

PSY 124B: Visual Information Processing

Fall 2008

Instructor: Dr. Tandra Ghose, PhD (tandra@ucla.edu)
Office Hours: Tue 1:45-2:45pm and By appointment
Office: 6522 Franz Hall
Course Time: Tuesday Thursday, 12:30 pm – 1:45 pm
Location: Franz 3534
Course website: Blackboard
SRS#: 328401200
Readings: - Palmer, S.E. (1999) Vision Science: Photons to phenomenology, MIT press.
- Original research articles (see the list below)

Course Introduction: This course is an exploration of issues in visual information processing. Central to this approach is the idea that some kind of computation leads to a meaningful percept (output) of the outside world from photons entering our eyes (input). We will discuss different models that have been proposed in the literature for the steps involved in processing the input leading to the desired output - how is information processed to give rise to coherent percept we get so effortlessly? In this course we will assume that humans are equipped with a biological system that can efficiently process the required information. Our primary focus will be on the processes that transform a 2D array of light entering our eyes into a coherent percept of the 3D world in a seemingly effortless way. Early in the course we will discuss the various theories of visual information processing and contrast Helmholtz's and Gibson's approach. We will discuss the models of visual information processing as proposed by Marr and Palmer. Color vision will be used as an example of how this model works at various levels. As the course progresses we will discuss how bits and pieces of information gets organized by our perceptual system, the different ways objects may be represented by our perceptual system, and the role attention plays in visual information processing.

The course will be conducted in a seminar format and will include original research articles and background material from secondary sources.

The things that you learn in this course will allow you to start to address interesting and important questions, such as:

- Can the same physical stimulus give rise to different perceptions?
- Is "redness" properly understood as a physical reality or a psychological experience?
- Why is it difficult to watch a regular television outside during the day?
- How do we perceive which images in a visual image are parts of the same object?
- Do newborn babies see the world in the same way as we do?
- Can people "see" without being aware of what they see?

Many of these questions have practical implications for our daily lives. The main goal of this course is to give you a foundation of knowledge about visual perception i.e., how do we make sense of the world around us from information contained in patterns of light? Another purpose is to provide skills to evaluate new information about perception, as it emerges. Should you believe an article or book in the popular press that suggests that green light can be produced by mixing blue and yellow lights? How do you know whether the study is scientifically valid? What are the implications of this study for you? You will develop skills necessary to read, understand and present research papers in psychology.

Course Plan – COGS 124B Visual Information Processing *

Date	Day	Topic	Due
9/25	Week-1 Thu	Class Business	[Intro & Index Card]
9/30	Week-2 Tue	Visual Perception	
10/2	Thu	Information Processing	
10/7	Week-3 Tue	Color Image/Surface	
10/9	Thu	Color Categories	Thu 10/9: Paper Proposal due
10/14	Week-4 Tue	Perceptual Organization 1: Grouping	
10/16	Thu	Perceptual Organization 2: Figure-Ground	
10/21	Week-5 Tue	Perceptual Completion	
10/23	Thu	Perceptual Constancy	
10/28	Week-6 Tue	Parts & Wholes	
10/30	Thu	Object Perception & Categorization	
11/4	Week-7 Tue	Object Recognition	Thu: Term Paper presentation Final Draft Due
11/6	Thu	In class presentation	
11/11	Week-8 Tue	Veterans Day holiday	
11/13	Thu	Object Recognition	
11/18	Week-9 Tue	Attention	
11/20	Thu	Scene Perception	
11/25	Week-10 Tue	Attentional Blink	Term Paper due in class
11/27	Thu	Thanksgiving holiday	
12/2	Week-11 Tue	Change Blindness	
12/4	Thu	Awareness	

* This schedule may be updated by the instructor during the course of the semester.

Course Requirements:

Class Participation: The course will be conducted in a seminar format in which the students will share the responsibility for presenting and discussing research articles in vision science. To enroll in this class, you must be committed to critically evaluate the assigned research articles in advance. Group-learning and discussions will be negatively impacted if students come unprepared to class. A significant portion of course grade will be based on class participation that includes attendance and preparation for the class.

Discussion: Each student will help lead discussion during 2-3 class meetings and prepare a short “issues list” for the papers assigned for that meeting. The list should be posted on the course website by the night before the class (by 10:00pm latest to be considered for grading). I strongly recommend that you meet with me to discuss the list before posting it on the website.

Short Reports: You are expected to have done the reading from the reader and text before class meetings. Additionally, you are expected to write short reports on one of the assigned research paper. A Short Report can be written on any week’s reading, but only the top **10** reports count toward your grade. These are due at the beginning of the class in which the article is scheduled for discussion. They may not be turned in via email or electronically. The Short Reports must be typed. They usually should be less than a page long.

