Subject: Applied Artificial Intelligence
Code:
Duration: 18-09-2020 to 04-11-2020
Time: Monday to Friday 14:30 to 16:30
Classroom:
Teacher's name: Gissel Velarde.
Place and time of attention to students: During lectures.

Skills that students should develop
- 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 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.

Important dates
First partial exam: October 5
Second partial exam: October 19
Report submission: October 30
Third partial and final exam: November 2, 3 and 4.

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).

Table 1. Conents

First module. First Exam Parcial: 5 Octuber	**AI, machine learning and deep learning** Introduction, Methodology, Course structure, Problem Based Learning (PBL). Evaluation. History of AI. What is ML? Basic concepts, classes, features, labels, data representation. Scenarios: supervised learning, unsupervised learning, reinforcement, learning, recommender systems. Data processing. Bayesian decision theory. Support vector machines, clustering, ensembles. Design and analysis of experiments in ML. Background of Deep Learning, history. CNNs, convolution, brain processes. CNNs, filters, architectures, padding. Deep Networks, Gradient-based learning, back-propagation, learning rate. Regularization for deep learning, data augmentation, early stopping, dropout. Sequence modeling, LSTMs, RNNs. Representation learning, transfer learning. Generative models.
Second module. Second Exam Parcial: 19 Octuber	**Relevant considerations in AI.** Ethical issues in AI. Bias in data sets. Bias in design of experiments. Horse models. Philosophical considerations of AI. How to write a scientific report. How to make a presentation. Presenting scientific results. AI and data science projects. Research and innovation. Tools for AI project management. Business opportunities. Canvas model. Presenting a business model. AI startups.
Third module. Third partial - Final exam: November 2, 3 and 4.	**Design and analysis of machine learning experiments.** Factors, response experimentation strategy. Cross-validation and resampling methods. Algorithm performance measurement. Hypothesis testing. Binomial test, normal test approximation. t-test. Comparing AI algorithms. Benchmarking.

Basic Bibliography:

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

Supplementary Bibliography:

- Witten, I. H., Frank, E., y Hall, M. A. (2011). Data mining: Practical machine learning tools and techniques. Morgan Kaufmann.
- 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