Computational Vision—Project

Partner selection: Due Thursday, March 30 (with HW 5)
Description due: Tuesday, April 11
Project Check due: Tuesday, April 25
Presentations: Tues-Thurs May 2 - 4
Final paper due: Tuesday, May 2
(See Timeline at the end of this document)

Project Description: For the final project in this course you will work with a partner to complete a paper that examines some topic in computational vision that was not covered in class, or examines a course topic in more depth. The project will involve exploring a topic area in the field of computational vision that is of interest to you and beyond the scope of the regular course material. Exploring this topic will involve reading background material from books or journals on computational vision. A list of topic areas you might consider is given below. You are welcome to consider topics outside of this list, however you must have me approve the topic you choose.

The paper should typically be around 5 - 7 pages, double spaced, 12 point type.   In addition, on one of the last two days of classes, you will give a short presentation on your topic so the rest of the class can learn from your research.

Content of paper:
1) Research paper: The particular issues addressed in your paper will depend on the topic area. I do not want you to simply read one textbook summary of a topic and just reproduce the textbook-like summary. Your paper should outline the problem, discuss experiments that address the problem and provide some critical analysis. Your paper should draw from at least 3 separate sources (books or journal articles). For example, it might compare multiple strategies for solving some problem in computational vision, and discuss advantages and disadvantages of alternate approaches.   An example for organizing your paper is as follows:

Introduction: What is the topic or question you are studying and why is it interesting?
Background: Information that is important for understanding the problem being addressed.
Current approaches or theories: What are some current approaches for addressing the problem? How do different approaches compare to one another? What experiments or simulations support the different approaches or theories?
Conclusions: How well do current theories or algorithmic approaches solve the problem being addressed? What aspects of this problem still need to be resolved?

Presentations: Each pair will give a short, 10 minute, presentation to the class discussing their project.

List of topics:
You may choose one of the topics below or one of your own. The textbook is a good source for ideas. You can find information on some of these on the web. **Avoid choosing a topic that is exclusively about deep learning algorithms,** since this is not an AI course, and it is difficult to impossible to understand how the neural network is solving the problem after training.

Subjective contours or surfaces (Illusory contours)
Automated driving systems
Interpretation of shadows
Texture analysis
Vision systems for robots
Vision systems for the blind
Object recognition
Figure-ground organization
Face recognition systems (but not ones based on deep learning neural networks)
Fingerprint identification
Medical imaging applications
Attention: visual search
Change blindness--Large changes in the scene can occur during saccadic eye movements or
    during a short blank of the image and people do not notice the changes.
3D object motion--There are some interesting papers on how outfielders run to catch fly balls.
Biological Motion Recognition--People are very good at recognizing biological motions, such as
    walking, running, etc, from sparse information (points of light). How do we do this?
Shape from shading--We are very good at using shading cues to determine the 3D shape of a
    surface. How does this work?

Resources:
Paper Reference Requirement: Your paper must draw information from at least 3 journal articles or books. On-line sources are not acceptable unless they are a peer-reviewed journal (E.g. Journal of Vision). Please check with me if you are unsure if a source is acceptable.

The following journals (among others) have lots of good articles on vision and computational vision. The Holy Cross Libraries have many of them:

Vision Research
Perception and Psychophysics
Journal of the Optical Society of America A
International Journal of Computer Vision
Computer Vision and Image Understanding
Journal of Vision (an online journal)
Journal of Neuroscience

There are also numerous books on computational vision.

Computational Vision Project Timeline:

Thursday, March 30—Choose a partner. Turn this in with assignment 5.

Tuesday, April 11--Project Description: Together with your partner, turn in a 1 paragraph description of what your project will be about. List at least one reference on this topic that you intend to use.

Tuesday, April 25--Project check:

Turn in a detailed outline and list of references for your paper. The outline should give enough subheadings to show that you have done some significant research and have an idea of the specific topics that you will cover in the paper.

Tuesday, May 2--Final paper due at the beginning of class.

Tuesday, May 2 – Thursday May 4--Presentations: Each pair will give a 10 minute presentation on their findings.