Read the Course Syllabus

Welcome

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Course Description and Objectives

Historically, the goal of pattern recognition is the automated recognition of patterns and regularities in data. It has grown to be the foundation of machine learning, which forms the core of data science that has attracted so much recent attention.
In this course, we start with the optimal decision theory to understand how to make the best decision in a probabilistic sense based on the observations. The probabilistic specifications of data in any application are rarely complete or accurate. As such we have to approximate using supervised or unsupervised learning methods.
The course objectives are such that the learners will be able to

1. explain the optimal decision rule in terms of probability theory and the role of learning in decision rules
2. describe the learning (from data) problem and the tradeoff of bias vs. variance in learning
3. explain the design and evaluation of supervised learning methods
4. explain the design and evaluation of unsupervised learning methods

Prerequisites

Graduate standing in computer science, computer engineering, or informatics. Competency in linear algebra and Python programming.

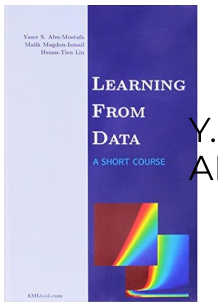
Course Readings

Textbook

C.M. Bishop, *Pattern Recognition and Machine Learning*, Springer, N.Y., 2006.

PDF file of the book

A very good reference



Y.S. Abu-Mostafa, M. Magdon-Ismail, H.-T. Lin, *Learning from Data*, AML Book, 2012.

Course Contents

Module	Lecture Topics
0	Getting Started -Introduction
1	Elements of the classification problem
2	Optimal decision rule
3	The learning problem
4	Supervised learning and the plug-in classifier
5	Performance measures of supervised learning
6	Linear classifiers
7	Data frames and visualization
8	Artificial neural networks
9	Support vector machines
10	Nearest neighbor classifiers
11	Decision trees
12	Unsupervised learning and projection methods
13	Clustering methods and performance measures
14	K means clustering
15	Agglomerative clustering
16	DBSCAN clustering
17	Synthesis

Requirements for completing the programming

assignments

This course requires that you complete assignments that involve computer implementation of pattern recognition algorithms. These assignments must be completed using the Python 3.0 (or above) programming language. As such, you must be proficient in the Python programming language and, at a minimum, the numpy library. You must be proficient in using a text editor or an integrated development environment to write the code.

You may work on campus in the Oliver Hall Swamp Lab, or you may do your work on your own computer, or you may do the work in a cloud development environment of your choice. You may work in any operating system, viz. Windows, Mac OS, or Linux. In the system of your choice, it is required that

1. you are proficient in file manipulation, file directory set up
2. you have access to a text editor or an integrated development environment
3. you have access to Python >3.0 and the latest stable version of numpy
4. you have access and the ability to, or access to help to, install additional libraries, including scikit-learn, matplotlib, and pandas

Course Requirements and Rubrics

Assignments:

All assignments must be submitted as technical reports or essays. Code fragments may be included in the report to illustrate solution steps. The complete code must be attached as an appendix. Including only the code listing will not earn full credit for an assignment.

Rubrics:

For each assignment:

- Correctness of solution as supported by derivations or obtained results: 50%
- Description of solution approach, method, results: 35%
- Discussion of findings and results: 15%

Discussion Posts:

In each module, there may be a discussion forum as an assignment. Participation is expected and will be graded. Note that in each module there is a separate Q&A discussion forum for students to ask questions about that module's material and assignment. A posting to that forum is not required and is not graded.

Rubrics:

Each post assignment is graded on (i) idea development and (ii) presentation and organization. Each criterion is graded from 1 point to 3 points, so that the maximum number of points for an original post is 6 points. Follow-ups and replies are graded similarly. The assignment score is the average of those for the original post and follow-ups or replies.
The points are assigned as follows:

- Idea development
  - [Developing: 1 point] Minimal idea development with limited or unrelated details.
  - [Satisfactory: 2 points] Supported by elaborated and relevant details.
  - [Exemplary: 3 points] Focused and supported by engaging or pertinent details; evidence of reflection and insight.
- Presentation and organization
  - [Developing: 1 point] Weak organization. Incorrect or ineffective language.
  - [Satisfactory: 2 points] Logical organization. Acceptable and effective language.
  - [Exemplary: 3 points] Careful organization. Precise terms and language.

Forums in Moodle

This course will make use of several types of Moodle Forums:
Announcements Forum: This is a forum space for news, **announcements**, and other important course updates from your instructor or coach. Please note that students cannot initiate a post to this forum or reply to the **announcements** to this forum.

