

# 198:534 COMPUTER VISION

## SPRING 2015

Instructor: Dr. Ahmed Elgammal -- email: elgammal (at) cs  
Office hours: Friday 12-1pm – Core 316

Class TA: Polina Yanovich – email yanovich as cs.rutgers.edu  
TA office hours: Tuesday 10:30am-11:30am at Hill 266

**Class Web page:** <http://www.cs.rutgers.edu/~elgammal/classes/cs534/cs534.html>

**Class Materials:** Lectures and other reading materials will be available at  
<http://www.cs.rutgers.edu/~elgammal/classes/cs534/materials.htm>

Regular class time: Monday 1:40-4:40pm - (with 20 minutes break around 3pm.)  
Class will meet at CBIM 22

There is a Sakai web site for the class where the assignment, announcements, grades, and other resources will be posted.

### Overview:

This is a basic graduate-level computer vision course that intends to cover a variety of fundamental computer vision topics to get you acquainted with the field.

### Topics:

Image Formation: Cameras, Geometric camera models, Calibration, Radiometry, Color.

Early Vision: Linear filters, Edge detection, Texture, Geometry of multiple views.

Mid-level Vision: Motion, Segmentation, and Tracking.

High-Level Vision: Model-based vision, Pose estimation, Appearance-based vision, Generic Object Recognition.

### Recommended Background:

The class doesn't assume any prior knowledge of computer vision

Linear algebra and basic statistics.

Familiarity with Matlab programming is an advantage, however you can learn Matlab during the class.

Pre-requisite: 198:520 or 198:530 or equivalent.

### Textbooks

The class will be covered from different sources, these two text books contain most of the topic that will be covered.

"Computer Vision: A Modern Approach" – Second Edition

By David Forsyth and Jean Ponce

Prentice Hall 2012

"Computer Vision Algorithms and Application"

By Richard Szeliski

Springer 2010

<http://szeliski.org/Book/>

Other useful reading materials will be provided.

Other useful references:

- G. Medioni, S.B. Kang "Emerging Topics in Computer Vision", Prentice Hall
- Y. Ma, S. Soatto, J. Koseca, S. S. Sastry "An Invitation to 3D Vision, From Images to Geometric Models" Springer
- L. Shapiro, G. C. Stockman "Computer Vision", Prentice Hall.
- O. Faugeras "Three-Dimensional Computer Vision: A Geometric View Point", MIT press.
- Horn "Robot Vision", MIT press.
- D. Marr "Vision", Freeman 1982.

### Course Load

- Assignments: (60%) 4 assignments, Matlab programming.
- Biweekly Quizzes (15%)
- Late Midterm Exam (25%)

### Tentative Class Schedule:

Date		Lecture
1/26/15	Week 1	1- <a href="#">Introduction to Computer Vision and Applications</a>
2/2/15	Week 2	2- <a href="#">Human Vision- a brief</a> 3- <a href="#">Cameras and Lenses</a>
2/9/15	Week 3	4- <a href="#">Binary Image Analysis</a>
2/16/15	Week 4	6- <a href="#">Linear Filters</a> 7- <a href="#">Edge Detection</a> + Local Features
2/23/15	Week 5	8- <a href="#">Fourier Transform of images</a> - <a href="#">Texture</a> - Color
3/2/15	Week 6	9- <a href="#">Camera Geometry</a>
3/9/15	Week 7	10 - <a href="#">Camera Calibration</a>
3/22/15	Week 8	11 - <a href="#">Stereo imaging</a> + MRFs
3/30/15	Week 9	12 - <a href="#">Multiple View Geometry and Structure from Motion</a>
4/6/15	Week 10	13- <a href="#">Perceptual Grouping and Segmentation by Clustering</a>  14 - <a href="#">Segmentation- statistical methods, mean shift</a>
4/13/15	Week 11	15 – Segmentation: <a href="#">Model Fitting</a>
4/20/15	Week 12	16 - <a href="#">3D Model-based Recognition and Pose Recovery - RANSAC</a>
4/27/15	Week 13	17 - <a href="#">Appearance-based Vision</a>
5/4/15	Week 14	18- <a href="#">Local-Feature based Object Detection and Recognition</a>