

Computer Vision

Course Name	Course type (credit/hours)		Elective course(3/3)		Course code	F097
	Target students Division/major/grade		Software and Computer Engineering/Senior		Opening semester	2020 1ST SEMESTER
	Class time and classroom		Mon F(Pal325)Thu F(Pal325)		English Grade	A(100%English)
Reference to this course	Prerequisite courses		Data Structure			
	Related basic courses		Probability & Statistics, Linear Algebra			
	Recommended concurrent courses					
	Related advanced courses		Artificial Intelligence, Computer Graphics			
Instructor	Name (title/division)		Wonjun Hwang(Assistant Professor, Software and Computer Engineering)			
	Office Room Number	팔달관 703호	Office phone Number	2632	e-mail	
	Office hours			Homepage address	https://sites.google.com/site/haepaly/	
Teaching Assistant	Name (title/division)					
	Office Room Number		Office phone Number		e-mail	

1. Introduction

Humans perceive the three-dimensional structure of the world with apparent ease. The goal of a computer vision is to achieve the dream of having a computer interpret an image at the same level. In this course, we will explore the variety of techniques commonly used to analyze and interpret images. It also describes challenging real-world applications where vision is being successfully used, both for specialized applications such as medical imaging, and for fun, consumer-level tasks such as image editing and stitching, which students can apply to their own personal photos and videos.

2. Course Objectives

Program Objectives

- Improving mathematical foundation
- Understanding various image data sets
- Recognize engineering problems
- Enhancing usage of various tools
- Lifelong learning ability

Outcomes

- analyze various image related problems (program outcomes item number 1, 2, 4)
- develop programming skills for various image handling tasks (program outcomes item number 1, 2, 4)
- recognize various application areas (program outcomes item number 4, 9)
- building ability to adopt newly developed vision ideas(program outcomes item number 8, 9, 10)

3. Class types and activities

This course consists of mostly lectures, presentation and discussions. Students are asked to have homework assignment, and term projects.
There will be two examinations (mid and final terms) and term project presentation will be held in last weeks.

4. Teaching Method

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|---|---|
| <input checked="" type="checkbox"/> lecture | <input checked="" type="checkbox"/> discussion and debate |
| <input checked="" type="checkbox"/> team project(presentation and case studies) | <input type="checkbox"/> experiments(role-playing,etc) |
| <input type="checkbox"/> designing and production | <input type="checkbox"/> on-site learning(on-site training) |
| <input type="checkbox"/> others | |

5. Support Systems in Use

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|--|---|---|
| <input checked="" type="checkbox"/> AjouBb | <input type="checkbox"/> automatic recording system | <input type="checkbox"/> web-based assignment |
| <input type="checkbox"/> cyber lecture | <input type="checkbox"/> online content | |
| <input type="checkbox"/> class behavior analyzing system | <input type="checkbox"/> others | |

6. Teaching Tools

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|--|---|---|
| <input type="checkbox"/> PBL(Problem Based Learning) | <input type="checkbox"/> CBL(Case Based Learning) | <input type="checkbox"/> TBL(Team Based Learning) |
| <input type="checkbox"/> UR(Undergraduate Research) | <input type="checkbox"/> FL(Flipped Learning) | <input type="checkbox"/> DSAL(Data Science Active Learning) |
| <input type="checkbox"/> others | | |

7. Knowledge and ability required for taking this course

Students need to have a working knowledge of calculus, basic probability theory, computer programming and elementary data structure.

8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10%	
midterm exam	1	35%	
final exam	1	35%	
quiz			
presentation			
discussion			
homework	2	20%	
etc			
study hours	6 hours		

9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	Computer Vision: Algorithms and Applications	R. Szeliski	Springer	2011
Sub	Concise Computer Vision An Introduction into Theory and Algorithms	Klette, Reinhard	Springer	2014

10. Class system and Class shedule

<p>We will cover following topics.</p> <ul style="list-style-type: none"> - Introduction and Preliminaries - Visual Features - Object Detection and Recognition - Grouping and Segmentation - Motion and Tracking - Geometric Computer Vision - Deep Learning 						
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< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Introduction (CV and Linear Algebra)	E	Wonjun Hwang			
2	Camera Model and Geometry	E	Wonjun Hwang			

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
3	Image Formation and Processing	E	Wonjun Hwang			
4	Edge and Corner Detection	E	Wonjun Hwang			
5	Image Feature and Representation	E	Wonjun Hwang			
6	General Concepts for Eigenspaces	E	Wonjun Hwang			
7	Feature-based Instance and Category Recognition	E	Wonjun Hwang			
8	Midterm Exam. and Problem Solving	E	Wonjun Hwang			
9	Clustering and Segmentation	E	Wonjun Hwang			
10	Neural network: Perceptron	E	Wonjun Hwang			
11	Deep Learning: Introduction	E	Wonjun Hwang			
12	Deep Learning: CNN	E	Wonjun Hwang			
13	Deep Learning: Loss Function and Optimization	E	Wonjun Hwang			
14	Deep Learning: Backpropagation	E	Wonjun Hwang			
15	Deep Learning: Advanced Topic	E	Wonjun Hwang			
16	Final Exam. and Problem Solving	E	Wonjun Hwang			

11. Other items of notification

- The final evaluation rule will be shared in the first lecture day. (Tentative)