

San José State University
College of Science/Department of Computer Science
CS286, Advanced Topics in Computer Science, Section 2, Fall, 2020

Course and Contact Information

Instructor(s):	Dr. Katarzyna Tarnowska
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Office Hours:	Online by appointment
Class Days/Time:	MW 3:00 PM – 4:15 PM
Classroom:	Online (Canvas LMS/Zoom)
Prerequisites:	CS157A (or equivalent) with a grade C- or better or instructor consent

Course Description

Covers the field of Artificial Intelligence with focus on its applications to systems, including Data Science, Knowledge Discovery, Knowledge Representation, Reasoning, Knowledge-Based Systems, Logical Programming, Natural Language Processing. Focus on interdisciplinary fields, such as decision support systems. Required team-based project.

Course Format

This edition of the CS286 course will be taught entirely online, using Canvas as an LMS platform and Zoom. Therefore, you will need access to a computer and the Internet. The mode of online will be hybrid; with synchronous meetings on Wednesdays, and asynchronous labs due on Mondays.

Course Web Page

All course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the course web page on [Canvas Learning Management System course login website](http://sjsu.instructure.com) at <http://sjsu.instructure.com>.

Course Goals

To familiarize students with the field of intelligent systems, that is, systems that make use of different approaches to Artificial Intelligence. The goal is to learn both theoretical and practical aspects of intelligent systems.

Course Learning Outcomes (CLO)

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

- CLO1 Perform data-preprocessing on a large dataset, such as discretization, normalization, transforming, and combining attributes.

- CLO2 Perform feature selection on a large dataset using including search-based methods (such as best-first, exhaustive, genetic algorithm, ranking) and evaluation-based methods (such as correlation-based, wrapper, information gain, chi-squared) or any combination of these methods.
- CLO3 Built a prediction model for a given decision problem using different algorithms (such as decision trees and lists, support vector machines, multilayer perceptrons, logistic regression, Bayes' nets) or a combination of algorithms (using bagging, boosting, stacking, weighting).
- CLO4 Built descriptive models for datasets in a given decision problem, using association rule mining and action rule mining.
- CLO5 Use logic programming to implement rule-based knowledge and reasoning.
- CLO6 Develop a simple knowledge-based decision support system in a chosen area.
- CLO7 Apply natural language processing techniques, such as text mining, text classification, or opinion mining to a given problem area.
- CLO8 Learn interdisciplinary applications of intelligent systems, such as medicine and business.

Required Texts/Readings

Textbook

Selected Readings from:

[1] Data Mining: Practical Machine Learning Tools and Techniques, 4th Ed., by I. H. Witten, E. Frank, M. A. Hall. Information on text from WEKA site: <http://www.cs.waikato.ac.nz/ml/weka/book.html>

[2] Decision Support System for Diagnosis and Treatment of Hearing Disorders. The Case of Tinnitus. Studies in Computational Intelligence, Vol. 685, Springer, 2017, by K. A. Tarnowska, Z. W. Ras, P. J. Jastreboff.

[3] Recommender System for Improving Customer Loyalty. Studies in Big Data, Springer, 2019, by K. Tarnowska, Z.W. Ras, L. Daniel.

[4] Handbook of Natural Language Processing, 2nd Ed., by N. Indurkha and F. J. Damerau, Chapman & Hall/CRC, 2010.

[5] Sentiment Analysis and Opinion Mining, by B. Liu, Morgan & Claypool Publishers, 2012.

[6] Other articles and tutorials assigned by the instructor.

Other technology requirements / equipment / material

The following software will be used in the class and for projects:

- WEKA - <https://www.cs.waikato.ac.nz/ml/weka/>
- LISp-Miner - <https://lispminer.vse.cz/>
- Java Expert System Shell – <https://jessrules.com/jess>
- Stanford NLP - <https://nlp.stanford.edu/software/>
- The datasets used for learning tools and in-class activities will be chosen from publicly available repositories, such as KDNuggets, Kaggle, UCI.

Course Requirements and Assignments

- **Exams:** there will be 3 exams covering the following material:

- Exam 1 (15%) – Knowledge Discovery in Data (KDD): 23-SEP (tentative)
- Exam 2 (15%) – Natural Language Processing (NLP): 27-OCT (tentative)
- Exam 3 (15%) – Knowledge-Based Systems (KBS): 7-DEC (tentative)

Exams will be closed-books and consist of open-ended questions/problem-solving. They will be taken during class time (75 min). They will require access to the internet, Canvas, Lockdown Browser (on Windows or macOS machine), and Respondus Monitor (web camera).

- **Participation:** Attendance in weekly lectures is recommended. Readings assigned before lectures are required (they might be “entry” pop-up quizzes). Active participation in the lecture is encouraged. The score for participation will be determined based on graded assignments, such as online discussions and pop-up quizzes.
- **Labs:** there will be weekly labs due on Mondays 4:15 PM during the first 10 weeks. Lab sessions are asynchronous meaning they can be completed anytime after release (out on Wednesdays after lectures) and due time (Mondays 4:15 PM). Labs will complement lecture material and allow students to gather hands-on experience with the topics. Required deliverables must be submitted on Canvas and no late work will be accepted. Labs will be graded according to the posted rubrics.
- **Programming assignments:** there will be 2 or 3 larger programming assignments with at least 2 weeks to complete. Submission required on Canvas and no late work will be accepted.
- **Projects:** there will be a team-based project to complete during the last 5 weeks of the semester. The goal will be to implement a Knowledge-Based Decision Support/Recommender System in the chosen domain with the use of KD/NLP techniques learned in the lecture. Final source code and documentation due on Canvas before 12/10. Final project presentations (online, around 30 minutes per team) on 12/10.

Final Examination or Evaluation

The final evaluation will consist of a group presentation of projects’ results delivered via Zoom video conferencing system, and final project deliverables including design, implementation (source code & code repository), documentation, and presentation slides.

Grading Information

- Total points for the course will be weighted by:
 - Exams (3 x 15%) 45%
 - Participation 5%
 - Labs & programming 30%
 - Project 20%
- Letter grades will be assigned according to the following policy:

100 -99-----A+
 93 – 98 ---- A
 89 -- 92 ---- A-
 87 -- 88---- 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

Classroom Protocol

University Policies

- Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>.
- Policy on Academic Integrity
“Your commitment, as a student, to learning is evidenced by your enrollment at San Jose State University. The [University Academic Integrity Policy F15-7](#) requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. Visit the [Student Conduct and Ethical Development](#) website for more information.”
- Policy on Workload
[University Policy S16-9](#): *“Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.”*

CS286 / Advanced Topics in Computer Science, Fall 2020, Course Schedule

Course Schedule

The schedule is subject to change with fair notice available to registered students through Canvas.

Week	Date	Topics, Readings, Assignments, Deadlines	Learning Outcomes
1	8/19	San Jose fires. Campus closed.	
1	8/24	Introduction. Lab 1: Working with Large Datasets, Assigned Reading: [2]: 4.1.1-4.1.2.	
2	8/26	Rough Sets, Information Systems, and Decision Tables	
2	8/31	Lab 2: Exploratory Data Analysis in WEKA. Assigned Reading: [2]: 4.3, [1]: 10-11.1	
3	9/2	Decision Reducts. Programming Assignment 1 (PA1) out. Assigned Reading: [2]: 4.2-4.3	
3	9/7	Labor Day	
4	9/9	Decision Rules & Classification Rules.	
4	9/14	Lab 3: Feature selection and data pre-processing. Assigned Reading: [2]: 4.4. PA1 due.	CLO1-2
5	9/16	Action Rules.	
5	9/21	Lab 4: Predictive machine learning in WEKA.	CLO3
6	9/23	Exam 1	
6	9/28	Lab 5: Descriptive rule-based models using LISp-Miner. Assigned Reading: [4]:1,2	CLO4
7	9/30	Introduction to NLP; Text preprocessing	
7	10/5	NLP lab1: text parsing, POS tagging using Stanford NLP Assigned Reading: [5]: 1,2,6	
8	10/7	Introduction to sentiment analysis; Sentiment Lexicons	
8	10/12	NLP lab2: working with text reviews and SentiWordNet. Assigned reading: [5]: 3,4	
9	10/14	Sentiment classification and sentence-level sentiment analysis	CLO7
9	10/19	NLP lab3: Classifying sentiment. Assigned reading: [5]:5,7	CLO7
10	10/21	Aspect-based sentiment analysis; Opinion Summarization	CLO7
10	10/26	NLP lab4: Stanford typed dependencies	CLO7
11	10/28	Exam II	
11	11/2	KBS lab1: Intro to JESS	CLO5
12	11/4	KBS 1 – rule-based systems	CLO5

Week	Date	Topics, Readings, Assignments, Deadlines	Learning Outcomes
12	11/9	Projects teamwork	CLO6
13	11/11	Veteran's Day	
13	11/16	Project proposals due	
14	11/18	KBS2 – rule-based system case study	CLO8
14	11/23	Project work	CLO6
15	11/25	Non-instructional Day	
15	11/30	Project work.	CLO6
16	12/2	KBS3 – sentiment analysis-based case study	CLO8
16	12/7	Exam III	
Final	12/10	12:15-14:30: Project presentations, project reports & code due.	