DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ECSEVAC01 MACHINE LEARNING WITH PYTHON

UNIT – I

Introduction to Machine Learning: Supervised learning, unsupervised learning, self-supervised learning, reinforcement learning. Evaluating machine learning models: Training, validation and test sets. Data preprocessing, feature engineering and feature learning. Overfitting and underfitting.

UNIT – II

Machine perception - feature extraction - classification, clustering, linear and logistic regression - Types of learning - Bayesian decision theory - classifiers, discriminant functions - univariate and multivariate normal densities - Bayesian belief networks – Implementation of Regression with Python.

UNIT – III

Perceptron and backpropagation training algorithm- Deep neural network (DNN): Architecture and training - Implementation of DNN for MNIST database with Python - k-nearest-neighbor rule. Support vector machine (SVM).

UNIT – IV

Principal component analysis (PCA) - k-means clustering - Decision tree: Classification and Regression Tree (CART) - Random Forest (RF) - Autoassociative neural network (AANN).

UNIT – V

One dimensional convolutional neural network (1D CNN): convolution layer - pooling layer - fully connected layer- ReLu - softmax- training - implementation with keras. Applications of 1D CNN. Introduction to Two dimensional convolutional neural network (2D CNN) - Standard 2D CNN architectures: VGG16, VGG19, GoogleNet, ResNet- Applications of 2D CNN.

TEXT BOOKS

Duda,R.O., E. Hart, and D.G. Stork, Pattern classification, Second edition, John Wiley & Sons, Singapore, 2012.

Francois Chollet, Deep Learning with Python, Manning Publications, Shelter Island, New York, 2018.

REFERENCES

Lovelyn, S., Rose, L. Ashok kumar, D. Karthika Renuka, Deep Learning using Python, Wiley India Pvt. Ltd., First Edition, 2019.

Ethem Alpaydin, Introduction to Machine Learning, 3rd Edition, MIT Press, 2014.

Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.

Navin Kumar Manaswi, Deep Learning with Applications using Python, Apress, New York, 2018.

COURSE OUTCOMES

At the end of this course, the students will be able to

- Understand the fundamental concepts of machine learning and data preprocessing.
- Analyze and Implement the classification, clustering and regression based machine learning algorithms.
- Solve problems using deep neural network, SVM and decision tree using MNIST database with Python.
- Evaluate PCA, k-means clustering, CART, RF and AANN techniques for solving problems.
- Develop pre-trained convolutional neural network (CNN) architectures and implementation of 1D CNN and 2D CNN in keras for solving real world problems.