Rudolph

Student Learning Outcomes

1	Develop intelligent systems using foundational AI algorithms.
2	Automate processing of data to accelerate decision-making.
3	Evaluate the strengths, weaknesses, and limitations of various AI algorithms.
4	Solve real-world problems across diverse domains using artificial intelligence and machine learning.
5	Communicate AI solutions to various audiences.

Course Materials and Texts

Required materials, fees, and technology

Artificial Intelligence: A Modern Approach **4th Edition** by Stuart Russell and Peter Norvig
ISBN-13: 978-0134610993
ISBN-10: 0134610997
The 4th Edition is required. The earlier 3 editions are out-of-date and NOT acceptable substitutes for this course. Students who attempt to use editions 1, 2 or 3 will at best struggle unnecessarily and fail at worst.
Python 3.13 or compatible version is required

Technology Expectations

- Access to the Internet, Teams, and Canvas
- Have a GitHub user account
    - optionally sign up with GitHub Education as a student
- Computer with Python 3.13 installed and the ability to install Python modules (free download)
- Use a code editor of your choice, but all code must run from a terminal window command line interface
- Computer with reasonable graphics display capability

Course Requirements

Course Assignments, Assessments, and Grading Policy
Projects:
There is one warmup tutorial and 4 programming projects to do in this course. The programming demonstrates that you understand the theory well enough to implement it correctly in code.

P0: Tutorial and Python Basics
If you are comfortable with Python and Linux, you can skip this one, except do read the section in the Tutorial about forking and cloning the GitHub repository for project source code.

P1: Search
Implement several classic AI search algorithms used in games and path planning applications.

P2: Multiagent
Implement several classic AI used in collaborative and adversarial multiplayer games and strategy tools.

P3: Reinforcement
Implement reinforcement learning algorithms for agents that interact with their environment in rational ways.

P4: Ghostbusters
Implement algorithms that act rationally in the presence of uncertain information.
All projects are auto-graded using a script. All project code will be submitted in GitHub, with links to your code submitted in Canvas. Partial credit is possible for each project, but only for parts that work when graded by the autograder.

Each project description discusses scoring, getting help, working with a partner, and cheating. If a project allows you to work with a partner, this means you can study together, discuss algorithms, compare results, and help each other debug code. You may not share code, nor submit someone else's

code as your own, even if you study together and write code together. If you can't write the code on your own, it's not yours. See the statement on Cheating below.

GitHub Source Code for Projects

Project descriptions and starting source code for all projects are in the https://github.com/Utah-Valley-University/cs6460. GitHub repository. It is expected that you will do the following:

1. Fork this repository into your own private repository.
2. Add your instructor as a collaborator to your repository.
3. Clone the repository to your local machine.
4. For each project 0-4 respectively
    1. create a new branch for that project
    2. make changes on that branch to make your solution
    3. run the autograder on your solution before you submit it
    4. commit your changes to your local repository
    5. push your changes to your remote repository to submit them
    6. put a link to your repository in the Canvas submission page for that assignment

If you've never used GitHub before, instructions for forking, cloning, committing and pushing and adding collaborators can be found in GitHub documentation on their website.

Homework:

There are 3 homework assignments due at various points in the semester. All are to be completed individually--you may help each other, but not copy each other's work as your own. Homework is preparation for exams and projects and to help you engage with the material beyond programming.

They are spaced out in the semester to help you prepare for exams and get experience reflecting on concepts.

Discussions:

There are no mandatory assigned discussion topics for this course. Earlier in the syllabus Burning Questions and Muddiest Point questions were mentioned as opportunity to post questions on the Discussion Board. In addition to posting questions and answers, other information of interest may be posted in as a Discussion topic during the course. These are opportunities for learning and interaction that are not graded.

Assessments:

A midterm exam and final exam will be given in Canvas. Proctorio will not be used. They are timed, open-book, open-notes, but not open-internet. You are on your honor to not cheat as these are summative assessments of what you know and can do.

