

**City University of Hong Kong
Course Syllabus**

**offered by School of Data Science
with effect from Semester A 2024/25**

Part I Course Overview

Course Title:	<u>Machine Learning</u>
Course Code:	<u>SDSC8003</u>
Course Duration:	<u>One Semester</u>
Credit Units:	<u>3</u>
Level:	<u>R8</u>
Medium of Instruction:	<u>English</u>
Medium of Assessment:	<u>English</u>
Prerequisites: (Course Code and Title)	<u>Nil</u>
Precursors: (Course Code and Title)	<u>Nil</u>
Equivalent Courses: (Course Code and Title)	<u>Nil</u>
Exclusive Courses: (Course Code and Title)	<u>Nil</u>

Part II Course Details

1. Abstract

This course focuses on machine learning models and their deployments. Topics include neural networks (principles, optimization, generalization), recent neural network models (convolutional, self-attention, transformers, generative adversarial networks), and system issues in machine learning (on-device machine learning, federated learning).

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes		
			A1	A2	A3
1.	Identify and describe the fundamental principles, ideas, and theories of machine learning and deep learning	20%	✓		
2.	Compare and explain recent machine learning and deep learning models and algorithms	20%	✓		
3.	Apply existing machine learning models and design new algorithms to practical datasets	30%	✓	✓	✓
4.	Identify and discuss practices to deploy machine learning models to systems	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. Learning and Teaching Activities (LTAs)

LTA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	Students will engage in formal lectures to gain knowledge about the principles, algorithms, and practices of recent machine learning and deep learning methods.	✓	✓	✓	✓	39 hours in total
Group Projects	Students will participate in groups to design machine learning models for real-world datasets, present their research related to machine learning, and assess the presentation of peers.	✓	✓	✓	✓	After classes; presentations in class in the last week

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.				Weighting	Remarks
	1	2	3	4		
Continuous Assessment: <u>70</u> %						
<u>Programming Test</u> Open-book Python programming test to assess students' ability to apply and design machine learning methods on given real-world datasets	✓	✓	✓		35%	Group projects
<u>Research Presentation</u> Group research to demonstrate the students' ability to formulate research questions and design preliminary solutions on topics related to machine learning models and systems	✓	✓		✓	35%	Group projects
Examination: <u>30</u> % (duration: 2 hours, if applicable)						
<u>Examination</u> Questions are designed to see how well the students have learned the basic concepts, fundamental theory, and applications of learning algorithms.	✓	✓	✓	✓	30%	
					100%	

5. Assessment Rubrics

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Programming Test	Ability to learn the basic concepts, apply methods and algorithms of machine learning.	High	Moderate	Basic	Not even reaching marginal level
2. Research Presentation	Ability to conduct and demonstrate research on machine learning models and systems.	High	Moderate	Basic	Not even reaching marginal level
3. Examination	Ability to solve learning tasks using machine learning methods.	High	Moderate	Basic	Not even reaching marginal level

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Programming Test	Ability to learn the basic concepts, apply methods and algorithms of machine learning.	High	Significant	Moderate	Basic	Not even reaching marginal level
2. Research Presentation	Ability to conduct and demonstrate research on machine learning models and systems.	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 (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

Neural networks, generalization, convolutional neural networks, self-attention, transformers, generative adversarial networks, on-device machine learning, and federated learning.

2. Reading List

2.1 Compulsory Readings

1.	Lecture slides
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2.2 Additional Readings

1.	I. Goodfellow, Y. Bengio, and A. Courville, Deep Learning, MIT Press, 2016.
2.	The Elements of Statistical Learning, by Hastie, Tibshirani, Friedman, Springer 2001