Course guides
230324 - IDLCV - Introduction to Deep Learning for Computer Vision

Last modified: 12/07/2017

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications.

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS SCIENCE AND TECHNOLOGY (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ELECTRONIC SYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN NETWORK ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Optional subject).

Academic year: 2017 **ECTS Credits:** 2.0 **Languages:** English

LECTURER

Coordinating lecturer: Xavier Giró i Nieto

Others: Xavier Giró i Nieto, Elisa Sayrol, Amaia Salvador, Kevin McGuinness and Eva Mohedano

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

TEACHING METHODOLOGY

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

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 task using state of the art software frameworks and computational resources.

STUDY LOAD

Type	Hours	Percentage
Hours small group	4,0	8.00
Hours large group	16,0	32.00
Self study	30,0	60.00

Total learning time: 50 h

CONTENTS

Deep Learning

Description:
Classification, Deep Neural Networks, Convolutional Neural Networks, Backpropagation, Training neural networks, Software frameworks, Computational requirements, Data augmentation, Model visualization, Recurrent Neural Networks, Transfer learning, Unsupervised learning, Optimization, Adversarial Training and Attention models.

Full-or-part-time: 14 h
Theory classes: 4h
Self study : 10h

Computer Vision

Description:
ImageNet. Saliency Prediction. Object detection and recognition. Face detection and recognition. Image retrieval. Semantic segmentation. Vision and language. Video Processing. Medical applications.

Full-or-part-time: 19 h
Theory classes: 4h
Self study : 15h

TensorFlow

Description:
TensorFlow? is an open source software library for numerical computation using data flow graphs. Nodes in the graph represent mathematical operations, while the graph edges represent the multidimensional data arrays (tensors) communicated between them.

Specific objectives:
Develop a deep learning project in Python using Tensorflow libraries and tools.
Use TensorBoard to debug the code.

Related activities:
Practical sessions.
Programming exercises.

Full-or-part-time: 17 h
Theory classes: 4h
Self study : 13h

GRADING SYSTEM

Daily quizzes: 90%
Attendance: 10%

BIBLIOGRAPHY

Basic:
- Torres, Jordi. First contact with TensorFlow : get started with deep learning progamming [on line]. Barcelona: Universitat Politècnica de Catalunya, Barcelona Supercomputing Centrer, 2016 [Consultation: 14/07/2017]. Available on: http://jorditorres.org/first-contact-with-tensorflow-book/. ISBN 978-1-326-56933-4.
- Goodfellow, Ian; Bengio, Yoshua; Courville, Aaron. Deep Learning [on line]. 1. MIT Press, 2016 [Consultation: 22/02/2017]. Available on: http://www.deeplearningbook.org/. ISBN 9780262035613.

RESOURCES

Hyperlink:
- https://telecombcn-dl.github.io/2017-dlcv/. Course site