



BA810: Supervised Machine Learning

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HAR639A or [Zoom](#).

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Email Hazel to arrange if you need to meet in person.

COURSE DESCRIPTION & LEARNING GOALS

This course will teach students how to perform hands-on analytics on real-world datasets using modern machine learning techniques through series a lectures and in-class exercises. Students will analyze data using Python programming language, derive actionable recommendation from data, and present their findings. The goal of the course is to create an understanding of popular predictive modeling techniques, and the types of problems they can be applied to.

PREREQUISITES

- MSBA Python and Statistics bootcamp
- BA775

COURSE STRUCTURE & PEDAGOGY

The general structure of each class will be as follows:

- Lecture and discussion (first half of class) – every lecture will start with a recap of the previous lecture; if you have questions from the prior lecture (or any other prior material), this is a great time to bring them up
- Short break
- Lab, coding session, discussion, Q&A (second half of class)

The lab part of each class will be devoted to applying lecture concepts to real-world datasets using Python. If you complete the daily lab assignment early, you can any remaining time to make progress on your team project.

You must bring your laptop to each class: they are necessary to do the lab exercises.

DIVERSITY AND INCLUSIONS STATEMENT

In developing this course, I have aimed to be thoughtful about how identity and culture impact the course content. I invite you to share your personal experiences and perspective related to the course content. If there are topics or conversations that you feel would benefit from incorporation of social

context, a differing perspective, or Questrom's Office of Diversity & Inclusion, please inform me and I will explore resources and opportunities for us to engage a wide variety of perspectives in our classroom.

COURSE MATERIALS

- *Textbook*: "An Introduction to Statistical Learning" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani. The textbook is available for free from the authors' website: https://hastie.su.domains/ISLR2/ISLRv2_website.pdf . We will not cover the entire book. See the table of contents on Blackboard where I have highlighted the chapters you need to read.
- *Recommended*: "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow." (2022, 3e) by Géron, A. This book emphasizes the practical side of machine learning. Only "Part I. The Fundamentals of Machine Learning" is relevant for this course.

Software

We'll use Google Colab to write our code and analyze data. Review the [Overview of Colaboratory Features](#) before the first class.

COURSE POLICIES

Attendance

Attendance is mandatory except as permitted by the [Boston University rules](#). Unexcused absences will hurt your participation grade.

Accommodations for Students with Special Needs

In keeping with university policy, any student with a disability who needs or thinks they need academic accommodations must call the Office of Disability Services at 353-3658 or stop by 19 Deerfield Street to arrange a confidential appointment with a Disability Services staff member. Accommodation letters must be delivered to me in a timely fashion (within two weeks of the date on the letter and not later than two weeks before any major examination). Please note that accommodations will not be made absent an official letter of accommodation.

Mental Health and Wellness

Life at college can get complicated and it is easy to feel overwhelmed, lost, anxious, or depressed. If you find yourself struggling with your mental or physical health this semester, please feel free to approach me. I will try to be flexible and accommodating, within reason. But I am not a professional therapist and there is no shame in getting help. Help for managing stress and your mental wellbeing can be found at Student Health Services. There you can find short term therapy, groups and workshops, 24/7 on-call service (617-353-3569), referrals, and more resources. If you are feeling stressed and having trouble making choices around alcohol consumption the Collegiate Recovery Program may offer help.

Financial Insecurity

We learn as whole people. It can be challenging to do your best in school when you are worried about meeting basic needs like safe shelter, sleep, and nutrition. If financial insecurity is an obstacle to

learning for you I urge you to contact Terrier Meal Share, Boston University Financial Assistance, or the Dean of Students Office.

Academic Integrity

My goal is to create a community in BA810 where you will feel invested and included. The importance of honesty and integrity in this learning community cannot be overemphasized. Every member of the Boston University Questrom School of Business is responsible for creating an ethical environment; I will do my best every day to create that in our class, but it can't happen without your commitment too. I expect you to abide by the Academic Conduct Code. It is easy to do: follow all assignment and exam rules. If you have a question about the rules of an assignment, (can I collaborate on this assignment? Can I use my phone to check the time during an exam?) ask me.

Any student caught cheating or submitting work that is not their own will receive a failing grade for the assignment and/or the course and be referred to the Academic Committee for investigation which may result in removal from the program. They most likely will be ashamed of themselves and embarrassed for their lapse in judgment for years to come.

Please see [BU's Academic Conduct Code](#) for more information. And always remember: if you have questions or concerns about an assignment, deadline, reading, exam, or anything related, just ask me.

Classroom Conduct

- **Professionalism:** Students are expected to follow the [Boston University's Student Codes of Conduct](#). They are expected to conduct with a sense of respect and professionalism and can expect the same treatment. A part of the training is learning what is expected in a workplace, and we try to enforce those standards throughout the program.
- **Punctuality:** Students are expected to arrive at the classes and scheduled meetings on time.
- **Name Tents:** Students are expected to keep the name tents in front of them during the class. This helps peers and faculty know them faster.
- **Participation:** Students are expected and strongly encouraged to ask questions and get involved in class discussions. This helps everyone get more out of the class.
- **Cell Phone:** Students cannot use their cell phone during class or exams unless specifically instructed. If you need to take an urgent call, simply leave the classroom, and return as soon as possible.
- **Activities Unrelated to Class:** Activities that are unrelated to the class are not allowed during the class. These include, but are not limited to, using social media, news sites, online video sites, gaming, checking/writing emails, unless asked by the instructor for the purpose of the class.
- **Absence Policy** - If you need to miss a class, notify your instructor before the class.

