

2209 CS460/EIE460/SE460 Course Outline

Subject Code : CS460/EIE460/SE460
Subject Title : COMPUTER VISION
Level : 2
Credits : 3
Teaching Activity : Lecture 45 hours

Prior Knowledge* : CS121 Data structures, CS110 Programming, MATH101 Math

Class Schedule :	Class	Week	Time	Classroom	Date
	D1	WED	9:00-11:50	C507	2023/09/04- 2023/12/17

Instructor : Nannan Li
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Office : A302
Office Hour : MON – FRI 9:00-13:00, 14:30-18:20

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Course Description

This course provides a comprehensive introduction to computer vision including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, deep neural networks, high-level vision tasks like image classification and object detection. The focus of the course is to develop the intuitions and mathematics of the methods in class, and then to learn about the difference between theory and practice in the problem sets.

Textbook(s)

Required Text book (S)

Book name: Computer Vision: Algorithms and Applications

Author/Editor: Richard Szeliski

Edition: 2nd Edition

Available online for free: <https://szeliski.org/Book/>

References Book (F&P)

Book name: Computer Vision: A Modern Approach

Author/Editor: David Forsyth and Jean Ponce

Edition: 2nd Edition

ISBN: 978-0136085928

Publisher: Pearson, Prentice Hall

Date: 2011

References Book (H&Z)

Book name: Multiple View Geometry in Computer Vision

Author/Editor: Richard Hartley and Andrew Zisserman

Edition: 2nd Edition

ISBN: 978-0-521-54051-3

Publisher: Cambridge University Press

Date: 2003

INTENDED LEARNING OUTCOMES

Upon successful completion of this subject, students will be able to:

- (a) Explain basic theories and techniques in computer vision;
- (b) Identify various approaches of computer vision and design the components of the system for computer vision;
- (c) Describe and discuss the basic functions and methods for image processing;
- (d) Design simple systems for computer vision which can handle certain problem;
- (e) Evaluate, experiment with, and optimize the performance of the systems for computer vision;
- (f) Conduct research in this field; and
- (g) Write technical reports in right format and master professional text-editing techniques.

Weekly Schedule

內容 Topic	學時 Hours	教學方法 Teaching Method	備註 Remarks
Introduction and Math Recap	3	Lecture	
Image Processing Techniques	3	Lecture	
Camera Models	3	Lecture	S:2, H&Z:2
Multi-view Geometry	6	Lecture	S:6, S:11
Image Features	9	Lecture	S:3, H&Z:2
Machine learning	6	Lecture	S:5.1
Neural Networks	9	Lecture	S:5
Applications	6	Lecture	S:6

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TEACHING AND LEARNING APPROACH

The teaching and learning approach of this subject is to help students in understanding the basic principles and fundamental methods of computer vision. Application-oriented thinking is strongly suggested to promote study interest, help student develop right methodology for real problem-solving.

The teaching activities are conducted by means of explanation and chalk-talk through problem solving and plenty of examples of real applications from common life as well. Students are encouraged to respond to lecturer's questions through in-class discussion.

ASSESSMENT APPROACH

<u>Assessment method</u>	% weight
1. In-class Quiz	10%
2. Assignments	40%
3. Final Project	50%
Total	100 %

Notes:

In-class quizzes are used to evaluate how well students have learned the basic concepts of computer vision as well as the procedure of certain algorithms.

Assignments are used to measure how far students have achieved their course outcomes. Tasks will primarily be analyzed and accomplished via programming with Python.

Final project is used to measure how far students have achieved their course outcomes. The whole project will firstly be decomposed into separate sub-tasks that will be achieved by different group members, then the outcomes will be integrated to achieve the final designed goal. Simultaneously, team members must work together to compose a research technical report that meets the formal academic format.

Guideline for Letter Grade:

Marks	Grade
93 - 100	A+
88 - 92	A
83 - 87	A-
78 - 82	B+
72 - 77	B
68 - 71	B-

63 - 67	C+
59 - 62	C
56 - 58	C-
53 - 55	D+
50 - 52	D
49 -	F