Name of the subject:

Name of the subject (English): Introduction to Deep learning for computer vision

Name of the subject (Català): Introducció a l'aprenentatge profund per a visió per computador

Name of the subject (Español): Introducción al aprendizaje profundo para visión por computadora

Coordinating unit: ETSETB - Escola Tècnica Superior d'Enginyeria de Telecomunicació de Barcelona

Teaching unit: TSC Department

Study programme:

- ICT Bachelor Degrees (Graus TIC)

ECTS credits: 2

Type of subject (compulsory, elective, seminar): Seminar

Type of learning (face-to-face, semi-distance learning, distance learning): Face-to-face

Weekly hours of theory and laboratory (3T+0L, 2T+1L, 1T+2L, 0T+3L): 2T+1L

Pre-requirements: - To have passed at least 150 ECTS at bachelor level

Co-requirements: -

Coordinator: Xavier Giró i Nieto

Other teaching staff (minimum 2): Elisa Sayrol, Amaia Salvador, Eva Mohedano, Kevin McGuiness

Capacity of the course: 10

Any specific classroom?: Aula Merit D5-010

Any specific laboratory?: D5-005

Capacity of the laboratory: -

Bachelor competences to which the subject contributes:

Specific competences:

- Ability to analyze, encode, process and transmit multimedia information using techniques analog and digital signal processing.

Transversal competences:

- G5.3 - Identify the roles, skills and weaknesses of the different group members. Propose improvements in the structure of the group. Interact effectively and professionally. Negotiate and manage conflicts in the group. Recognize and support or assume the role of leading the working group. Evaluate and present the results of the work of the group. Represent the group in negotiations with third parties.

- G6.3 - Planning and using the information necessary for an academic project from a critical appraisal of the information resources used. Managing information in a competent, independent and autonomous manner. Select search and presentation tools according to the needs. Evaluate opposite information and identify gaps. Critically compare of specifications of components and equipment with different formats.

- G3.3 - Perform an oral presentation in English and answer questions from the audience.

Teaching methodology:

- Lectures
- Application classes
- Short answer test (Test)

Learning objectives and results of the subject:

Learning objectives of the subject:

The aim of this course is to train students in methods of deep learning for computer vision. Convolutional neural networks (convnets) will be presented and analyzed in detail to understand the potential of these state of the art tools in visual pattern recognition. Engineering tips and scalability issues will be addressed to solve tasks such as image classification, object detection or automatic textual captioning. Hands-on sessions will provide development skills so that attendees can solve a selected task in an open scientific benchmark and, if successful, submit their results.

Learning results of the subject:

- Ability to design a convnet as an end-to-end model and estimate its memory and computational requirements.
- Ability to train a convnet by defining the appropriate error loss function and monitor its learning performance.
- Ability to design and implement a data annotation campaign capable of collecting enough examples to train or adapt a convolutional neural network.

Study load:

Total learning time: 50h

- Large group/Theory classes: 11h
- Medium group/Practical classes: 0h
- Small group/Laboratory classes: 9h
- Guided study: 0h
- Self study: 30h

Content:

1. Convolutional Neural Networks

Description:

- Architecture: Forward and recurrent networks.
- Backpropagation
- Layer Visualization.
- Memory and computational requirements.
- Best practices.
- Fine-tunning

Dedication: 18h

- Large group/Theory classes: 5h
- Medium group/Practical classes: 0h
- Small group/Laboratory classes: 5h
- Guided study: 0h
- Self study: 8h

2. – Applications

Description:

- Image retrieval and classification
- Object detection
- Semantic segmentation
- Saliency prediction

Dedication: 32h

- Large group/Theory classes: 6h
- Medium group/Practical classes: 0h
- Small group/Laboratory classes: 6h
- Guided study: 0h
- Self study: 20h

Planning of activities:

Laboratory practical exercises:

- Description: Training of a convnet
- Description: Visualization and ablation of convnet layers.
- Description: Fine-tunning a convnet for transfer learning.

Qualification system:

Quizzes:	90%
Attendance	10%

Bibliography:

Basic:

- Slides of the course and the bibliography referred within.

Complementary:

- Fei-Fei Li, Andrej Karpathy, "CS231n: Convolutional Neural Networks for Visual Recognition". Stanford University 2015. http://cs231n.stanford.edu/