

COMPSCI 589 – MACHINE LEARNING SYLLABUS

Spring 2022

Instructor:	Bruno Castro da Silva	Time:	Tue & Thur (10:00 – 11:15)
Email:	bsilva@cs.umass.edu	Place:	Morrill Sci. Ctr. II, Rm 131

1 About the course

This course will introduce core machine learning models and algorithms for classification, regression, clustering, and dimensionality reduction. On the theory side, the course will cover the mathematical foundations underlying the most commonly-used machine learning algorithms. It will focus on understanding models and the relationships between them. On the applied side, the course will focus on effectively using machine learning methods to solve real-world problems with an emphasis on model selection, regularization, design of experiments, and presentation and interpretation of results. The course will have assignments that involve both mathematical problems and implementation tasks.

Broad topics covered in this course will include classification algorithms in general, decision trees, random forests, probabilistic models, Naive Bayes methods, various ensemble meta-algorithms (such as bagging and boosting), gradient-based techniques, linear regression, logistic regression, neural networks, convolutional neural networks and deep learning, unsupervised learning and clustering algorithms, k-means, hierarchical clustering, and dimensionality reduction techniques.

2 Website

You will find homework assignments, slides, and other material on [Moodle](#). This course's syllabus is also hosted [here](#).

3 Class

Classes will be held on Tuesdays and Thursdays from 10:00 to 11:15am in Morrill Sci. Ctr. (II), Rm 131.

4 Textbooks

The course has no mandatory textbook. However, you may find the following (freely available) books helpful:

- [Machine Learning: a Probabilistic Perspective](#), by Kevin Patrick Murphy.
- [The Elements of Statistical Learning](#), by Hastie, Tibshirani and Friedman.
- [An Introduction to Statistical Learning](#), by James, Witten, Hastie and Tibshirani.

Although these books are a fantastic introduction to machine learning (and I encourage purchasing a copy if you plan to investigate machine learning topics in depth), owning them is *not* a requirement.

5 Required background

While this course has an applied focus, it still requires appropriate mathematical background in probability and statistics, multivariate calculus, linear algebra, and programming. The official prerequisites for undergraduate students can be found [here](#). Graduate students can check the descriptions for these courses to verify that they have sufficient mathematical background for COMPSCI 589. The following references can provide a useful review:

- [Probability Theory](#)
- [Linear Algebra and Matrix Calculus](#)
- [Matrix Cookbook](#)
- Optimization: Any calculus textbook.

6 Attendance policy

Please make every effort to attend and actively participate in each class meeting. However, you are free to choose not to attend “regular” class meetings (i.e., classes where no assignments or exams are given) if the circumstances warrant. We do understand that all students are capable of autonomously deciding how to best allocate their time. *However, notice that you are responsible for classes you miss.* In the event that you miss class, it is your responsibility to obtain the missed notes from a classmate and for picking up any handouts distributed in class by the instructor. The instructor will not provide class notes or condense the entire contents of a missed class period in an e-mail message or a five-minute summary. *Important: please see Section 12 of this document for more details on this course’s late policy regarding late homework submissions and missed exams.*

7 Teaching Assistants

The teaching assistants (TAs) this semester will be:

- Iman Deznabi (ideznabi@umass.edu)
- Samer Nashed (snashed@cs.umass.edu)
- Eddie Cunningham (edmondcunnin@umass.edu)
- Ankita Rajaram Naik (arnaik@umass.edu)

8 Office Hours

Office hours will be held according to the following schedule ([starting on 01/31](#) and except on holidays):

	Monday	Tuesday	Wednesday	Thursday	Friday
9am–10:30am					Bruno (in person)
11am–1pm	Eddie (in person)				
12pm–2pm		Iman (in person)		Ankita (in person)	
1:30pm–3:30pm			Samer (in person)		
2pm–3pm		Eddie (remote)		Ankita (remote)	
4pm–5pm		Iman (remote)			
5pm–6pm	Samer (remote)				

If one of the TA's or the instructor needs to reschedule their office hours, an official announcement will be made on Moodle.

Office Hours – Locations:

- TA's in-person office hours: LGRT T223/T225.
- Remote office hours: on [Zoom](#).
- Prof. da Silva's office hours will be held in his office, room 278 of the Computer Science building.

9 Grading

Your grade will have three components:

1. **Homework Assignments (55%)**: There will be frequent homework assignments, both written and programming. All assignments will have an equal weight.
2. **Midterm exam (30%)**.
3. **Project (15%)**: Given the wide range of possible real-life applications of machine learning, it is critical that we study how to implement, fine-tune, and deploy these algorithms in practice. Further details will be available when the project is assigned, after the most relevant course material has been covered.

A cumulative grade in [90% – 100%] will be an A- or A, [75%, 90%) will be a B-, B, or B+, [65%, 75%) will be a C-, C, or C+, and [55% – 65%) will be a D or D+. Course grades will be curved only in students' favor (that is, these thresholds may be lowered, but a grade of 90% will not be lower than an A-). **Some extra credit opportunities may be given. Your grade may be reduced by any amount at the instructor's discretion due to inappropriate behavior, such as academic dishonesty.**

10 Re-grading policy

Errors in grading of assignments and exams can occur despite the best efforts of the course staff. If you believe you've found a grading error, complete an online re-grade request form via Gradescope. Re-grade requests must be submitted no later than one week after the assignment is returned. Note that re-grading may result in your original grade increasing or decreasing as appropriate.

