Machine Learning for Natural Language Processing

EEL-6935 Section 34E7
Class Periods: Mon., Weds, and Fri., Period 7, 1:55 PM-2:45 PM
Location: BEN 328
Academic Term: Spring 2019

Instructor:

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- Office Hours: Mon., Wed., 8:00 AM – 9:30 AM or by appointment, 226E Materials Engineering Bldg.

Teaching Assistants:
To Be Determined

Course Description
The goal of natural language processing is to allow machines to understand and process human language. This course extends the knowledge presented in EEL-5840 Elements of Machine Intelligence to understand how machine learning methods can be applied to natural language processing. During the first part of the course, fundamental concepts and methods used in natural language processing are introduced. During the second portion of the course, more recent machine learning-based approaches, particularly neural networks/deep-learning are presented.

Credits: 3

Course Pre-Requisites / Co-Requisites
EEL-5840 Elements of Machine Intelligence is a prerequisite for the course and instructor approval.

Course Objectives
An objective of this course is to provide students with the scientific foundations required to design, implement, and evaluate neural network-based solutions to natural language processing problems such as machine translation, sentiment analysis, and language modeling. Students will also improve their technical communication skills by articulating details of existing research as well as proposed approaches through reports, quizzes, and presentations.

Course Structure
The initial lectures will be prepared and delivered by the instructor. The remaining lectures will involve the instructor and students. Each student (or a small group of students depending on the class size) will generate presentation slides dealing with one of the above topics and based on several recent publications in the literature (some distributed by the instructor; some gathered by the presenters). In addition to summarizing these papers, the students will work with the instructor to develop quizzes to test the class on the topic. The instructor will meet with the students before and after to discuss improvements to the presentation slides. All students are expected to participate in group discussions during presentations. An end-of-semester course project will involve implementing an existing machine learning method for a natural language processing application, testing the implementation on a benchmark dataset, writing a six-page research paper, and presenting the work in a short presentation during the last week. *Note that students who make a presentation early in the semester will have less time to prepare, but more time to devote to the project, and vice versa.*

Materials and Supply Fees
None

Required Textbooks and Software
There is no required textbook for the course. Reading assignments will be primarily from the research literature, and instructor provided materials.

Recommended Materials
None

Course Schedule

Week	Date	Topics
Instructor-led Presentations		
1	1/7 – 1/11	Overview of Course; Introduction to Natural Language Processing
2	1/14 – 1/18	Natural Language Processing Pipeline; Tokenization, Normalization; Parts-of-Speech Tagging; Named Entity Tagging
		Formation of groups and assignment of presentation topics
3	1/21 – 1/25	Introduction to Deep Learning for Natural Language Processing; **Selection of final project topics due**
4	1/28 – 2/1	Vector Semantics; Word Embeddings
		Quiz #1
5	2/4 – 2/8	Advanced Word Vector Representations; Language Models; SoftMax, Single Layer Networks
6	2/11 – 2/15	Neural Networks and Backpropagation for Named Entity Recognition
		Quiz #2
7	2/18 – 2/22	Gradient Checks; Overfitting; Regularization, and Activation Functions
Start of Student-led Presentations		
8	2/25 – 3/1	Recurrent Neural Networks (RNNs) for Language Modeling
		Quiz #3
9	3/4 – 3/8	**Spring Break (No Class)**
10	3/11 – 3/15	Gated Recurrent (GRUs) Neural Networks and Long Short-Term Memory (LSTMs) for Machine Translation
11	3/18 – 3/22	Recursive Neural Networks for Parsing
		Short status report on the final project due (Project Task #1)
12	3/25 – 3/29	Recursive Neural Networks for Sentiment Analysis
		Quiz #4
13	4/1 – 4/5	Sequence to Sequence Learning with Neural Networks
14	4/8 – 4/12	Convolutional Neural Network (CNN) Based Sentence Classification
		Quiz #5
15	4/15 – 4/19	Dynamic Memory Networks
16	4/22 – 4/24	**Final Presentations and Demos (Project Task #2)**
17	4/27	**Final Project Report Due**

Attendance Policy, Class Expectations, and Make-Up Policy
Students are expected to:

- Attend all lectures. Five quizzes will be given during the semester. Students are expected to request prior permission from the instructor when missing class. If such permissions are not requested or not granted, the student will receive a score of zero on quizzes, etc. during the class (NO EXCEPTIONS). Else, makeups must be scheduled between the instructor, TA, and student within one week of the missed class.
- Set up a schedule with the instructor and/or TAs to plan presentation slides, quiz, and discuss project milestones
- Submit all their work and slides promptly on Canvas
- Use the PowerPoint template and organization developed by the instructor and TAs
- Present their topics in their entirety within the specified timeslot
- Develop a quiz with the instructor

- Develop novel slides and solutions, i.e., they are not allowed to use any prior project or research material (even their own) as part of the final course project. This will be considered cheating and will be dealt with severely. *See Section on Honesty Policy.*

Evaluation of Grades

Assignment	Percentage of Final Grade
Quizzes (5)	20%
Oral Presentation (Course Topic)	20%
Project Task #1	20%
Project Task #2	15%
Project Final Report	20%
Class Participation	5%
TOTAL	100%

Grading Policy

Percent	Grade	Grade Points
94 - 100	A	4.00
90 – 93	A-	3.67
88 – 89	B+	3.33
82 – 87	B	3.00
80 – 81	B-	2.67
78 – 79	C+	2.33
72 – 77	C	2.00
70 – 71	C-	1.67
62 – 69	D	1.00
0 – 61	E	0.00

Students Requiring Accommodations
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation
Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use

All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Campus Resources:

Health and Wellness

U Matter, We Care:
If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance concerning using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall*,* 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.