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Percent	93+	90+	87+	83+	80+	77+	73+	70+	67+	63+	60+	0+

Assignment Categories

Activity	Percent
Projects	50
Homework	20
Exams (midterm + Final)	30

Late Work Statement:
Late submissions are assessed a 10% per day deduction up to 5 business days. Weekends, breaks and holidays are not business days. If you figure something out on a later project that builds on an earlier project, you *may* be allowed to **resubmit** the earlier project for an improved score at your instructor's discretion.

Required or Recommended Reading Assignments
See the schedule below.

General Description of the Subject Matter of Each Lecture or Discussion

Module	Week	Topic	Assignments
Module 1	Week 1 Jan 6	Course Introduction Introduction to AI	
Module 2	Week 2 Jan 13	Uniformed Search	P0: Tutorial
Module 3	Week 3 Jan 20	Informed Search	HW1
Module 4	Week 4 Jan 27	Adversarial Search	P1: Search

Module 5	Week 5 Feb 3	Constraint Satisfaction Problems	
Module 6	Week 6 Feb 10	Markov decision Process	P2: Multiagent
Module 7	Week 7 Feb 17	Reinforcement Learning	HW2
Module 8	Week 8 Feb 24	Probability Bayes Net Representation	Midterm
Module 9	Week 9 Mar 3	Bayes Net Independence Inference	
	Week 10 Mar 10		**Spring Break**
Module 10	Week 11 Mar 17	Bayes Net Sampling Hidden Markov Models	P3: Reinforcement
Module 11	Week 12 Mar 24	Particle Filtering	
Module 12	Week 13 Mar 31	Independent Study (chosen by student, approved by instructor)	HW3
Module 13	Week 14 Apr 7	Independent Study (chosen by student, approved by instructor)	
Module 14	Week 15 Apr 14	Independent Study (chosen by student, approved by instructor)	P4: Tracking (Ghostbusters)

Module 15	Week 16 Apr 21		HW 4 Due Apr 22 Classes end Apr 22 Final Exam Apr 24-25 Independent Study Presentation Due before you complete the Final Exam

The schedule is subject to change as needed. This is an independent study course, so there are no scheduled class sessions and so no automatic classroom recordings. Check Course Media for and Read & Watch pages for any supplemental instructor recordings.

Required Course Syllabus Statements

Generative AI
ChatGPT (and similar Tools) in This Course: Use ChatGPT as a learning assistant, not as a crutch. If you use it, cite it at the top of your code, note in presentations and acknowledge in written papers. **You** are responsible to make sure that any code or content does what it is supposed to do and says what you want it to say. Don't accept anything it generates at face value without checking it critically. These days potential employers will expect you to know how to use tools like ChatGPT to generate code and content, so it is a skill we need to teach you. If it helps you learn some things faster, GREAT. Just remember: If you REALLY want to be good, work for it.
Does your instructor REALLY expect you to use GEN AI in this class? REALLY? Yes!
Suggestions for using it responsibly:

1. **Concept Clarification:** If you're stuck on a concept like Bayes Nets, or multivariate gradient descent, GenAI can explain it in simpler terms or provide examples to help you understand better.

2. **Practice Problems:** GenAI can generate practice problems for you to solve on your own. After you attempt them, it can help you check your answers and understand any mistakes.

3. **Study Tips:** GenAI can offer strategies for studying various AI algorithms effectively, such as how to break down complex problems or how to organize your study sessions.

4. **Resource Recommendations:** GenAI can suggest other textbooks, online courses, or websites that provide additional explanations and practice problems.

5. **Homework Guidance:** While GenAI could but should not do your homework for you, it can help you understand the questions and guide you on how to approach solving them.

6. **Exams:** GenAI is not to be used on Exams. For remote exams such as in Canvas, your instructor leaves people on their honor not to cheat in any form. We note that the only exam in this course is the final project.

7. **Debugging and Understanding Code:** GenAI should not be used to write blanket write code for you with no work on your part--the goal is to train **you**, not it--but it can help you get started, find and fix problems and suggest improvements.

Using Remote Testing Software
☒ This course does not use remote testing software.

☐ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities
Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity
At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.

To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.