CS4186: COMPUTER VISION AND IMAGE PROCESSING

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Computer Vision and Image Processing

Subject Code
CS - Computer Science
Course Number
4186

Academic Unit
Computer Science (CS)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
CS2303 Data Structures for Media or
CS2334 Data Structures for Data Science
CS3334 Data Structures or
CS4335 Design and Analysis of Algorithms or
EE2331 Data Structures and Algorithms

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

The elective course introduces a thorough grounding of the principles of computer vision and image processing, and seeks to develop students' knowledge from basic image processing techniques to advanced computer vision and image analysis systems. It concentrates on the fundamental theory of computer vision and image processing with emphasis on the areas of feature extraction, image segmentation, object recognition, motion analysis and scene understanding.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain the main characteristics of different computer vision and image processing techniques through observation of their operations.			x	
2	Implement different computer vision and image processing solutions.			x	
3	Perform critical assessment of the effectiveness of different computer vision and image processing approaches.		x		
4	Apply and combine suitable computer vision and image processing principles to create new and improved solutions for real-world applications.		x	x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	The lecture will focus on the introduction of computer vision and image processing techniques, and related real-world applications such as object recognition, motion analysis and scene understanding.	1, 3, 4	3 hours/week

2	Tutorial	Students will work on a different problem set each week during the tutorial sessions, through which they can discover the main characteristics of different computer vision and image processing techniques. They will also be invited to present their solutions, and the class will be encouraged to provide comments.	1, 3	8 hours/semester
3	Assignment	The students will implement selected computer vision and image processing approaches, apply these approaches to real images/videos, and interpret the results. In this way, students can observe the characteristics and perform critical assessment of these different approaches.	2, 3	
4	Project	The students will apply the principles they have learnt from the course in real-world application scenarios.	2, 4	
5	Final Exam	Final exam will include questions to assess the capability of students 1) to identify the important features of different computer vision and image processing techniques; 2) to perform critical evaluation of different computer vision and image processing approaches; 3) to assess the capability of students to identify the important features of different computer vision and image processing techniques.	1, 3, 4	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	2, 3	30	Expect to have 2 assignments. One of them should be programming assignment.
2	Project	4	20	Can be in group of 2-3 students per project

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task

Assignment

Criterion

The ability to implement and assess the effectiveness of different algorithms and techniques.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal level

Assessment Task

Project

Criterion

The ability and creativity in applying appropriate algorithms and techniques for real-world applications.

Excellent (A+, A, A-)

High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal level

Assessment Task
Examination

Criterion
The extent to which the students can understand the algorithms and techniques, apply them appropriately for different applications, and evaluate their performances.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal level

Part III Other Information

Keyword Syllabus
Digital image fundamentals; feature extraction; image segmentation; object recognition; motion analysis; scene understanding.

Reading List

Compulsory Readings

	Title
1	Richard Szeliski (2011). Computer Vision: Algorithms and Applications. Springer.
2	D. Forsyth and J. Ponce (2011). Computer Vision: A Modern Approach. Prentice Hall, 2nd edition.
3	R. Gonzalez and R. Woods (2007). Digital Image Processing. Prentice Hall, 3rd edition.

Additional Readings

	Title
1	Nil