Ask A Question Forum: If you have a question about the course, please post that as a discussion topic in the **Ask a Question** forum. All course questions will be addressed there for transparency and the benefit of all students. Please reserve email to your instructor and coach for questions ONLY regarding your personal grades, performance, or other issues that need to be addressed privately. Do not post private or grade-related information in the **Ask a Question** forum.

Posting of Grades & Feedback

Instructor's response time and feedback on assignments is typically within 14 days after due date. Responses to inquiries are typically within 48 hours on work days.

Grading and Evaluation

Grade Distribution:

Discussion Posts: 6 points each (10 total=60 points)

Assignments:

30 points each (11 total = 330 points)

Total= 390 points

Grading Scale:

In determining the final course grade, the following scale is used:

90-100% = A
80-89% = B
70-79% = C
60-69% = D
0-59% = F

Course Policies

Participation Policies:

Participation in the discussion forums (whether graded or not) and peer reviews are expected.

Late Submission Policies:

Due dates are listed on assignments. If you need an exception, please contact the instructor as soon as possible.

Course Communication Guides:

Official University Conduct-Related Correspondence University email is the University of Louisiana at Lafayette's primary means of communication with students. Students are responsible for all communication delivered to their University email address. Students are also responsible for all **announcements** of this course posted through the Moodle page.

Code of Student Conduct:

The Code of Student Conduct is designed to enhance and uphold the purposes, goals, and processes of this University. It is understood that all students should be knowledgeable of and abide by the Code of Student Conduct. The Code of Student Conduct may be applied to behavior conducted online, via email or other electronic media. The Code of Student Conduct can be found online at **https://studentrights.louisiana.edu/student-conduct/code-conduct**. For more information, contact the Office of Student Rights and Responsibilities at 482-6373 or **srr@louisiana.edu.**

Citation and References:

Please cite all work using your choice of either IEEE or ACM Style. Google Scholar has an easy tool for copying citations or if you are unfamiliar with citation guides and formats.

Academic Honesty:

The University holds that all work for which a student will receive a grade or credit shall be an original contribution or shall be properly documented to indicate sources. Abrogation of this principle entails dishonesty, defeats the purpose of instruction, and undermines the high goals of the University. Cheating in any form will not be tolerated. Students shall be assumed to know the acceptable methods and techniques for proper documentation of sources and to avoid cheating and plagiarism in all work submitted for credit, whether prepared in or out of class.

Cheating, in the context of academic matters, is the term broadly used to describe all acts of dishonesty committed in taking tests or examinations and in preparing assignments. Cheating includes but is not limited to such practices as gaining help from another person or using unauthorized notes when taking a test, relying on a calculator if such an aid has been forbidden, and preparing an assignment in consultation with another person when the instructor expects the work to be done independently. In other words, cheating occurs when a student makes use of any unauthorized aids or materials. Furthermore, any student who provides unauthorized assistance in academic work is also guilty of cheating.

Plagiarism is a specific type of cheating. It occurs when a student claims originality for the ideas or words of another person, when the student presents as a new and original idea or product anything which in fact is derived from an existing work, or when the student makes use of any work or production already created by someone else without giving credit to the source. In short, plagiarism is the use of unacknowledged materials in the preparation of assignments. The student must take care to avoid plagiarism in research or term papers, musical compositions, science reports, laboratory experiments, and theses and dissertations.

The University considers both cheating and plagiarism serious offenses. The minimum penalty for a student responsible of either dishonest act is a grade of “zero” for the assignment in question. The maximum penalty is dismissal from the University. The complete policy may be found in the UL Lafayette Undergraduate and Graduate Academic Catalog. Please go to **https://catalog.louisiana.edu/**, click Policies from the menu in the left column, and click Academic Honesty under Rules & Regulations list.

Disability Accommodations:

Students needing academic accommodations for a disability must first be registered with the Office of Disability Services (ODS) to verify the disability and to establish eligibility for accommodations. Students may call 337-482-5252 to register with ODS. Once registered, students should then schedule an appointment with the professor to make appropriate arrangements. At the beginning of every semester, students are required to contact ODS to update your information, and ODS will print accommodations letters for the students.

Students can also visit the **ODS website** for Student Information on ODS services and on eligibility requirements.

Course Evaluation - Student Evaluation of Instruction (SEIs)

Student Evaluation of Instruction (SEI) is one of the University's most important means of improving the quality of instruction at the University. The results have a direct impact on faculty, on teaching and on students. Towards the end of each semester, all students will receive an email from the Office of Academic Affairs announcing when the evaluation period of each course is open. The email will provide instructions on how to access the online course evaluations and the time of the closing period. Students are encouraged to complete all evaluations as soon as possible.

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◄ Ask a Question

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Data retention summary
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