SÍLABO 2020

Versión 2, de 23 de julio de 2020

SUBJECT

Applied Artificial Intelligence

LECTURER

Gissel Velarde

ATTENTION TO STUDENTS

During class hours

Basic, specific and transversal competencies

- Ability to study, learn and execute a project independently, in a group and under academic supervision.

- Ability to search for relevant information.

- Ability to analyze, describe the theory, methods and practices in AI-based projects based on the contents of the subject.

- Ability to implement AI algorithms in programming languages to solve concrete problems in a project.

- Ability to discuss, reflect and evaluate project results orally and in writing specifically and in a general context.

LEARNING OBJECTIVES OF THE SUBJECT

The objective is that students know the most used techniques in artificial intelligence: supervised learning, unsupervised learning and reinforcement learning, so that when they find a problem to solve, they can apply the best solution using the techniques learned.

CONTENTS

Introduction to artificial intelligence
Introduction to Machine Learning, supervised learning, unsupervised learning, reinforcement learning Introduction to fuzzy logic
Introduction to Neural Networks

Table 1.

First module. First Partial Exam:	**First module** Introduction. Course structure. Problem Based Learning (PBL). History of neural networks. Scenarios: supervised learning, unsupervised learning, reinforcement learning. Training, testing and evaluation. Convolution, brain processes. Convolutional Neural Networks CNNs, filters, architectures, padding. Deep Networks, Gradient-based learning, back-propagation, learning rate. Regularization for deep learning, data augmentation, early stopping, dropout.
Second module. Second Partial Exam:	**Second module** Sequence modeling, LSTMs, RNNs. Representation learning, transfer learning. Generative models. Bias in data sets. Bias in design of experiments. Horse models.
Third module. Third part - Final exam:	**Third module.** Fuzzy logic and neuro-fuzzy networks. Experimentation strategy. Algorithm performance measurement. Hypothesis testing. Binomial test, normal test approximation. t-test. Comparing AI algorithms. Benchmarking. Commercial opportunities. Canvas model. Presenting a business model. AI startups.

METHOD

The course uses the Problem Based Learning method.: https://www.aau.dk/digitalAssets/148/148025_pbl-aalborg-model_uk.pdf.

EVALUATION

The maximum passing grade for the course is 100 points and the minimum grade is 60 points. From 0 to 59 points the student fails the course. The final grade is obtained by adding the grades of each midterm.

The maximum grade for the first partial is 30%.

(60% corresponds to the progress of the project and 40% to the exam).

The maximum grade for the second midterm is 30%.

(60% corresponds to the progress of the project and 40% to the exam).

The maximum grade for the third midterm is 40 %.

(60% corresponds to the report and code. 40% Oral exam and presentation of the project).

SOURCES OF INFORMATION

Basic Bibliography:

- Goodfellow, I. J., Bengio, Y., y Courville, A. (2016). Deep Learning. London, England: MIT Press.
- Alpaydin, E. (2014). Introduction to machine learning. The MIT Press, Cambridge, Massachusetts, London, England.

Complementary Bibliography:

- Velarde, G. (2021). Era artificial: Predicciones para ultrahumanos, robots y otros entes inteligentes. Düsseldorf: PRICA Verlag.
- Witten, I. H., Frank, E., y Hall, M. A. (2011). Data mining: Practical machine learning tools and techniques. Morgan Kaufmann.
- Bishop, C. (2006). Pattern Recognition and Machine Learning. New York: Springer.
- Kuncheva, L. I. (2004). Combining pattern classifiers: methods and algorithms. John Wiley & Sons.
- Pedregosa, F., Varoquaux, G., Gramfort, A., Michel, V., Thirion, B., Grisel, O.,... Duchesnay, E. (2011). Scikit-learn: Machine learning in Python. Journal of Machine Learning Research, 12, 2825?2830. https://scikit-learn.org/.
- Chollet, Francois and others. Keras. https://keras.io.
- Google Colab. https://colab.research.google.com/.
- Problem Based Learning. (2015) Aalborg University.

Prerequisites:
Python programming
Linear Algebra
Calculus
Probability and Statistics
English (reading)

Nice to have:
Version control (Git)
Latex