



ITP-459 Applied Machine Learning for Natural Language Processing and Generative AI

Units: 4

Term: Spring 2024

Prerequisite(s): ITP 359

Time: Mondays 6-9:20 PM

Location: KAP 144

Instructor: Allen Bolourchi

Office: Zoom

Office Hours: Tuesdays 6:30 PM-8:30 PM by appointment only. Select your desired time 12 hours in advance here: <https://calendly.com/allenusc>

Contact Info: bolourch@usc.edu

Course Assistants:

Course Assistant	Email	Mode	Location	Day	Time Slot	Meeting Link
Gaurav Tadkapally	tadkapal@usc.edu	In Person + Online	TBD	Mon	11:00am - 12:00pm	meet.google.com/fid-azra-hsg
Rajeev Singh	rajeevdh@usc.edu	Online	Google Meet	Thu	02:00pm - 03:00pm	meet.google.com/oqy-wueg-twt
Rajeev Singh	rajeevdh@usc.edu	In Person + Online	TBD	Fri	12:30pm - 01:30pm	meet.google.com/oqy-wueg-twt

Course Description

Learn the state-of-the-art technology in Artificial Intelligence including the latest AI tools and algorithms in Natural Language Processing, Generative AI, GPT/BERT models and Hugging Face. You will learn the fundamentals of how computers understand human languages and what technologies and products have been built based on NLP and Generative AI for text.

Co-Requisite(s): None

Concurrent Enrollment: None

Recommended Preparation: Google Colab

Course Notes

Grading Type: Letter grade

Lecture slides, assignments, readings, announcements, and other class information will be posted on Blackboard.

Technological Proficiency

Familiarity with Google Colab and Python is necessary. If you haven't used them, familiarize yourself with Google Colab and set it up. We will teach you the rest of the python packages in the classroom.

- Google Colab - <https://colab.research.google.com/>
- Python packages – Keras, PyTorch, TensorFlow, scikit-learn - <https://www.tensorflow.org/>

Description and Assessment of Assignments and Grading Breakdown

See the Course Schedule for more details and due dates.

Assignment	% of grade
Homework – Top 13 Scores	26
Gen AI Short Presentation	10
Final Project	25 + 4 Extra Credit
Midterm Exam	15
Final Exam	25
TOTAL	101-105

Assignment Submission Policy

Students are responsible for completing individual assignments by the stated deadlines. Assignments must be turned in to Blackboard. Assignments turned in late will have 25% of the total points deducted from the graded score for each late day.

Additional Policies

No make-up exams (except for documented medical or family emergencies, or religious observance) will be offered. If students will not be able to attend an exam due to an athletic game or other valid reason, then they must coordinate with the instructor before the exam is given. They may arrange to take the exam before they leave, with approved university personnel during the time they are gone, or within the week the exam is given. If students do not take an exam, they will receive a 0 for that exam.

If students need accommodations authorized by OSAS (*Office of Student Accessibility and Services*), they should notify the instructor at least two weeks before the exam. This will allow time for arrangements to be made.

Sharing of course materials outside of the learning environment

SCampus Section 11.12(B)

Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is a violation of the USC Student Conduct Code. This includes, but is not limited to, providing materials for distribution by services publishing class notes. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the Internet or via any other media. (See Section C.1 Class Notes Policy).

Intellectual Property Policy: Codes and Ideas

All ideas discussed in the classroom or outside that are pertinent to the course, presentations made by students and the codes provided for assignments and the final project can be made available to all students for learning purposes anonymously and/or may be used or referred to outside the classroom.

Students should consider the classroom a public domain and refrain from discussing confidential information from their work environment or their own startups.

If you have concerns about the IP of your idea or code, please consult with USC staff and IP attorneys.

IT Help: Viterbi IT

Hours of Service: Monday – Friday, 8:30 AM – 5:00 PM

Contact Info: DRB 205

(213) 740-0517 engrhelp@usc.edu

Course Schedule: A Weekly Breakdown

Week	Date	Topic	Homework	Presentation	Comment
1	1/8	Class Introduction Intro to NLP and AI			
2 (H*)	1/15	Holiday	HW 1 (1/16)		Recording: Text Cleaning Text Preprocessing
3	1/22	Fundamentals of Machine Learning for NLP	HW 2 (Extended to 1/29)		
4	1/29	Neural Networks and Deep Learning in NLP	HW 3 (1/29)		
5	2/5	Transformer Models and Attention Mechanisms	HW 4 (2/5)		
6	2/12	Syntax, Parsing, Word Embeddings, and POS Tagging	HW 5 (2/12)		
7 (H*)	2/19	Holiday	HW 6 (2/20)		Recording: Semantic Analysis, Language Models, and QA
8	2/26	Advanced Topics in Machine Learning and NLP	HW 7-Survey (No HW)		
9(E**)	3/4	Text Classification & Machine Translation + Midterm Exam	HW 8 (3/10)		
	3/11	Spring Break			
10	3/18	Named Entity Recognition, Information Retrieval and Search	HW 9 (3/25)		
11	3/25	Advanced Machine Translation and Summarization	HW 10 (4/1)	Group 1	
12	4/1	Speech Processing and Conversational AI	HW 11 (4/8)	Group 2	
13	4/8	Generative AI, Ethical Considerations, and NLP APIs	HW 12 (4/15)	Group 3	
14	4/15	Fine-Tuning LLMs, Hugging Face, LangChain	HW 13 (4/22)	Group 4	
15 (E**)	4/22	Course Review, Future Trends, + Final Exam	HW 14 (4/26)	All	
	4/29	Study Day			No Class
16	5/6	Final Project Presentations	Report (5/9)		

H*: National Holiday – No in person class. Watch the recordings.
E**: Exam Day
Note: One Homework is optional! Only top 13 scores of assignments will be considered.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call

studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298
equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility and Services - (213) 740-0776
osas.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.