W		Topics	Readings	Other
1	Jan 6-10	Introduction; Cameras and Images: Understanding digital images; basic camera controls; color image acquisition; image noise	Sections 1.1-1.2, 2.1, 2.2, 2.4.2 (only paragraph entitled "silicon sensors"), 2.6.2 from Castleman book	
2	Jan 13-17	HDR Imaging and Alpha Matting: Computing camera response functions from images; the matting equation	Sections 1 and 2, up to Eq (2), from the Debevec 1997 Siggraph paper in Readings	
3	Jan 20-24	Computing 1D image derivatives: Least-squares polynomial fitting, intensity derivatives, weighted least squares, RANSAC		
4	Jan 27-31	Edge detection: Local analysis of 1D and 2D image patches, the image gradient, edge detection		A1 due on Wed
5	Feb 3-7	Template matching, correlation and patch-based image processing: Representing images as vectors; evaluating similarity using RMS distance error, cross-correlation and normalized cross-correlation		
6	Feb 10-14	Convolution; Analysis of WLS polynomial fitting and image smoothing as a template matching operation; Template matching expressed as a multiplication of an image with a Toeplitz matrix; Gaussian image smoothing; Interpolation		
7	Feb 17-21	Reading week		A2 due on Fri
8	Feb 24-28	Midterm test		
9	Mar 2-6	Dimensionality reduction; principle component analysis; case study: face recognition using Eigenfaces; Image Pyramids: Gaussian Pyramids, Laplacian Pyramids.	See many links in slides on understanding PCA Original paper by Burt and Adelson on the Gauss/Laplacian pyramids in Readings (up to, but not including section entitled Entropy).	
10	Mar 9-13	Matching images using SIFT; SIFT-based feature detection; the SIFT descriptor; image matching using SIFT; Homogeneous coordinates: Homography-based image warping; Homographies	Sections 1-3 of the Lowe paper on SIFT found in the Readings.	A3 due on Wed
11	Mar 16-20	Fourier Transform, Convolution Theorem		
12	Mar 23-27	The Haar Wavelet Transform: Wavelet compression of 1D and 2D images	The paper on the Haar Wavelets by Stollnitz et al in Resources/Readings.	A4 due on Fri
13	Mar 30 – Apr 3	Image morphing: backward mapping		Proj report due on Fri