CSE 5539-0100 - Spring 2016

Computational Audition

Syllabus

**Time/Place:** Monday 12:40-2:30pm, 266 Dreese Lab

**Instructor:** Prof. DeLiang Wang; Office: 598 DL, 292-6827; dwang@cse.ohio-state.edu

Http://www.cse.ohio-state.edu/~dwang/

**Office Hours:** 2:30-3:00 M & 2-3:30 R

**Course Description:** Computational models and algorithms for auditory perception and processing. Topics include auditory scene analysis, pitch analysis, sound localization, speech and music processing (enhancement, segregation, recognition), modeling of the auditory system, and temporal pattern processing.

**Prerequisites:** Grad standing or permission of the instructor


**Course Material:** Papers from the literature

**Grading Plan:** Paper presentation - 25%; Midterm programming - 15%

Participation - 10%; Term project - 50%
Tentative Schedule

Week/Sequence and Topics

**Week 1:** Class canceled due to travel  
Monday, 1/11

**Week 2:** No Class – MLK Day  
Monday, 1/18

**Week 3:** General introduction, acoustics and auditory computation, and physiological basis of audition  
Monday, 1/25

**Week 4:** Psychoacoustic basis of audition, and fundamentals of signal processing  
Monday, 2/1

**Week 5:** Real-world audition, and fundamental auditory representations  
Monday, 2/8

*Student presentation starts*

**Week 6:** Pitch detection and multipitch tracking  
Monday, 2/15  

**Week 7:** Classification based speech separation  
Monday, 2/22  

**Week 8:** Model-based speech separation  
Monday, 2/29  

**Week 9:** Reverberant signal processing  
Monday, 3/7  

**Spring Break Week:** 3/14-18

**Week 10:** Sound localization  
Monday, 3/21  

**Week 11:** Binaural segregation  
Monday, 3/28  
*Readings:* Feng and Jones (2006), Jiang et al. (2014)

**Week 12:** Automatic speech recognition (ASR) and robust ASR  
Monday, 4/4  
*Reading:* Hinton et al. (2012), Narayanan and Wang (2014)
**Week 13:** Automatic speaker recognition and robust speaker recognition  
Monday, 4/11  
**Reading:** Reynolds et al. (2000), Zhao et al. (2015)

**Week 14:** Music signal analysis and retrieval  
Monday, 4/18  
**Readings:** Goto (2006), Dannenberg et al. (2007)

**Week 15:** Auditory attention and neural modeling  
Monday, 4/25  
**Readings:** Shamma et al. (2011), Wrigley and Brown (2004)
Term Project

Each student is required to do a term project (counted as 50% of your final grade). Topics for a term project may be, but not limited to, a complete piece of original research, a proposal and some initial results of a research plan, or a detailed analysis or an in-depth review on a specific topic covered in the class. The term paper summarizing the project must be 2000-4000 (5-10 pages) words in length. **Written project report is due by 5 pm, April 27 (Wednesday).**

Selecting a topic

A topic proposal needs to be submitted prior to conducting the project, and **the proposal is due in class on February 15 (Monday).** Check with the instructor before deciding on a topic and writing the proposal. Your proposal should be one page long and should include

1. Your background: technical area, relevant coursework, and pertinent research you have done if any.
2. Proposed project
   - General area that the project falls in.
   - Technical description of your proposed project. What are you going to do?
   - List of a few references that you have read or scanned on the subject.

Class Presentation

Each enrolled student (BOTH regular and audit) is required to be responsible for at least one class presentation (counted as 25% of your final grade). The content of each class consists typically of a couple of papers. Please make three choices, in the order of preference, of the topic you want to present. However, your choices may not be honored due to conflict among student choices. Students responsible for a presentation need to check with the instructor beforehand to go over presentation details. It is required that students make powerpoint slides to facilitate presentations.
Course Material

(Some posted on class website: www.cse.ohio-state.edu/~dwang/teaching/cse5539/Wang5539-16.html)

Week 6


Week 7


Week 8


Week 9


Week 10

Week 11


Week 12


Week 13


Week 14


Week 15


Form for Student Information and Choosing Presentation Topic

Due: February 1 (Monday)

Name: ___________________________________________________________

Email Address and Phone No: _________________________________________

Department: _______________________________________________________

Thesis advisor (if any): _____________________________________________

Level: _________-th year Graduate or Undergraduate

Your Areas of Interest: ______________________________________________

Selecting three topics for possible class presentation in the order of preference, according to the class schedule. Student presentations cover Week 6 through Week 15. Take a look at the titles of the papers to be discussed in each class.

1. Topic ____________________________________________________________
   Week _______________________

2. Topic ____________________________________________________________
   Week _______________________

3. Topic ____________________________________________________________
   Week _______________________

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