Machine Learning

Course Code: BECSE2C023
Course Title: Machine Learning
Semester: IV
Credits: 04

Rationale

As the digital landscape expands, so do the complexities and opportunities within it. An introductory course in Machine Learning is essential for students to understand how intelligent systems can learn from data and make decisions. This foundational knowledge is crucial for developing solutions that analyze data, identify patterns, and predict outcomes across various industries. By gaining a solid understanding of Machine Learning, students will be equipped to innovate, optimize processes, and contribute to advancements in this rapidly evolving field, ensuring they are prepared for the future of technology.

Course Outlines

Contents	**No.of Lectures**
Unit– I **Introduction to Machine Learning:** Introduction, Types of Machine Learning: Supervised, Unsupervised, Semi-supervised and Reinforcement learning; Steps in the Design of Learning system, Applications of Machine Learning, Data Objects and Attributes, Statistical Summary of Data, Data Exploration and Data Pre-processing, Data Reading and Handling with DifferentFormats,TreatingMissingValues,Normalization,Performance Evaluation Metrics,Cross Validation	10
Unit– II **Supervised Learning:**Labeled-Unlabeled Data, Introduction to classification, Training and Testing, Over-Fitting and Under-Fitting, Classification algorithms: Naive-Bayes classifier, K-nearest neighbor, Support vector machine, Decision tree, Linear Regression, Logistic Regression,Performance Metrics,Ensemble Learning,Confusion Matrix	10
Unit-III **Unsupervised Learning:** Feature Selection: Introduction and its Importance, Feature Selection Technique: Principal Component Analysis, Clustering and its Types: K-means, Hierarchical: Agglomerative and Divisive, Fuzzy, Density based, Distance based, Model based clustering, Association rules: Apriori Algorithm.	10
Unit– IV **Neural Networks:** Introduction to Neural Networks, Artificial Neural Networks	

and its types, Activation Functions, Gradient Descent, Multilayer Networks and Back Propagation. Introduction to Deep Learning: Convolutional Neural Networks, Hyper-parameters Optimization, Introduction to Genetic Algorithm.	10
Unit– V **Model Deployment Using Python:** Python Libraries for Building Machine Learning Models: NumPy, Pandas, Matplotlib, Scikit Learn, Data Selection with Python Library in Python, Importing Libraries & Loading the Dataset, Test-Train Spilt for Implementation, Building the Model: Classification and Prediction, Text and Image Classification, Visualization of the Result.	10

Course Outcomes

After completing the course, students will be able to:

1. Demonstrate in-depth knowledge of methods, basic principles, techniques, applications, and theories in the field of Machine Learning.
2. Pre-process and manage data effectively for Machine Learning tasks.
3. Apply supervised and unsupervised learning algorithms to solve real-world problems.
4. Utilize neural networks and basic deep learning techniques.
5. Deploy and optimize Machine Learning models using Python.

Textbooks

1. Mitchell, T. M., Machine Learning, McGraw Hill (1997), 2nd Edition.
2. Alpaydin, E., Introduction to Machine Learning, MIT Press (2020), 3rd Edition.
3. Michie, D., Spiegelhalter, D. J., and Taylor, C. C., Machine Learning, Neural and Statistical Approaches, Cambridge University Press (1994).
4. Müller, A. C., and Guido, S., Introduction to Machine Learning with Python: A Guide for Data Scientists, O'Reilly Media (2016).

Reference Books

1. Murphy, K. P., Machine Learning: A Probabilistic Perspective, MIT Press (2012).
2. Bishop, C. M., Pattern Recognition and Machine Learning, Springer (2006).
3. Haykin, S., Neural Networks and Learning Machines, Prentice Hall (2008), 3rd Edition.
4. Duda, R. O., Hart, P. E., and Stork, D. G., Pattern Classification, Wiley (2012), 2nd Edition.
5. Smola, A. J., and Vishwanathan, S. V. N., Introduction to Machine Learning, Cambridge University Press (2008).