The Short Reports have two parts.

Part 1 is a description of the topic assigned (e.g. perceptual organization) for that meeting in approximately 100 words.

Part 2 is on an assigned research article for that meeting, and consists of 3 items. (1) The first item is a summary of the main points of the article in a sentence or two (no more than two sentences per point). (2) Briefly explain one of the findings of the article that supports one of the main points of the article. (3) Suggest a further, unanswered question, related to the article.

The purpose of the short reports is to help students keep up with the class material, and to make sure that students are prepared for discussing the articles in class.

Paper: The paper assignment is a chance for you to study in depth a topic of interest in visual perception. Your paper should be based on your reading and assimilation of at least 5 reference materials in the form of scientific journal articles, books, media reports, and web sites. Of these 5 required references, a minimum of two (2) must be articles published in a peer-reviewed journal within the past two years. This is to make sure that your topic is one of current scientific interests. Your paper must be 5 pages in length, double-spaced, with 12 point Times New Roman font, with 1-inch margins. The paper assignment will be completed in 3 stages.

Stage 1: The Proposal – The purpose of this stage is for you to propose a topic for your paper and provide the references on which you will base the paper. It will consist of (1) one paragraph (about 300 words) describing the thesis of your

paper. (2) A list of references that will be used in the paper. No credit will be given for late submissions, but this step must be completed. If you have any questions about whether an article meets these standards, you should ask the instructor ahead of time. Due at the beginning of class, **Thursday, Oct 9.**

Stage 2: Presentation & Draft – You are expected to present your paper in class for 5% of your grade. The presentation should be no longer than 10 minutes and 10 powerpoint slides. You are expected to submit a complete draft of your paper to earn credit (5%) while improving your term paper grade. The instructor’s opinion of what constitutes a complete draft will be final. The draft will not be graded, you will receive the points (5%) automatically if it is an acceptable draft. There will be no partial credit for incomplete draft submissions. You are expected to revise your term paper in accord with the feedback that you receive on the draft. Late drafts will not be accepted. Due at the beginning of class, **Thursday, Nov 6.**

Stage 3: Final Paper – The final, edited (based on feedback from instructor/TA) paper. This paper will be graded in full by the instructor/TA. Manuscripts must be submitted in **both** paper (in class) and online (at www.turnitin.com). Complete instructions for electronic submission will be given in class. There will be a 25% penalty for papers turned in one day late. No papers will be accepted more than 1 day late. Due at the beginning of class, **Tuesday, Nov 25**

More information about the paper will be presented later during the semester.

Grading Scheme:

Class Participation Presentation Discussion	40%
Term Paper Proposal Presentation Draft Final version	30% (5% +5%+5%+15%)
Assignments	30%

Grading Scale: The letter grades will be “curved” by basing them on the total points earned (by you) divided by the highest overall point total in the class, and the cut-offs will be approximately as follows:

Grade	Range	Grade	Range
A+	97% & above	C+	77% to 79.9%
A	92% to 96.9%	C	72% to 76.9%
A-	90% to 91.9%	C-	65% to 71.9%
B+	87% to 89.9%	D+	60% to 64.9%
B	82% to 86.9%	D	50% to 59.9%
B-	80% to 81.9%	F	below 50%

Class Policies:

(1) In general, there will be no makeup assignments. A missed deadline will be given a grade of 0, unless a valid excuse is given to the instructor prior to it. Valid excuses include sickness with a doctor's excuse, family emergencies, etc., but you must receive permission to miss a deadline prior to missing it. If it is due to an extreme emergency, it must be documented later.

(2) An "Incomplete" will be given only for valid reasons: family emergencies, serious illness, etc. In general, I will not give incompletes.

(3) Cheating/Plagiarism: Academic dishonesty will not be tolerated. UC LA outlines your rights and responsibilities regarding academic honesty policy, the details can be found at: <http://orientation.ucla.edu/guidepages/13.htm>

(4) Please arrive for class on time; late entrants to the classroom can be very disruptive.

Notes:

Please come see me during office hours. This is your chance to get detailed answers to any questions you may have, clear up any confusions, and let me know more about you and your interests. Do not waste your opportunities: come talk to me.

Visual Information Processing, like many other advanced topics in Psychology, requires a little background knowledge from other disciplines. Background requirements for this course are minimal. However, if you feel confused and suspect your difficulty is due to a lack of background (in computational approaches or in basic math, for instance), I can help. Do not be discouraged: come see me for extra help. You can learn anything.

Please put **PSY124B** in the subject line of **EVERY** email
Thanks!!!!

