Computer Vision

Academic Year: (2022 / 2023) **Review date: 20-05-2022**

Department assigned to the subject:

Coordinating teacher: GONZALEZ DIAZ, IVAN

Type: Electives ECTS Credits : 6.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Machine Learning
Statistical Signal Processing
Biomedical Image Processing
Deep learning

OBJECTIVES

Students are expected to achieve the following goals:
- Learn how images are formed both in the human visual system and in digital cameras, attending both to photometric and geometric dimensions.
- Know well-known algorithms that implement processes of human vision: extraction of visual characteristics, estimation of movement, stereopsis, image registration, object tracking, visual recognition.
- Apply the knowledge acquired in previous related subjects (e.g. machine learning, deep learning) to the field of computer vision.
- Solve practical problems related to computer vision
- Design and develop a scientific-technical project that involves the use of computer vision techniques.

DESCRIPTION OF CONTENTS: PROGRAMME

Block 1: image Formation

Topic 1: Light, shading and color.
Topic 2: Geometric Camera Models and Camera Calibration

Block 2: Early Vision

Topic 3: Local Invariant Features
Topic 4: Motion Estimation and Optical Flow
Topic 5: Stereopsis and Structure from Motion

Block 3: Mid-level Vision

Topic 6: Object Tracking
Topic 7: Image Registration: rigid and deformable

Block 4: High-level Vision

Topic 8: Object Recognition & Image Classification with Convolutional Neural Networks
Topic 9: Other applications of Deep Learning in images: object detection, segmentation, image matching, etc.

LEARNING ACTIVITIES AND METHODOLOGY

AF3 Theoretical practical classes
AF4 Laboratory practices
AF5 Tutorials
AF6 Team work
AF7 Student individual work
AF8 Partial and final exams

Activity code	total hours number	presencial hours number	% Student Presence
AF3	134	134	100%
AF4	42	42	100%
AF5	24	0	0%
AF6	120	0	0%
AF7	248	0	0%
AF8	16	16	100%
SUBJECT TOTAL	600	184	30,66%

ASSESSMENT SYSTEM

Continuous assessment based on the following aspects :

- Evaluation of laboratory and presentation / study scientific articles on topics of interest (50%).
- Development of a final project related to the subject of the course (50%).

% end-of-term-examination: 0

% of continuous assessment (assigments, laboratory, practicals…): 100

BASIC BIBLIOGRAPHY

- Forsyth, Ponce Computer Vision: A Modern Approach, Pearson, 2012

- Ian Goodfellow, Yoshua Bengio, Aaron Courville Deep Learning, The MIT Press, Cambrigde, Massachussetts, London, England, 2016
- Richard Hartley & Andrew Zisserman Multiple View Geometry in Computer Vision, Cambridge University Press, 2003
- Richard Szeliski Computer Vision: Algorithms and Applications, Springer-Verlag, 2011