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 equivelant.

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

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
  ▪  Horn “Robot Vision”, MIT press.
Course Load

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

Tentative Class Schedule:

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