ECSE 4961/6650 Computer Vision

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Semester and Year: Fall, 2021
Credit Hours: 3
Meeting Hours & Place: 12:30-1:50 pm, Tuesdays and Fridays, SAGE 2701
Office Hours: Fridays 2:00pm - 3:00pm pm or by Appointment
TA: TBD
TA Office hours: NA
Lecture notes: http://www.ecse.rpi.edu/~qji/CV/ecse6650_lecture_notes.html

Catalog Description:

This course covers core computer vision theories that deal with acquiring, processing and analyzing images in order to reconstruct and understand the 3D scene. It will focus on the mathematical models that map a 3D scene to its 2D images, theories that reconstruct and interpret the 3D scene from their images, and methods for image feature extraction. Topics to be covered include image formation and representation, camera models, projective geometry, camera calibration, pose estimation, 3D reconstruction, motion analysis, structure from motion, target tracking, feature extraction, and object recognition. Besides computer vision, this course will also be useful for students interested in pattern recognition, image processing, robotics, human computer interaction, and medical imaging.

Prerequisites: ECSE 2500 and MATH 2010 and CSCI 1200 and programming skill in **Python, C++** or **MATLAB**.

Textbook: No formal textbook but detailed lecture notes will be provided

Optional Texts:

- Computer Vision: Algorithms and Applications**,** Richard Szeliski
- Introductory Techniques for 3D Computer Vision Approach, Emanuele Trucco & Alessandro Verri.
- Three-Dimensional Computer Vision-a geometric viewpoint, Oliver Faugeras, The MIT Press, 1993.
- Multiple View Geometry in Computer Vision, Richard Hartley and Andrew Zisserman, Cambridge, 2001.
- Probabilistic graphical models for computer vision, Qiang Ji, Academic Press, 2019.

Student learning outcomes:

ECSE 6650

Students who successfully complete this courses will be able to:

1. understand the fundamental computer vision theories
2. have the ability to design and implement major computer vision algorithms
3. have the capability of applying computer vision technologies to applications of interest.
4. independently investigate research literature for advanced computer vision topics

ECSE 4961
Students who successfully complete this courses will be able to:
1. understand the fundamental computer vision theories
2. have the ability to implement basic computer vision algorithms
3. have the capability of applying computer vision technologies to certain applications

Assessment Measures:

ECSE 6650
- Assignments: 20%
- Class Projects: 40%
- Midterm Exam: 25%
- Final Project: 15% , including a review and discussion of related work

ECSE 4961
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- Midterm Exam: 25%
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Major differences in grade distribution: 6000 level students will be given more complex problems with increasing breadth and depth in all categories, often requiring advanced understanding of the topics covered in the class.

Grading:

ECSE 6650:
Grading will be based on homework assignments, projects, a middle-term exam, and the final project. The final project should include a review of research papers and discussion of related work. Note students cannot receive "D/D+" grades.

ECSE 4961
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Academic Integrity:

Student-teacher relationships are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the courses they teach, and teachers must trust that the assignments that students turn in are their own. Acts that violate this trust undermine the educational process. The Rensselaer Handbook of Student Rights and Responsibilities and The Graduate Student Supplement define various forms of Academic Dishonesty and you should make yourself familiar with these. In this class, all assignments that are turned in for a grade must represent the student's own work. In cases where help was received, or teamwork was allowed, a notation on the assignment should indicate your collaboration.