Universidad Zaragoza

Academic Year/course: 2024/25

69155 - Computational Imaging

Syllabus Information

Academic year: 2024/25
Subject: 69155 - Computational Imaging
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 615 - Máster Universitario en Robótica, Gráficos y Visión por Computador / Robotics, Graphics and Computer Vision
ECTS: 6.0
Year: 1
Semester: Second semester
Subject type: Compulsory
Module:

1. General information

The goal of this course is the study and learning of the main techniques and applications of computational imaging, the theoretical grounds of the most representative methods, its application to practical cases of use through the design and implementation of algorithmic solutions, as well as the study of open problems. The student will learn to communicate to a broad public the acquired knowledge, to work independently and in teams, and the planning and design of research projects.

2. Learning results

At the end of the course, the student should have acquired the following capabilities:

- Knowledge of the hardware elements that take part in the most common computational imaging devices.
- Understanding the main algorithms and techniques used in fundamental computational imaging problems.
- Knowledge of the main computational imaging applications.
- Design and development of computational imaging systems for different applications.
- Proposal and assessment of the potential of new computational imaging techniques to address open problems.
- Transversal skills related to teamwork.

3. Syllabus

The course syllabus will consist of the following topics:

1. Image formation models
2. Mathematical foundations of computational imaging
3. Plenoptic function and sampling
4. Light field imaging
5. Coded photography, compressed sensing
6. High dynamic range imaging
7. Computational illumination
8. Principles of transient imaging
9. Introduction to hyperspectral capture and computational displays

The order and content of the different topics may undergo small variations depending on the contingencies and opportunities that may arise throughout the course both from the industry and academic environments.

4. Academic activities

The course consists of 6 ECTS credits, which correspond to an estimated total of 150 work hours by the student, with the following distribution:

- Master classes (30h): Exposition of contents by means of presentation or explanation by a lecturer.
- Problem solving and cases (10h): Exposition and solving of practical cases as a counterparts to the theoretical concepts.
- Laboratory assignments (16h): Practical activities developed in computer machinery and tutored by a professor
- Study and acquirement of the theoretical concepts of the master classes, practical application or research works (88h)
- Evaluation tests (6h)

5. Assessment system

The course can be passed under two different evaluation modalities.

Under the **continuous evaluation** modality, the course can be passed by means of:

- Written and laboratory assignments (40% of the total grading of the course) with multiple deadlines throughout the schedule of the course.
- Practical assignments for the development of a final project in groups, involving the development of teamwork transversal skills (45% of the total grading of the course).
- Oral presentation of the final project and debates (15% of the total grading of the course).

In order to pass the course under this modality, the student must obtain a minimum of 4 points out of 10 in each of the activities described above, and the sum of each three parts with their corresponding weights must be greater or equal to 5 points out of 10.

Under the modality of **global evaluation**, the student will be able to obtain a 100% of the grading of the course in a single call, which will take place at the official date of the global evaluation. This call will consist of:

- A written test with questions related to theoretical and practical contents of the course.
- Submission of the final project, either individually or by groups.
- Oral presentation and defense of the final project.

6. Sustainable Development Goals

8 - Decent Work and Economic Growth
9 - Industry, Innovation and Infrastructure