Date	Readings
9/25 Class Business	
9/30 Visual Perception	<p>1. Richards, W., & Bobick, A. (1988) <i>Playing Twenty questions with Nature. Computational Processes in Human Vision: An Interdisciplinary Perspective</i>, 3 - 26</p> <p>2. Gregory, R.L.(1980) <i>Perception as hypothesis</i>. Phil. Trans. R. Soc. Lond. B 290, 181-187</p> <p>3. Kuhn, G., Amlani, A.A., Rensink, R.A. (2008) <i>Towards a science of magic</i>. Trends Cogn Sci. 2008 Sep 12(9), 349-54.</p>
10/2 Information Processing	<p>Classical Theories of vision (VS 46-64)</p> <p>Information Processing Approach (VS 70-84)</p> <p>4 stages of visual perception (VS 85-92)</p>
10/7 Color Image/Surface	<p>Computational stage (VS 95-100) Image based stage (VS 107-112)</p> <p>4. Jameson, D. , & Hurvich, L., & (1955). <i>Some quantitative aspect of an Opponent Colors Theory</i>. J Opt Soc Am. 45(7), 546-552</p> <p>5. Anderson, B.L, & Winawer, J. (2005) <i>Image segmentation and lightness perception</i>. Nature, 434, 79-83.</p>
10/9 Color Categories	<p>(VS 122- 135) (VS 137-141)</p> <p>6. Montag, E.D.,(1994) <i>Surface color naming in dichromats</i>. Vis. Res. 34, 2137–2151.</p> <p>7. Mitterer, H., de Ruiter, J.P. (2008) <i>Recalibrating color categories using world knowledge</i>. Psychol Sci. Jul;19(7):629-34.</p>
10/14 Perceptual Organization-1 Grouping	<p>(VS 255-266)</p> <p>8. Palmer, S.E., Brooks, J.L., & Nelson, R. (2003) <i>When does grouping happen?</i> Acta Psychol (Amst). Nov;114(3):311-30. Review.</p> <p>9. Palmer, S.E., & Beck, D.M. (2003) <i>The repetition discrimination task: an objective method for studying perceptual grouping</i>. Percept Psychophys. Jan;69(1):68-78.</p> <p>10. Pinna, B., Werner, J.S., Spillmann. L. (2003) <i>The watercolor effect: a new principle of grouping and figure-ground organization</i>. Vision Res. Jan;43(1):43-52.</p>

<p>10/16 Perceptual Organization-2 Figure-ground</p>	<p>(VS 280-287)</p> <p>11. Palmer, S.E., & Ghose, T. (2008) <i>Extremal edges: a powerful cue to depth perception and figure-ground organization</i>. Psychol Sci. Jan;19(1):77-84.</p> <p>12. Burge, J., Peterson, M.A., & Palmer, S.E. (2005) <i>Ordinal configural cues combine with metric disparity in depth perception</i>. J Vis. Jun 22;5(6):534-42.</p> <p>13. Humphreys, G.W., & Müller, H. (2000) <i>A search asymmetry reversed by figure-ground assignment</i>. Psychol Sci. May;11(3):196-201.</p>
<p>10/21 Perceptual Completion</p>	<p>(VS 287-300)</p> <p>14. Shipley, T.F. , & Kellman, P.J. (1992) <i>Perception of Partly Occluded Objects and Illusory Figures: Evidence for an Identity Hypothesis</i> Journal of Experimental Psychology: Human Perception & Performance, 18, 106-120.</p> <p>15. Lleras, A., & Moore, C.M. (2006) <i>What you see is what you get: functional equivalence of a perceptually filled-in surface and a physically presented stimulus</i>. Psychol Sci. Oct;17(10):876-81</p>
<p>10/23 Perceptual Constancy</p>	<p>(VS 312-332)</p> <p>16. Kaufman, L., & Rock, I. (1962). <i>The moon illusion</i>. Science. Jun 22 ;136(3521): 1023-1031.</p> <p>17. Bower, T.G. (1966) <i>Slant Perception and Shape Constancy in Infants</i>. Science. Feb 18;151(3712):832-834.</p> <p>18. Wallach, H. (1939) <i>On the constancy of visual speed</i>. Psychological Review 46:541–52.</p>
<p>10/28 Parts & Wholes</p>	<p>(VS 348-360)</p> <p>19. Tanaka, J.W., & Farah, M.J. (1993) <i>Parts and wholes in face recognition</i>. Q J Exp Psychol A. May;46(2):225-45.</p> <p>20. Childers, T.L., & Houston, M.J. (1984) <i>Conditions for a Picture-Superiority Effect on Consumer Memory</i>. The Journal of Consumer Research, Vol. 11, No. 2, 643-654</p>
<p>10/30 Object Perception & Categorization</p>	<p>(VS 416-432)</p> <p>21. Grill-Spector, K., & Kanwisher, N. (2005) <i>Visual recognition: as soon as you know it is there, you know what it is</i>. Psychol Sci. Feb;16(2):152-60.</p> <p>22. Oliva, A., & Torralba, A. (2007) <i>The role of context in object recognition</i>. Trends Cogn Sci. Dec;11(12):520-7.</p>

<p>11/4 Object Recognition Feature/part based Viewpoint based</p>	<p>(VS 416-432)</p> <p>23. Biederman, I. (1987). <i>Recognition by components: A theory of human image understanding</i>. Psychological Review, 94, 115-147.</p> <p>24. Tarr., M. J., Williams, P., Hayward, W. G., & Gauthier, I. (1998). <i>Three-dimensional object recognition is viewpoint dependent</i>. Nature Neuroscience, 1(4), 275-277</p>
<p>11/6</p>	<p>Term Paper presentation</p> <p>Final Draft Due</p>
<p>11/11</p>	<p>Veterans Day holiday</p>
<p>11/13 Object Recognition Feature/part based Viewpoint based</p>	<p>(VS 416-432)</p> <p>25. Biederman, I., & Gerhardstein, P.C. (1993). <i>Recognizing depth-rotated objects: Evidence and conditions for three-dimensional viewpoint invariance</i>. Journal of Experimental Psychology: Human Perception & Performance, 19, 1162-1182.</p> <p>26. Tarr, M. J., & Bülthoff, H. H. (1995). <i>Is human object recognition better described by geon structural descriptions or by multiple views? Comment on Biederman and Gerhardstein (1993)</i>. Journal of Experimental Psychology,; Human Perception and Performance, 21, 1494-1505.</p> <p>27. Shepard, R. N., & Metzler, J. (1971). <i>Mental rotation of three-dimensional objects</i>. Science, 171(3972): 701-703.</p>
<p>11/18 Attention</p>	<p>(VS 531-562)</p> <p>28. Treisman, A. (1986). <i>Features and objects in visual processing</i> Scientific American, 1986, vol. 255, 114- 124.</p> <p>29. Wolfe, J.M. (1998). <i>What can 1 million trials tell us about visual search</i>. Psychological Science, 9:33-39</p>
<p>11/20 Scene Perception</p>	<p>30. Rensink, R.A., O'Regan, J.K., & Clark, J.J. (1997) <i>To See or Not to See: The Need for Attention to Perceive Changes in Scenes</i>. Psychological Science, 8:368-373</p> <p>31. Brady, T.F., & Oliva, A. (2008) <i>Statistical learning using real-world scenes: extracting categorical regularities without conscious intent</i>. Psychol Sci. Jul;19(7):678-85.</p>

<p>11/25 Attentional Blink</p>	<p>(VS 531-562)</p> <p>32. Raymond, J.E., Shapiro, K.L., & Arnell, K.M. (1992) <i>Temporary suppression of visual processing in an RSVP task: an attentional blink?</i> J Exp Psychol Hum Percept Perform. Aug;18(3):849-60.</p> <p>33. Raymond, J.E. (2003) <i>New objects, not new features, trigger the attentional blink.</i> Psychol Sci. Jan;14(1):54-9.</p> <p>34. Shapiro, K.L., Caldwell, J., & Sorensen, R.E. (1997) <i>Personal names and the attentional blink: a visual "cocktail party" effect.</i> J Exp Psychol Hum Percept Perform. Apr;23(2):504-14.</p> <p>35. Shapiro, K.L., Driver, J., & et al. (1997) <i>Priming from the attentional blink</i> Psychological Science, 8, 95-100.</p>
<p>11/27</p>	<p>Thanksgiving holiday</p>
<p>12/2 Change Blindness</p>	<p>(VS 531-562)</p> <p>36. Simons, D.J. (2000) <i>Attentional capture and inattention blindness.</i> Trends Cogn Sci. Apr;4(4):147-155.</p> <p>37. Simons, D. J., & Levin, D. T. (1997). <i>Change blindness.</i> Trends in Cognitive Sciences, 1, 261-267.</p>
<p>12/4 Awareness</p>	<p>(VS 638-644)</p> <p>38. Lamme, V. A. F. (2003). <i>Why visual attention and awareness are different?</i> Trends in Cognitive Sciences, 7, 12-18.</p> <p>39. He S, Cavanagh P, Intriligator J. (1996) <i>Attentional resolution and the locus of visual awareness.</i> Nature. Sep 26;383(6598):334-7.</p>
<p>12/8-12/12</p>	<p>FINALS WEEK</p>