

Course Syllabus

offered by Department of Mathematics
with effect from Semester A 2017/18

Part I Course Overview

Course Title: Topics in Statistical Machine Learning

Course Code: MA8019

Course Duration: One Semester

Credit Units: 3

Level: R8

Arts and Humanities

Proposed Area:
(for GE courses only)

Study of Societies, Social and Business Organisations

Science and Technology

Medium of Instruction: English

Medium of Assessment: English

Prerequisites:
(Course Code and Title) Nil

Precursors:
(Course Code and Title) Nil

Equivalent Courses:
(Course Code and Title) Nil

Exclusive Courses:
(Course Code and Title) Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course introduces the theory, methodology and applications of statistical machine learning. It will help students develop a solid and systematic understanding of the core materials, explore cutting-edge development of machine learning, apply machine learning techniques to a variety of real applications in science and engineering.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs [#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	explain the fundamentals in the theory of statistical machine learning	20%	✓		
2.	develop a solid and systematic understanding of the classical and model techniques for regression, classification, and clustering	30%	✓	✓	
3.	conduct literature search, review and explore the cutting-edge development of statistical machine learning	30%	✓	✓	
4.	implement a number of popular machine learning techniques	10%		✓	✓
5.	apply machine learning techniques to analyse a variety of real life applications	10%	✓	✓	✓
		100%			

* If weighting is assigned to CILOs, they should add up to 100%.

Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5		
Lectures	Learning through teaching is primarily based on lectures	✓	✓	✓	✓	✓		3 hours/week
Assignments	Learning through take-home assignments helps students understand basic mathematical concepts and fundamental theory		✓		✓	✓		After-class

	of linear algebra, and develop the ability of proving mathematical statements rigorously.							
Final project	Learning through final projects helps students explore cutting-edge development of the current research in statistical machine learning	✓	✓	✓	✓	✓		After-class

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CIOs.)

Assessment Tasks/Activities	CILO No.					Weighting*	Remarks
	1	2	3	4	5		
Continuous Assessment: <u>50%</u>							
Hand-in assignments		✓		✓	✓	50%	These are skills based assessment to enable students to demonstrate the basic concepts and fundamental theory of statistical machine learning.
Final project presentation	✓	✓	✓	✓	✓	50%	Final project presentation provides students chances to demonstrate their exploration and understanding of the cutting-edge development of the current research in statistical machine learning
* The weightings should add up to 100%.						100%	

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Hand-in assignments	DEMONSTRATION of the understanding of the basic materials	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Final project presentation	DEMONSTRATION of the exploration and understanding of the modern research	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

Linear and nonlinear models, model assessment and selection, discriminant analysis, logistic regression, support vector machine, boosting, classification and regression trees, clustering, high-dimensional data.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

The Elements of Statistical Learning, 2nd edition, by Hastie, Tibshirani, and Friedman, Springer, 2009.

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)