Course guide
310764 - 310764 - Artificial Intelligence in Construction

Unit in charge: Barcelona School of Building Construction
Teaching unit:
748 - FIS - Department of Physics.
753 - TA - Department of Architectural Technology.
749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN ARCHITECTURAL TECHNOLOGY AND BUILDING CONSTRUCTION (Syllabus 2019). (Optional subject).

Academic year: 2022  ECTS Credits: 3.0  Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: Guillamon Grabolosa, Antoni
Others:
Rodriguez Cantalapiedra, Inmaculada
Berigüete Alcántara, Fanny Esther
Alvarez Lacalle, Enrique

PRIOR SKILLS
No prior programming knowledge is required. At the beginning of the course, a review of specific questions of mathematical foundations is advised: matrix representation, linear systems, elementary derivatives (chain rule) and optimization of functions of one or more variables.

TEACHING METHODOLOGY
In each block of the course, there will be introductory sessions to the subject by the teachers, and practical exercises will be proposed as homework. The other sessions will focus on the analysis of selected publications: students will work in groups and teachers will have a role to support learning. Other sessions will be dedicated to oral presentations by the students.

LEARNING OBJECTIVES OF THE SUBJECT
- Get the knowledge about the main applications of artificial intelligence in the field of building construction.
- Understand the basic knowledge of artificial intelligence, as well as the main ideas that govern machine learning algorithms.
- Learn to locate and manage the resources needed for the application of artificial intelligence methods, and incorporate them into the execution processes in building construction.

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>
</tr>
</tbody>
</table>

Total learning time: 75 h
## Artificial intelligence: examples of applications to building construction.

**Description:**
Diagnosis of pathologies.
Real estate valuation.
Energy efficiency.
Estimation of construction costs.

**Specific objectives:**
Introduce, through examples, applications of artificial intelligence in the field of construction.

**Related activities:**
Introductory lectures. Reading of specialized articles and oral presentation.

**Full-or-part-time:** 20h
- Theory classes: 3h 12m
- Practical classes: 4h 48m
- Self study : 12h

## Regression

**Description:**
Introduction of an overview of supervised learning versus unsupervised learning, and of classification problems versus regression problems.

Study of supervised learning problems using regression methods, both linear and multilinear.

**Specific objectives:**
Distinguish between supervised and unsupervised learning.
Distinguish between classification and regression problems.
Understand the concepts and procedures needed to perform a (multi)linear regression from experimental data: regression model, cost functions, gradient descent method.
State the possibility of other type of regressions.

**Related activities:**
Exercises for assimilating concepts, reading articles and modifying programming code. The block culminates with a practical application of solving a multilinear regression problem based on construction-related problem data.

**Full-or-part-time:** 25h
- Theory classes: 4h
- Practical classes: 6h
- Self study : 15h
Artificial neural networks.

Description:
Basic structure of an artificial neural network.
Elementary examples of artificial neural networks.
Analysis of network components in an application to building construction.
Other methods of artificial intelligence: genetic algorithms; unsupervised learning.

Specific objectives:
Understand the basic knowledge of artificial intelligence, as well as the main ideas that govern machine learning algorithms.
Learn to locate and manage the resources needed for the application of artificial intelligence methods, and incorporate them into the execution processes in building construction.

Related activities:
Exercises to assimilate concepts, reading articles and modifying programming code. The block culminates with a practical application of using software to solve a classification or regression problem, based on data from construction-related problems.

Full-or-part-time: 25h
Theory classes: 4h
Practical classes: 6h
Self study : 15h

GRADING SYSTEM

675 / 5.000
Resultats de traducció
A continuous assessment will be carried out in each of the blocks, which will consist of: (a) solving elementary exercises (3 o 4); (b) carrying out (in groups) a mini-project for the application of artificial intelligence tools to a construction problem, of which a brief report and an oral presentation will be made. The final grade of the subject is the average of the grade obtained in each of the blocks. Within each block, the grade assigned to the mini-project will be approximately 50% (that is, approximately a 25% of the total subject); Presentations will be held in early November and mid-December, depending on the school calendar and assigned schedules. This subject has no reevaluation.
BIBLIOGRAPHY

Basic:

RESOURCES

Computer material:

Hyperlink: