CSC 322 - Machine Learning

Fall 2019

College Center 228, MW 13:00 – 14:15

Instructor:	Dr. J. Timothy Balint	**Telephone:**	508-565-1376
Email:	jbalint@stonehill.edu	**Office:**	College Center 226A

Office Hours: Tuesday 13:30-15:30, Friday 13:30-15:30 or by appointment. You can also post questions to eLearn or send questions by email.

Main Reference:

- Shai Ben-David and Shai Shalev-Shwartz *Understanding Machine Learning: From Theory to Algorithms*, ISBN-13: 978-1107057135
- Other papers will be assigned during the semester. You will access those through eLearn.

Course Description (from catalog): The algorithms that enable computers to learn from experience. Supervised and unsupervised learning. Learning from Networks. Machine learning from big data.

Objectives: This course will introduce the theory and concepts related to supervised and unsupervised learning. You will gain a hands-on approach to the most popular techniques for machine classification, regression, and generation. Finally, you will apply this knowledge to a large scale project of your choosing.

Prerequisites: Undergraduate level CSC 211 Minimum Grade of D

Tentative Course Outline:

1. What is machine learning - PAC Learning
2. Linear Predictors and Regression
3. The Bias-complexity trade-off and Validation
4. Boosting Predictors and VC dimension
5. MDL, SRM, Nonuniform learnability, and KNN
6. Unsupervised Learning
7. Multi-class classification and ranking
8. Dimensionality Reduction
9. Generative Models
10. Convex Learning
11. Support Vector Machines
12. Neural Networks and Deep Learning
13. Deep Generation
14. Reinforcement Learning

Grade	Definition	Quality Points per Credit Hour	Range
A	**Excellent**, work that is of the highest standard, showing distinction	4.00	100-94
A-		3.70	93-90
B+	**Good**, work that is of high quality	3.30	89-87
B		3.00	86-83
B-	**Satisfactory**, work that fulfills requirements in quality and quantity and meets acceptable standard for graduation	2.70	82-80
C+		2.30	79-77
C		2.00	76-73
C-	**Passing**, work that falls below graduation standard, yet is deserving of credit.	1.70	72-70
D+		1.30	69-67
D		1.00	66-60
F	**Failure**, work undeserving of credit	0.00	59-0

Figure 1: Breakdown of Grading and Quality Points

Grading Policy: Class Participation (10%), Homework (50%), Midterm (15%), Final Project (25%).

Important Dates:

Midterm ..... October 11^{th}, 2019
Project Proposal Deadline ..... November 7^{th}, 2019
Project Deadline ..... December 9^{th} 2019
Project Presentation .. December 18^{th} 2019, 13:30-15:30

Course Policy:

- Make sure that you are enrolled in eLearn
- All assignments will be submitted through eLearn
- Unless stated through eLearn, late assignments will not be accepted
- Regular attendance is essential and expected

Final Project: In this course, you will propose and develop a final project based on a topic that is interesting to you. These will most likely fall into one of two categories: either an *application based project*, in which you will find or develop a corpora and determine how to apply machine learning techniques to it, or an *Algorithmic Project*. An algorithmic project consists of taking a well known corpora and developing novel techniques to improve the ability of the corpora's end goal. This idea was taken from http://cs229.stanford.edu/projects.html, and I encourage you to look at their past projects for ideas. You can explore ideas as soon as class begins, but you are expected to submit a written project proposal no later than the project proposal deadline. All projects will require approval by me for their intellectual merit.

Academic Honor Code and Integrity Policy: You are to adhere to the Stonehill Academic Honor Code and Academic Integrity Policy found in the 2018-2019 HillBook under Academic Policies and Procedures and to the Computer Science Department Statement on Academic Integrity:

- http://web.stonehill.edu/compsci/StatementOnAcademicIntegrity.html

In this course you are to do and to submit your own work, you may work in teams only as specifically directed by me. When in doubt, always verify with me if something is being done properly or is allowable in this class rather than simply make an assumption based on the fact that it was or is currently allowable in another class. A violation of Stonehill's Academic Integrity Policy will be dealt with appropriately.

Resources for Academic Support: The Center for Writing and Academic Achievement (CWAA) provides academic support services in a welcoming, professional environment that emphasizes collaborative learning and peer tutoring, supplemented with professional-level support. The CWAA offers a variety of academic support services, including peer tutoring in writing, math, and foreign languages.

The CWAA is located in MacPhidn Library, Room 314. Drop-in hours are offered Sunday Thursday. Students can visit the CWAA website to view schedules, make appointments, or request a tutor.

Students with Disabilities: Stonehill College is committed to providing a welcoming, supportive and inclusive environment for students with disabilities. The Office of Accessibility Resources (OAR) provides a point of coordination, resources and support for students with disabilities and the campus community. If you anticipate or experience physical or academic barriers based on disability, please let me know so that we can discuss options. You are also welcome to contact OAR to begin this conversation or to establish reasonable accommodations for this or other courses. OAR is located within the Academic Services & Advising Suite in Duffy 104. For additional information please call (508) 565-1306 or email accessibility-resources@stonehill.edu.

Inclusive Classroom Statement: Stonehill College embraces the diversity of students, faculty, and staff, honors the inherent dignity of each individual, and welcomes their unique cultural and religious experiences, beliefs, and perspectives. We all benefit from a diverse living and learning environment, and the sharing of differences in ideas, experiences, and beliefs help us shape our own perspectives. Course content and campus discussions will heighten your awareness to these differences.

There are many resources for anyone seeking support or with questions about diversity and inclusion at Stonehill. Resources are infused throughout the Mission Division, Academic Affairs, and Student Affairs. If youd like more information on how to get connected to resources, the Office of Intercultural Affairs is a good first stop: Location: Duffy 149, Phone: 508-565-1409, Email: diversity@stonehill.edu.

If you are a witness to or experience an act of bias at Stonehill, you may submit a bias incident report online or on the Stonehill App. If you would like to learn more on bias incident prevention and response, or submit a report please visit:

- http://www.stonehill.edu/offices-services/intercultural-affairs/bias-response-protocol/

Cell Phone Policy: Each cell phone is to be turned to silent mode during class time and remain out of sight throughout the entire duration of the class. During exam periods each cell phone must be in silent mode and remain visible with the screen side down on the desk. Absolutely no use of the cell phone (i.e., checking its screen) is permitted from the time an exam is handed out until it has been turned in to be graded.