

CS 534 Midterm Exam Preparation

1. Introduction

Will **not** cover the two introductory papers assigned or the Introduction powerpoint slides.

2. Digital Camera and Photography Concepts

Responsible for Chapters 2 and 3 in "Photography" by London et al. Will cover the powerpoint slides on digital cameras. *Important topics:* aperture, shutter speed, focal length, f-number, reciprocity, EV, ISO, depth of field, exposure, shutter priority, aperture priority, pinhole camera image formation, field of view, thin lens formula, defocus blur, circle of confusion, demosaicing, histogram equalization.

3. Matlab

Nothing on: Matlab.

4. Image Filters

Responsible for the main ideas in Szeliski Chapter 3.1, 3.2, and 10.3.1 except *nothing on* padding, steerable filters, summed area table, integral image, or recursive filtering. Includes material in the powerpoint slides except **nothing on:** illusions, Matlab, filter banks, or hybrid images. *Important topics:* image correlation (cross-correlation), linear filtering, point operations, local operations, box filter, sharpening filter, unsharp masking, convolution, properties of linear filters, Gaussian filter, shift invariance, isotropic, cascading Gaussian filters, separability, median filter, bilateral filter, edge detection, gradient, Laplacian, filters for computing gradient and Laplacian, Laplacian-of-Gaussian filter, Difference-of-Gaussians, Gaussian pyramid, Laplacian pyramid.

5. Texture Synthesis

Responsible for the main ideas in the paper "Image quilting for texture synthesis and transfer." Includes the powerpoint slides except **nothing on:** "accelerating texture synthesis," multi-scale texture synthesis, image analogies, or rendering images using objects as primitives. *Important topics:* Markov Random Field (MRF) model of texture, stationarity, Efros and Leung algorithm, sum of squared difference (SSD) measure of matching two windows, dependency on order of filling, Gaussian pyramids: definition and how to construct, Image Quilting algorithm, finding minimal error boundary using dynamic programming, texture transfer.

6. Image Resizing and Image Completion

Responsible for the main ideas in the paper "Seam carving for content-aware image resizing." Covers the powerpoint slides except **nothing on:** "image completion with structure propagation," Gabor filter or GIST image descriptor. *Important topics:* seam carving algorithm, dynamic programming, Criminisi image completion algorithm, Hays and Efros image completion algorithm.

7. Panoramas

Responsible for the main ideas in Chapter 9 of Szeliski book. *Nothing on* the paper "Recognising Panoramas." Covers material in the powerpoint slides except **nothing on:** the direct method for alignment, 2D rigid warp mosaics, global image registration, cylindrical panoramas, cylindrical projection, illusions, simultaneous contrast, mixing gradients in Poisson blending, feature-space outlier rejection, probabilistic model for verifying an image match, bundle adjustment, discovering panoramas in videos, panoramic video textures, gigapixel panoramas, or unwrap mosaics.

Important topics: When can two images be aligned and why, homogeneous coordinates, converting between homogeneous and Cartesian coordinates, using homogeneous coordinates to do 2D transformations, homography, projective transformation, affine transformation, similarity transformation, perspective warp, panorama-making algorithm, feature-based alignment, solving for homography matrix, warping methods, bilinear pixel interpolation, blending by averaging or weighted averaging, Laplacian pyramids, edge detection, image gradient, scale-space problem, Laplacian edge detector, Laplacian-of-Gaussian, Difference-of-Gaussian, Laplacian pyramid, gradient domain (Poisson) blending, RANSAC algorithm.

8. Multi-Perspective Images

Nothing on: this topic.

9. Feature Point Detection and Matching

Responsible for the “Local features tutorial” handout. Includes topics in the powerpoint slides except **nothing on:** affine invariant detection or M-estimators. **Important topics:** Edge detection, image gradient, Laplacian edge detector, Harris corner point detector, SIFT interest point detector, SIFT feature point descriptor, invariance properties to shift, rotation, scale, illumination.

10. Collages

Nothing on: this topic.