Course guide
200633 - EE - Spatial Epidemiology

Unit in charge: School of Mathematics and Statistics
Teaching unit: 1004 - UB - (ENG)Universitat de Barcelona.

Degree: MASTER'S DEGREE IN STATISTICS AND OPERATIONS RESEARCH (Syllabus 2013). (Optional subject).
Academic year: 2022  ECTS Credits: 5.0  Languages: English

LECTURER
Coordinating lecturer: ROSA Mª ABELLANA SANGRÀ
Others: Primer quadrimestre:
ROSA Mª ABELLANA SANGRÀ - A
JOSEP LLUÍS CARRASCO JORDAN - A

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
4. CE-1. Ability to design and manage the collection of information and coding, handling, storing and processing it.
5. CE-2. Ability to master the proper terminology in a field that is necessary to apply statistical or operations research models and methods to solve real problems.
6. CE-5. Ability to formulate and solve real problems of decision-making in different application areas being able to choose the statistical method and the optimization algorithm more suitable in every occasion.
7. CE-6. Ability to use appropriate software to perform the necessary calculations in solving a problem.
8. CE-7. Ability to understand statistical and operations research papers of an advanced level. Know the research procedures for both the production of new knowledge and its transmission.
9. CE-8. Ability to discuss the validity, scope and relevance of these solutions and be able to present and defend their conclusions.
10. CE-9. Ability to implement statistical and operations research algorithms.

Transversal:
1. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
2. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
3. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

The main concepts of each topic will be treated in the classes and illustrated by real data examples. Furthermore, supplementary stuff will be available for students to complement the concepts treated in the classes.
LEARNING OBJECTIVES OF THE SUBJECT

When the student finishes the course, he or she should be able to:
- Identify the spatial structure type of a data set.
- Use the tools for exploratory spatial data analysis.
- Interpolate geostatistical data.
- Adjust models for lattice data with spatial correlation.
- Identify the pattern of spatial structure in point data.

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>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>12.00</td>
</tr>
</tbody>
</table>

Total learning time: 125 h

CONTENTS

1. GEOSTATISTICS

Description:
1.1. Introduction. Various Examples.
1.2. Exploratory Analysis for Geostatistical Data.
1.3. Variograms: Modelization and Estimates.
1.4. Spatial Prediction and Kriging.

Full-or-part-time: 41h 40m
Theory classes: 10h
Practical classes: 5h
Self study : 26h 40m

2. LATTICE DATA

Description:
2.1. Introduction. Examples.
2.2. Definitions of the proximity matrix
2.3. Exploratory Data Analysis: definitions of the proximity matrix, measurements of spatial association
2.4. Autoregressive models and heterogeneity spatial models. Definition, specifications and Properties

Full-or-part-time: 41h 40m
Theory classes: 10h
Practical classes: 5h
Self study : 26h 40m
3. SPATIAL POINT PROCESSES

Description:
3.1. Introduction. Various Examples.
3.2. Basic Theory of Point Processes
3.3. Exploratory Data Analysis (EDA) for Point Processes
3.4. Models of Point Processes

Full-or-part-time: 41h 40m
Theory classes: 10h
Practical classes: 5h
Self study: 26h 40m

GRADING SYSTEM

Continuous evaluation

In each one of the blocks that make up the subject, the students will have to solve some exercises, which will have to be delivered within a certain period that will announce during the course. The exercises will be scored between 0 and 10, and the average of these qualifications will be the note of exercises (NEJ).

Additionally, a summary exam or test which will include the entire syllabus of the subject, will be scheduled. Attendance at this exam will be optional and will be aimed at those students who have not passed the continuous assessment with NEJ less than 5. To take the test it will be necessary to have completed 60% of the continuous assessment exercises. The synthesis exam will receive a score between 0 and 10 (NPS).

The final grade for the course will be calculated as:
1) For those students who do not take the summary test, the final grade for the course will be the NEJ.
2) For those students who take the summary test, the final grade for the subject will be the maximum between NPS and NEJ.

Unique evaluation

Those students who want to do the unique evaluation will have to notify the course coordinator during the first 15 school days of the course.

The single evaluation will consist of a summary test that will include the entire syllabus of the subject. The summary test will receive a score between 0 and 10 and will correspond to the final grade for the subject.

To pass the subject, the final mark must be greater than 5.

BIBLIOGRAPHY

Basic:
RESOURCES

Computer material:
- WinBUGS. WinBUGS is part of the BUGS project, which aims to make practical MCMC methods available to applied statisticians.
  http://www.mrc-bsu.cam.ac.uk/bugs/winbugs/contents.shtml
- R. R is a free software environment for statistical computing and graphics.
  http://www.r-project.org/