CAP 6411 – Foundations of Vision – Spring 2009

Syllabus

Instructor:	**Dr. Oge Marques**	**Dept:**	Computer Science and Engineering
Office:	SE 420	**Phone:**	(561) 297-3857
Email:	omarques@fau.edu	**Web:**	http://www.cse.fau.edu/~oge/
Office Hours:	Tuesdays & Thursdays: 11:00-12:15 / Fridays: 8:45-12:15		

Catalog description:

3 Credits

Study of the interdisciplinary science of vision, combining psychological, neurophysiological, and computational aspects of vision research. Research paper and project topics will be chosen from a list of latest developments in the field.

Prerequisites: Graduate-level status or permission from instructor.

Course goal: To provide a broad and solid conceptual understanding of how visual information can be processed by humans and machines. To understand, model, and simulate human vision mechanisms and appreciate the challenge involved in designing artificial vision systems to achieve comparable goals. To enable students to carry out research on selected topics of interest in this field.

Textbook: *Vision Science: Photons to Phenomenology*, by Stephen E. Palmer, Bradford Books, MIT Press, Cambridge, MA: 1999.

References: Additional books and papers whose details will be provided during the semester.

Course outline:

1. **Introduction to vision science**: visual perception, the human visual system (HVS), selected theories of vision, an interdisciplinary approach to studying vision.
2. **Object detection, recognition, and categorization:** object properties (size, shape, orientation, position) and parts, image segmentation, perception of function, object recognition by human and computer: models and theories, theories of object categorization.
3. **Scenes analysis, recognition, and classification**: region analysis, statistics of natural images, scene recognition by human and computer: models and theories, scene classification: choice of features and examples of applications (indoor vs. outdoor).
4. **Objects in context:** the role of context, contextual priming, theories and models of the interdependence between objects and context
5. **Visual selection, attention, and saliency**: eye movements, the role of attention, theories and models of visual attention and saliency, novelty detection and rapid scene analysis.
6. **Visual search by human and computer**: models and theories for visual search, bottom-up and top-down factors in visual search, the role of attention, the role of context.
7. **Visual memory**: memory models, short- and long-term memory, conceptual short-term memory (CSTM).
8. **Open challenges and opportunities**: overview of open topics in the field and how they are being approached, inventory of applications for the knowledge acquired in the course.

CAP 6011 – Foundations of Vision – Spring 2009

Syllabus

Grading Policy: Grades will be determined primarily from the following:

o Midterm exam:	20 %
o Homework assignments (include MATLAB work) (2 × 10%):	20 %
o Project (experiments and/or code, paper, and oral presentation):	50 %
o Participation in class discussions:	10 %

Grading Scale:

92-100 = A
88-91 = A–
84-87 = B+
80-83 = B
77-79 = B–
73-76 = C+
70-72 = C
66-69 = C–
61-65 = D+
56-60 = D
50-55 = D–
0-49 = F

Important notes:

- The **midterm exam** will cover primarily topics 1 through 4.
- Class **participation** is strongly encouraged and will be rewarded with up to 10% of your grade. FEEDS students will demonstrate their "participation" by submitting short summaries and questions every week.
- The **project** will consist of selecting a problem within the scope of the course and:
    - Read about it
    - Find an angle to approach it
    - Formulate hypotheses
    - Design an experiment involving human subjects and/or a computer-based solution to test the hypotheses
    - Collect and analyze data
    - Produce a paper with your findings
    - Present your paper to class
- Students will be encouraged to use MATLAB and work in teams for their project.
- **Homework assignments** may include MATLAB tutorials and the use of selected toolboxes.
- Reading assignments will be posted on the Web on a regular basis. Students are expected to read the material to be covered in the lectures ahead of time.
- Submission of papers and projects will be done electronically via ***Blackboard***. **No late submission will be accepted.**
- Changes in class policies and/or office hours may be necessary during the semester and if so the changes will be announced in class and/or in the course home page. It is the student's responsibility to be aware of any such changes.

Course Home Page: A home page containing relevant information and useful links for the course is available at: ***http://blackboard.fau.edu/***