Cambodia Academy of Digital Technology
Institute of Digital Technology
COURSE SYLLABUS

Machine Learning

1. Course Information

Course Title	Machine Learning		
School	Computer Science	Hour:45	Credite:3
Instructor	Soklay HENG	Office Hour	8h:00-12h:00,13h:00-17h:00
Mobile	+855 86 87 24 24	Email	soklay.heng@cadt.edu.kh
Learning Outcomes	• Understand the fundamental concept of Machine Learning. • Know how to analyze data, preprocess data, and visualize data. • Learn how to train, test, and evaluate machine learning models. • Able to deal with regression, classification, and clustering using machine learning techniques. • Get a glimpse into deep learning concepts such as neural networks and state-of-the-art neural network architectures.		
Learning Level	1. Remembering☑; 2. Understanding ☑; 3. Applying☑; 4. Analyzing ☑; 5. Evaluating☑; 6. Creating☑		
Textbook & References	1. Machine Learning for Absolute Beginners 2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow 3. Introduction to Machine Learning with Python: A Guide for Data Scientists 4. Artificial Intelligence: A Modern Approach		
Communication	• Telegram • Discord • Google Classroom		
Technologies & Tools	• Python, Pandas, NumPy, Seaborn • Jupyter Lab		

2. Course Description

The course focuses on studying the Machine Learning Life Cycle, the three types of machine learning for solving regression and classification problems, and experience some fundamental concepts in deep learning such as neural networks and some of the state of art architectures that help in solving problems associated with Machine Translation, Image Recognition ... etc.

3. Course Plan

Week (5h)	Expected Output	Chapter/Contents	Contents
1	-Know the necessary information about the course, the teaching strategy, scoring criteria, learning outcomes, and learning material. -Know the history of AI -Differentiate the differences between AI and ML. -Understand the life cycle of ML -Get a better picture of the learning curve of ML -Know the different types of ML	1. Overview	1. Learning outcomes 2. Teaching strategy 3. Learning materials 4. Assessment
		2. Introduction to Machine Learning	1. What is Artificial Intelligence 2. Why Artificial Intelligence 3. History of Artificial Intelligence 4. What is Machine Learning 5. Why Machine Learning 6. Types of Machine Learning 7. Machine Learning Algorithms 8. Machine Learning Life Cycle
2	-Understand types of data and variables in the field of ML -Able to clean data adaptively -Learn about feature scaling and when to apply this to the dataset -Understand what is feature encoding and its types -Comprehend and able to interpret the correlation between features	3. Data Preprocessing	1. Types of data 2. Types of variables 3. Data Cleaning 4. Feature Scaling 5. Feature Encoding 6. Feature Correlation

3	-Learn the different phases of learning in machine learning. -Differentiate the difference between batch, iteration, and epoch. -Differentiate the difference between parameters and hyperparameters. -Learn how to split data into training, testing, and optionally validation sets. -Learn about the different behavior of a model during the training. -Master different kinds of metrics for evaluation according to any given problem.	4. Training and Evaluation	1. Learning Phases 2. Training 3. Evaluation
4	-Differentiate Linear and Nonlinear Correlation -Know the basic concept of the cost function -Understand Gradient Descent Optimization algorithm -Know the existence of local minimum and global minimum -Able to find the best fit line via either least square and gradient descent	5. Linear Regression	1. Introduction 2. Linear Equation 3. Simple Linear regression 4. Gradient Descent 5. Least Square method
5	-Understand the limitation of linear regression for classification problem -Know about different types of classifications -Know the concept of the sigmoid activation function -Identify the decision boundary for each class -Understand the concept of using binary cross entropy as a cost function instead of MSE -Able to apply gradient descent to logistic regression -Understand one vs rest and softmax regression	6. Logistic Regression	1. Introduction 2. Activation function- Sigmoid activation function 3. Hypothesis 4. Decision boundary 5. Cost Function 6. Gradient Descent 7. Multiclass Classification
6	-Know what is Deep learning and its applications -Understand the intuition behind artificial neurons -Realize the differences between ML and DL -Learn about other activation functions on top of the sigmoid function -Master the basic concept of Neural Network -Know about the concept of forward and backward propagation -Learn about the existence of the state of the art neural network architectures	7. Neural Network	1. Deep Learning 2. Artificial neuron 3. Activation function 4. Artificial Neural Network 5. Different kinds of Neural networks architectures

7	-Understand the concept behind SVM -Able to use SVR and SVC for their respective problems -Able to tune hyperparameters so that the model could perform better	8. Support Vector Machine	1. Introduction 2. Support Vector Machine 3. Hypothesis 4. Cost Function 5. Margin 6. Kernel function 7. Support Vector Regressor and Support Vector Classifier
8	-Have a better idea of what Unsupervised learning is -Understand the concept of clustering -Know the existence of different kinds of Clustering Algorithms -Learn how to calculate similarities between data points -Understand the concept of the K-mean algorithm	9. Clustering	1. Introduction 2. Types of Clustering 3. Distance Measures 4. K-mean Clustering
9	-Learn how to simplify sophisticated high-dimensional data -Learn about the concept of data compression -Understand the PCA algorithm -Know about the existence of Autoencoder	10. Dimensionality Reduction	5. Data Compression 6. Principal Component Analysis 7. Autoencoder