Course curriculum for STAE02 Bayesian Methods

1. General information

1. Name: Bayesian Methods
2. Level: Basic (G1F)
3. Credit points: 7.5; ECTS-credits: 7.5
4. Approved by the Board of Directors at the Department of Statistics, School of Economics and Management, Lund University on November 24, 2014

2. Course placement within the educational system

1. Subject: Statistics
2. This is an undergraduate level course.
3. The course is offered in English.

3. Learning outcomes

On a general level the students should be able to understand concept of Bayesian methodology for analysis of empirical data. They will learn how to choose prior and present posterior information from an experiment. The process of updating prior information by using the likelihood will be elaborated. The students should be able to understand difference between frequentist and Bayesian modeling. Modern algorithmic methods of processing the data to obtain posterior information will be illustrated using numerical tools.

4. Course content

To balance frequentist ideas that dominate most undergraduate statistics education the course provides exposure to Bayesian methods. With advances of computational tools it is shown that Bayesian methods are no longer of limited practical use. The implementation Markov chain methods for sampling from the posterior is presented and thus demonstrating that Bayesian methods are possible, even in very complicated models.

This course on Bayesian statistics covers methodology, major programming tools and applications in this field. The course starts with a review of conditional probability and Bayes’ Theorem. Introduction to the Bayesian approach will follow that includes discussing: subjective probability and likelihood function. Inference for populations is presented using random samples and conjugate priors, including posterior estimates and credibility sets. Presentation of sequential use of Bayes’ theorem is covered and its benefits are illustrated by evaluating Bayesian updates based on increasing data flow. Fundamentals of building hierarchical models are discussed. Illustrations are carried out using the statistical package R.

Students are required to work on projects to practice applying discussed methods utilizing existing software tools. Classes are provided in three forms: lecture, lab projects, and problem discussions. Problem discussions will enable students to share and compare ideas with each other and to receive specific guidance from the
instructors. Efforts will be made to help students formulate real-world problems into mathematical models so that suitable algorithms can be applied with consideration of computational constraints.

5. Teaching and assessment

The course is designed as a series of lectures, student presentations, and lab sessions with reports. Grading is based on individual performance, via written assignments, oral presentation as well as group activities.

Note

The university views plagiarism very seriously, and will take disciplinary actions against students for any kind of attempted malpractice in examinations and assessments. Plagiarism is considered to be a very serious academic offence. The penalty that may be imposed for this, and other unfair practice in examinations or assessments, includes suspension from the University for a specified period.

6. Grading scale

At the School of Economics and Management grades are awarded in accordance with a criterion-based grading scale A-F:

A: Excellent
B: Very good
C: Good
D: Satisfactory
E: Sufficient
F: Fail

Students have to receive a grade of E or higher in order to pass a course

<table>
<thead>
<tr>
<th>GRADE</th>
<th>CHARACTERISTIC</th>
<th>POINTS</th>
<th>CRITERIA</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
<td>100-85</td>
<td>A distinguished result that is excellent with regard to the following aspects – theoretical depth, practical relevance, analytical ability and independent thought.</td>
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<tr>
<td>B</td>
<td>Very good</td>
<td>84-75</td>
<td>A very good result with regard to the above mentioned aspects.</td>
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<tr>
<td>C</td>
<td>Good</td>
<td>74-65</td>
<td>The result is of a good standard with regard to the above mentioned aspects and lives up to expectations.</td>
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<tr>
<td>D</td>
<td>Satisfactory</td>
<td>64-55</td>
<td>The result is of a satisfactory standard with regard to the above mentioned aspects and lives up to expectations.</td>
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<td>E</td>
<td>Sufficient</td>
<td>54-50</td>
<td>The result satisfies the minimum requirements with regard to the above mentioned aspects, but not more.</td>
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<td>F</td>
<td>Fail</td>
<td>49-0</td>
<td>The result does not meet the minimum requirements with regard to the above mentioned aspects.</td>
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7. Prerequisites
The students should have completed STAA31 or equivalent introductory undergraduate level course in probability or probability and statistics.

8. Literature
See separate document.