COS598B/PSY594 Spring 2008:
Vision: From Neuronal Mechanisms to Computational Models

Syllabus

(last update: 2008.03.26)

Instructor: Prof. Fei-Fei Li
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Course website: http://www.cs.princeton.edu/courses/archive/spring08/cos598B/
Course mailing list signup: https://lists.cs.princeton.edu/mailman/listinfo/cos598b_spr08
Course location and time:
Monday, 1:30pm – 4:20pm, Room 301 CS Bldg
Course assignments:
A short summary of one-two papers assigned weekly (due the Sunday night before)
Paper presentations
1 final project
Grading policy:
Attendance and class participation: 20%
Summaries, and Paper presentations: 30%
Final project: 50%
Suggested readings:
S. Palmer (1999). Vision Science: Photons to Phenomenology.
Scientific papers
Important dates:
Final project write-up due (05/13/2008)

Scribe!

Syllabus:

	Date	Description and Readings	Readings	Lecturer
1	Mon, Feb 04	Administrative matter; A case study: natural scene categorization		
2	Mon, Feb 11	The primate visual pathway	Gross, 1992; Bear et al. Neuroscience (Chp 9 & 10), 2001	Charlie Gross
3	Mon, Feb 18	Object parts in IT; Faces in FFA	Tanaka, 1996; Kanwisher et al, 1997; Gauthier et al. 1999; Tarr & Gauthier 2000	
4	Mon, Feb 25	Object perception: Object-centric vs. viewer-centric; Evidence from monkey physiology.	Biederman et al. 1987, 2000; Tarr, 1995; Bulthoff et al. 1995; Logothetis 1995, 1996	

5	Mon, Mar 3	Segmentation	TBA	Jianbo Shi
6	Mon, Mar 10	Biologically inspired models for object recognition	Fukushima 1980; Et al. Poggio, 1999, 2007; LeCun et a. 1998	
	Mon, Mar 24	No class		
7	Mon, Mar 31	Computer Vision models for object recognition	Ullman et al. 2002; Felzenszwalb et al. 2005	
8	Mon, Apr 7	Objects in scenes; Attention and objects	Treisman & Gelade 1980. Thorpe et al. 1996; Ahissar & Hochstein 2004	
9	Mon, Apr 14	Modeling object-based attention	Itti et al. 1998; Lowe 2000, 2004	
10	Mon, Apr 21	Objects in context	Bierderman 2004; Bar 2003, 2004	
11	Mon, Apr 28	Biological motion recognition	G. Rizzolatti & L. Craighero, 2004; R. Blake & M. Shiffrar, 2007; H. Jhuang et al. 2007	
12	TBA	Course project presentation	TBA	
	Tues, May 13 Dean's Day			

References

Lecture #2:
M. F. Bear, *Neuroscience* (2001) Chap. 9 & Chap. 10.
C. G. Gross, Representation of visual stimuli in inferior temporal cortex. *Phil. Trans. Royal Soc. B, Lond*., 1992, *335*: 3-10.

Lecture #3:
N. Kanwisher, J. McDermott & M.M. Chun (1997). The Fusiform Face Area: A Module in Human Extrastriate Cortex Specialized for Face Perception. *The Journal of Neuroscience,* 17(11):4302–4311
McKone, E., Kanwisher, N., Duchaine, B. (2007) Can generic expertise explain special processing for faces? *Trends in Cognitive Science*. **11** 8-15.
I. Gauthier, M. Tarr, A. W. Anderson, P. Skudlarski, & J.C. Gore. (1999) Activation of the middle fusiform 'face area' increases with expertise in recognizing novel objects. *Nature Neuroscience* **2**, 568 - 573
M. Tarr & I. Gauthier (2000). FFA: a flexible fusiform area for subordinate-level visual processing automatized by expertise. *Nature Neuroscience* **3**, 764 – 769

Lecture #4:
I. Biederman (1987). Recognition-by-Components: A theory of human image understanding. *Psychological review.* 94(2): 115-147.

I. Biederman & M. Bar (2000). Differing views on views: response to Hayward and Tarr. *Vision Research*. 40. 3901-3905.
Tarr, M. J. (1995). Rotating objects to recognize them: a case study of the role of viewpoint dependency in the recognition of three-dimensional objects. *Psychonomic Bulletin and Re6iew*, 2, 55–82.
H. Bulthoff, S. Edelman & M. Tarr. (1995). How are three-dimensional objects represented in the brain? *Cerebral Cortex 1995;* 5:247-260.
N. Logothetis, J. Pauls & T. Poggio (1995). Shape representation in the inferior temporal cortex of monkeys. *Current Biology.* 5(5): 5520563.
N. Logothetis & D. Sheinberg. (1996). Visual object recognition. *Annual review neuroscience.* 19: 577-621.

Lecture #6:
K. Fukushima (1980). Neocognitron: A self-organizing neural network model for a mechanism of pattern recognition unaffected by shift in position. *Biol. Cybernetics* 36, 193-202.
Riesenhuber, M. & Poggio, T. (1999). Hierarchical Models of Object Recognition in Cortex. *Nature Neuroscience* **2**: 1019-1025.
Serre, T., L. Wolf, S. Bileschi, M. Riesenhuber and T. Poggio. (2007). Object Recognition with Cortex-like Mechanisms, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 29, 3, 411-426.
Y. LeCun, L. Bottou, Y. Bengio and P. Haffner: (1998). Gradient-Based Learning Applied to Document Recognition, *Proceedings of the IEEE, 86(11):2278-2324,*

Lecutre #7:
Ullman, S., Vidal-Naquet, M. , and Sali, E. (2002) Visual features of intermediate complexity and their use in classification. *Nature Neuroscience*, 5(7), 1-6.
Felzenszwalb, P. and Huttenlocher, D. (2005). Pictorial Structures for Object Recognition. International Journal of Computer Vision, Vol. 61, No. 1, January 2005.

Lecture #8:
A. Treimann & G. Gelade (1980). A feature integration theory of attention. *Cognitive Psychology.* 12: 97-136.
S Thorpe, D Fize, C Marlot (1996). Speed of processing in human visual system. *Nature*. 381: 520-522.
M. Ahissar & S. Hochstein (2004). The reverse hierarchy theory of visual perceptual learning. *Trends in Cognitive Sciences.* 8(10).

Lecture #9:
Laurent Itti, Christof Koch, Ernst Niebur, (1998). "A Model of Saliency-Based Visual Attention for Rapid Scene Analysis," *IEEE Transactions on Pattern Analysis and Machine Intelligence,* vol. 20, no. 11, pp. 1254-1259.
D. Lowe (2000). Towards a Computational Model for Object Recognition in IT Cortex. In *Proceedings of the First IEEE international Workshop on Biologically Motivated Computer Vision* (May 15 - 17, 2000). S. Lee, H. H. Bülthoff, and T. Poggio, Eds. Lecture Notes In Computer Science, vol. 1811. Springer-Verlag, London, 20-31.
(supplementary) D. Lowe (2004). Distinctive image features from scale-invariant keypoints. *International Journal of Computer Vision.* 60(2); 91-110.

Lecture #10:
I. Biederman, R. Mezzanotte, and J. Rabinowitz. (1982) Scene perception: detecting and judging objects undergoing relational violations. *Cognitve Psychology,* 14(2):143–77.

M. Bar, E. Aminoff (2003). Cortical Analysis of Visual Context. Neuron, Volume 38, Issue 2, Pages 347-358.
M. Bar (2004). Visual objects in context. *Nature Review Neuroscience*. 5: 617-629.

Lecture #11:
G. Rizzolatti & L. Craighero. (2004) The mirror-neuron system. Annu. Rev. Neurosci, 27:169-192.
R. Blake & M. Shiffrar. (2007). Perception of Human Motion. Annu. Rev. Psychol, 58:47-73.
H. Jhuang, T. Serre, L. Wolf, T. Poggio (2007). A biologically inspired system for action recognition. ICCV.
(supplementary) G. Rizzolatti, L. Fogassi. V. Gallese (2001). Neurophysiological mechanisms underlying the understanding and imitation of action. Nature Rev. Neurosci. 2:661-670.
(supplementary) L. Fogassi, P. F. Ferrari, B. Gesierich, S. Rozzi, F. Chersi, G. Rizzolatti (2005). Parietal Lobe: from action organization to itention understanding. Science. 308: 662-667.