

Ministry of Higher Education and Scientific research



Department of Software and Informatics Engineering

College of Engineering

University of Salahaddin

Subject: Computer Vision course book – (MSc- level)

Lecturer's name: Dr Gullanar M Hadi

Academic Year: 2023/2024

MSc Course Book

1. Course name	Computer Vision and Advanced Image Processing
2. Lecturer in charge	Dr Gullanar M Hadi
3. Department/ College	Software and Informatics Engineering/ Engineering
4. Contact	+9647503108228
5. Time (in hours) per week	3 hours per week
6. Office hours	8:30-2:00
7. Course code	SIE03
8. Teacher's academic position	Senior lecturer
9. Keywords	Segmentation, Clustering, feature detection , Illumination, SVM, SIFT, Optical flow, KLT tracking, BOW
10. Course overview:	The challenge of computer vision is to develop a computer based system with the capabilities of the human eye-brain system. It is therefore primarily concerned with the problem of capturing and making sense of digital images. The field draws heavily on many subjects including digital image processing, artificial intelligence, and computer graphics. This course will explore some of the basic principles and techniques from these areas which are currently being used in real-world computer vision systems and the research and development of new systems.
11. Course objective:	The computer vision goal is to extract data from digital images. Computer vision is a discipline that studies how to reconstruct; interrupt and understand a 3D scene from its 2D images in terms of the properties of the structure present in scene. The students will learn the fundamental of the design of computer vision techniques and their applications. The subject is divided in two main parts: 1 st with emphasis on segmentation, description and recognition methods in order to get symbolic data from images. 2 nd focusing on extracting geometric data from images.
12. Student's obligation:	<ul style="list-style-type: none"> • Students are expected to have good working knowledge of Matlab • This course has more Mathematics so students are expected to have good knowledge in linear algebra and numerical techniques. • Students must keep tracking research journal during the course
13. Teaching technique:	The methodology of the course will be through master classes of 3 h/session, where the teacher will explain the theory and will introduce exercises to improve the understanding of the subject. The exercises will consist in problems exposed and solved in class (on the whiteboard), or in some cases they can be program codes (with the help of a computer), as lab practices.
14. Assessment scheme:	Through the course, the student will have to solve at least 3 specific exercises of the different topics of the subject. These exercises will be evaluated by the professor and will constitute part of the final score. There will be also a short project that will be selected by the student, where the student has to show the acquired

knowledge. This short project will be presented and evaluated in an oral presentation. For the solution of some of the exercises and the complete project, the students will use a computer vision programming tool

15. Student learning outcome: Upon successful completion of the course, students will:

- understand the vision technology in conjunction with real world applications
- learn the principles and commonly used paradigms and techniques of computer vision
- be able to identify the limitations of vision systems
- be able to demonstrate successful applications to process and analyze images, and to make automatic decisions based on extracted feature information

16. Course Reading List and References:

- Szeliski, Richard. Computer vision: algorithms and applications [on line]. London: Springer, cop. 2011. Available on: <<http://site.ebrary.com/lib/upcatalunya/docDetail.action?docID=10421311>>.
- González, Rafael C; Woods, Richard E. Digital image processing. 3rd ed. Harlow: Pearson Prentice Hall, cop. 2008.
- González, Rafael C; Woods, Richard E; Eddins, Steven L. Digital Image processing using MATLAB. 2nd ed. s.l: Gatesmark Publishing, 2009.
- Hartley, Richard; Zisserman, Andrew. Multiple view geometry in computer vision. 2nd ed. Cambridge: Cambridge University Press, 2003.

17. The Topics:

Chapter 1. Introduction to computer vision
Chapter 2. Image Formation
Chapter 3. Image Processing
Chapter 4. Feature Detection and Matching
Chapter 5. Hough Transformation
Chapter 6. Segmentation
Chapter 7. Dense Motion Estimation
Chapter 8. Stereo Correspondence
Chapter 9. Object and Face Detection
Chapter 10. Face Recognition and Category Recognition (BOW)