



Course Syllabus: Advanced Statistical Inference - STAT 320

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| Division | Computer, Electrical and Mathematical Sciences & Engineering |
| Course Number | STAT 320 |
| Course Title | Advanced Statistical Inference |
| Academic Semester | Fall |
| Academic Year | 2019/2020 |
| Semester Start Date | 08/25/2019 |
| Semester End Date | 12/10/2019 |
| Class Schedule (Days & Time) | 01:00 PM - 02:30 PM Mon Thu |

| Instructor(s) | | | | |
|---------------|------------------------------|---------------|---|-----------------|
| Name | Email | Phone | Office Location | Office Hours |
| Haavard Rue | HAAVARD.RUE@KAUST.ED U.SA | +966128080640 | 4110, 1, Al- Khawarizmi (bldg. 1) | By appointment. |

| Teaching Assistant(s) | |
|-----------------------|-------|
| Name | Email |

| Course Information | |
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| Comprehensive Course Description | The course 'Advanced statistical inference' will give a comprehensive introduction to the role of probability theory in general scientific endeavour, and is relevant for those who have to do inference from incomplete information. We will discuss various threads of modern thinking about Bayesian probability and statistical inference, and discuss Bayesian techniques with the results of other approaches. The lectures are based on this book "Probability theory: The logic of science, by ET Jayes, Cambridge University Press". |
| Course Description from Program Guide | The course aims to provide a solid presentation of the main approaches to statistical inference, in particular of those formulations based on the so-called likelihood function, and of the most important statistical methods in current use for data modeling and for the interpretation of the uncertainty inherent in the conclusions from statistical analyses. The course is intended for students in science, engineering and statistics. At the end of the course, the student should be able to select and apply the main statistical procedures to a wide range of practical problems. |
| Goals and Objectives | The objective for this course is that the student should gain a more mature and in-depth view of the relevance of probability theory in science and for conducting inference from incomplete data. |
| Required Knowledge | STAT 220, 230, 240, 250 |
| Reference Texts | We will base the course on this book: "Probability theory: The logic of science, by ET Jayes, Cambridge University Press". We will also use some review articles with alternative views of the topic. |
| Method of evaluation | 33.00% - Scientific review article presentation 33.00% - Presentation 34.00% - Active participation |
| Nature of the assignments | As this course is more philosophical in style, the evaluation is based on the active participation of each student like discussing the course content during classes and being prepared for doing that, being able to present new material and lead the discussion of a new subject, and being able to present and discuss articles of the subject. |

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| Course Policies | Grades will be posted on the course website and may be disputed only within 48 hours |
| Additional Information | |

Tentative Course Schedule
(Time, topic/emphasis & resources)

| Week | Lectures | Topic |
|-------------|----------------------------------|---|
| 1 | Mon 08/26/2019 Thu 08/29/2019 | Introduction: Plausible reasoning and the quantitative rules |
| 2 | Mon 09/02/2019 Thu 09/05/2019 | Elementary sampling theory and hypothesis testing |
| 3 | Mon 09/09/2019 Thu 09/12/2019 | Queer uses for probability theory |
| 4 | Mon 09/16/2019 Thu 09/19/2019 | Elementary parameter estimation |
| 5 | Mon 09/23/2019 Thu 09/26/2019 | Saudi National Day The normal distribution |
| 6 | Mon 09/30/2019 Thu 10/03/2019 | Sufficiency, ancillarity and all that |
| 7 | Mon 10/07/2019 Thu 10/10/2019 | Repetitive experiments: probability and frequency |
| 8 | Mon 10/14/2019 Thu 10/17/2019 | Physics of 'random experiments' |
| 9 | Mon 10/21/2019 Thu 10/24/2019 | Discrete prior probabilities: the entropy principle |
| 10 | Mon 10/28/2019 Thu 10/31/2019 | Ignorance priors and transformation groups |
| 11 | Mon 11/04/2019 Thu 11/07/2019 | Decision theory, historical background & Simple applications of decision theory |
| 12 | Mon 11/11/2019 Thu 11/14/2019 | Paradoxes of probability theory & Orthodox methods: historical background |
| 13 | Mon 11/18/2019 Thu 11/21/2019 | Model comparison |
| 14 | Mon 11/25/2019 Thu 11/28/2019 | Outliers and robustness |
| 15 | Mon 12/02/2019 Thu 12/05/2019 | Paper presentations |
| 16 | Mon 12/09/2019 | Exams |

Note

The instructor reserves the right to make changes to this syllabus as necessary.