SCIS 432: Artificial Intelligence

Spelman College, Computer Science Department

Spring 2026

Course Information

Meeting Time:	Tuesday & Thursday, 1:00 PM – 2:15 PM
Location:	Tapley 223
Credit Hours:	3 credits
Prerequisites:	Data Structures & Algorithms, Programming proficiency in Python

Instructor Information

Instructor:	Dr. Antonio Khalil Moretti
Email:	antoniomoretti@spelman.edu
Office:	Tapley 218
Office Hours:	Tuesday 11:00 AM – 12:00 PM (also welcome to stop by T/Th 10:40 AM – 1:00 PM)

Course Description

This course provides a comprehensive introduction to artificial intelligence, covering both classical AI techniques and modern machine learning approaches. We begin with foundational search algorithms and problem-solving methods, then transition to mathematical foundations necessary for machine learning. The second half of the course focuses on supervised learning, neural networks, deep learning with PyTorch, and cutting-edge topics in generative AI including transformers and large language models.

Course Learning Objectives

By the end of this course, students will be able to:

- Implement classical search algorithms for problem-solving
- Apply mathematical foundations to machine learning problems
- Build and train supervised learning models from scratch
- Design and implement neural networks
- Use modern deep learning frameworks (PyTorch)

- Understand and work with state-of-the-art AI models
- Critically evaluate AI systems and their societal impact

This course prepares students for careers in AI/ML and graduate studies.

Required Textbook

Russell, Stuart and Norvig, Peter. *Artificial Intelligence: A Modern Approach*. 4th Edition. Pearson.

Additional Course Materials

- Online resources: PyTorch tutorials, research papers, lecture notes
- Computing: Python, Jupyter notebooks, Google Colab
- Supplementary readings will be provided throughout the semester

Topics Covered

Part 1: Uninformed Search & Classical AI (Weeks 1–5)

- Introduction to AI and problem-solving agents
- State space representation
- Uninformed search strategies (BFS, DFS, UCS)
- Informed search (heuristic functions, A* algorithm)
- Advanced search topics (iterative deepening, bidirectional search)
- Game playing and adversarial search (minimax, alpha-beta pruning, MCTS)

Part 2: Mathematical Foundations (Week 6)

- Linear algebra review (vectors, matrices, eigenvalues)
- Calculus review (derivatives, gradients, chain rule)
- Optimization basics

Part 3: Machine Learning (Weeks 7–15)

- Supervised learning foundations (linear regression, gradient descent)
- Classification (logistic regression, decision boundaries)
- Neural networks (perceptrons, feedforward networks, backpropagation)
- Deep learning with PyTorch (CNNs, transfer learning)
- Advanced architectures (RNNs, LSTMs, attention mechanisms, transformers)
- Generative AI (VAEs, GANs, LLMs, diffusion models)
- AI ethics and societal implications

Grading Breakdown

Component	Weight
Weekly Homework	25%
Midterm Exam	25%
Final Exam	25%
Course Project	25%

Grading Scale: 90–100 A, 80–89 B, 70–79 C, 60–69 D, <60 F. Plus and minus grades will be assigned within these 10-point ranges.

Course Components

Weekly Homework (25%)

Problem sets will be assigned weekly, combining theoretical questions with coding implementations. Homework reinforces concepts from lecture and provides hands-on experience with AI algorithms and machine learning techniques.

Exams (50%)

There will be a midterm exam (25%) covering classical AI and mathematical foundations, and a comprehensive final exam (25%) covering the entire course with emphasis on machine learning and deep learning topics.

Course Project (25%)

Students will complete a semester-long project implementing and evaluating a machine learning model. The project will involve selecting a problem, implementing a solution using techniques learned in class, and presenting results. Detailed requirements will be provided mid-semester.

Course Policies

Class Recording

All class sessions will be recorded via Zoom for educational purposes. **Students are required to attend class in person.** Recordings are provided as a supplementary resource and do not substitute for attendance.

Attendance

Students are required to be present and on time for each class and are responsible for all material covered in class whether present or absent. If a student has missed two or more weeks of class (6 or more class meetings), the student may be withdrawn without further notice.

Late Policy

Homework assignments turned in late will be penalized 10 percentage points per day, with a maximum penalty of 50 points. Assignments may not be turned in for credit more than one week late. No makeup exams will be given except by prior agreement with the instructor or a dean's excuse.

Inclement Weather or Emergency Policy

If a class is not held at the assigned time, all work scheduled for that day is automatically rescheduled for the next scheduled class period. Any assignments or homework due on a missed day become due at the next scheduled class period.

Use of Generative AI

Given that this is an AI course, we will have nuanced discussions about the appropriate use of AI tools. **You may not use generative AI (ChatGPT, GitHub Copilot, etc.) to complete homework or exams unless explicitly permitted for a specific assignment.** When AI tools are permitted, you must document their use. The goal of this course is for you to learn to build these systems, not just use them. Unauthorized use of AI tools constitutes academic dishonesty.

Academic Integrity

At the heart of Spelman College's mission is academic excellence, along with the development of intellectual, ethical, and leadership qualities. All members of the academic community are expected to uphold a commitment to high ethical standards. Students are expected to read and abide by the Spelman College Code of Conduct and behave as mature and responsible members of the academic community.

Common violations include:

- **Cheating:** Using or attempting to use unauthorized assistance, materials, or study aids in examinations or academic work (including unauthorized use of AI tools, using cheat sheets, soliciting exam information from other students, copying code from online sources without attribution, etc.)
- **Plagiarism:** Using the ideas, data, or language of another without specific and proper acknowledgment (including submitting downloaded/purchased code, copying from GitHub or Stack Overflow without citation, etc.)

Consequences:

- Cheating on an examination: Zero on the exam and possibly an F in the course
- Cheating on homework/projects: Zero on the assignment and a one-letter grade penalty for the course
- All cases will be forwarded to the Office of Undergraduate Studies for additional disciplinary action

Disability Statement

Spelman College is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or think you may have a disability) and need a reasonable accommodation to participate in class, complete course requirements, or benefit from the College's programs or services, contact the Office of Disability Services (ODS) as soon as possible. To receive academic accommodation, you must be appropriately registered with ODS. For further information, contact ODS at 404-270-5289, located in MacVicar Hall, Room 106.

Excused Absences

The Dean of Undergraduate Studies will issue official excuses for students who have missed two consecutive class sessions (T/Th). Students must request an excused absence within one week of the absence. All requests must be accompanied by valid documentation.

Excused absences include:

- Student illness or injury
- Critical illness/death in the immediate family
- Short-term military obligation
- Jury duty or court subpoena
- Religious holidays

Do not schedule any event, interview, or trip in conflict with any examination for this course. Such absences will not be approved or excused.

COVID-19 Health Guidance

If you test positive for COVID-19 or experience respiratory viral symptoms:

- Stay home and away from others
- Seek medical treatment if needed
- Resume normal activities when symptoms are improving and you are fever-free (without medication) for at least 24 hours
- Notify Student Health Services when absent due to COVID-19

For the College's full statement, visit:
`https://spelmancollege.activehosted.com/index.php?action=social&chash=7e9e346dc5fd268b49bf4185`
`2262&s=bd42c316b9c6c8ff903f2c741cb31530`

Weekly Course Schedule

Week	Topic	Reading
1	**Introduction to AI & Problem Solving** What is AI? History and applications, problem-solving agents, state space representation	R&N Ch. 1–2
2	**Uninformed Search Strategies** Breadth-First Search (BFS), Depth-First Search (DFS), Uniform-Cost Search (UCS), complexity analysis	R&N Ch. 3
3	**Informed Search** Heuristic functions, Greedy Best-First Search, A* Search algorithm, admissibility and consistency	R&N Ch. 3
4	**Advanced Search Topics** Iterative deepening, bidirectional search, search in continuous spaces	R&N Ch. 3
5	**Game Playing & Adversarial Search** Minimax algorithm, alpha-beta pruning, Monte Carlo Tree Search	R&N Ch. 5
6	**Mathematical Foundations** Linear algebra review (vectors, matrices, eigenvalues), calculus review (derivatives, gradients, chain rule), optimization basics	Supplementary notes
7–8	**Supervised Learning Foundations** Introduction to machine learning, linear regression and least squares, loss functions and optimization, gradient descent **Midterm Exam** (Week 8)	R&N Ch. 19
9	**Classification** Logistic regression, decision boundaries, multi-class classification	R&N Ch. 19
10–11	**Neural Networks** Perceptrons and activation functions, feedforward neural networks, backpropagation algorithm, training neural networks	R&N Ch. 21
12	**Deep Learning with PyTorch** Introduction to PyTorch, building and training models, Convolutional Neural Networks (CNNs), transfer learning	PyTorch tutorials
13	**Advanced Neural Network Architectures** Recurrent Neural Networks (RNNs), Long Short-Term Memory (LSTM), attention mechanisms, transformers	Research papers
14–15	**Generative AI & Ethics** Autoencoders and VAEs, Generative Adversarial Networks (GANs), Large Language Models (LLMs), diffusion models, ethical considerations in AI **Final Exam** (Week 15)	Research papers

This schedule is subject to modification. Any changes will be announced in class and posted on the course website.