THE GEORGE WASHINGTON UNIVERSITY
School of Engineering and Applied Science
Online Programs Office

Syllabus for
SEAS 8520-DA2
Deep Learning and NLP
Summer 2024

Instructor: Walid Hassan
eMail: wnhassan@gwu.edu
Credit Hours: 3 credit hours
Course Website: On Blackboard
Class Time and Dates:

- Day and Time: Saturdays 1PM – 4PM (Eastern)
- All Class Meeting Dates: June 15, 22, 29, July 6, 14, 20, 27, August 3, 10, 17
- Attendance is normally expected at all sessions. If an absence from a class meeting is needed (due to family/medical or work-related emergency) students must contact the instructor in advance.
- Online classes are conducted via Zoom; Links are provided in Blackboard.
- Zoom link for Office Hours: https://gwu-edu.zoom.us/my/walid.hassan

Office Hours: For 3 hours every week I will be available for drop-in office hours, as follows:

- Every Wednesday 6PM-7:30PM EST
- Every Friday 6PM-7:30 PM EST

Bulletin Description of the Course:
Deep dive into deep learning fundamentals, spanning ANN, MLP, backpropagation, and essential algorithms, with a practical focus on TensorFlow and Keras applications. Advance through topics like CNNs,optimization, and hyperparameter tuning, NLP and LLMs, culminating in hands-on applications for image classification and sentiment analysis.

Course Learning Objectives:
Upon completing the course, students will know how to:

1. Understand the foundational principles and core concepts of Artificial Neural Networks (ANN), Multilayer Perceptrons (MLP), and essential deep learning algorithms.
2. Gain proficiency in implementing deep learning techniques using TensorFlow and Keras.
3. Delve into advanced areas of deep learning, including Convolutional Neural Networks (CNNs), Natural Language Processing (NLP), and optimization strategies.
4. Refine and apply deep learning models for tasks like image classification to solidify understanding and skills.
5. Refine and apply NLP LLM models for tasks like sentiment analysis and text prediction.

Required Textbook and Other Materials:

- Textbook: **Chollet, F. (2021). Deep Learning with Python, Second Edition (2nd ed.). Manning**
  The textbook is available at **https://wrlc-gwu.primo.exlibrisgroup.com/permalink/01WRLC_GWA/15suu1b/cdi_skillsoft_books24x7_bks000158142**
- Other Material: Google Colab

Average Amount of Out-of-Class or Independent Learning Expected per Week:

Over 10 weeks, students will spend 3 hours per week in lecture, 2.5 hours per week in Blackboard discussion, and 6 hours in two exams given outside class hours. Homework and other out-of-class work is estimated at around 6 hours per week.

Class Schedule and Assignments

Class	Topic/Activity	Assignment Due
1	Introduction to Deep Leaning and Artificial Neural Networks (ANN)	None
2	Multilayer Perceptrons (MLP) Architecture and Core Concepts	HW1: June 22, 9 AM Discussion 1: June 22, 9 AM
3	Optimization and Regularization Techniques in Deep Learning	HW2: June 29, 9 AM Discussion 2: June 29, 9 AM
4	Fundamentals of Convolutional Neural Networks(CNNs)	HW3: July 6 , 9 AM Discussion 3: July 6, 9 AM
5	Practical Applications and Techniques in CNNs	HW4: July 13, 9 AM Discussion 4: July 13, 9 AM
6	Introduction to Natural Language Processing (NLP)	Midterm July 20
7	NLP Architectures	HW5: July 27, 9 AM Discussion 6: July 27, 9 AM
8	Transformers	HW6: August 3, 9 AM Discussion 6: August 3, 9 AM
9	Advanced NLP Techniques and Applications	HW7: August 10 9 AM Discussion 7: August 10, 9 AM
10	Course Review and Current Trends in NLP	Discussion Summary Final

Course recordings: Downloadable recordings of each class session will be available within about 2 hours of the conclusion of class meetings and will be available for the duration of the course. These recordings are to be used exclusively by registered students in that class for their own private use. *Releasing these recordings is strictly prohibited.*

Weekly Discussion on Blackboard:
At the beginning of the course, I will post an assignment prompt on the discussion board and you will be randomly assigned to a discussion group. Throughout the course there will be milestones that need to be met by each discussion group. You are responsible for spending at least one hour each week collaborating within your group, and individually posting a one-paragraph response on Blackboard discussion board for your discussion group to see. During the final week of class, you will submit a 1-2 page summary of the collaborative group project. Mandatory. Calculated as part of grade (includes your weekly posting as well as your end of semester report). Response due by 9AM EST Saturdays.

Exams:

- There will be a mid-term and a final exam, both closed book, administered on Blackboard outside the class meeting time.
- You may only use calculators native to the PC or Mac as well as Excel.
- Each exam is designed to be completed in 2.5 hours, with a 3-hour window to take it in.
- You are permitted to bring a single, 8.5”x11”, reference sheet (front and back) to each exam, any format.
- **The mid-term will be released at 8 pm Eastern on Saturday, July 20th and must be started no later than the following Monday, 5 pm Eastern. The final exam will be available at 8 pm eastern on Saturday, August 17, the last week of classes and must be started no later than 5 pm Eastern on the following Monday.**
    - Students are highly encouraged to take the exam early during the exam period
    - Exams are proctored by Honorlock, which records the examinee’s webcam, audio, and desktop. Certified reviewers confirm that the student adheres to the institution’s and the faculty member’s policies.

