NARSIMHA REDDY ENGINEERING COLLEGE
An Autonomous Institution| Affiliated to JNTUH | Approved by AICTE
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Department of Computer Science and Engineering

MACHINE LEARNING AND ITS APPLICATIONS

B Tech III Year II Sem

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P		CIE	SEE	TOTAL
25CS405	**Professional Core**	3	0	0	**3**	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: -**				**Total Classes:48**		

Prerequisites:
1. Mastery of introduction-level algebra, statistics, and probability theory
2. Fundamental knowledge on data modeling and evaluation

Course Outcomes:
1. Explain the concepts machine learning models and able to perform feature engineeringtechniques.
2. Identify and apply appropriate supervised learning models.
3. Design neural network models for the given data.
4. Design an ensemble method to increase the classification accuracy.
5. Devise un-supervised and reinforcement learning models.

UNIT I
Introduction: Introduction to machine learning, supervised learning, unsupervised learning, Semi-supervised learning, Reinforcement learning, deep learning, Concept learning using find-S algorithm.
Feature Engineering: Feature Selection using Filter, Wrapper, Embedded methods. Feature normalization using min-max normalization, z-score normalization, and constant factor normalization,
Introduction to Dimensionality Reduction: Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) techniques.

UNIT II
Supervised Learning–I (Regression and Classification)
Regression models: Simple linear regression, Multiple linear regression, Polynomial regression, Cost Function. Performance Metrics: Mean Absolute Error (MAE), Mean Squared Error(MSE), R-Squared error, Adjusted R Square.
Classification models: Decision Trees - ID3, CART, Naïve Bayes, K-Nearest-Neighbours (KNN),Logistic regression, Multinomial logistic regression, Support Vector Machines(SVM).
Classification Metrics: Confusion matrix, Precision, Recall, Accuracy, F-Score, ROC curves.

UNIT-III
Supervised Learning–II (Classification with Neural Networks)
Neural Network Representation: Artificial Neural Networks: Biological neuron, Artificial neuron, Activation functions, neural network architecture, perceptron, learning process in ANN, Back propagation algorithm.
Convolutional Neural Networks (CNN) –Convolution and Pooling layers.

UNIT IV
Model Validation in Classification: Cross Validation-Holdout Method, K-Fold, Stratified K-Fold, Leave-One-Out Cross Validation (LOOC-V).
Bias-Variance tradeoff, Regularization, Overfitting, Underfitting.
Ensemble Methods: Boosting, Bagging, Random Forest classifiers.

UNIT V
Unsupervised Learning: Unsupervised vs Supervised learning, Applications of unsupervised learning,
Clustering and its types: Partitioning methods: K-means, K-Modes, K-Prototypes, Hierarchical clustering: Agglomerative, Divisive. Density-based methods: DBSCAN.
Reinforcement Learning: Exploration and exploitation trade-offs, non-associative learning, Q-learning.

TEXTBOOKS:
1. Data Mining–Concepts and Techniques -Jiawei Han and Micheline Kamber, Morgan Kaufmann (2nd Edition).
2. Machine Learning – Tom M. Mitchell, TMGH.
3. Introduction to Data Mining - Michael Steinbach, Pang-Ning Tan, and Vipin Kumar (Second Edition).

REFERENCES:
1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. R. S. Sutton and A. G. Barto. Reinforcement Learning - An Introduction. MIT Press,1998.
3. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009.
4. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
5. Machine Learning Yearning, Andrew Ng.