City University of Hong Kong
Course Syllabus

offered by School of Data Science
with effect from Semester A 2019/20

Part I Course Overview

Course Title:	Machine Learning
Course Code:	SDSC8003
Course Duration:	One Semester
Credit Units:	3
Level:	R8
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

This course provides students with an extensive exposure to machine learning. Topics include theory of uniform convergence, generalization analysis of learning algorithms for regression and classification, kernel methods, analysis of online learning and distributed learning, and some unsupervised learning methods such as clustering and dimensionality reduction.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs	Weighting	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	State rigorously fundamental principles, ideas, theories, and methods of machine learning	20%	✓		
2.	Distinguish various learning tasks and select appropriate machine learning methods accordingly	10%	✓		
3.	Apply common machine learning methods and algorithms to datasets and evaluate the performance quantitatively	40%	✓	✓	✓
4.	Solve some practical problems by existing machine learning methods and designing new algorithms	30%	✓	✓	✓
		100%			

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)

TLA	Brief Description	CILO No.						Hours/week
		1	2	3	4			
Lecture	Learning through **teaching** is primarily based on lectures and demonstrations.	✓	✓	✓	✓			39 hours in total
Mini-project	A typical machine learning case study will be given to students to solve. The students are expected to work individually or in groups to tackle the given problem. This learning activity will be mainly student-led but with some structural guidance from the teacher.	✓	✓	✓	✓			After class

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.						Weighting	Remarks
	1	2	3	4				
Continuous Assessment: _40_%								
Test Questions are designed for the first part of the course to see how well the students have learned the basic concepts, fundamental theory, supervised learning methods and algorithms, and applications of learning algorithms to some datasets.	✓	✓	✓				20-40%	
Mini-Project The individual or group project provides students chances to demonstrate their achievements on machine learning theory methods learned in this course.	✓		✓	✓			0-20%	
Examination: __60__% (duration: 2 hours , if applicable)								
Examination Examination questions are designed to see how well students have achieved their intended learning outcomes.	√	√	√	√			60%	
							100%	

5. Assessment Rubrics

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Test	Ability to understand and apply the fundamental theory, supervised learning methods and algorithms.	High	Significant	Moderate	Basic	Not even reaching marginal level
2. Mini-Project	Ability to learn the basic concepts, apply methods and algorithms of machine learning, and develop applications of learning algorithms.	High	Significant	Moderate	Basic	Not even reaching marginal level
3. Examination	Ability to solve learning tasks using machine learning methods.	High	Significant	Moderate	Basic	Not even reaching marginal level

Part III Other Information

1. Keyword Syllabus

Exponential probability inequalities, theory of uniform convergence, generalization analysis of empirical risk minimization algorithms for least squares regression and classification, reproducing kernel Hilbert spaces and kernel methods including support vector machines, analysis of online learning and distributed learning for big data, unsupervised learning, brief description of deep learning.

2. Reading List

2.1 Compulsory Readings

1.	Lecture slides and other related material

2.2 Additional Readings

1.	The Elements of Statistical Learning, by Hastie, Tibshirani, Friedman, Springer 2001
2.	Learning Theory: An Approximation Theory Viewpoint, by Cucker and Zhou, Cambridge University Press, 2007.