SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Introduction to Artificial Intelligence

CS 156

Fall 2025 Section 04 In Person 3 Unit(s) 08/20/2025 to 12/08/2025 Modified 08/20/2025

Contact Information

Course and Contact Information

Instructor: Saptarshi Sengupta, PhD

Office Location: MacQuarrie Hall 416

Telephone: 408-924-4808

Email: saptarshi.sengupta@sjsu.edu

Office Hours: Friday, 11:00 AM – 1:00 PM

Class Days/Time: MW 12 PM - 1:15 PM

Classroom: MacQuarrie Hall 520

Course Description and Requisites

Basic concepts and techniques of artificial intelligence: problem solving, search, deduction, intelligent agents, knowledge representation. Topics chosen from logic programming, game playing, planning, machine learning, natural language, neural nets, robotics.

Prerequisite(s): CS 146 (with a grade of "C-" or better); Allowed Majors: Computer Science, Data Science, Computer Science and Linguistics, Applied and Computational Mathematics or Software Engineering; or instructor consent.
Grading: Letter Graded

Cross-listed with SE 156. Computer Science is responsible for scheduling.

Classroom Protocols

- Cheating will not be tolerated

- Student must be respectful of the instructor and other students. For example, No disruptive or annoying behavior
- Turn off cell phones
- Class begins on time
- Valid picture ID required at all times

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Goals

Upon successful completion of this course, students will be able to:

1. Develop intelligent algorithms and apply them to problems across various application areas.
2. Achieve competence in performing model development, deployment and testing across multiple modalities in real-world settings.

Course Learning Outcomes (CLOs)

After taking this course, a student should be able to:

1. Have a solid understanding of the concepts and methodologies related to artificial intelligence.

2. Analyze and solve complex problems using algorithms and models.

3. Learn to use machine learning models for supervised, unsupervised and reinforcement learning tasks in real-world scenarios.

4. Learn about knowledge representation and automated reasoning.

5. Develop proficiency in the fundamentals of natural language processing in application areas like machine translation and generation.

6. Develop an intuition about search algorithms and optimization.

7. Learn about the ethical aspects and societal-scale implications of deployed AI products.

8. Explore relevant applications of AI, such as Prognostics, Cybersecurity and Vision.

9. Develop the ability to evaluate AI models keeping key metrics in mind.

10. Collaborate with peers to propose data-driven solutions to problems and be able to effectively communicate results using technical reports.

Course Materials

Textbook:

None Required

Other Readings:

Artificial Intelligence: A Modern Approach Author: Stuart J. Russell and Peter Norvig Edition: 4th

Probabilistic Machine Learning: Kevin P. Murphy

Deep Learning Author: Ian Goodfellow, Yoshua Bengio, and Aaron Courville

Other technology requirements / equipment / material:

Python 3, Scikitlearn libraries, numpy/scipy, Tensorflow and Keras, PyTorch, gym, Jupyter notebooks. Installing Anaconda is highly recommended. I will be using Jupyter Notebook and VS code in my demos in class.

Grading Information

Semester grade will be computed as a weighted average of the scores obtained in each of the four categories listed above. No make-up tests or quizzes will be given, and no late homework (or other work) will be accepted. Also, in-class work must be completed in the section that you are enrolled in.

Determination of Grades

Semester grade will be computed as a weighted average of the scores obtained in each of the four categories listed above. No make-up tests or quizzes will be given, and no late homework (or other work) will be accepted. Also, in-class work must be completed in the section that you are enrolled in.

Nominal Grading Scale:

Percentage	Grade
97 – 100 plus	A+
93 – 96	A
90 – 92	A-

87 – 89	B+
83 – 86	B
80 – 82	B-
77– 79	C+
73 – 76	C
70 – 72	C-
67 – 69	D+
63 – 66	D
60 - 62	D-
0-59	F

Breakdown

- Homework: 25%
- Exam 1: 25%
- Exam 2: 25%
- Final Project: 25%

Note that "All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades." See University Policy F13-1 at http://www.sjsu.edu/senate/docs/F13-1.pdf (http://www.sjsu.edu/senate/docs/F13-1.pdf)for more details.

University Policies

Per University Policy S16-9 (PDF) (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance,

counseling, and other resources) are listed on the Syllabus Information (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

Course Schedule:

The schedule is subject to change with fair notice communicated via Canvas course page/in-class

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	08/20	Introduction
2	08/25	Bayesian Learning
2	08/27	Statistics and Linear Algebra
3	09/01	**No class**
3	09/03	Search, Optimization and Knowledge Representation
4	09/08	Classification, Regression, Generalization and Model Complexity
4	09/10	K Nearest Neighbors, Linear Models, Naïve Bayes
5	09/15	Decision Trees, Kernelized SVM
5	09/17	Neural Networks Fundamentals
6	09/22	Introduction to Deep Learning
6	09/24	Computer Vision with Convolutional Neural Networks
7	09/29	Advanced Computer Vision: Architectures

Week	Date	Topics, Readings, Assignments, Deadlines
7	10/01	Computer Vision Applications, Neural Style Transfer
8	10/06	Generative Adversarial Networks: DCGAN, SRGAN, CycleGAN and InfoGAN
8	10/08	Autoencoders: Vanilla, Sparse, Denoising and Stacked
9	10/13	Recurrent Neural Networks, BPTT, Vanishing and Exploding Gradients
9	10/15	RNN Cell Variants, RNN Variants and RNN topologies
10	10/20	Attention mechanisms in RNN, Transformers and other SOTA models
10	10/22	Exam 1
11	10/27	Language Modeling: Types, Bag-of-Words, Stopwords, Rescaling, Model Coefficients, n-Grams, Advanced Tokenization, Stemming and Lemmatization
11	10/29	Different kinds of Embeddings
12	11/03	Large language models: BERT and derivatives
12	11/05	Sequence to sequence learning and speech recognition
13	11/10	Unsupervised Learning: PCA, NMF, Manifold Learning
13	11/12	Unsupervised Learning: K-Means, Agglomerative Clustering, DBSCAN, CART
14	11/17	Adversarial AI
14	11/19	Time Series Analysis

Week	Date	Topics, Readings, Assignments, Deadlines
15	11/24	Large Language Models: Training and Inference
15	11/26	Large Language Models: Reasoning
16	12/01	Exam 2
16	12/03	Project Presentations
17	12/08	Project Presentations