DAIHC-1-03T: Basics of Machine Learning

Total Marks: 100
External Marks: 70
Internal Marks: 30
Credits: 4

Detailed Contents:

Module	Module Name	Module Contents	Lectures / Tutorials Hours
Module-I	Introduction to Machine Learning Paradigms	• Definition and scope of Machine Learning (ML) • Types of ML: Supervised, Unsupervised, Reinforcement Learning • Supervised learning: (Regression (Linear, Polynomial), Classification (Logistic Regression, K-Nearest Neighbors)) • Unsupervised learning: (Clustering (K-Means, Hierarchical), Dimensionality reduction basics (PCA overview)) • Decision Trees: Concepts, Information Gain, Entropy • Real-world examples from healthcare and other domains	15
Module-II	Applied Machine Learning on Real-World Data	• Machine learning process pipeline • Dataset selection and exploration • Handling missing data, outliers, and noisy features • Feature selection and engineering • Application to healthcare datasets: e.g., disease prediction, diagnostics • Case studies: Breast cancer prediction, diabetes detection, patient clustering	15
Module-III	Model Evaluation and Performance Metrics	• Confusion matrix: TP, TN, FP, FN • Evaluation metrics: Accuracy, Precision, Recall, Specificity, F1-score, ROC Curve and AUC • Cross-validation and model validation techniques • Bias-variance trade-off • Overfitting and underfitting • Interpreting results in the context of healthcare outcomes	15

Module	Module Name	Module Contents	Lectures / Tutorials Hours
Module-IV	ML Workflow Implementation using Python	• Introduction to Python libraries for ML: scikit-learn, pandas, matplotlib, seaborn • Building ML workflows: Data loading and preprocessing, Model selection and training, Hyperparameter tuning with GridSearchCV, Model validation and testing • Sample projects: Disease risk classification, Patient clustering based on symptoms • Ethical considerations and explainability in healthcare ML	15

Books

• Géron, A. (2019). Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow: Concepts, tools, and techniques to build intelligent systems (2nd ed.). O'Reilly Media.

• Mohri, M., Rostamizadeh, A., & Talwalkar, A. (2018). Foundations of machine learning (2nd ed.). MIT Press.

• Marsland, S. (2015). Machine learning: An algorithmic perspective (2nd ed.). CRC Press.

• Alpaydin, E. (2020). Introduction to machine learning (4th ed.). MIT Press.