UCL Université catholique de Louvain

LELEC2885

2012-2013

Image processing and computer vision

5.0 credits	30.0 h + 30.0 h	1q

Teacher(s) :	Jacques Laurent (compensates Macq Benoît) ; De Vleeschouwer Christophe (coordinator) ; Macq Benoît ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Inline resources:	The course is available online on iCampus : > http://www.icampus.ucl.ac.be/claroline/course/index.php?cid=ELEC2885
Prerequisites :	This course assumes known basic notions of signal processing, such as those taught in the courses "signal and systems" or "signal processing". The main objective is to introduce the key concepts necessary for understanding what are "images", from their initial recording until their final usage, including the important questions of image representation and approximation for transmission or interpretation purposes.
Main themes :	See description
Aims :	The aim of the course LELEC2885 is to provide an advanced teaching of image processing techniques and of computer vision principles. *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods :	The evaluation includes three components : ' An oral examination: Scheduled in January of each year, this test evaluates individually the students on their understanding of the concepts and methods taught during the theoretical courses. ' A project (realized by a team of 2 or 3 students): The objective is to solve an actual problem of intelligent vision or of computer vision. Each group realizes first a brief midterm presentation (not evaluated); the objective is to evaluate the group progression in the project realization and to provide them advices on the selected approach and methodologies. The final project score is based on a written report and on a final oral presentation made in December. ' A critical analysis of 3 scientific papers in the field: This helps the student to develop his ability to analyze the advantages and the weaknesses of a scientific work, considering both its content and its general structure. Each student provides a report (3 pages, 1 page per article) in December. These three components are weighted as 40%, 40% and 20% of the final grade, respectively. The global evaluation is essentially performed off-session (end of December and January).
Teaching methods :	' Theoretical courses ; ' Personal reading of scientific papers ; ' Learning by problems: some practical challenges are solved by using a software platform (e.g., Matlab) in order to program image processing algorithms.
Content :	In particular, the course develops the following concepts : ' Spatial, temporal and colored image representations; ' Representation, approximation and transmission of images ; ' Linear and non-linear filtering operations ; ' Feature detection (contours, active points) ; ' Segmentation and semantic interpretation ; ' The sparsity principle in image processing ; ' Inverse problems and image restorations (denoising, debluring, inpainting) ; ' Compressed Sensing ; ' Image and Video Database Processing (detection, classification) ; ' Co-registration and biomedical applications ; ' Objects detection and tracking in videos ; ' Signal and image compression (JPEG, MPEG, ...). The learned ability will allow the students to provide solutions to involved problems implying image processing, like quality control, video-surveillance, automatic target tracking in videos, and image restoration and compression.
Bibliography :	Electronic presentations, tutorial papers, Matlab codes

Cycle and year of study :	> Master [120] in Biomedical Engineering > Master [120] in Computer Science and Engineering > Master [120] in Computer Science > Master [120] in Electrical Engineering > Master [120] in Electro-mechanical Engineering > Master [120] in Mathematical Engineering
Faculty or entity in charge:	ELEC