200629 - ASA - Advanced Topics in Survival Analysis

Coordinating unit: 200 - FME - School of Mathematics and Statistics
Teaching unit: 715 - EIO - Department of Statistics and Operations Research
1004 - UB - (ENG)Universitat de Barcelona
749 - MAT - Department of Mathematics

Academic year: 2018
Degree: MASTER'S DEGREE IN STATISTICS AND OPERATIONS RESEARCH (Syllabus 2013). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: English

Teaching staff
Coordinator: GUADALUPE GÓMEZ MELIS
Others: Segon quadrimestre:
GUADALUPE GÓMEZ MELIS - A
KLAUS GERHARD LANGOHR - A

Prior skills
Students must know the basic concepts of survival analysis as taught in the first semester Lifetime Data Analysis course. These concepts include: Censored data, Likelihood in the presence of censoring, Continuous parametric distributions other than normal, Kaplan-Meier survival estimator, Log-rank test, Accelerated Failure Time Model, Cox proportional hazards model, Diagnostic of the Cox Regression model. The student can find these concepts in chapters 2-4, 7-8, 11-12 in the book "Survival analysis: techniques for censored and truncated data" by Klein and Moeschberger.

Degree competences to which the subject contributes

Specific:
1. CE-1. Ability to design and manage the collection of information and coding, handling, storing and processing it.
2. 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.
3. CE-3. Ability to formulate, analyze and validate models applicable to practical problems. Ability to select the method and / or statistical or operations research technique more appropriate to apply this model to the situation or problem.
4. CE-4. Ability to use different inference procedures to answer questions, identifying the properties of different estimation methods and their advantages and disadvantages, tailored to a specific situation and a specific context.
5. 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.
6. CE-6. Ability to use appropriate software to perform the necessary calculations in solving a problem.
7. 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.

Transversal:
8. 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.
9. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
The course Advanced Survival Analysis prepares students to address situations in which the data presents complex patterns of censoring, where the covariates could vary over time, the multivariate analysis of two or more times to an event and briefly introduces how to jointly analyse survival and longitudinal data. The theoretical foundations of survival analysis are taught from the theory of counting processes.

Learning objectives of the subject

The course Advanced Survival Analysis prepares students to address situations in which the data presents complex patterns of censoring, where the covariates could vary over time, the multivariate analysis of two or more times to an event and briefly introduces how to jointly analyse survival and longitudinal data. The theoretical foundations of survival analysis are taught from the theory of counting processes.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 30h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>12.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 80h</td>
<td>64.00%</td>
</tr>
</tbody>
</table>

Teaching methodology

Lectures are organized into two types:

a) Theoretical sessions in which the teacher presents and discusses the general learning objectives and basic concepts. These concepts are motivated with real case studies. The support material used will be published in advance in Atenea (syllabus, content, slides, examples, scheduled assessment activities, references, ...)

b) Laboratory classes in the computer lab. These sessions focus on the practical aspects of the methodology. Software R is available for the students and they can continue laboratory sessions in their hours of self study.

Students must devote enough time to complement the lectures by reading research papers, solving problems, learning relevant software, etc.
## Content

### B1: Beyond the Cox Model

**Learning time:** 28h  
- Theory classes: 6h  
- Laboratory classes: 3h  
- Self study: 19h

**Description:**  

### B2: Multivariate Survival Analysis

**Learning time:** 51h 30m  
- Theory classes: 13h 30m  
- Laboratory classes: 6h  
- Self study: 32h

**Description:**  

### B3: Interval Censoring

**Learning time:** 16h  
- Theory classes: 4h 30m  
- Laboratory classes: 1h 30m  
- Self study: 10h

**Description:**  
B3. Interval censoring  

### B4: Counting Processes

**Learning time:** 29h 30m  
- Theory classes: 9h  
- Laboratory classes: 1h 30m  
- Self study: 19h

**Description:**  
Blocks B1, B2 and B4 will be independently assessed on the dates specified in the planning document. The final grade will be the mean of these scores. For block B3 only attendance is required.

### Qualification system

The student will be informed at the beginning of the course on the dates of each deliverable.

### Bibliography

#### Basic:


#### Complementary: