

## 5MCACC1: MACHINE LEARNING USING PYTHON

Total No. of Hours: 52

Hours/Week: 04

**Course Objective:** To understand the basic theory underlying Machine Learning, and also to apply machine Learning algorithms to solve problems of complexity, to formulate machine Learning problems corresponding to different applications.

**Course Outcome:** Students will be able to

**CO1:** Understand the concepts of machine learning and types of machine learning

**CO2:** Learn neural networks, classifiers and different algorithms

**CO3:** Understand the concepts Support vector machine, Ensemble Classifiers, clustering and decision problems

**CO4:** Familiarize with Python, data types, operators, List, Tuple, Dictionary, Functions, Modules and Packages

**CO5:** Understand the applications of machine learning in various fields like text data processing and computer vision

Unit I	Introduction to learning - Types of Learning, Rote learning, Learning by parameter adjustment, Learning by general problem solving, Concept learning, Learning by analogy. Introduction to machine learning, Why machine learning. Types of problems in machine learning, History of machine learning, Aspects of inputs to training, Learning systems, Machine learning as a classifier, Intelligent agents, Machine learning applications. Evaluation of machine learning algorithms.	10 hrs
Unit II	<b>Neural Networks:</b> Artificial Neural Nets, ANN Basics, ANN - Learning Process, Types of Networks, Perceptron, Multilayer Perceptron, Error back Propagation Algorithm, RBF Networks. Linear Classifiers, Quadratic Classifiers, Decision Trees, C 4.5 Algorithm, Random Forest, Bayesian Networks, Bayesian Networks Learning, Limitation of Bayesian Networks. Self-Organizing Maps, Learning Process of SOM, Adaptive Resonance Theory, ART Networks, ART Architecture, ART Algorithms	12 hrs
Unit III	Support Vector Machines, Inductive Logic Programming, Generic ILP Algorithm, Principal Approaches to ILP, Characteristics of ILP System, Ensemble Classifiers, Ada Boost algorithm, Bayes Optimal Classifier, Nearest Neighbourhood techniques, Fuzzy Network, Fuzzy Systems, Fuzzy Neural Systems. Clustering, Fuzzy Clustering, Reinforcement Learning, Markov Decision Problem, Q-learning, Q-Learning Algorithms.	12 hrs
Unit IV	<b>Core Python:</b> Data Types, Operators, Control Statements, List, Tuple, Dictionary, Functions, Modules and Packages. <b>Machine Learning and Python:</b> Introduction to NumPy, SciPy, Matplotlib. Reading in data, Pre-processing and cleaning data, Building a Classifier, Evaluation, Improve performance of the classifier, Clustering, Tweaking the parameters, Regression – Single and Multidimensional regression, Cross Validation, Penalized regression.	10 hrs
Unit V	<b>Applications in some fields:</b> Text Data Processing, Topic Modelling – LDA, Sentiment Analysis from Twitter Data, Basket Analysis, Music Genre Classification, Computer Vision – Pattern Recognition, Dimensionality Reduction.	8 hrs

## REFERENCE BOOKS

- [1] Vinod Chandra S S, Anand Hareendran S, “Artificial Intelligence and Machine Learning”, PHI, 2014.
- [2] Willi Richert, Luis Pedro Coelho, “Building Machine Learning Systems with Python”, Packt Publishing, 2013.
- [3] Ethem Alpaydin, “Introduction to Machine Learning”, 2nd Ed., PHI Learning Pvt. Ltd., 2013.
- [4] Tom M Mitchell, “Machine Learning”, McGraw Hill.
- [4] Jacek M. Zurada, „Introduction to Artificial Neural Systems“, Jaico Publishing home, 2002
- [5] Laurance Fausett, „Fundamentals of Neural Networks“, Pearson Education, 2004.