VNIVERSITAT DE VALÈNCIA

Course Guide
36410 Statistical inference

COURSE DATA

Data Subject	
Code	36410
Name	Statistical inference
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1406 - Degree in Data Science	School of Engineering	2	First term

Subject-matter

Degree	Subject-matter	Character
1406 - Degree in Data Science	2 - Statistics	Basic Training

Coordination

Name	Department
SANTONJA GOMEZ, FRANCISCO JOSE	130 - Statistics and Operational Research

SUMMARY

This subject presents the basic concepts of statistical inference. Students will work on the definition, and use, of probabilistic models. Statistical estimation and hypothesis testing will be covered in the context of simple probabilistic models.

Theory sessions will be taught in Spanish. The language for the practical sessions will depend on the group (see the course guidelines available on the website for this degree).

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Concepts studied in the subjects of Mathematical Analysis (code 36407) and Probability and Simulation (code 36409)

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1406 - Degree in Data Science

- (CG01) Knowledge of basic subjects and technologies that enable students to learn new methods and technologies, and to provide them with versatility to adapt to new situations.
- (CG04) Ability to work in a multidisciplinary group in a multilingual environment and to communicate, orally and in writing, knowledge, procedures, results and ideas related to data science.
- (CT01) To be able to access (bibliographical) information tools and appropriately use them in the development of their daily tasks.
- (CE09) To methodologically know and apply the concepts and techniques of probability and statistics necessary for the extraction of useful knowledge from data analysis.
- (CE15) Ability to model and analyse the uncertainty in data-based studies, as well as to know how to interpret and contextualise the results obtained.
- (CB2) Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.
- (CB5) Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

Know the bases of frequentist statistical learning (CG01, CE09, CE15, CB2).

Understand the concept of statistical population in relation to probabilistic models (CG01, CE09, CE15, CB2).

Understand the concepts of random sample and observed sample (CG01, CE09, CE15, CB2).

Understand the concept of likelihood (CG01, CE09, CE15, CB2).

Know the basic statistical procedures for estimation and hypothesis testing. Apply these procedures in the study of normal populations and proportions (CG01, CE09, CE15, CB2).

Understand the phenomena of censorship and truncation in a dataset (CG01, CE09, CE15, CB2).

DESCRIPTION OF CONTENTS

1. Sample and Population.

1.1 Basic concepts. Descriptive statistics.
1.2 Sampling distributions.

2. Maximum likelihood. Estimation.

2.1 Estimation procedures.
2.2 Properties of the estimators.

3. Confidence intervals.

3.1 Definition of confidence intervals. The pivotal method.
3.2 Asymptotic confidence intervals.

4. Hypothesis testing.

4.1 Previous concepts. Power function. Significance level.
4.2 Definition of tests: Likelihood ratio.
4.3 Alternative procedures: Wald test.
4.4 Concept of p-value.

5. Survival analysis.

5.1 Kaplan-Meier curves. Comparison of survival curves.
5.2 Cox regression.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	32,00	100
Laboratory practices	20,00	100
Classroom practices	8,00	100
Development of group work	10,00	0
Development of individual work	10,00	0
Study and independent work	20,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	15,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

MD1. Theoretical activities. Expository development of the subject (CG01). Students will be encouraged to participate in solving specific issues (CB2, CE09).

MD2. Practical activities. Students' work will focus on solving problems, completing exercises, and analyzing case studies (CB2, CE15).

MD3. Computer classroom activities. Students will work in small groups to complete activities using the computer (CB2, CB5, CT01, CE15).

As well as completing classroom activities, students will work on tasks outside the classroom. Some of these tasks will be completed individually in order to encourage autonomous work. Other tasks will require students to work together in small groups of 2 or 3 (CG04, CT01, CE09, CE15).

The University of Valencia's online platform (*Aula Virtual*) will be used to communicate with students.

EVALUATION

SE1. Objective test. Students will take a theoretical-practical test at the end of the course. This test will account for 50% of the final grade (evaluation of competences CG01, CB5 and CE09).

SE2. Evaluation of practical activities. Students' answers to questions set during the practical sessions will be evaluated. These practical activities will account for 30% of the final grade (evaluation of competences CB2, CE15, CG04, CT01, CB5 and CE09). This component of the assessment may be retaken at a second examination sitting by means of an individual practical exam.

SE3. Continuous assessment of tasks set periodically. This evaluation will account for 20% of the final grade (evaluation of competences CG01, CB2, CE09, CE15). This continuous assessment component cannot be retaken.

To pass the course, a minimum score of 3 (out of 5) is required on SE1 and a minimum score of 1.5 (out of 3) is required on SE2.

In all cases the evaluation system will be governed by the University of Valencia's regulations on grading and assessment for bachelor's degrees and master's degrees, which is available at:

http://www.uv.es/graus/normatives/2017_108_Reglament_avaluacio_qualificacio.pdf

REFERENCES

Basic

- L. Chihara and T. Hesterberg. Mathematical Statistics with resampling and R. Wiley, 2011.
- K.M. Ramachandran and C.P. Tsokos. Mathematical statistics with applications in R. Academic Press, 2015.

Additional

- G. Casella, R.L.Berger. Statistical Inference. Duxbury Press, 2002.
- M.A. Gómez. Inferencia Estadística. Díaz de Santos, 2005