

CS 4984 Computer Vision: A First Class

Instructor: Francis Quek

Course Text: David Forsyth and Jean Ponce, "Computer Vision: A Modern Approach," Prentice Hall, 2003.

About the Class

Computer vision is about the understanding of digital images and videos. In this class, students will be introduced to the fundamentals of image formation, low-level processing of images, and selected topics on dealing with multiple cameras/video streams and mid-level vision. Students are expected to have a grasp of mathematics and linear algebra for the class.

The class is intended for seniors and graduate students.

Topics

Image Formation and Image Models

- Cameras
- Geometric Camera Models
- Geometric Camera Calibration
- Radiometry --- Measuring Light
- Sources, Shadows and Shading
- Color

Early Vision: Just One Image

- Linear Filters
- Edge Detection
- Texture

Early Vision: Multiple Images (Selected Topics)

- The Geometry of Multiple Views
- Stereopsis
- Affine Structure from Motion
- Projective Structure from Motion

Mid-Level Vision (Selected Topics)

- Segmentation by Clustering
- Segmentation by Fitting a Model
- Segmentation and Fitting using Probabilistic Methods
- Tracking with Linear Dynamic Models

Projects

There will be a series of four to five projects in the class, as well as final project. Projects will be done in teams (size dependent on class size). These projects will determine 60% of the course grade. The final project will be worth 30% of the final grade, and the other projects will be evenly weighted.

Projects will be graded by project reports and a demonstration.

Students select the final project in consultation with the instructor. Projects ideally should be related to the students' areas of research interest.

Exams

There will be a mid-term and final exam worth 10% and 30% of the course grade respectively, and will cover material covered in the course.

Prerequisites

CS 2604, Math 2214 & 2224