COURSE CODE	COURSE TITLE	L	T	P	C
UCS1603	INTRODUCTION TO MACHINE LEARNING	3	0	0	3

OBJECTIVES

- To understand machine learning problems
- To study the various supervised, unsupervised and reinforcement learning algorithms in machine learning
- To study the dimensionality reduction techniques to represent the data and their dependencies
- To understand the need of optimization techniques.

UNIT I INTRODUCTION 8

Introduction: Machine learning; Examples of Machine Learning Applications: Learning associations -- Classification -- Regression -- Unsupervised learning -- Reinforcement learning; Preliminaries: Weight space -- Curse of dimensionality -- Testing machine learning algorithms -- Turning data into probabilities -- Basic statistics -- Bias-variance tradeoff.

UNIT II SUPERVISED LEARNING 11

Neural Networks and Linear Discriminants: Brain and the neuron -- Neural networks -- Perceptron -- Linear separability – Linear regression; Multi-layer Perceptron: Going forward -- Back-propagation of error; Support Vector Machines.

UNIT III PROBABILISTIC LEARNING, LEARNING WITH TREES 9

Probabilistic Learning: Gaussian mixture models -- Nearest neighbour methods; Learning with Trees: Constructing decision trees -- Classification and Regression trees -- Classification example; Ensemble Learning: Boosting -- Bagging -- Random forests.

UNIT IV UNSUPERVISED LEARNING, REINFORCEMENT LEARNING 9

Unsupervised: K-means algorithm -- Self-organizing feature map; Reinforcement learning: State and action space -- Reward function -- Discounting -- Action selection -- Policy -- Markov decision process -- Values -- SARSA and Q-learning.

UNIT V DIMENSIONALITY REDUCTION, OPTIMISATION TECHNIQUES 8

Dimensionality Reduction Techniques: Linear Discriminant analysis, Principal Component Analysis; Optimization and Search: Least-squares optimization -- Conjugate gradients -- Search approaches -- Exploitation and exploration.

TOTAL PERIODS: 45

OUTCOMES

On successful completion of this course, the student will be able to:

- Understand the basic concepts of machine learning (K2)
- Apply supervised algorithms for different classification problems (K3)
- Understand the need of ensemble methods (K2)
- Apply unsupervised and reinforcement learning techniques to various problems (K3)

- Understand the requirement of dimensionality reduction and optimization techniques (K2)

TEXTBOOKS

1. Stephen Marsl and, “Machine Learning – An Algorithmic Perspective”, 2nd Edition, Chapman and Hall/CRC Machine Learning and Pattern RecognitionSeries, 2015.
2. Ethem Alpaydin, “Introduction to Machine Learning”, 3rdEdition, The MIT Press, 2014.

REFERENCE BOOKS

1. Jason Bell, “Machine learning – Hands on for Developers andTechnicalProfessionals”, 1st Edition,Wiley, 2014.
2. Peter Flach, “Machine Learning: The Art andScience of Algorithms thatMake Sense of Data”,1st Edition,Cambridge University Press, 2012.
3. Richert,Willi, “Building machine learning systems withPython”, PacktPublishing, 2013.
4. TomM Mitchell,“Machine Learning”, McGraw-Hill Education (India),2013.
5. Y S Abu-Mostafa, M Magdon-Ismail, HT Lin, “Learning from Data”, AML Book Publishers, 2012.