MATH 3423 Statistical Inference

Course Outline – Fall 2023

1. **Instructor**

Name: Dr. Chi-Wai YU
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2. **Teaching Assistants**

T1A
Name: Zhenhang SHANG
Contact Details: e-mail: zshangab@connect.ust.hk
T1B
Name: Lei SUN
Contact Details: e-mail: lsunak@connect.ust.hk

3. **Meeting Time and Venue**

Lectures:
Date/Time: Mon (1:30pm – 2:50pm) and Fri (9:00am - 10:20am)
Venue: Rm2464

Tutorials:

T1A
Date/Time: Mon (7:00pm-7:50pm) **Venue:** Rm4475

T1B
Date/Time: Mon (4:30pm-5:20pm) **Venue:** Rm4475

T1C
Date/Time: Tue (11:00am-11:50am) **Venue:** CYTG003

T1D
Date/Time: Mon (10:30am-11:20am) **Venue:** CYTG003

4. **Course Description**

Credit Points: 3 units
Pre-requisite: MATH 2421 or equivalence
Exclusion: NIL
Brief information:
This course covers the material about the basic concepts of statistical inference: point estimation and hypothesis testing. The key topics are the sampling from the normal distributions; order statistics; maximum likelihood estimation; properties of point estimators; unbiased estimation; tests of hypotheses; likelihood-ratio tests.

5. Intended Learning Outcomes

Upon successful completion of this course, students are expected to

No.	ILOs
1	understand the main concept of doing statistical inference.
2	be able to find the maximum likelihood estimator in some statistical problems.
3	understand the new inferential ideas like Fisher information and CR lower bound clearly.
4	be able to find different estimates with some special estimation techniques they learn in class.
5	be able to do some advanced testing of hypotheses such as likelihood-ratio test.

6. Assessment Scheme

a. Examination duration: 3 hrs for Final Examination

b. Percentage of assignments and examination.

Assessment	Assessing Course ILOs
20% by Assignment	1, 2, 3, 4, 5
30% (0%, resp) by Midterm	1, 2, 3, 4, 5
50% (80%, resp) by Final exam	1, 2, 3, 4, 5

- For Assignment, no late submission will be accepted.
- No make-up midterm exam will be arranged for any reason.
- If a student misses the final exam, s/he must fill in a form to apply for a make-up final exam with evidence officially.

The maximum score from the above two different schemes will then be taken to determine the student's final grade.

c. The grading is assigned based on students' performance in assessment tasks.

7. Student Learning Resources

Lecture Notes: The course notes are available online. They give a concise (to the point) presentation of the course material, usually enough for most students. Some supplementary materials can also be found and downloaded on the course webpage.

Reference books:

(i) "Statistical Inference" by George Casella and Roger L. Berger

(ii) "Introduction to the Theory of Statistics" by A.M. Mood, F.A. Graybill and D.C. Boes

8. Teaching

Weekly schedule: 3 hrs for lecture and 1 hr for tutorial

9. Course Schedule

Keyword Syllabus:

- Introduction to statistical inference
- Multivariate Normal distribution and central limit theorem
- Relationship between normal and other distributions
- Point estimation: Maximum likelihood estimation
- Fisher information and Cramer-Rao inequality
- Likelihood ratio tests