
Department of Computer Science
The Islamia University of Bahawalpur

COURSE DESCRIPTION FORM

BS (Computer Science)

Discipline / Program

Course Description

Course Code	COSC-5108
Course Title	Machine Learning
Credit Hours	3(3-0)
Prerequisites by Course(s) and Topics	Programming Fundamentals, Mathematics (Linear Algebra and Statistics)
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	1- Assignments 2- Quizzes 3- Course Project
Course Coordinator	
URL (if any)	
Current Catalog Description	
Textbook	1. Python Machine Learning: Machine Learning and Deep Learning with Python, Scikit and TensorFlow by Sebastian Raschka and Vahid Mirjalili (2nd/3rd Edition) 2. Deep Learning with Python Francois Chollet (First Edition)
Reference Material	3. Introduction to Machine Learning by Ethem Alpaydin (First Edition) 4. An Introduction to Statistical Learning by James, Witten, Hastie, and Tibshirani
Course Objectives	The objective of this course is to: 1. Understand basic concepts of Machine Learning and different algorithms 2. Perform different techniques of preprocessing to clean and prepare data for machine learning algorithms 3. Apply appropriate ML Algorithms in different real life problems
Course Outcomes	1. Students shall be able to learn basic concepts of different machine learning concepts and algorithms 2. Students shall be able to apply different pre-processing techniques to clean and prepare data for machine learning algorithms 3. Students shall be able to apply appropriate machine learning algorithms in different real life problems

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Topics Covered in the Course, with Number of Lectures on Each Topic		Topics Covered (16-Week Plan)
WEEK #	1	Introduction to Machine Learning, Three types of Machine Learning Supervised Learning Classification, Regression Data setup for Supervised Learning Unsupervised Learning Clustering Data setup for Unsupervised Learning Re-enforcement Learning
WEEK #	2	KNN algorithm for classification Mathematical calculation for k-Nns Minkoski and Euclidean distance Training KNN for classification
WEEK #	3	Exploratory analysis and Data Visulization using Matplotlib Graphs Sub-graphs Scatter Graphs Bar Graph Line Graph Box Plots Pie Charts Visualization of Datasets
WEEK #	4	Concepts and Implementation of Introducing linear regression Exploring the Housing dataset Implementing and Evaluating the performance of linear regression models
WEEK #	5	Logistic regression Decision Tree learning
WEEK #	6	Data Pre-processing Dealing with missing data Handling categorical data Partitioning a dataset in training and test Bringing feature sets on same scale Selecting meaningful features Unsupervised PCA
WEEK #	7	Hyper-parameter tuning and model selection Using k-fold cross-validation to assess model performance Debugging algorithms with learning and validation curves Fine-tuning machine learning models via grid search Looking at different performance evaluation metrics Dealing with class imbalance
WEEK #	8	Preparing the IMDb movie review data for text processing Introducing the bag-of-words model
Mid Term Examination		
WEEK #	9	Training a logistic regression model for document classification
WEEK #	10	Simple Websites for Machine Learning Algorithms
WEEK #	11	Connecting Model with Flask or Streamlit Website

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WEEK #	12	Grouping objects by similarity using k-means Organizing clusters as a hierarchical tree
WEEK #	13	Motivation behind using ANN Structure of artificial neuron How ANN works
WEEK #	14	Transfer function and activation function Feed Forward Neural Network Algorithm / Forward Pass Backpropagation Neural Network Algorithm / Reverse Pass ANN Cost Function
WEEK #	15	Introduction to convnets Training convnets on small dataset Using pre-trained convnets
WEEK #	16	Recap
Final Terms		