ARTIFICIAL INTELLIGENCE

3rd year of Computer Engineering
ESTiG – IPB
Paulo Gouveia
2024/2025

Paulo Gouveia: Class B e C
Paulo Costa: Class A (in English)

NOTA IMPORTANTE:
Os alunos da turma A que não pretendam aulas em inglês podem mudar de turma;

IMPORTANT NOTE:
Students in classes B or C who want classes in English must change to class A.

Syllabus

1. Introduction to Python
2. Python Libraries for Machine Learning (ML)
   - *'**NumPy**' for multidimensional arrays, linear algebra, and other high-level mathematical operations*
   - *'**Pandas**' for data representation and processing in the form of tables (DataFrames)*
   - *'**Matplotlib**' and 'Seaborn' for graphical visualization of data*
   - *'**Scikit-Learn**' for ML (provides us with the main ML algorithms)*
3. Contextualization of Machine Learning – ML (Machine Learning)
   - *Knowledge Discovery in Database – KDD*
   - *Data Mining and Machine Learning*
   - *Types of Learning*
   - *Predictive Models*
   - *Top Data Mining Algorithms*
   - *Performance Evaluation of Predictive Models*
     - Metrics used
     - Cross-validation

Syllabus (cont.)

4. Implementation of the first ML models through the library ‘Scikit-Learn’
5. Implementation of supervised learning
   - *Linear Regression*
   - *Logistic Regression*
   - *K-Nearest Neighbors – KNN*
   - *Decision Trees*
   - *Random Forests*
   - *Support Vector Machines – SVM*
   - *Neuronal Networks – NN*
6. Implementation of unsupervised learning
   - *Clustering using K-Means*
7. Dimensionality Reduction
   - *Principal Component Analysis (PCA), Singular Values Decomposition (SVD) and Manifolds*

Bibliografia

- [1] Python Machine Learning. Wei-Meng Lee, John Wiley & Sons, Inc., 2019.
- [2] Scikit-learn Cookbook – Over 80 recipes for machine learning in Python with scikit-learn. Second Edition, Julian Avila & Trent Hauck, Packt, 2017.
- [3] Aprendizagem Computacional em Engenharia. – Catarina Silva e Bernardo Ribeiro, Imprensa da Univ. Coimbra. 2018.
- [4] A Byte of Python. – Swaroop C H, 2016. https://python.swaroopch.com/
- [5] Programação em Python. Ernesto Costa, FCA, 2015.
- [6] Python Documentation. https://docs.python.org/3/
- [7] Scikit-learn Documentation. https://scikit-learn.org/stable/user_guide.html

Evaluation

- Practical assignment during the semester (50%)
  (mandatory for normal and recovery seasons)
- Normal Season
  - *exam* *(50%)*
  - *minimum grade required: 5 points*
- Recovery Season
  - *exam* *(50%)*
  - *minimum grade required: 5 points*
- Special Seasons and September
  - *Part I – 50 questions of multiple selection* *(50%)*
  - *Part II – essay questions* *(50%)*