



School of Interdisciplinary Engineering & Sciences (SINES)
National University of Sciences & Technology

Course Title: Applied Machine Learning

Course Code CSE-845

Course Objectives:

- To introduce the student to the concepts of machines learning and its applications in different areas of Computational Science & Engineering, Systems Engineering and Bioinformatics.
- To develop hands-on expertise towards the development of machine learning applications.
- To develop hands-on experience on machine learning libraries and frameworks by arranging lab sessions.

Course Contents:

- Machine Learning Overview, Supervised Learning & its Applications
- Linear and weighted Linear Regression, Logistic Regression
- Gradient Descent (GD), Stochastic Gradient Descent (SGD)
- Maximum Likelihood Estimation (MLE)
- Lab/Capstone Project in Supervised Learning
- Data Classification and Dimensionality Reduction techniques
- Unsupervised learning approaches
- Principal Component Analysis
- Cluster Analysis: K-means, Hierarchical Clustering
- Lab/Capstone Project in Unsupervised Learning
- Deep learning, Neural Networks
- Deep learning architectures
- Programming deep learning applications Relevance of deep learning applications to RCMS research domains.
- Advanced HPC hardware for deep learning
- Deep learning on Edge devices and Embedded GPUs
- Parallel & Distributed Techniques for training and inference
- Lab/Capstone Project in Deep Learning
- Advanced topics in machine learning

Recommended / Reference Books:

- E.-R. Olderog and H. Dierks: Real-Time Systems. Cambridge University Press, 2008.
- B. Bérard et al.: Systems and Software Verification: Model-Checking Techniques and Tools, Springer 2001.
- C. Baier and J.-P. Katoen: Principles of Model Checking, MIT Press, 2008.
- T-A. Henzinger, P-H. Ho, and H. Wong-Toi. HYTECH: A model checker for hybrid systems. International Journal on Software Tools for Technology Transfer, 1(1-2):110-122,1997.
- Goran Frehse. Phaver: Algorithmic verification of hybrid systems past HYTECH. In HSCC, pages 258-273, 2005