CS795/895: Deep Learning for Natural Language Understanding Syllabus (Spring 2022)

Instructor

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Office Location

DRGS 1102

Office Hours

by appointment

Class Time

5:45 pm. -8:25 pm. T

Class Period

Tuesday, 1/11/2022—
Tuesday, 4/19/2022

Course Overview

Over the past two decades, with the advent and prevalence of GPUs and recently adopted TPUs, deep learning has made significant revolutionary advances, making remarkable progress on state-of-the-art tasks in traditional natural language processing (NLP) and computer vision (CV). In this background, a new subject field called natural language understanding (NLU) emerged out of and has received much attention by both academia and industrial researchers. The core task of NLU is to tackle fundamental challenges to train and test computer algorithms that effectively and efficiently represent human language by data structures that are processable by computers and to build artificial intelligent (AI) systems to mimic human's ability to interpret and generate human languages.

The subject covers many emerging research topics. Some have made substantial progress over the past decade (such as building pre-trained language models) and some are still challenging (such as automatically generating coherent abstract summaries). This topical course is designed for graduate students to learn fundamental concepts and algorithms of deep learning and to explore important research topics in NLU including contextual representation models, grounded language understanding, natural language reference, supervised sentiment analysis, neural information retrieval, relation extraction with distant supervision, semantic parsing. The course will also introduce representative benchmark datasets and evaluation metrics. In the first half of the class, the course will focus on introducing neural networks and deep learning. The other half of the course will cover contemporary research topics in form of lectures, invited speakers, and student presentations. Students will be evaluated on homework assignments, presentations, and literature survey papers.

Course Delivery Method

This course will be delivered face-to-face in the classroom specified in the syllabus. Students will have access to the class video from ODU's online class portal at https://online.odu.edu/video/online-class. Slides will be available on Blackboard.

Required Text

There is no required textbook. One recommended textbook is

- Neural Networks and Deep Learning: A Textbook, by Charu C. Aggarwal, 2018. ISBN-13: 978-3319944623. ISBN-10: 3319944622

Hardware and Software Requirements

Students will need frequent access to a PC (with Windows 10) or a Mac (with MacOS 10.14+) or a Linux (with Ubuntu 20.04 LTS) capable of hosting application development activities or of connecting to remote servers. If a student cannot attend the face-to-face meeting, he/she can attend the virtual meeting from the ODU's online portal, requiring the use of a microphone, a webcam, and a speaker (or a headphone) and the student will have Zoom installed on his/her computer.

Course Materials

- Course materials and other resources including slides and assignments will be distributed as the course proceeds in the semester.

Grading Policy

Students are graded based on the following aspects.

- Attendance: 10% (evaluated on Blackboard)
- Discussion: 10% (at my discretion)
- Homework assignments: 30% (5, each 6%)
- Survey topic presentation: 25% (peer evaluation)
- Survey topic paper: 25% (based on report)

Grading Chart

A	A-	B+	B	B-	C+	C*
94-100	90-93.99	87-89.99	84-86.99	80-83.99	77-79.99	74-76.99

* Graduate students: see the graduate policies and procedures page for specific requirements of grades (https://catalog.odu.edu/graduate/graduatepoliciesandprocedures/)

Attendance Policy

Attendance is required. One absence causes a deduction of 1% on attendance until all points are deducted in this aspect. If more than 11 absences are observed, the student automatically get F for this course. In case of absence due to legitimate reasons, including but not limited to sickness, University-approved curricular and extracurricular activities (such as athletic contests), career interviews, the death of

family members, students should be prepared to provide documentation **before** classes. Makeup classes are not available.