11 Pass/Fail & SAT/Fail

- If you are an undergraduate student, Pass/Fail is requested through the university.
- If you are a graduate student, at some time near the end of the semester (likely around the last day of class), you will be given the option to take the class SAT/Fail rather than for a letter grade. If you plan to take the course SAT/Fail, keep an eye out for an email (or a message on Moodle) from me around the end of the semester with instructions for requesting SAT/Fail. If you elect SAT/Fail, you will earn a SAT grade if your letter grade would have been a C or higher, and you will receive an F if your letter grade would have been lower.
- The above conditions *do not* hold for students with an academic honesty violation. In these cases, the requests described in this section are disallowed and/or un-approved.

12 Late Policy

- To allow some flexibility to complete assignments (*homeworks*) given other constraints, you have a total of seven free late days. You will be charged one late day for handing in an assignment within 24 hours after it is due, two late days for handing in an assignment within 48 hours after it is due, etc. Your assignment is considered late if either the written or code portions are submitted late. The late homework clock stops when both the written and code portions are submitted. After you have used up your late days, late homework will not count for credit except in special circumstances (i.e., illness documented by a doctor's note). *If you do not hand in an assignment at all, this will count as using all seven late days.*
- All exams must be taken at the scheduled time unless (1) there is a documented conflict and arrangements have been made with the instructor before the exam; or (2) you have a medical emergency and you bring proof of such to the instructor before final grades for the given exam are computed. In any other case (unless those covered by the [University's Academic Regulations](#)), missing an exam will result in a grade of "F" for that exam.

13 Disability Services

The University of Massachusetts is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with [Disability Services](#), you may be eligible for academic accommodations to help you succeed in this course. If you would like to register with Disability Services, please visit their [website](#) or their office (161 Whitmore Administration Building; phone (413) 545-0892). Finally, if you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we can make appropriate arrangements.

14 Cheating

- Cheating will not be tolerated. Assignments may include instructions about what forms of collaboration are allowed, if/when relevant.
- Copying answers or code from external sources (books, web pages, etc.), from other students, or from solutions to assignments from previous years is *always* considered cheating. To emphasize: no detectable copying is acceptable, even, e.g., copying a single sentence from an outside source. Sharing your code or solutions with other students is also considered cheating.
- The College of Information and Computer Sciences explicitly forbids any redistribution (including publicly available posting on an internet site) of any CICS course materials (including student solutions

to course assignments, projects, exams, etc.) without the express written consent of the instructor of the course from which the materials come. Violations of this policy will be deemed instances of “facilitating dishonesty” (since a student making use of such materials would be guilty of plagiarism) and therefore may result in charges under the [Academic Honesty Policy](#).

- Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent.
- **All instances of cheating will be reported to the university’s Academic Honesty Board.** Any detected cheating will result either *(i)* in a grade of -100% on the assignment for all students involved (negative credit); or *(ii)* a grade of F in the course. The instructor will decide at their discretion which of these possible resolutions is more appropriate.

15 COVID-19 and Face Covering Policy

Students and course staff in COMPSCI 589 are expected to do their part to slow the spread of COVID-19 and minimize risk of illness for all community members. It is important to remember that community members may be vulnerable or live with vulnerable individuals.

Students and course staff in COMPSCI 589 must comply with all [university policies](#) regarding COVID-19, including self-isolating (don’t come to class) if you test positive, have COVID-19 symptoms, or are in contact with someone who tests positive and meet the criteria for self-isolation (see [FAQs](#)). If you are in any doubt, please do not come to class—you can request an excused absence from any course meeting by sending the instructor an email; you will not be penalized for any missed quizzes, discussion exercises, etc.

As of the start of the Spring 2022 semester, everyone must wear a high-grade mask (such as KN95, KF94, or N95) to all indoor course meetings, including lectures, discussion sections, exams, and office hours. For more details, see the [face covering FAQ for the start of the Spring 2022 semester](#). The only exceptions to the face-covering policy are:

- Employees who receive a medical exemption through the Accessible Workplace Office (see [face-covering FAQ](#)).
- Students who receive a medical exemption through the Disability Services Office (see [face-covering FAQ](#)). If you have a valid medical exemption, you must notify the instructors and present documentation prior to attending a meeting without a face covering.

If a student in COMPSCI 589 does not comply with public health protocols (e.g. does not wear a mask), the course staff will first remind them of the protocols and their importance, and ask them to comply.

If a student refuses to wear a mask and does not comply after you have reminded them, the staff will ask them to leave the classroom. The instructor will then submit a referral to the [Student Conduct and Community Standards Office](#) (SCCS) in the Dean of Students Office. The SCCS will follow up with the student as appropriate and according to policies outlined in the Classroom Civility and Respect policy as well as the Code of Student Conduct. If a student refuses to leave the classroom, the course staff may elect to end the course meeting to allow other students and staff to leave, and then resume the course meeting on Zoom after a short delay (if logistics permit).