HONG KONG BAPTIST UNIVERSITY
COURSE OUTLINE

1. COURSE TITLE

Machine Learning

2. COURSE CODE

COMP7250

3. NO. OF UNITS

3 Units

4. OFFERING DEPARTMENT

Master of Science in Data Analytics and Artificial Intelligence

5. PREREQUISITES

Basic knowledge of probability theory and optimization techniques.

6. MEDIUM OF INSTRUCTION

English

7. AIMS & OBJECTIVES

To introduce the basic concepts, theories and techniques of machine learning. To give students practical insights into the current development of the field.

8. COURSE CONTENT

I. Introduction to Machine Learning
- The Problem of Learning
- Applications
- Current Challenges in Machine Learning

II. Simulation and Evaluation
- Estimation and Simulation
- Probabilities and Sampling
- Monte Carlo Simulations
- Confidence Intervals

III. Artificial Neural Networks and Deep Learning

- Perceptron and Deep Feed-forward Networks
- Regularization for Deep Learning
- Optimization for Training Deep ModelsD
- Advanced Models: ResNet, LSTM, GANs and Transformer

IV. Classification Techniques
- The Bayes Classifier
- Likelihood Methods
- Prototype Methods
- Logistic Regression
- Support Vector Machine

V. Risk Estimation and Model Selection
- Risk Estimation
- Cross-Validation
- Out-of-Bag Risk Estimation
- Model Selection Criteria

VI. Clustering
- Density-based Clustering
- Hierarchical Clustering

VII. High-Dimensional Data Analysis
- Principles of Low-Dimensional Models
- Dimension Reduction Techniques

9. COURSE INTENDED LEARNING OUTCOMES (CILOs)

CILO	By the end of the course, students should be able to:
CILO 1	Explain the capabilities, strengths and limitations of various machine learning techniques
CILO 2	Explain various machine learning algorithms and their applications
CILO 3	Describe learning models and algorithms
CILO 4	Apply selected machine learning algorithms to solve real-world problems
CILO 5	Understand complex ideas and relate them to specific situations, the ability to evaluate available learning methods

10. TEACHING & LEARNING ACTIVITIES (TLAs)

CILO alignment	Type of TLA
1-5	Students will learn the basic concepts and fundamental principles of machine learning, as well as the application examples, in lectures.
3-5	Students will work on assignments to enhance the understanding of

	learning principles, and acquire hands-on experience on a mini project.

11. ASSESSMENT METHODS (AMs)

Type of Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
Continuous Assessment	40 %	1-5	Assignments and a mini-project will be used to evaluate students' understanding of basic concepts and to assess their ability to apply learning theory to solve real-world problems
Examination	60 %	1-5	Examination will be used to assess students' overall understanding of various machine learning algorithms, their applications, as well as their capabilities, strengths and limitations.

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