Academic Integrity

Individual assignments must be completed independently. Students are strongly encouraged to form study groups and to learn from their peers. However, discussion on final proposal writing and presentation in the study group should be limited to general approaches to solutions. **Specific answers should never be discussed**. ODU's policy regarding Academic Integrity must be followed. **Students who violate academic integrity will be reported and receive an "F" for this course.**

- **Cheating**: Using unauthorized assistance, materials, study aids, or other information in any academic exercise (Examples of cheating include, but are not limited to, the following: using unapproved resources or assistance to complete an assignment, paper, project, quiz or exam; collaborating in violation of a faculty member's instructions; and submitting the same, or substantially the same, paper to more than one course for academic credit without first obtaining the approval of faculty).
- **Plagiarism**: Using someone else's language, ideas, or other original material without acknowledging its source in any academic exercise. 4 Examples of plagiarism include, but are not limited to submitting a research paper obtained from a commercial research service, the Internet, or from another student as if it were original work; or making simple changes to borrowed materials while leaving the organization, content, or phraseology intact. Plagiarism also occurs in a group project if one or more of the members of the group does none of the group's work and participates in none of the group's activities but attempts to take credit for the work of the group.
- **Fabrication**: Inventing, altering or falsifying any data, citation or information in any academic exercise. Examples of fabrication include, but are not limited to, the following: citation of a primary source which the student actually obtained from a secondary source; or invention or alteration of experimental data without appropriate documentation (such as statistical outliers).
- **Facilitation**: Helping another student commit, or attempt to commit, any Academic Integrity violation, or failure to report suspected Academic Integrity violations to a faculty member. An example of facilitation may include circulating course materials when the faculty member has not explicitly authorized their use.

Copyright

- All course materials students receive or to which students have online access are protected by copyright. Students may use course materials and make copies for

their own use as needed, but **unauthorized distribution and/or uploading of materials without the instructor's express permission is strictly prohibited**.

Disability Accommodations

- In order to receive consideration for reasonable accommodations, you must contact the appropriate services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. The detail of disability accommodations is documented in ODU policy #4500.

Discrimination and Harassment

- The university is committed to equal access to programs, facilities, admission and employment for all persons. It is the policy of the university to maintain an environment free of harassment and free of discrimination against any person because of age, race, color, ancestry, national origin, religion, creed, service in the uniformed services (as defined in state and federal law), veteran status, sex, sexual orientation, marital or family status, pregnancy, pregnancy-related conditions, physical or mental disability, gender, perceived gender, gender identity, genetic information or political ideas. Discriminatory conduct and harassment, as well as sexual misconduct and relationship violence, violates the dignity of individuals, impedes the realization of the university's educational mission, and will not be tolerated.
- Gender-based sexual harassment, including sexual violence, are forms of gender discrimination in that they deny or limit an individual's ability to participate in or benefit from University programs or activities. These policies shall not be construed to restrict academic freedom at the university, nor shall they be construed to restrict constitutionally protected expression. The policy is coded in University Policy #1005.

Course Schedule*

Week	Dates	Subject	Practice Problems
1	1/11/2022	Course Introduction and Introductions to Deep Learning and NLU	
2	1/18/2022	Linear, logistic, and softmax regression	Assignment 1
3	1/25/2022	Fully connected neural networks	Assignment 2
4	2/1/2022	Convolutional and Recurrent neural networks	Assignment 3

Week	Dates	Subject	Practice Problems
5	2/8/2022	Training, optimization, and back propagation	Assignment 4
6	2/15/2022	Regularization and loss functions	Assignment 5
7	2/22/2022	Attention mechanism and graph neural networks	
8	3/1/2022	Invited speaker (TBD) + Evaluation methods and metrics	Student presentation assignments
9	3/8/2022	Spring Holidays, no class	
10	3/15/2022	Distributed word representations	Student presentation
11	3/22/2022	Relation extraction with distant supervision	Student presentation
12	3/29/2022	Natural language inference	Student presentation
13	4/5/2022	Contextual word representations	Student presentation
14	4/12/2022	Supervised sentiment analysis	Student presentation
15	4/19/2022	Semantic parsing	Student presentation, survey paper due

* Course schedules are subject to change depending on availability of speakers and the instructor.

Exam Schedule

No final exams.