

Computer Vision (CS 543 / ECE 549) – Spring 2011

Class Time and Place: Tues, Thurs 2:00-3:15 at Everitt 241

Instructors	Email	Office	Office Hours
Derek Hoiem	dhoiem	Siebel 3312	Wed 4-5pm
Ian Endres (TA)	iendres2	Siebel 3307	Mon 3-4pm, Thurs 3:30-4:30pm

The False Mirror, Magritte, 1928

Syllabus

Bulletin Board

<http://groups.google.com/group/cs543-spring2011-uiuc>

Anonymous Feedback

<https://illinois.edu/sb/sec/362368>

Homeworks

HW1 due Feb 15: [assignment](#) ; [materials](#)

HW2 due Mar 10: [assignment](#) ; [materials](#)

HW3 due April 5: [assignment](#) ; [p1 materials](#) ; [p3 materials](#)

HW 4 due April 26: [assignment](#) ; [materials](#)

Final Project: [guidelines](#); [examples](#); [proposed projects](#)

Poster Session: May 10, 10:30am, Siebel Center 2405

Paper: May 11 noon (or at poster session) – cannot accept late papers

Resources

Recommended Textbooks:

[Computer Vision: A Modern Approach](#), Forsyth and Ponce 2002

[Multiple View Geometry in Computer Vision](#) by Hartley and Zisserman 2004

Other Useful Books:

[Computer Vision: Algorithms and Applications](#) by Rick Szeliski 2010 (online, or can be purchased in hardcover)

Computer Vision by Linda Shapiro and George Stockman 2001

Matlab: Useful Functions List; Reference Guide; Writing Fast Code

Schedule (subject to change)

Note: FP5 is short for Forsyth and Ponce chapter 5; HZ6 for Hartley and Zisserman chapter 6; and Sz7 for Szeliski chapter 7.

Date	Topic	Slides	Reading / Notes
Jan 18 (Tues)	Intro: Logistics and Overview	pdf ; ppt	
	Image Formation and Basic Processing		
Jan 20 (Thurs)	Camera Models and Projective Geometry	pdf ; ppt	Perspective Ch Draft - Hoiem, Savarese FP1-2 (camera models) HZ6-7 (camera models, calibration)
Jan 25 (Tues)	Single-view Metrology and Camera Calibration	pdf ; ppt	HZ8 (single view geometry) Criminisi et al. 2000 Cross-ratio proof by Varsha Hedau
Jan 27 (Thurs)	Light and Color	pdf ; ppt (zip)	FP4-6 (Radiometry, Shading, Color)
Feb 1 (Tues)	Pixels and Image Filters	pdf ; ppt	FP7.1-7.2 (linear filters) S3.2 (linear filtering) S3.3 (non-linear

			filtering)
Feb 3 (Thurs)	Thinking in Frequency	pdf ; ppt	FP7.3-7.4 (FFT and frequency) S3.4 (fourier transforms) S2.3.3 (compression) FFT Matlab demo
Feb 8 (Tues)	Templates, Image Pyramids, and Applications	pdf ; ppt	FP7.5-7.7, 9.2 (templates, pyramids) S3.5.2 (image pyramids) S8.1.1 (pyramid alignment) Burt Adelson 1983 – The Laplacian Pyramid
	Grouping and Fitting		
Feb 10 (Thurs)	Edge Detection and Line Fitting w/ Hough Transform	pdf ; ppt	FP8 (edge detection) S4.2 (edges) S4.3 (lines) Berkeley Pb Detector
Feb 15 (Tues)	Robust fitting (RANSAC) and Registration	pdf ; ppt	HW 1 due FP15 (Fitting and Registration) line fitting demo
Feb 17 (Thurs)	Clustering and K-means	pdf ; ppt	http://en.wikipedia.org/wiki/Cluster_analysis FP14 (clustering) Spectral Clustering Tutorial – von Luxburg
Feb 22 (Tues)	EM algorithm, mixture	pdf ; ppt	EM Tutorial by Bilmes

	of Gaussians		FP16.1-16.2 (EM) EM demo
Feb 24 (Thurs)	MRFs and Graph Cuts	pdf ; ppt	What Energy Functions can be Minimized via Graph Cuts? - Kolmogorov and Zabih
Mar 1 (Tues)	Image Segmentation and Gestalt cues	pdf ; ppt	Intro to Mean-Shift -- Thirumuruganathan Boundaries and Watershed – Arbelaez et al. 2009
	Recognition		
Mar 3 (Thurs)	Interest Points: SIFT and Matching Speaker: Ian Endres	ppt ; pdf	Grauman/Leibe Draft Chapter on Local Features Optional: Lowe - SIFT paper
Mar 8 (Tues)	Object Instance Recognition w/ Hough-based Geometric Verification	ppt ; pdf	Lowe-Object Recognition Grauman/Leibe Draft Visual Vocabularies S14.3
Mar 10 (Thurs)	Face Recognition w/ PCA, LDA Speaker: Ali Farhadi	ppt ; pdf	HW 2 due FP22.3.1-2; S14.1; Optional: Face recognition: A Literature Survey (pp 1-26)
Mar 15 (Tues)	Image Features and Categorization	ppt ; pdf	Hoiem/Savarese draft categorization

			S14.4.1
Mar 17 (Thurs)	More w/ Classifiers + Object Categories	ppt ; pdf	See slides for suggested reading
Mar 22, 24	No Class -- Spring Break!		
Mar 29 (Tues)	Detection with Sliding Windows	ppt ; pdf	S14.2; Viola-Jones 2001
Mar 31 (Thurs)	Pictorial Structures and Distance Transform Speaker: Ian Endres	ppt ; pdf	Project Proposal due Grauman/Leibe Draft Parts-based Models ; S14.4.2 Pictorial Structures (Felz.&Hutt 2005)
	Multiple Views and Motion		
Apr 5 (Tues)	Image Stitching	ppt ; pdf	HW 3 due Brown Lowe 2007 ; (panoramic stitching) HZ4.1, HZ4.7 (direct linear transform, RANSAC) Optional: S9 (Image Stitching)
Apr 7 (Thurs)	Feature Tracking and Optical Flow	ppt ; pdf	Seminal paper: Lucas Kanade 1981 KLT Tracker
Apr 12 (Tues)	Epipolar Geometry and Stereo	ppt ; pdf	HZ9: Epipolar Geometry
Apr 14 (Thurs)	Structure from Motion	ppt ; pdf	Seminal paper: Tomasi

			Kanade 1992 S7, FP12: Structure from Motion
Apr 19 (Tues)	Object Tracking	ppt ; pdf	Forsyth and Ponce v2 Tracking draft
	Advanced Topics		
Apr 21 (Thurs)	Action Recognition	ppt ; pdf	See slides for linked references
Apr 26 (Tues)	3D Scenes and Context	ppt ; pdf	HW 4 due Hoiem and Savarese: Chapters 4, 6, 11
Apr 28 (Thurs)	Opportunities of Scale	ppt ; pdf	
May 3 (Tues)	Last Class: Summary, Important Open Problems, and Feedback	ppt ; pdf	
May 10 (Tues)	<i>Poster session at SC2405</i>		
May 11 (Wed)	<i>Final Paper due</i>		