Course guide

205239 - NT - Numerical Tools in Machine Learning for Aeronautical Engineering

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 748 - FIS - Department of Physics.
Degree: BACHELOR’S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).
BACHELOR’S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2022  ECTS Credits: 3.0  Languages: English

LECTURER

Coordinating lecturer: Alex Ferrer Ferré

Others:

TEACHING METHODOLOGY

Each session consists in a theoretical part of 1 hour and a practical part of 1.5 hour. In the practical part, a set of small exercises will be solved and discussed in class to fix the main ideas and concepts of the session, and the take-home assignments will be discussed.

LEARNING OBJECTIVES OF THE SUBJECT

This course is an introduction to Machine Learning. The main objective is to learn several numerical techniques used in this field. After learning some basics in optimization and statistics, the course will focus on understanding the numerical algorithms used for solving some of the most important problems in Machine Learning: linear regression, logistic regression, clustering, k-means, support vector machine, principal component analysis, EM, neuronal networks and others. Finally, the techniques learned during the course will be applied to some problems that appear in Aeronautical engineering.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>30.0</td>
<td>40.00</td>
</tr>
<tr>
<td>Self study</td>
<td>45.0</td>
<td>60.00</td>
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</tbody>
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Total learning time: 75 h

CONTENTS

Module 1: Introduction to Machine Learning

Description:
2. Basics in Python and Jupyter.

Full-or-part-time: 15h
Theory classes: 8h
Self study: 7h
Module 2: Supervised learning

Description:

Full-or-part-time: 25h
Theory classes: 10h
Self study: 15h

Module 3: Unsupervised learning

Description:

Full-or-part-time: 25h
Theory classes: 10h
Self study: 15h

Module 4: Application to Aeronautical Engineering

Description:
Aeronautical engineering problems solved by Machine learning algorithms

Full-or-part-time: 10h
Theory classes: 2h
Self study: 8h

GRADING SYSTEM

3 or 4 take-home assignments (50% of the final grade).
1 final project (50% of the final grade).

BIBLIOGRAPHY

Basic: