

DEEP LEARNING IN COMPUTER VISION

1. SYLLABUS INFORMATION

1.1. Course title

Deep Learning in Computer Vision

1.2. University

Université de Bordeaux

1.3. Semester

2nd year, 1st semester

2. COURSE DETAILS

2.1. Course nature

Compulsory

2.2. ECTS Credit allotment

3

2.3. Recommendations

Fundamentals in image analytics, C++ and Python programming

2.4. Faculty data

Prof. Jenny Benois-Pineau - LaBRI - firstname.lastname@u-bordeaux.fr

Dr. Akka Zemhari - LaBRI - firstname.lastname@u-bordeaux.fr

3. COMPETENCES AND LEARNING OUTCOMES

3.1. Course objectives

The group of artificial intelligence methods named "Deep Learning" show excellent performances in computer vision tasks, such as scene understanding, object recognition in images and video and action recognition in video. The main objective of this course is that students learn to design and implement a Deep Learning approach for visual scenes understanding. They will get the following skills:

- Design and implement an adequate data extraction and augmentation strategy
- Set-up an architecture using known models
- Select and parameterize optimisation algorithms
- Design transfer-learning and information fusion schemes
- Implement Deep Learning algorithms with open source frameworks
- Evaluate performances of the designed approaches in terms of common quality metrics

3.2. Course contents

1. What are our data? :
 - Colour systems, Spatial sampling in images and video
 - Key methods of motion estimation in video
2. Kinds of machine Learning:
 - Unsupervised learning
 - Supervised learning
 - Artificial Neural Networks, MLP as a supervised learning approach
3. CNN:
 - Fundamentals (convolution, pooling, normalization, non-linearity layers)
 - First architectures (LeNet, AlexNet).
4. Training Deep CNNs:
 - Problem of training data, domain dependent data augmentation,
 - Optimization algorithms, transfert learning, deeper architectures
 - Information fusion with CNNs
5. Temporal aspects in Deep Learning:
 - RNN, LSTM, 2D+t ConvNets
 - Applications case studies

3.3. Course bibliography

Y. Bengio Goodfellow, "Deep Learning", series Adaptive Computation and Machine Learning, MIT Press, 2016

J. Benois-Pineau, P. Le Callet, "Visual Content Indexing and Retrieval With Psycho-visual Models", Eds, Springer, 2017

4. TEACHING-AND-LEARNING METHODOLOGIES AND STUDENT WORKLOAD

Activity	Hours
Lectures	12
Tutored computer lab	12
Exam	1,5

* Classroom instruction: 33%
Independent study time: 66%

5. EVALUATION PROCEDURES AND WEIGHT OF COMPONENTS IN THE FINAL GRADE

Evaluatory activity	%
Lab assignments	50
Exam	50