Information about Honorlock can be found at the following link: https://online.engineering.gwu.edu/student-resources/

- Contact Mark Griffith at seasonline@gwu.edu (202-422-2806) and copy instructor email regarding issues related to the exam in Honorlock and/or Blackboard

Online Engineering Programs Labs: Students can remotely access most computer labs of the School of Engineering and Applied Science and work with a variety of engineering design and analysis software packages. See https://www.seas.gwu.edu/remote-access-labs

Grading:

GW's grading system for graduate students is: ***A,*** Excellent; ***B,*** Good; ***C,*** Satisfactory; ***F,*** Fail; other grades that may be assigned are ***A–, B+, B–, C+,*** **C-**. In this course, grades are determined by weighted average values and based on a standard curve relative to the class average:

Homework, totaling:	20%
Discussion Board	5%
Exam 1	35%
Exam 2	40%

Written work must comply with the Academic Integrity Policy of the George Washington University policy. Any plagiarized material will receive a grade of 0. No late submission of homework or discussion board will be accepted.

Withdrawals:

- Students may drop from courses through the day after the second class meeting without any academic or financial penalty. After that time, students may withdraw through the day after the eighth class meeting and will receive a designation of "W" and are responsible for full tuition.

Incomplete

- Students who cannot complete a course due to deployment overseas/called to active military duty/death in the immediate family/debilitating illness may seek an incomplete with proper documentation.

University Policies

University Policy on Observance of Religious Holidays: Students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. See https://registrar.gwu.edu/university-policies#holidays

Student Disability Support Services (DSS) 202-994-8250: Students needing an accommodation based on the potential impact of a disability should contact Disability Support Services. See https://disabilitysupport.gwu.edu/.

Student Mental Health Services 202-994-5300: GW offers 24/7 assistance and referral for students needing crisis and emergency mental consultations, confidential assessment, and counseling services. See https://counselingcenter.gwu.edu/.

Online Engineering Programs Office Policies: https://online.engineering.gwu.edu/policies-procedures-doctoral

Emergencies: In case of emergency, students will be notified on Blackboard.

Academic Integrity Code: Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own work, taking credit for the work of others without crediting them and without appropriate authorization, and fabricating information. All academic work is subject to GW University and SEAS Online Programs policy and may be scrutinized electronically. For more information, see https://studentconduct.gwu.edu/.

Student Guidelines for "Honorlock", our exam proctoring software

Honorlock is used with all online exams:

- Students must establish identity following the procedures outlined in the Honorlock User Guide.
- Students are responsible for testing the functionality of the system well in advance of the remote-proctored exams in their courses so that any troubleshooting required can be accomplished. Check with your exam sponsor/faculty member for practice exams.

Review the Honorlock video tutorial streaming recording link at:
https://honorlock.kb.help/how-to-use-honorlock-student/

Test Environment Requirements

The online test environment should mimic the in-class test environment, and conform to the following:

Test Area

- Sit at a clean desk or table (not on a bed or couch).
- Ensure that lighting in the room is bright enough to be considered "daylight" quality. Overhead lighting is preferred; however, if overhead is not possible, the source of light should not be behind you.
- Clear the desk or table of all materials: Students can have a single sheet of 8.5 x 11 inch paper with handwritten or typed notes on the front and back only
- Use one computer monitor only; dual monitors are not permitted.
- Have no writing on desk or walls or any notes or writing saved as your computer desktop background.
- No software other than Honorlock and Blackboard should be open unless permitted by the instructor.
- Close all other programs and/or windows on the testing computer before logging in to the proctored test environment.
- Do not have a radio or television playing in the background.
- Do not talk to anyone else—you may not communicate with others by any means.
- No other persons except the test-taker is permitted in the room during testing.
- If a calculator is required, you may use the calculator that comes with the Mac or the Windows operating system only. No physical calculators will be allowed in the testing area.

Behavior

- Dress as if in a public setting
- You will be allowed to take a brief bathroom break during the exam. You should not leave the room for any other reason during the exam. Do not take the computer into another room to finish testing (exam must be completed in the same room as the "Exam Environment View").
- No headsets, ear plugs, or similar audio devices are permitted
- Cell phones are not permitted in the exam room.
- Your entire face must be visible throughout the exam. Being out of camera view is considered an exam violation. You should check the thumbnail at the top of the screen to confirm.
- Your ID photo ID must be readable

Policy Violation Consequences

- Exams
    - **Minor Violations** – radio/TV in the background, someone enters the room, sitting on a couch, any part of face out of camera view briefly (less than 5 minutes in total), second

monitor (off) on the desk, improper lighting, using headphones, wearing hats, sunglasses, etc.
        - If you are flagged for a minor violation, you will receive a warning for the first offense. Students who commit minor violations after being warned will be penalized 10% on the exam. Subsequent minor violations could result in referral to the office of academic integrity. Minor violations will be counted cumulatively across the entire program.
    - **Major Violations** - browsing the web, using the phone or other devices, using additional screens, any part of face out of camera view (more than 5 min), communicating with another individual by any means.
        - If you are flagged for a major violation you will receive a 20% reduction on the exam and may be referred to the office of academic integrity.
- Homework and other written material
    - Written work must comply with the Academic Integrity Policy of the George Washington University policy. Any plagiarized material will receive a grade of 0.