Universitat Autònoma de Barcelona

2019/2020

Advanced Modelling

Code: 104865
ECTS Credits: 6

Degree	Type	Year	Semester
2503852 Applied Statistics	OB	3	2

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

Prerequisites

Linear Models, Statistical Inference and Probability.

Objectives and Contextualisation

To learn different data modelling strategies, both the theory and their applications.

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.
- Design a statistical or operational research study to solve a real problem.
- Formulate statistical hypotheses and develop strategies to confirm or refute them.
- Interpret results, draw conclusions and write up technical reports in the field of statistics.
- 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.
- 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.
- Summarise and discover behaviour patterns in data exploration.
- Use quality criteria to critically assess the work done.

Learning Outcomes

1. Analyse data through inference techniques using statistical software.
2. Analyse data using other models for complex data (functional data, recount data etc.).
3. Critically assess the work done on the basis of quality criteria.
4. Establish the experimental hypotheses of modelling.

5. Identify the stages in problems of modelling.
6. Identify the statistical assumptions associated with each advanced procedure.
7. Make effective use of references and electronic resources to obtain information.
8. Make slight modifications to existing software if required by the statistical model proposed.
9. Prepare technical reports within the area of statistical modelling.
10. Reappraise one's own ideas and those of others through rigorous, critical reflection.
11. 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.
12. 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.
13. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
14. Validate the models used through suitable inference techniques.

Content

The contents will cover (1) logistic regression model, (2) mixed-effects linear models and (3) regression and classification trees.

Methodology

Theory lectures will be devoted to the main concepts while practice lectures will be focused on undergoing effective data analysis wiht R.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Practical lecture	50	2	2, 1, 10, 3, 9, 4, 5, 6, 8, 13, 11, 12, 7, 14
Theory lecture	50	2	2, 1, 10, 3, 9, 4, 5, 6, 8, 13, 11, 12, 7, 14

Assessment

Evaluation will be determined by three partial exams (EP1, EP2 i EP3) an three data analysis projects (PAD1, PAD2 i PAD3). The final qualification will be computed as:

QUALIFICATION= 0.7 * (EP1+EP2+EP3)/3 + 0.3 * (PAD1+PAD2+PAD3)/3

Attitude and participation in class will be taken into account.

In case of (EP1+EP2+EP3)/3 <5 or any of EPs or PADs are missing, students will have to attend a final and single exam.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam 1	23.33%	7	0.28	2, 1, 10, 3, 9, 4, 5, 6, 8, 13, 11, 12, 7, 14
Exam 2	23.33%	7	0.28	2, 1, 10, 3, 9, 4, 5, 6, 8, 13, 11, 12, 7, 14

Exam 3	23.34%	6	0.24	2, 1, 10, 3, 9, 4, 5, 6, 8, 13, 11, 12, 7, 14
Practical work	30%	30	1.2	2, 1, 10, 3, 9, 4, 5, 6, 8, 13, 11, 12, 7, 14

Bibliography

Venables, W. & Ripley, B. (2002). Modern Applied Statistics with S-PLUS. Springer

Faraway, J. (2006). Extending the Linear Model with R. Chapman & Hall.

Hosmer, D.W.; Lemeshow, S. & Sturdivant, R.X. (2013) Applied Logistic Regression. 3rd ed. Wiley.

Pinheiro JC & Bates D (2000) Mixed-Effects Models in S and S-PLUS. Springer.

T Hastie, R Tibshirani, J Friedman. (2009) The Elements of Statistical Learning. Data Mining, Inference and Prediction, Springer, New York.