

CMP_SC/ECE 8735: Unsupervised Learning

Instructor: Dmitry Korin

Prerequisites:

Instructor's consent. Students are expected to have undergraduate knowledge in discrete math, statistics and algorithms.

Course outline

This course introduces the main methods for supervised and semi-supervised learning. During the course students will study theory behind the classical and state-of-the-art algorithms, learn how to implement these algorithms, and will work on a research project where the algorithms will be applied to solve the real-world problems.

Textbook:

Pattern Recognition, Fourth Edition (Hardcover or Paperback), by Sergios Theodoridis, Konstantinos Koutroumbas, Academic Press; 4th edition (Nov 3, 2008)

Course topics:

1. Introduction and basic concepts of feature-based learning approaches.
MATLAB/Octave Basics (1 week)

PART I: Feature-based supervised methods

2. Support Vector Machines (2 weeks)
3. Feature selection. Multiclass labeling (1 week)
4. Artificial Neural Networks (2 weeks)
5. Graphical Models (2 weeks)
6. Hidden Markov Models (1 week)
7. Forests (1 week)

PART II: Symbolic-based methods

8. Learning decision trees (1 week)

PART III: Advanced topics

9. Semi-supervised learning (1 week)
10. Deep Learning (1 week)
11. Learning under privileged information (LUPI) (1 week)

Grading:

Grading will be based upon (1) Class attendance, (2) Home assignments, (3) Midterm, (4) Team project paper, and (5) Team project presentation. The project includes either a comparative analysis of the state-of-art methods published in the recent years in peer-reviewed journals applied for a specific real-world problem, or development of a novel unsupervised learning technique for a real-world problem. The research application project will include a short research paper, describing the obtained results and methodology used and a presentation.

Grade:

Attendance 5%

Assignments 30%

Midterm 25%

Project paper 20%

Project presentation: 20 %

Academic Dishonesty Statement

Academic integrity is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person's work has been responsibly and honorably acquired, developed, and presented. Any effort to gain an advantage not given to all students is dishonest whether or not the effort is successful. The academic community regards breaches of the academic integrity rules as extremely serious matters. Sanctions for such a breach may include academic sanctions from the instructor, including failing the course for any violation, to disciplinary sanctions ranging from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, collaboration, or any other form of cheating, consult the course instructor.

ADA Statement

If you need accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately. Please see me privately after class, or at my office.

Office location: 207EBW, Office hours: TBA

To request academic accommodations (for example, a notetaker), students must also register with the Office of Disability Services, (<http://disabilityservices.missouri.edu>), S5 Memorial Union, 882-4696. It is the campus office responsible for reviewing documentation provided by students requesting academic accommodations, and for accommodations planning in cooperation with students and instructors, as needed and consistent with course

requirements. For other MU resources for students with disabilities, click on "Disability Resources" on the MU homepage.

Intellectual Pluralism Statement

The University community welcomes intellectual diversity and respects student rights. Students who have questions concerning the quality of instruction in this class may address concerns to either the Departmental Chair or Divisional leader or Director of the Office of Students Rights and Responsibilities (<http://osrr.missouri.edu/>). All students will have the opportunity to submit an anonymous evaluation of the instructor(s) at the end of the course.