

# Machine Learning

## Basic stuff

**Instructor:** Prof. Dr. Arif Mahmood

**Lecture room:**

**Meeting times:**

Monday 5:30-7:00,

Tuesday 7:15-8:45,

**Office:** 6<sup>th</sup> floor CS Department, ITU Lahore

**E-mail:** arif.mahmood@itu.edu.pk

**Course website:** Google Classroom

## Textbooks:

1. C.M. Bishop, "Pattern Recognition and Machine Learning", Springer, ISBN: 978-0387310732, 2003.
2. R.O. Duda, P.E. Hart, and D.G. Stork, "*Pattern Classification*", Wiley Interscience, ISBN: 0-13-022616-5, 2001.

**Course Objectives:** To understand the basic concepts of Machine Learning. We will focus on the following modules:

## Course Contents:

- K-Nearest Neighbors
- Linear Regression
- Multi-Linear Regression
- Linear Classification, Logistic Regression
- Maximum Likelihood
- Bayesian Inference
- Neural Networks, Optimization, Activation Functions, Overfitting, Backpropagation algorithm
- Convolutional Neural Networks
- Gaussian Classifiers, EM Algorithm
- Principal Component Analysis
- Autoencoders for Dimensionality Reduction, Image Generation

- Decision Trees
- Deep Reinforcement Learning, Evolution Strategies
- Knowledge Distillation
- Generative Adversarial Networks, Neural Style Transfer
- Graph Neural Networks (GNN)
- Attention and Transformers
- Applications of ML: Anomaly Detection
- Applications of ML: Human Pose Detection
- Application of ML: Image Generation and Pose Transfer
- Other applications

**Marks Distribution (MS):**

Midterm: 20 for MS and 25 for BS

Final Exam: 30 for MS, 35 for BS

Project (only for MS): 10

HomeWorks: 10 (4-5 HW)

Programming Assignments: 20 (4-5 assignments)

Quiz: 10 (~7 Quizzes, 2 will be dropped).