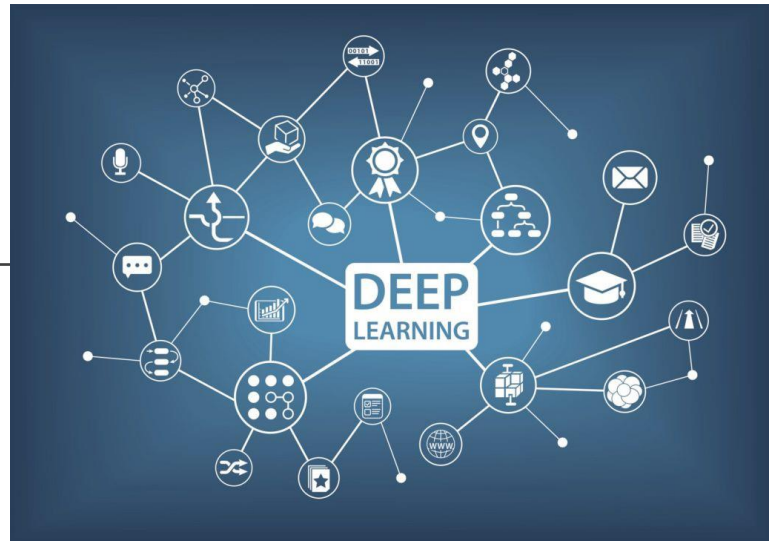
Introduction and Policy

DEEP LEARNING COURSE – 2023

E. FATEMIZADEH



Course Specifications

- Graduate Level Course
- Prerequisite: *Statistics*, *Linear Algebra*, *Python Programming*
- Date and Time: Sunday and Tuesday, 09:00-10:30 (Theory)
- Date^{+} and Time^{+}: TBA (after Add & Drop Period)

Evaluation

- Midterm: 6 out of 20
- Final: 6 out of 20
- Homeworks (×5): 5 out of 20
  - Delay Policy: 5 days (each one) and 20 days (total)
- Project: 3 out of 20
  - Delay policy: TBA

References

- I. Goodfellow, etc., Deep Learning, MIT Press, 2016.
- S. Theodoridis, Machine Learning: A Bayesian and Optimization Approach, Academic Press, 2015.
- Top Hot Papers

Important Dates

- Midterm: Azar, 9th, 1402, 13:00
- Final: Dey, 24th, 1402, 15:00

Prerequisites

- ✝Probability and Statistics (random variables, probability and distributions, expectation concept, …)
- ✝ Linear Algebra (matrix/vector multiplications, matrix decompositions, vector calculus, eigenvalues and eigenvectors, …)
- ✝Classical Machine Learning (Regression, SVM, KNN, Decision Trees, Random Forests, …)
- ✹Familiarity with programming in python
- ✹ Familiarity with basic python data libraries (numpy, pandas, matplotlib, …)
- ✝: Rapid Review, ✹ : Strictly required

Syllabus

- Introductions: An Introduction to Machine Learning Concepts, importance, applications, and examples.
- Rapid Survey (essential mathematics for machine learning: Linear Algebra and Random Variables)
- Shallow and Deep Neural networks as classifier and function approximator: Single layer perceptron (SLP), multilayer perceptron (MLP), error back propagation (EBP) algorithm, most important theorems.
- Regularization, Normalization, and Optimization with emphasis on stochastic gradient descent (SGD) and its variations.
- Convolutional Neural Networks (CNN): History, Foundations, Architecture, Learning.
- Application of CNN in computer vision: Most important network (AlexNet, GoogleNet, VGGNet, ResNet , and state of art networks)

Syllabus

- Recurrent Neural Networks: RNN, LSTM, GRU, Transformers, applications in natural language and signal/image processing.
- Unsupervised Learning: Auto Encoder (AE), Variational Auto Encoder (VAE), Conditional Variational Auto Encoder (CVAE)
- Adversarial learning: Generative Adversarial Networks (GAN) and Conditional GAN (CGAN), mathematical foundation, architecture, applications, and most important networks (GAN, DCGAN, CycleGAN, WGAN, and state of art networks)
- Generative Models (Diffusion)

Contacts, News, and Repository

- Sharif CourseWare
- fatemizadeh@{sharif.edu and gmail.com}

Any Question

- Quota subjects