Fall 2007

BME 670 EARLY VISUAL PROCESSING

Time and Place: T/TH 9:30 -10:50 AM, Hedco Auditorium
Course web site: https://blackboard.usc.edu

Overview

This class will give students a broad view of modern vision research, with a focus on early visual processing. A companion course, BME 671, will be offered in the spring of 2008, focusing on higher visual processing. To ensure both depth and breadth of perspective in the course, two or more instructors with experimental or modeling backgrounds will cover each of the main topics. These topics were chosen to emphasize the particular strengths of USC vision researchers. The topics include phototransduction, retinal processing and development, retinal diseases, prostheses, imaging, and transplantation. In addition, topics include computational and hardware models of early vision, and anatomical, physiological, and computational views of the extra-retinal, sub-cortical visual nuclei. In total, fourteen USC lecturers from different schools, departments, and disciplines will participate in this vision course. A subset of its lectures will be devoted to open questions in each of the main topic areas.

Prerequisites

The courses will be limited to graduate students. Senior undergraduate students will be accepted only with prior approval of the instructors. Prerequisites will be either neuroscience (e.g., NEUR 524 and 525, or BME 502) or computer-vision (e.g., CSCI 574) courses.

Course Format

Students will be expected to read one article and answer one question per lecture. Articles and questions will be posted on the course web site prior to each lecture. Questions will be synthetic and will require 300 word answers (approximate length of a scientific abstract). Answers should be typeset rather than handwritten, and answers longer than 300 words will not be

graded. Answers must be turned in at the next class after the associated lecture, at the beginning of class. Late answers will not be accepted or graded. Example answers written by the instructor will be posted on the course web site.

Exams

Exams will be closed book and will last approximately 90 minutes. They will be non-cumulative, covering material only since the previous exam, and will consist of both short-answer and synthetic questions. Tentative exam dates are 10/4 (in class), 11/13 (in class), and Thursday 12/13 (during finals week, in the classroom).

Grading

Course grades will be assigned as follows:

Homeworks: 25%
Exams: 25% each, = 75%

Proposed Lecture Topics

1.	8/28	Introduction to Vision	Bosco Tjan; Psychology
2.	8/30	Introduction to Phototransduction	Cheryl Craft; Ophthalmology
3.	9/4	Physiology/Biochemsitry in Phototransduction	Jeannie Chen; Ophthalmology
4.	9/6	Open Questions in Phototransduction	Jeannie Chen; Ophthalmology
5.	9/11	Molecular Biology of Phototransduction	Cheryl Craft; Ophthalmology
6.	9/13	Retinal Processing/Morphology	Eun Jin Lee; Biomedical Engineering
7.	9/18	Retinal Processing/Physiology	Alapakkam Sampath, Physiology & Biophysics
8.	9/20	Retinal Development	Eun Jin Lee; Biomedical Engineering
9.	9/25	Growth Factors in Retinal Diseases	David Hinton; Ophthamology
10.	9/27	Diseases of the Retina	Rajat Agrawal; Ophthalmology
11.	10/2	Neural Remodeling in Retinal Degeneration	Eun Jin Lee; Biomedical Engineering
12.	10/4	**Exam #1**	

13.	10/9	Hybrid Electronic/Photonic Implementations of Visual Proc.	Armand Tanguay; Electrical Engineering
14.	10/11	Retinal Transplantation	Biju Thomas; Ophthalmology
15.	10/16	Retinal Prosthesis	James Weiland; Ophthalmology
16.	10/18	Optical Coherence Tomography of Retina	David Huang; Ophthalmology
17.	10/23	Open Questions in Low-Vision Research	Bosco Tjan; Psychology
18.	10/25	Computational Models of Edge Detection	Bartlett Mel; Biomedical Engineering
19.	10/30	Lateral inhibition in the Retina	Eun Jin Lee; Biomedical Engineering
20.	11/1	Computational Models of Color Processing	Bartlett Mel; Biomedical Engineering
21.	11/6	Color Processing in the retina	Eun Jin Lee; Biomedical Engineering
22.	11/8	Open Questions in Retinal Research	Alapakkam Sampath, Physiology & Biophysics
23.	11/13	**Exam #2**	
24.	11/15	From Retina to Thalamus: The Lateral Geniculate Nucleus	Judith Hirsch; Biology
25.	11/20	Post-transplantation Responses in Superior Colliculus	Biju Thomas; Ophthalmology
26.	11/22	**Thanksgiving Holiday – no class**	
27.	11/27	Physiology of LGN 1: Relay Cells	Judith Hirsch; Biology
28.	11/29	Physiology of LGN 2: Interneurons	Judith Hirsch; Biology
29.	12/4	Computational Models of the LGN	Bartlett Mel; Biomedical Engineering
30.	12/6	Open Questions in Thalamus/ Surprise	Laurent Itti; Computer Science
31.	12/13	**Final Exam**, 11:00 a.m. - 1:00 p.m.	