BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI,
HYDERABAD CAMPUS

ACADEMIC-GRADUATE STUDIES AND RESEARCH DIVISION

FIRST SEMESTER 2023-2024

Course Handout (Part-I)

Date: 30/07/2023

Course No. **: EEE G513**

Course Title **: Machine Learning for Electronic Engineers**

Instructor-in-charge : Dr. Prashant K. Wali

Scope of the Course:

The rise of machine learning (ML) has introduced many opportunities in the design of electronic systems. This course provides a requisite conceptual foundation of ML and contextual application of ML techniques for improving the performance of electronic systems. The course introduces the major approaches to ML such as supervised, unsupervised, semi-supervised, and reinforcement learning.The course also lays emphasis on various deep learning techniques and their application to various types of electronic systems/sub-systems (e.g. control-dominated systems, NLP systems, vision-based systems, communication systems, embedded systems, IoTs). Additionally, the course covers advance topics in ML such as multi-modal, multi-task learning as well as transfer learning. The course discusses the challenges in implementation of ML techniques, complexity analysis of the ML architectures for hardware implementation, efficient architectures, and various topologies used for implementation.

Outcomes:

- Students should be able to apply ML techniques to model, design, validate, and optimize embedded electronic systems in their area of interest.
- Develop the skills and practical exposure in modeling, developing and debugging ML-based systems.
- Develop the foundation required to explore advanced topics of research in ML.

Text Book(s):

T1. I. Goodfellow, Y. Bengio, A. Courville, Deep Learning, MIT Press, 2016.
T2. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006

Reference Book(s):

1. Aurélien Géron, Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems.

Lecture No.	Topic	Learning Objective	Ref. To TB/RB
1-2	Introduction to Machine Learning	What is Machine Learning, Applications, Examples.	Text Book [1,2] Ref [1]
3 - 20	Supervised Learning	Linear Regression, Polynomial Regression, Classification, Logistic Regression, Perceptron, GLMs, Regularized Linear Models, Support Vector Machines, Decision Trees, Dimensionality Reduction, Principal Component Analysis	Text Book [1,2] Ref [1]
21-30	Unsupervised Learning	Clustering, K-Means, Gaussian Mixture Models, Expectation Maximization	Text Book [1,2] Ref [1]
30-40	Neural Networks and Deep Learning	Multilayer Perceptron, Backpropagation, Regression MLPs, Classification MLPs, Convolutional Neural Networks, Recurrent Neural Networks	Text Book [1,2] Ref [1]

Evaluation Scheme

Component	Duration	Weightage	Marks	Date & Time	Evaluation type
Mid sem	90 min	20%	40	12/10 - 4.00 - 5.30PM	Closed Book
Lab		30%	60	-	Open Book
Term Project (Research Paper presentation and extension of ideas + Report)		20%	40	-	Open Book
Compre. Exam.	3 hours	30%	60	16/12	Closed Book
Total			**200**		

Chamber Consultation Hour: To be announced in the class
email: wali@hyderabad.bits-pilani.ac.in
Notices: EEE Notice Board and CMS.

Make-up Examination:

Make-up examination will be given only in **extremely genuine cases** for which prior permission of the instructor-in-charge is required.

Academic Honesty and Integrity Policy:

Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
EEE G 513