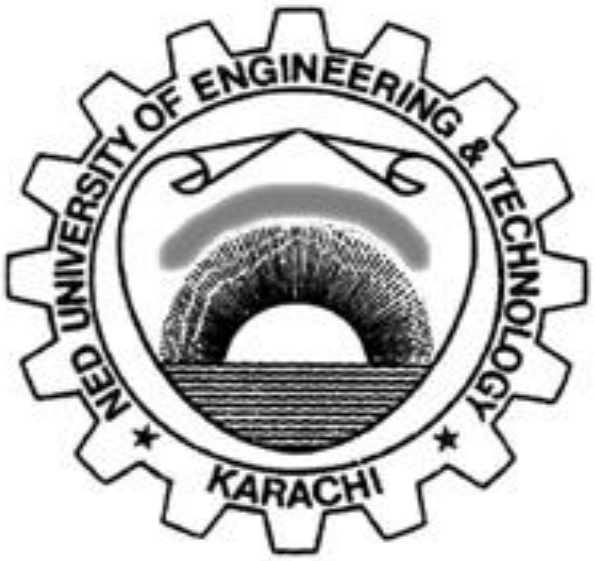
# Practical Workbook
# CS-324
# Machine Learning

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Department: _____

**Department of Computer & Information Systems Engineering**
**NED University of Engineering & Technology**

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# INTRODUCTION

This workbook has been compiled to assist the conduct of practical classes for CS-324 Machine Learning. Machine learning approaches are divided into supervised, unsupervised, and reinforcement learning. Practical work relevant to this course aims at teaching the basic supervised and unsupervised machine learning techniques along with the dimensionality reduction technique. Due to the availability of extensive machine learning libraries, all the labs of this workbook have been designed using Python.

The Course Profile lays down the following Course Learning Outcome:
**"Explore** modern techniques for machine learning (C3, PLO-5)"
All lab sessions of this workbook have been designed to assist the achievement of the above CLO. A rubric to evaluate student performance has been provided at the end of the workbook.

Lab sessions 1 & 2 give an overview of various operations present in numpy and pandas packages for the implementation of machine learning tasks. Lab session 3 covers the basic *k*-nearest neighbor (*k*NN) binary classifier. Lab session 4 covers the naïve bayes binary classifier. Lab session 5 implements and compares linear and *k*NN regressors. Lab session 6 deals with logistic regression. Lab session 7 elaborates the multi-label and multi-output classification. Lab session 8 explains the use of decision trees in performing classification and regression tasks. Lab session 9 employs support vector machines (SVM) to perform classification and regression. Lab session 10 covers ensemble learning using voting, bagging (Random Forest), and boosting. Lab session 11 deals with dimensionality reduction using principal component analysis (PCA). Lab session 12 demonstrates the use of clustering for image segmentation, preprocessing, and semi-supervised learning. Lab session 13 deals with multilayer perceptron to perform classification and regression. Lab session 14 discusses the complex engineering activity.

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