科目ナンバリング	U-LAS11 10010 LE55						
授業科目名 <英訳>	Mathematical Statistics-E2 Mathematical Statistics-E2			担当者所属 職名・氏名	数理解析研究所 准教授 Croydon, David Alexander		
群	自然科学科目群			分野(分類)	データ科学(基礎)	使用言語	英語
旧群	B群	単位数	2単位	週コマ数	1コマ	授業形態	講義（対面授業科目）
開講年度・開講期	2026・後期	曜時限	木1	配当学年	主として2回生	対象学生	理系向

[授業の概要・目的]

This course will develop the theory of statistical inference, which has applications across the natural and social sciences, and beyond. It will focus on the key topics of parameter estimation and hypothesis testing. As well as presenting the theoretical justification for various techniques covered, it will also be a goal to show how these can be applied in examples.

[到達目標]

- To understand the basic concepts of, and mathematical justification for, point estimation and hypothesis testing
- To be able to apply key techniques of statistical inference in applications

[授業計画と内容]

The following indicates possible topics that will be covered and approximate schedule, though the precise details may vary depending on the students’ proficiency level and background.

(1) Review of probability theory [3 weeks]
Outcomes and events, probability spaces, conditional probability, independence, random variables, probability mass functions, probability density functions, expectation and variance, multivariate distributions, common families of distributions

(2) Point estimates [5 weeks]
Parameterized statistical models, statistics and estimators, sampling distribution, bias, mean-squared error, maximum likelihood estimates (computation and properties), confidence intervals, point estimation for linear models

(3) Hypothesis testing [4 weeks]
Null and alternative hypotheses, likelihood ratio tests, methods of evaluating tests, goodness-of-fit tests, tests for comparing mean and variance of two samples, tests for independence, p-values

(4) Applications [2 weeks]
Example applications will be explored in exercise sheets covering the main aspects of the course, and the solutions of these will be discussed in class.

Total: 14 classes and 1 week for feedback.

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Mathematical Statistics-E2(2)

[履修要件]

No statistical knowledge will be assumed. However, some basic calculus (e.g. finding the maximum of a function using differentiation) will be helpful.

[成績評価の方法・観点]

There will be 3 exercise sheets throughout the course, for which students will be expected to return work and present some of their answers in class. This will account for 30% of the final mark. The remaining 70% will be based on a final exam.

[教科書]

There will be no set textbook for the course, as the lectures will contain all the material needed for the homework and exam. However, students might find the books listed in the reference section useful as additional reading. (All of these references contain much more than will be covered in the course.)

[参考書等]

（参考書）

Casella and Berger 『Statistical Inference』（Duxbury, 2002）
McKean, Hogg and Craig 『Introduction to Mathematical Statistics』（Pearson, 2020）
Rossi 『Mathematical Statistics: An Introduction to Likelihood Based Inference』（Wiley, 2018）

[授業外学修（予習・復習）等]

The lecturer will present the basic concepts in class, upon which exercise sheets will be set. The time required to complete these exercise sheets will vary from assignment to assignment and student to student, but the lecturer estimates that they will take 4-5 hours each.

[その他（オフィスアワー等）]

[主要授業科目（学部・学科名）]

理学部