Sexual Misconduct/Title IX Policy

The Questrom School of Business is committed to fostering a safe learning environment for all members of the its community and preventing sexual misconduct. All forms of sexual misconduct, including rape, acquaintance rape, sexual assault, domestic and dating violence, stalking, and sexual harassment are violations of Boston University's policies, whether they happen on campus or off campus. Title IX of the Education Amendments of 1972 is a federal civil rights law that prohibits sex-based discrimination in federally funded education programs and activities. This law makes it clear

that violence and harassment based on sex and gender is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. If you or someone you know has been harassed or assaulted, you can find the appropriate resources at <http://www.bu.edu/safety/sexual-misconduct/>.

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I also have a mandatory reporting responsibility in my role as a faculty member. It is my goal that you feel able to share information related to your life experiences in this class. I will seek to keep the information you share private to the greatest extent possible. However, I am required to share information regarding sexual misconduct with the University. Students may speak to someone confidentially by contacting the Sexual Assault Response & Prevention Center.

Class Recording Policy

All class sessions will be recorded for the benefit of registered students. Recorded sessions will be made available to registered students ONLY via their password-protected course accounts. Students may not share such sessions with anyone not registered in the course and may certainly not repost them in a public platform. Students have the right to opt-out of being part of the class recording. Please contact me to discuss options for attending the course in such cases.

COURSE DELIVERABLES AND GRADING

You will be graded according to the following criterion:

Class participation:	5%
In-class quizzes:	5%
Individual assignments: $2 \times 15\% =$	30%
Team project: 5% (proposal) + 25% (final) =	30%
Final Exam:	30%
Total:	100%

Class Participation

Satisfactory class contributions require attending every session, preparing all materials for every session; and active, quality participation in class discussions. Simply attending class, however, does not constitute a positive contribution to class and will not yield high class contribution scores. I may call upon any student to answer questions during class. Please bring your name tent card to class so that I can accurately assign participation points.

In-class Quizzes

In some classes we will take short online quizzes on recently discussed topics. These will be available *only during the class*. We will drop the lowest among these to allow one bad day.

Individual Assignment

The homework assignments need to be completed individually and submitted through blackboard by 11pm on the day they are due. It is OK to ask your classmates for help, but you must disclose them (no penalty). It is not OK to copy someone else's code into submission. All code and answers that you submit must be produced by you.

Team Project

You will work on projects in teams of four students. You will select teams during the first class. I will assign anyone unassigned at the end of first class to a team.

The project involves acquiring a dataset, performing a descriptive analysis on the dataset, and formulating & solving a prediction problem. There are two key steps. First, present your project proposal in class. Ultimately it is up to the instructor to approve the project and make recommendations. On the last day of class (prior to the final exam), you will present your project to the instructor and your classmates. This will consist of a 15-minute presentation where you will present your key findings, and 3-4 minutes Q&A.

Please see the “BA810: Team Project” document on the course site for important details.

Exam

The final exam will be open book and open notes. It’ll consist of small coding and short answer questions.

Grade Distribution

Keeping with the voluntary grade distribution guidelines for MSBA core courses:

- Up to 40% of grades in the class will be in the A or A- range
- Grades below A- will be assigned as earned

If you have any questions about grades that you receive on assignments, raise them within two weeks of receiving your grade on that assignment. Unless we have made computational errors, we will be unable to alter grades after final grades have been determined. If you have grade-related considerations that you think are important, please raise these with me as early as possible (during the first half of the semester at the latest!), so that I can help you approach the course in a way that will maximize your performance.

COURSE SCHEDULE*

#	Date	Topics; Readings	Deliverable
1	Mon, Oct 24, 2022	Intro, types of ML problems, bias-variance, evaluation ISL 2.1, 2.2	Team composition
2	Wed, Oct 26, 2022	Regression ISL 3.1, 3.2	
3	Mon, Oct 31, 2022	Cross validation, Regularization, end-to-end example ISL 5.1, 6.2	
4	Wed, Nov 2, 2022	Classification, evaluation metrics ISL 4.1, 4.2, 4.3	HW1
5	Mon, Nov 7, 2022	Proposal presentation	Proposal slides
6	Wed, Nov 9, 2022	Model selection and tuning, Bootstrap ISL 5.2	
7	Mon, Nov 14, 2022	Prediction using high dimensional data ISL 6.1, 6.3, 6.4	HW2
8	Wed, Nov 16, 2022	Support Vector Machines and kernels ISL 9.1, 9.2, 9.3	
9	Mon, Nov 21, 2022	Decision Trees ISL 8.1	
10	Mon, Nov 28, 2022	Ensembles ISL 8.2	Slides and notebook
11	Wed, Nov 30, 2022	Survival analysis ISL 11.1, 11.2, 11.5	
12	Mon, Dec 5, 2022	Miscellanea (semi supervised learning, probability calibration, managing imbalanced data) and wrap up	
13	Wed, Dec 7, 2022	Final Presentation	Slides and notebook
14	Mon, Dec 12, 2022	Exam	

Note: The lab sessions will use scikit-learn and other related python packages.

* The schedule is tentative.