

Sampling

Code: 100123
ECTS Credits: 6

Degree	Type	Year	Semester
2500149 Mathematics	OT	4	0

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

Name: Aureli Alabert
Email: Aureli.Alabert@uab.cat

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

It is assumed that the student has acquired the competencies of the Statistics Inference, Probability Calculation, and Stochastic Processes, and that he has a good level and practice with the R programming.

Objectives and Contextualisation

Learn how to generate samples with a computer and apply it to the analysis of complex systems, the optimization of processes and the techniques of reporting in inference.

Competences

- Actively demonstrate high concern for quality when defending or presenting the conclusions of ones work.
- Effectively use bibliographies and electronic resources to obtain information.
- Formulate hypotheses and devise strategies to confirm or reject them.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Use computer applications for statistical analysis, numeric and symbolic calculus, graphic display, optimisation or other purposes to experiment with Mathematics and solve problems.
- When faced with real situations of a medium level of complexity, request and analyse relevant data and information, propose and validate models using the adequate mathematical tools in order to draw final conclusions

Learning Outcomes

1. Actively demonstrate high concern for quality when defending or presenting the conclusions of ones work.
2. Design, program and implant statistical packages.
3. Determine the size of the sample and establish a sampling strategy for comparison of means studies.
4. Determine the size of the sample and establish a sampling strategy for parameter estimation studies.
5. Determine the size of the sample and establish a sampling strategy for proportion comparison studies.

6. Determine the size of the sample and establish a sampling strategy for special comparisons.
7. Draw conclusions and draft reports.
8. Effectively use bibliographies and electronic resources to obtain information.
9. Have the capacity to randomly detect and model in real problems.
10. Identify the different sources of information available.
11. Know the different data collection techniques.
12. Recognise the different types of sampling.
13. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
14. Understand, identify and select statistical sources.
15. Use programs correctly and rationally.
16. Use quantitative thinking and reasoning.
17. Use statistical programs to calculate sample sizes.

Content

Simulation: Simulation of random variables based on uniform law. Simulation of discrete events. Simulation with the simmer package. Analysis of the output, reduction of the variance. Generation of uniform variables. Permutational tests: Tests for two samples. Paired test of data. Correlation test. Advanced examples Bootstrap and other remoting methods: Basics. Standard and bias error estimates. Parametric Bootstrap. Non-parametric Bootstrap. Methods for calculating trusted intervals. Examples of application (generalized linear and linear models, hypothesis tests, temporary series, ...).
Remuestreig for automatic learning: Bagging. Boosting

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. Deviations that you observe regarding this objective.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classroom lectures (theoretical and practical)	48	1.92	9, 14, 11, 1, 6, 4, 3, 5, 2, 17, 7, 10, 16, 15
Type: Autonomous			
Assignments	66	2.64	9, 14, 11, 1, 6, 4, 3, 5, 2, 17, 7, 10, 16, 13, 12, 15, 8
Personal study of the subject	32	1.28	9, 14, 11, 6, 4, 3, 5, 2, 17, 7, 10, 16, 13, 12, 15, 8

Assessment

An exam will be done for each of the two parts of the subject (simulation and remotion), which will include both the theory and the practical part. The resulting grade will represent 60% of the final grade. The evaluation of practical assignments will represent the remaining 40% of the final mark.

To pass the course, you must:

Obtain an overall average of 5 out of 10. (Notes starting at 4.8 will be assessed on a case by case basis). Obtain a minimum of 4 out of 10 in each of the two parts of the course (simulation and remotion), both in practice assignments and in examinations.

From each one of the examinations there will be a second call to recover / improve the note. The delivery of this second exam will automatically annul the note of the first call. The deliveries are NOT recoverable. In the same call, the examinations of the different parties do not necessarily have to be on different days.

The student who has submitted works or has taken exams for a total of 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 of Resampling	Thirty per cent	2	0.08	6, 4, 3, 5, 13, 12
Exam of Simulation	Thirty per cent	2	0.08	6, 4, 3, 5, 13, 12
Resampling assignments hand in	Twenty per cent	0	0	9, 14, 11, 1, 6, 4, 3, 5, 2, 17, 7, 10, 16, 15, 8
Simulation Assignments hand in	Twenty per cent	0	0	9, 14, 11, 1, 6, 4, 3, 5, 2, 17, 7, 10, 16, 15, 8

Bibliography

- Ross, Sheldon (2013) Simulation. Elsevier (Recurs electrònic UAB).
- Efron, Bradley (1982) The jackknife, the bootstrap and other resampling plans. Society for Industrial and Applied Mathematics.
- Efron, Bradley (1993) An Introduction to the Bootstrap. Chapman & Hall.
- Gareth, J. et al. (2013) An introduction to Statistical Learning: with Application in R. Springer.

Software

During the course the relevant installation instructions for the software to be used will be given, at the appropriate time.