

[Collapse All](#)

▼ Online Lecture Room + Office Hour Links

[Lecture and Instructor Office Hours](#)



https://canvas.wisc.edu/courses/478888/external_tools/27637

[TA Office Hours](#) (https://canvas.wisc.edu/courses/478888/external_tools/27637)



▼ Lecture 1 - 09/04 - Introduction and Optical Illusions



Quiz - Introduction

Sep 6 0.5 pts



HW1

Sep 16 5 pts

Slide

[Lecture 1: Introduction and Optical Illusions](#)



<https://drive.google.com/file/d/1YegzPtnTO1tYGmy0cHGGi7lCHoNYA6Qq/view?usp=sharing>

▼ Lecture 2 - 09/09 - Image Formation and Sensing



Quiz - Image Formation and Sensing

Sep 11 0.5 pts

Videos

Video 1: Intro and Perspective Imaging



(<https://drive.google.com/file/d/1py9JP2ckzJsSO9aZmQH9AoauEPsmFFdX/view?usp=sharing>)

Video 2: Magnification and Vanishing Point



(<https://drive.google.com/file/d/1n2eW733G-YhODvgRDXiv-sJai0qxRRLJ/view?usp=sharing>)

Video 3: Lenses



(https://drive.google.com/file/d/1-R_qDzgspwc5_YCgjsi0V4NzeJt35wFO/view?usp=sharing)

Video 4: Defocus



(<https://drive.google.com/file/d/1gKStcg48QBy4OaEYU9oq6MyTEAdvJiEb/view?usp=sharing>)

Video 5: Lens-based Image Artifacts



(<https://drive.google.com/file/d/1aJnEWKtnKHyTBjeR-UAbg76kTegQjHWD/view?usp=sharing>)

Video 6: Image Sensors, Noise, and Dynamic Range



(<https://drive.google.com/file/d/1z4V4iFkacDUbOYx8i0gouQLcW1oN3XgM/view?usp=sharing>)

Slide

Lecture 2: Image Formation and Sensing



(<https://drive.google.com/file/d/19ROy1qZgFq9nQPu3PMMmTGIXiT7iOEPm/view?usp=sharing>)

▼ Lecture 3 - 09/11 - Image Filtering



Quiz - Image Filtering

Sep 13 0.5 pts

Videos

Video 1: Intro

(https://drive.google.com/file/d/1IQVt0OEUUqeVjpfGRNeyjG_6j64UW52N/view?usp=sharing)

Video 2: Linear Filtering

(<https://drive.google.com/file/d/1kD7dDewYppHL3y4Q9sGjGSrtfApzgJl/view?usp=sharing>)

Video 3: Box Filter Example Linear Filtering

(https://drive.google.com/file/d/1dH3nDw_a6DW6S66PoGRSIK22Of7uo2t8/view?usp=sharing)

Video 4: Filtering Examples and Gaussian Smoothing

(https://drive.google.com/file/d/1Fu8mF9MQ2amubzK60FO_G_hU0NEiJE71/view?usp=sharing)

Video 5: Median Filtering

(<https://drive.google.com/file/d/1HEPGwRik2HYCw11ybZmXdRMBLGgTXv8A/view?usp=sharing>)

Video 6: Template Matching

(<https://drive.google.com/file/d/1nWczVoshrrNiplg-rRXsIL5kL8DAtdD/view?usp=sharing>)

Slide

Lecture 3: Image Filtering

(https://drive.google.com/file/d/10Sstb1q2z80PvUyH_iZhYXiL_vPLh8he/view?usp=sharing)

▼ Lecture 4 - 09/16 - Thinking about Images in the Fourier Domain**Quiz -Thinking about Images in the Fourier Domain**

Sep 18 0.5 pts

Videos

Video 1: Intro to Fourier Transform



Video 2: Fourier Transform Examples



Video 3: Fourier Transform Properties



Video 4: 2D Fourier Transform Example



Video 5: Filtering in the Fourier Domain



Video 6: Deconvolution



Video 7: Sampling

Slide

Lecture 4: Thinking about Images in the Fourier Domain

Will unlock Sep 15 at 5pm

▼ Lecture 5 - 09/18 - Edge and Corner Detection



Quiz - Edge and Corner Detection

Sep 20 0.5 pts

Videos



Video 1: Intro



Video 2: Theory of Gradient Edge Detector



Video 3: Discrete Gradient Operator



Video 4: Laplacian and Noise Suppression



Video 5: Canny Edge Detector



Video 6: Harris Corner Detection

Will unlock Sep 17 at 5pm

▼ Lecture 6 & Lecture 7 - 09/23 & 9/25 - Boundary Detection and Hough Transforms & Video ...



Quiz - Image Formation, Processing, and Edge Detection Review

Sep 25 0.5 pts



Quiz - Boundary Detection and Hough Transforms

Sep 27 0.5 pts

Lecture Videos



Video 1: Intro



Video 2: Line Fitting



Video 3: Hough Line



Video 4: Hough Transform Practical Considerations



Video 5: Circle and Generalized Hough Transform



Video 6: Active Contours Intro



Video 7: Active Contours Optimization

Will unlock Sep 22 at 5pm

▼ Lecture 8 - 09/30 - 2D Object Recognition using SIFT



Videos



Video 1: Intro to Image Matching



Video2: 1D Blob Detection



Video 3: 2D Blob Detection



Video 4: Scale Space Analysis



Video 5: SIFT Descriptor



Video 6: SIFT Examples and Active Contours

Will unlock Sep 29 at 5pm

▼ Lecture 09 and 10 - 10/02 and 10/07 - Image Alignment: Image Transformations and RANSAC



Survey about Quizzes

Dec 8



Quiz - Image Alignment

Oct 4 0.5 pts

Videos



Video 1: Intro and Overview



Video 2: Linear Warping



Video 3: Homogeneous Coordinates



Video 4: Homography



Video 5: Least Squares Homography



Video 6: RANSAC



Video 7: Warping



Video 8: Blending

Will unlock Oct 1 at 5pm

▼ Lecture 11 - 10/09 - Face Detection with Support Vector Machines**Quiz - Face Detection and SVM**

Oct 14 0.5 pts

Videos

Video 1: Intro to Face Detection



Video 2: Haar Features



Video 3: Integral Images



Video 4: Nearest Neighbor Classifier



Video 5: Linear Decision Boundaries



Video 6: Support Vector Machines

Will unlock Oct 8 at 5pm

▼ Lecture 12 - 10/14 - Image Segmentation with k-Means Clustering and Mean-Shift**No Quiz for this Lecture**

Videos



Video 1: Intro



Video 2: Clustering



Video 3: K-Means Clustering



Video 4: K Means Segmentation



Video 5: Mean Shift Clustering



Video 6: Mean Shift Segmentation



Video 7: Graph Cut Segmentation



Video 8: Normalized Cut Segmentation

Will unlock Oct 13 at 5pm

▼ Lecture 13 - 10/16 - Introduction to Neural Networks and Convolutional Neural Networks



Quiz - Introduction to Neural Networks

Oct 21 0.5 pts

Videos



01 - Introduction



02 - Neurons and Activations



03 - Character Recognition Example



04 - Neural Network Training



05 - Motivating Convolutional Networks



06 - Convolutional Networks Description



07 - ConvNets for Semantic Segmentation

Will unlock Oct 15 at 5pm

▼ **Lecture 14 & 15- 10/23 & 10/28 - Radiometry and Surface Appearance & 3D Shape from Pho...**



Quiz - Radiometry and Photometric Stereo

Oct 30 0.5 pts

Videos



01 - Introduction to Radiometry



02 - BRDF



03 - Lambertian Model



04 - Specular and Rough Surfaces



05 - Photometric Stereo



06 - Photometric Stereo Analysis and Applications



07 - Example-based Photometric Stereo

Will unlock Oct 22 at 5pm

▼ Lecture 16 - 10/30 - Shape from Focus/Defocus



Quiz - Shape from Focus/Defocus

Nov 4 0.5 pts

Videos



01 - Introduction to Camera Defocus



02 - Depth from Focus



03 - Depth from Defocus

Will unlock Oct 29 at 5pm

▼ Lecture 17 - 11/04 - Camera Calibration and Shape from Stereo



Quiz - Camera Calibration and Simple Stereo

Nov 11 0.5 pts

Videos



01 - Introduction to Depth from Stereo



02 - Intrinsic Camera Matrix



03 - Extrinsic Camera Matrix



04 - Camera Calibration



05 - Recovering Extrinsic and Intrinsic Matrices



06 - Triangulation



07 - Finding Correspondences

Will unlock Nov 3 at 5pm

▼ Lecture 18 - 11/06 - Internet-Scale 3D Reconstruction



Quiz - Internet-Scale 3D Reconstruction

Nov 11 0.5 pts

Videos



01 - Introduction and Review of Basic Stereo



02 - Intuition and Outline



03 - Essential Matrix



04 - Fundamental Matrix



05 - Stereo Autocalibration



06 - Finding Dense Correspondences via Epipolar Geometry



07 - Triangulation and Internet Scale 3D

Will unlock Nov 5 at 5pm

▼ Lecture 19 - 11/11 - Optical Flow and Motion Measurement

Quiz - Optical Flow and Motion

Nov 13 0.5 pts

Videos

01 - Introduction to Motion Estimation



02 - Theory of Optical Flow



03 - Lucas-Kanade Optical Flow



04 - Large-Motion Optical Flow

Will unlock Nov 10 at 5pm

▼ Lecture 20 - 11/13 - Background Subtraction and Image Tracking**Quiz - Object Tracking**

Nov 18 0.5 pts

Videos

01 - Introduction and Change Detection



02 - Motion Detection using Gaussian Mixture Models



03 - Template-based Tracking



04 - Detection-based Tracking

Will unlock Nov 12 at 5pm

▼ Lecture 21 - 11/18 - Modern 3D Cameras: Structured Light and Time-of-Flight**Quiz - Structured Light and Time-of-Flight**

Nov 20 0.5 pts

Will unlock Nov 17 at 5pm

▼ Lecture 22 - 11/20 - Advanced Topics: Computational Cameras

Will unlock Nov 20 at 12am