USC Viterbi School of Engineering

Note: Due to the high demand, the course will have an **entrance exam**.

1. D-clearance will be cleared **strictly** based on student's exam results (and major for tie-break).

CSCI 566: Deep Learning and its Applications

Fall 2020—Tuesday/Thursday—5:00pm-6:40pm (Units: 4)

Location: Online (zoom)

Contacts: Please **ONLY** use piazza for any communication. **No e-mail will be answered!**

- **Piazza: https://piazza.com/usc/fall2020/csci566**

Instructor: Joseph J. Lim
Office: zoom
Office Hours: Tuesday 7:00-8:00pm (for assignment related meetings, please go to TA OHs)

Teaching Assistants:

Ayush Jain	**Karl Pertsch**	**Jesse Zhang**

TA Office Hours (@ zoom):
Tuesday 10-11am, Thursday 4-5pm

Course Description
Recently, deep learning has advanced many AI-related problems from image search, to machine translation, to self-driving, and to medical applications. Our goal is to guide students to get familiar with these recent cutting-edge deep learning (DL) advances in computer vision, natural language processing, and robotics. Through this course, students will gain a basic understanding of DL algorithms, and how to setup and solve problems involving deep learning techniques. The course will include a couple of practical assignments and a final course project. For the final course project, students will be encouraged to pick their own topics, but can also select from a provided list of projects.

Prerequisite(s):

1. Proficiency in Python

2. College Calculus, Linear Algebra
3. Probability and Statistics
4. Equivalent knowledge of CSCI 567 (Machine Learning)

Required Readings and Supplementary Materials
Deep Learning (MIT Press) by Ian Goodfellow, Yoshua Bengio, and Aaron Courville. A free online version is available at http://www.deeplearningbook.org/

Description and Assessment of Assignments
Pop-up Quizzes, 3 Assignments, 1 Midterm, and 1 Course project

Grading Breakdown
Extra credit: participation (5 points), each assignment (up to 1 point), midterm (up to 2 points), and course project (up to 3 points).

Entry	% of grade
Participation (Pop-up Quiz)	5
Assignment #1	11
Assignment #2	12
Assignment #3	12
Midterm	25
Course Project	40
TOTAL	105

Project grading breakdown:

Entry	% of the total grade
Project Team	1
Project Proposal	1
Project Spotlight	1
1st Meeting with TA	1
2nd Meeting with TA	1
Meeting with Instructor	1

Project Mid-report	4
Final Presentation	12
Final Report	18
TOTAL	**40**

Assignment Submission Policy
All assignments need to be submitted in an electronic form by **11:59pm** of the due date.

Additional Policies
There will be a total of 5 late days for the entire semester, to be used in **integer amounts** and distributed as the student sees fit. Any exception needs to be discussed within the first 2 weeks of the semester (no exception otherwise). Note that there is no late day for the project-related deadlines.

Course Schedule: Weekly Breakdown

	Topics/Daily Activities	**Readings and Homework**	**Deliverable/ Due Dates**
Week 1 8/25	Course Introduction / Applications of Deep Learning		
8/27	Machine Learning 101 + Course registration		
Module 1: CNN & RNN			
Week 2 9/1	Loss functions and Optimization + Neural Networks		
9/3	**No class**		
Week 3 9/8	Convolutional Neural Networks	**Assignment 1 OUT**	
9/10	Training Neural Networks		
Week 4 9/15	CNN Architectures + Deep Learning Software + Cloud service (by TA)		**Course Project Team**
9/17	CNN Architectures +		

	Deep Learning Software + Cloud service (by TA)		
Week 5 9/22	Recurrent Neural Networks 1		
9/24	Recurrent Neural Networks 2		
Module 2			
Week 6 9/29	Deep Generative Models 1		**Assignment 1**
10/1	Deep Generative Models 2	**Assignment 2 OUT**	
Week 7 10/6	Deep Reinforcement Learning 1		**Course Project Proposal**
10/8	Deep Reinforcement Learning 2		
Week 8 10/13	**In-class Midterm**		
10/15	**Project Spotlight (2mins per team)**		
Module 3: Advanced Topics **Advanced topics are all subject to change**			
Week 9 10/20	Deep Learning for Computer Vision	**Assignment 3 OUT**	**Assignment 2**
10/22	Deep Learning for Natural Language Processing		
Week 10 10/27	Deep Learning for Robotics - Visuomotor - Imitation learning - Inverse RL - Sim-to-real / Domain adaptation		
10/29	- Attention, Memory, Relation Networks, Program Synthesis & Induction (covering NTM & extensions)		

Week 11 11/3	Meta Learning		**Assignment 3**
11/5	Advanced Topics in Deep Reinforcement Learning - Hierarchical RL - Exploration - AlphaGO - Bayesian - Multi-Agent RL - Multi-task RL		
Week 12 11/10	- Representation Learning (Inductive Bias, Graph Neural Networks)		**Course Project Mid-report**
11/12	Transfer learning, Continual learning		
Week 13 11/17	Career Advice		
11/19	**No class** (Project preparation)		
Week 14 11/24	**Term Project Presentation (4 hours) Spotlight + Poster**		
11/26	Thanksgiving Holiday		
Week 15 12/1	**No class**		**Final report**
12/3	**No class**		
FINAL	**No Final**		

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 Section 11, *Behavior Violating University Standards* https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions. Other forms of academic dishonesty are equally unacceptable. See additional information in *Campus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* http://equity.usc.edu or to the *Department of Public Safety* http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage http://sarc.usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* http://emergency.usc.edu will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.