MATH 3428
Statistical Computing
2026-27 Fall

https://canvas.ust.hk/courses/73406

Lecture

Time	Monday 03:00PM-04:20PM and Friday 10:30AM-11:50AM
Venue	Room 1410
Instructor	**Tang, Rong**
E-mail	martang@ust.hk

Tutorial

Time	Wednesday 05:00PM-05:50PM
Venue	Room 1409
Teaching Assistant	**Li, Rui**
E-mail	rui.li@connect.ust.hk

Course Description

Course outline: This course covers the models, methods and algorithms in computational statistics. Topics include random variable generation, Monte Carlo integration and inference, resampling methods, Markov chain Monte Carlo (MCMC), the Expectation-Maximization (EM) algorithm, and generative models (if time permits).

Credits: 3

Prerequisites: : MATH 2411, MATH 2421 and some familiarity with R programming. The R programming language is needed for completing the assignments.

Intended Learning Outcomes (ILOs)

Upon completion of this course, students are expected learn about the commonly used statistical computing methods, including

(1) Understand the application background of statistical computing algorithm and techniques;
(2) Elaborate the theories behind the algorithms in computational statistics;
(3) Implement various types of statistical computing algorithms in R.

Assessment and Grading

Homework: Five assignments that requires using R and Rstudio. Each assignment will contain coding problems and theoretical questions. For the coding problem, you are required to use R Markdown to write your code and generate outputs in pdf format. For the theoretical questions, you have the option to either type the answer using Markdown syntax or handwrite the answer and submit the photo (in .pdf or .png format). The homework is intended mainly to help you keep up with the course. It will not be graded based on full correctness; You will receive full credit as long as your submission shows a reasonable effort to answer the questions.

Project: The course project will require computational work using R or Python. By default, students are expected to use RStudio and R Markdown to write code, present results, and prepare the final report. Students who prefer to use Jupyter Notebook and Python for the computational component may also do so; however, instruction in Jupyter Notebook and Python will not be provided as part of the course. The project should involve a statistical computing problem related to topics covered in the course and should include both implementation and analysis. Students are expected to submit their code together with a clearly written final report in PDF format. Detailed project guidelines, including the scope, required components, and grading criteria, will be provided later in the semester.

Examinations: There will be a final exam arranged by ARO.

Grading Scheme:

This course will be assessed using **criterion-referencing**, and grades will **not** be assigned using a curve.

Homework	10%
Project	30%
Exam	60%
Course Total	100%

Letter Grades: Tentative Cutoff:

A-/A/A+	B-/B/B+	C-/C/C+	D	F
Above 85%	65%	50%	43%	Below 43%

Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	The student has mastered almost all statistical computing algorithms and techniques taught in the course. The theories behind the algorithms are well understood and the statistical computing algorithms can be proficiently implemented in R.
B	Good Performance	The student has mastered most statistical computing algorithms and techniques taught in the course, yet the understanding of some challenging concepts may not be deep enough.
C	Satisfactory Performance	The student meets the minimum expectation of the instructor, has acquired some basic computational techniques of the subject, yet some concepts were not clearly understood.
D	Marginal Pass	The student is only able to recall some fragments of topics and is able to complete some of the easiest computations.
F	Fail	The student does not have sufficient understanding of even some fragments of topics, and is not even able to complete some of the easiest computations.

Academic Integrity

For the homework assignments, you should feel free to consult the lectures, textbook, and online resources. You can also discuss with your classmates, TA, and the instructor. You may not, however, copy answers, computer codes, or written work from your classmates or any forms of outside assistance. The work you hand in must be of your own. For exams, you should work independently. Exams, assignments and solutions of this course are copyright protected and redistribution (e.g., posting online) is prohibited.

Textbooks and References

References: The major reference is the instructor's lecture notes posted on Canvas. In addition, the following references are recommended:

(1) Textbook: *Statistical Computing with R*, Second Edition By Maria L. Rizzo.
(2) Hands-On Programming with R
(3) Getting Started with R Markdown
(4) Basic Syntax of R Markdown
(5) Math Expression in R Markdown
(6) Mathematical Expressions in Latex

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct.