UNIVERSITY OF LONDON | INTERNATIONAL PROGRAMMES

Course information 2018–19
ST2134 Advanced statistics: statistical inference (half course)

To infer means to make general statements on the basis of specific observations. From an early age, human beings are experts at inference. It is such a fundamental part of our intelligence that we do it without even thinking about it. We learn to classify objects on the basis of a very limited set of examples. In statistical inference, we go from specific to general via a mathematical model. Our specific observations come from a data set; that is, a collection of numbers, or at least, information that can be represented numerically. The mathematical models that we use draw on distributions of probability that are described in the companion half course *ST2133 Advanced statistics: distribution theory*. Methods for using probabilistic models to make general statements on the basis of an observed set of data is the central topic of this half course.

Prerequisites

If taken as part of a BSc degree, the following courses must be passed before this half course may be attempted:

(ST104a Statistics 1 **and** *ST104b Statistics 2)* **and** *(MT1174 Calculus* **or** *(MT105a Mathematics 1* **and** *MT105b Mathematics 2)* **or** *MT1186 Mathematical Methods)*

Learning outcomes

At the end of this half course and having completed the essential reading and activities students should be able to:

- ☑ explain the principles of data reduction
- ☑ judge the quality of estimators
- ☑ choose appropriate methods of inference to tackle real problems.

Co-requisite

Students can only take *ST2134 Advanced statistics: statistical inference* at the same time as or after *ST2133 Advanced statistics: distribution theory,* not before.

Assessment

This half course is assessed by a two-hour unseen written examination.

Aims and objectives

The aim of this half course is to provide a thorough theoretical grounding in statistical inference. The course teaches fundamental material that is required for specialised courses in statistics, actuarial science and econometrics.

Essential reading

For full details, please refer to the reading list

Casella, G. and R.L. Berger *Statistical Inference.* (Duxbury)
Hogg, R.V. and E.A. Tanis P*robability and Statistical Inference.* (Pearson/Prentice Hall)

Students should consult the appropriate *EMFSS Programme Regulations*, which are reviewed on an annual basis. The *Regulations* provide information on the availability of a course, where it can be placed on your programme's structure, and details of co-requisites and prerequisites.

Syllabus

This is a description of the material to be examined. On registration, students will receive a detailed subject guide which provides a framework for covering the topics in the syllabus and directions to the essential reading

Data reduction; Sufficiency, minimal sufficiency. Likelihood.

Point estimation; Bias, consistency, mean square error. Central limit theorem. Rao-Blackwell theorem. Minimum variance unbiased estimates, Cramer-Rao bound. Properties of maximum likelihood estimates.

Interval estimation; Pivotal quantities. Size and coverage probability.

Hypothesis testing; Likelihood ratio test. Most powerful tests. Neyman-Pearson lemma.