BA865: Advanced Topics (Introduction to Neural Networks)
Spring 2022

Instructional Staff

Instructor: Gordon Burtch

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Office Hours: Wednesdays via Zoom, 2-3pm (or by appointment)
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Course Description & Objectives

This course will introduce you to neural networks using the Python programming language in Keras. The course will focus on the theory of Neural Networks and Deep Learning concepts and implementation in Keras. The material will be presented through a combination of lecture slides interactive python notebooks (Google Colab).

Course Meeting Times & Location

Section A1:   Tuesdays & Thursdays: 8:00am – 10:45am; HAR 224
Section B1:   Tuesdays & Thursdays: 12:30pm – 3:15pm; HAR 316

Course assignments and announcements will be posted to the course Blackboard site. Assignments are to be submitted via Blackboard. An up-to-date course schedule can also be viewed on Blackboard: https://learn.bu.edu/ultra/courses/_81952_1/outline

Course Materials & Readings

Textbook: This course has one required text. We will closely follow the material in the latest release of François Chollet's Deep Learning with Python. The book is available in both digital and physical formats from the publisher, Manning (or from Amazon).

- Chollet, François. (2021). *Deep Learning with Python (2nd Edition).* Manning Publications Co. **ISBN-13: 978-1617296864.** https://www.manning.com/books/deep-learning-with-python-second-edition

Grading Distribution & Scale

(1) Homework 1	25%.
(2) Homework 2	25%
(3) Final Project	50%.
Total:	100%.

Homework: There are two HW assignments (I reserve the right to change this depending on how the class progresses), collectively worth 50% of your final grade. These assignments may be completed individually *or in pairs*. You may discuss with others outside of your pair but **cannot copy/share code or collaborate with other pairs of students**. Assignments are due by 11:59pm on the due date (unless I say otherwise). Late assignments will not be accepted.

Final Project: The final project is worth 50% of your grade and is intended to evaluate / allow you to demonstrate your practical understanding of the course material. You will work on this project in groups of 4 students (your choice).

Pick a real-world topic that interests you and is relevant to your career (e.g., addressing a business problem, or a domain that is simply of interest to you), where *neural network-based predictions can be applied to add real value* (text-, time series- or image-based problem domains are your best bet to keep this interesting). Conduct in-depth research on the topic, and meet a few milestones along the way:

- Submit a 1-page proposal to outline the topic of your choice (5%). You have the first 2 weeks to complete this deliverable.
- Attend a mid-point check-in with me to keep you on track (5%). Schedule a 15-min Zoom call with me during the week of Feb 8th / 10th.
- Submit a final deliverable that summarizes everything you have learned / completed on the topic – this will just by a Jupyter Notebook with in-line text walking me through your project solution (25%).
- Deliver a 10-minute presentation, in class, during the final week (15%)

Make this project useful for YOU. By the end of this assignment, ideally, you should have become a decent expert on the topic, and the report you produce should be readily convertible into a high-quality blog post, e.g., on Medium.

Course Guidelines & Academic Policies

Attendance: I expect all students to attend each class and to actively participate in class discussions and exercises. I try to foster an informal, hands-on approach to learning. Much of what will be presented and discussed in class will be available only, or primarily, in class.

Online Submissions: All homework assignments will require online submission via the course Blackboard page. Online submission provides several advantages to the course staff and students, including date/time stamps and confirmation/verification of your submission. If you are not familiar with the online submission process, please plan to make your first few submissions early, so that you can address any issues. For a variety of reasons, you should not email assignments to the instructor or TA unless specifically requested to do so.

Grading Appeals: If you disagree with any assignment score for a specific item, you should feel free to discuss or get feedback from the teaching assistant or myself about the question. Note that any grading check request must be raised within 1 week of the grade's posting. Late requests to review a score will not receive attention.

Academic Misconduct / Individual Work: The university's policies on academic integrity govern the class. These policies are available at: http://questromworld.bu.edu/acc/. Any clear evidence of an honor code violation on an assignment, project, or test will be brought to the Academic Conduct Committee. The Boston University Questrom School of Business defines academic misconduct as

"Conduct by which a student misrepresents his or her academic accomplishments or impedes other students' chances of being judged fairly for their academic work."

This includes, but is not limited to, cheating on assignments or examinations, plagiarizing, i.e. misrepresenting as one's own work any work done by another, submitting the same project or substantially similar projects, to meet the requirements of more than one course without the approval and consent of the instructors concerned, or sabotaging another's work. Students found guilty of academic misconduct face penalties ranging from lowering of the course grade to suspension from the University.

Accommodations for Students with Disabilities: 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 without an official letter of accommodation.

Diversity and Inclusion Statement: In this course, I try 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 or a differing perspective, please let me know. I will explore resources and opportunities for us to engage a wide variety of perspectives in our classroom.

A Complete Schedule Follows on the Next Page

COURSE SCHEDULE
(*Subject to Revision Depending on Progress*)

Week	Date	Topic	Assignments	Readings
1	1/20 (Th)	**Course Logistics / Introduction**	--	Chapter 1
2	1/25 (Tu) 1/27 (Th)	**The Math Behind NNs** **Introduction to Keras and TensorFlow**	-- --	Chapter 2 Chapter 3
3	2/1 (Tu) 2/3 (Th)	**Neural Networks for Classification & Regression** **Model Tuning + Deep Dive on Keras**	HW1 Posted Project Proposal Due --	Chapter 4 Chapters 5 & 7
4	2/8 (Tu) 2/10 (Th)	**Mid-Point Project Check-in Meetings (via Zoom – Sign-up)**	-- HW1 Due	Chapter 6
5	2/15 (Tu) 2/17 (Th)	**Intro to CNNs** **Advanced CNNs**	HW2 Posted --	Chapter 8 Chapter 9
6	2/22 (Tu) 2/24 (Th)	*No Class* *No Class*	-- HW2 Due	
7	3/1 (Tu) 3/3 (Th)	**RNNs (Time Series)** **RNNs (Text)**	-- --	Chapter 10 Chapter 11
8	Spring Break			
9	3/15 (Tu) 3/17 (Th)	**Interpretable ML (SHAP)** *No Class*	-- (Project Video, Notebook and Slides Due)	