This is tentative

Course ID and Title
Units: 4
Term—Day—Time: Spring 2017 – Tuesdays/Thursdays – 4pm – 6pm

IMPORTANT:
The general formula for contact hours is as follows:
Courses must meet for a minimum of one 50 minute session per unit per week over a fifteen-week semester. Standard fall and spring sessions require a final summative experience during the University scheduled final exam day and time.

(Please refer to the Contact Hours Reference, located at arr.usc.edu/services/curriculum/resources.html.)

Location: Physical address and/or course-related URLs, etc.

Instructor: Fei Sha
Office: RTH 403
Office Hours: TBD (tentatively Wed 2pm – 3pm)
Contact Info: feisha@usc.edu

Teaching Assistant: N/A
Office: Physical or virtual address
Office Hours:
Contact Info: Email, phone number (office, cell), Skype, etc.

IT Help: N/A at present
Hours of Service:
Contact Info: Email, phone number (office, cell), Skype, etc.
Course Description
This is a graduate-level seminar for advanced topics in machine learning. The primary audience is PhD students and M.Sc students who have prior research background. The course is based on lectures, presentations and discussions of research papers, proposing and executing research projects.

Learning Objectives
This primary goal of this course is to introduce the frontiers of machine learning research. Contents vary every year. This offering focuses on new developments in deep learning and related topics. Of special interests are generative models, deep reinforcement learning, novel applications of deep learning and related AI techniques, etc.

Prerequisite(s): CSCI567 and permission by the instructor
Co-Requisite(s): course(s) that must be taken prior to or simultaneously
Concurrent Enrollment: course(s) that must be taken simultaneously
Recommended Preparation: course work or background that is advisable, not mandatory

Course Notes
Grading Type, if other than the assumed letter grade (i.e., Credit No-Credit or Numeric and/or In Progress). Note any unique characteristics of the course of operating procedure. Is the course Web-Enhanced (i.e. Blackboard), Blended or Online? If copies of lecture slides and other class information will be posted on Blackboard, note that here. If multimedia or technology-enhanced learning strategies will be used, please describe them here.

Technological Proficiency and Hardware/Software Required
If applicable, provide details of accessing course if not in a traditional classroom setting.

Required Readings and Supplementary Materials
All required readings are publicly accessible.

Description and Assessment of Assignments
Assessment is based on presentation and discussions of research papers, and research projects. Presentation is measured against the standard of talks at scientific conferences/workshops. Discussion of research papers is an important component to this course. Students are expected to read the assigned research papers prior to the class and students are also expected to contribute to the understanding and analyzing of those research papers. Research projects are assessed on their scientific novelty/originality, significance of the work, etc. Students are also expected to complete a research project report. The report, both its scientific contents and exposition, should be in submissible format to a high-quality scientific conference or workshop.
Grading Breakdown
Including the above detailed assignments, how will students be graded overall? Participation should be no more than 15%, unless justified for a higher amount. All must total 100%.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>% of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation of research</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>papers</td>
<td></td>
<td></td>
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<tr>
<td>Discussion of research</td>
<td>20</td>
<td>20</td>
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<tr>
<td>papers</td>
<td></td>
<td></td>
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<tr>
<td>Research Project</td>
<td>60</td>
<td>60</td>
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<tr>
<td>TOTAL</td>
<td>100</td>
<td>100</td>
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Grading Scale (Example)
Course final grades will be determined using the following scale
A  95-100
A- 90-94
B+ 87-89
B  83-86
B- 80-82
C+ 77-79
C  73-76
C- 70-72
D+ 67-69
D  63-66
D- 60-62
F  59 and below

Assignment Rubrics
Include assignment rubrics to be used, if any.

Assignment Submission Policy
Presentation slides needs to be submitted 24 hours before the scheduled presentation time

Grading Timeline
Students will be provided immediate feedback (with 48 hours) by the instructor and their peers after they have presented the assigned research papers.

Additional Policies
Add any additional policies that students should be aware of: late assignments, missed classes, attendance expectations, use of technology in the classroom, etc.
Course Schedule: A Weekly Breakdown
Provide a detailed course calendar that provides a thorough list of deliverables—readings, assignments, examinations, etc., broken down on at least a weekly basis. The format may vary, but the content must include:

- Subject matter (topic) or activity
- Required preparatory reading, or other assignments (i.e., viewing videos) for each class session, including page numbers.
- Assignments or deliverables.

**IMPORTANT:**
In addition to in-class contact hours, all courses must also meet a minimum standard for out-of-class time, which accounts for time students spend on homework, readings, writing, and other academic activities. **For each unit of in-class contact time, the university expects two hours of out of class student work per week over a semester.**

(Please refer to the Contact Hours Reference at arr.usc.edu/services/curriculum/resources.html.)

<table>
<thead>
<tr>
<th>Topics/Daily Activities</th>
<th>Readings and Homework</th>
<th>Deliverable/ Due Dates</th>
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</thead>
<tbody>
<tr>
<td><strong>Week 1</strong></td>
<td>Introduction, overview of potential research projects, Overview of Deep Learning</td>
<td>Deep learning textbook (by Yoshua Bengio, online)</td>
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<tr>
<td><strong>Week 2</strong></td>
<td>Generative models (I)</td>
<td>Generative Adversarial Network</td>
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<tr>
<td><strong>Week 3</strong></td>
<td>Generative models (II)</td>
<td>Variational autoencoders</td>
</tr>
<tr>
<td><strong>Week 4</strong></td>
<td>Generative models (III)</td>
<td>PixelRNN, WaveNet</td>
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<td><strong>Week 5</strong></td>
<td>Research project ideas discussion, proposals, experimental platform setup</td>
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<td><strong>Week 6</strong></td>
<td>Reinforcement learning</td>
<td>Reinforcement learning (Sutton and Barto, online)</td>
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<td><strong>Week 7</strong></td>
<td>Policy gradient methods</td>
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<td><strong>Week 8</strong></td>
<td>Deep Q Learning</td>
<td>Deep Q Networks (Minh et al, online)</td>
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<td><strong>Week 9</strong></td>
<td>Guided Policy Search Methods</td>
<td>Levine (ICML2013, NIPS 2014)</td>
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<td><strong>Week 10</strong></td>
<td>Guest lectures on reinforcement and robotic motorcontrol</td>
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<td><strong>Week 11</strong></td>
<td>Project ideas finalization</td>
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<td><strong>Week 12</strong></td>
<td>Adaptation and transfer learning in reinforcement and robotics</td>
<td>Parisoto et al (2016)</td>
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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” [https://policy.usc.edu/student/scampus/part-b](https://policy.usc.edu/student/scampus/part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, [http://policy.usc.edu/scientific-misconduct](http://policy.usc.edu/scientific-misconduct).

Discrimination, sexual assault, intimate partner violence, stalking, and harassment are prohibited by the university. You are encouraged to report all incidents to the Office of Equity and Diversity/Title IX Office [http://equity.usc.edu](http://equity.usc.edu) and/or to the Department of Public Safety [http://dps.usc.edu](http://dps.usc.edu). This is important for the health and safety of the whole USC community. Faculty and staff must report any information regarding an incident to the Title IX Coordinator who will provide outreach and information to the affected party. The sexual assault resource center webpage [http://sarc.usc.edu](http://sarc.usc.edu) fully describes reporting options. Relationship and Sexual Violence Services [https://engemannshc.usc.edu/rsvp](https://engemannshc.usc.edu/rsvp) provides 24/7 confidential support.

**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://ali.usc.edu](http://ali.usc.edu), which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs [http://dsp.usc.edu](http://dsp.usc.edu) 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](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.

<table>
<thead>
<tr>
<th>Week 13</th>
<th>Application of deep reinforcement learning in games and NLP</th>
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<tbody>
<tr>
<td>Week 14</td>
<td>Other topics Selected from NIPS 2016 Conferences and workshop proceedings</td>
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<tr>
<td>Week 15</td>
<td>Project presentation Project presentation slides</td>
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<tr>
<td><strong>FINAL</strong></td>
<td><em>Date:</em> For the date and time of the final for this class, consult the USC Schedule of Classes at <a href="http://www.usc.edu/soc">www.usc.edu/soc</a>.*</td>
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