Universitat Autònoma de Barcelona

2020/2021

Machine Learning 2

Code: 104871
ECTS Credits: 6

Degree	Type	Year	Semester
2503852 Applied Statistics	OB	3	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Antonio Lozano Bagen

Prerequisites

The first year subjects, Numerical Methods and Optimization and Automatic Learning 1.

Objectives and Contextualisation

To learn at theoretical and practical level the potentialities of deep learning for structured and also unstructured data.

Competences

- Analyse data using statistical methods and techniques, working with data of different types.
- Correctly use a wide range of statistical software and programming languages, choosing the best one for each analysis, and adapting it to new necessities.
- Critically and rigorously assess one's own work as well as that of others.
- Make efficient use of the literature and digital resources to obtain information.
- Select and apply the most suitable procedures for statistical modelling and analysis of complex data.
- Select statistical models or techniques for application in studies and real-world problems, and know the tools for validating them.
- Select the sources and techniques for acquiring and managing data for statistical processing purposes.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.

- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Summarise and discover behaviour patterns in data exploration.
- Use quality criteria to critically assess the work done.
- Work cooperatively in a multidisciplinary context, respecting the roles of the different members of the team.

Learning Outcomes

1. Analyse data using an automatic learning methodology.
2. Critically assess the work done on the basis of quality criteria.
3. Describe the advantages and disadvantages of algorithmic methods compared to the conventional methods of statistical inference.
4. Develop a study based on multivariate methodologies and/or data mining to solve a problem in the context of an experimental situation.
5. Discover individuals' behaviours and typologies through data-mining techniques.
6. Identify the statistical assumptions associated with each advanced procedure.
7. Identify, use and interpret the criteria for evaluating compliance with the requisites for applying each advanced procedure.
8. Implement programmes in languages suitable for data mining.
9. Make effective use of references and electronic resources to obtain information.
10. Obtain and manage complex databases for subsequent analysis.
11. Reappraise one's own ideas and those of others through rigorous, critical reflection.
12. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
13. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
14. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
15. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
16. Use data mining methods to validate and compare possible models.
17. Use summary graphs of multivariate or more complex data.
18. Work cooperatively in a multidisciplinary context, accepting and respecting the roles of the different team members.

Content

Topic 1: Fully connected neural network
Topic 2: Convolutional neural networks.
Topic 3: Recurrent neural networks.
Topic 4: Reinforcement learning.

*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

Methodology

Teaching will combine classroom lessons by teachers and practical work for students with a computer.

In all aspects of teaching/learning activities, the best efforts will be made by teachers and students to avoid language and situations that can be interpreted as sexist.

To achieve continuous improvement in this subject, everyone should collaborate in highlighting them.

*The proposed teaching methodology may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Theoretical and practical classes	52	2.08	
Type: Autonomous			
Personal study of the subject	34	1.36	
Practices	40	1.6	

Assessment

The final grade will be 0,5 * exams + 0,5 * work. Where the exam marks will be max (0.4 * partial + 0.6 * final, final, second exam).

In order for an activity to be taken into account in the final note, a minimum of 3,5 must be taken.

The student who has submitted works for at least 50% of the subject will be considered evaluable, according to the weight that appears in the following table of Evaluation activities. Otherwise, it will appear in the Minutes as Non-Valuable.

The notes of the second call will not be taken into account for the allocation of Honor Matriculations.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam	50%	4	0.16	1, 11, 2, 5, 3, 17, 6, 7, 8, 10, 15, 14, 12, 13, 18, 9, 16
Task	50%	20	0.8	1, 5, 17, 8, 10, 4, 15, 14, 12, 13, 9, 16

Bibliography

- Goodfellow, I. et al (2016) Deep Learning (MIT Press)
- Chollet, F. (2017) Deep Learning with Python (Manning)
- Geron, A. (2017) Hands-on Machine Learning with Scikit-Learn and Tensorflow (O'Reilly)