

CS4186: COMPUTER VISION AND IMAGE PROCESSING

Effective Term

Semester A 2024/25

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 Computing (CC)

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 DEC-A1 app.)		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.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage with 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	

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. The students will attend the 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.

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