ONLY GOD

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Neural Networks & Deep Learning

Course Outline

CSE & IT Department
ECE School
Shiraz University

Description

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- Fundamental methods and techniques of field of Artificial Neural Networks and Deep Learning
- From primitive shallow networks to modern deep networks
- Supervised, unsupervised and reinforcement learning
- Emphasis on concepts, mathematical formulations, and applications

Goals

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- To provide a comprehensive understanding of Artificial Neural Networks and Deep Learning
- To present the theory and practice of shallow/deep neural networks
- To provide hands-on experience in design and implementation of shallow/deep neural systems
- To explore different neural network models and applications

After Taking this Course…

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You should …

- Be able to design and implement different types of neural network models
- Understand characteristics of different neural network models and their implications for applications
- Understand significance of neural networks in AI and computational neuroscience

Before Taking this Course…

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You should be comfortable with…

- Linear algebra
  - Vectors, matrices and their manipulations
- Calculus
  - Differential calculus
- Matlab or Python
  - Some demos in Matlab
  - Projects in Matlab/Python

Grading

Point distribution

- Midterm exam 40 %
- Final exam 40 %
- Projects (design & implementation) 20 %
- Quiz/Attendance + ? %

Course Contents

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1. Neural Network and its Learning methods
   - 1-1. Introduction to NNs
   - 1-2. Overview of NN Classifier
   - 1-3. NN Learning
2. Single-layer NNs
   - 2-1. Feed-forward Networks for Classification
   - 2-2. Feed-forward Networks for Association
   - 2-3. Recurrent Networks
   - 2-4. Competitive Networks

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3. Shallow NNs (single-hidden-layer)

- 3-1. Multilayer Perceptrons
- 3-2. Radial Basis Function Networks
- 3-3. Extreme Learning Machines
- 3-4. Convolutional Networks
- 3-5. Recurrent Networks
- 3-6. Restricted Boltzmann Machines

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4. Deep NNs

- 4-1. Deep Learning
- 4-2. Deep MLP
- 4-3. Deep AE (VAE & AAE)
- 4-4. GAN
- 4-5. Deep ELM
- 4-6. Deep ConvNet
- 4-7. Deep CapsNet
- 4-8. Long Short-Term Memory and Attention
- 4-9. Deep Belief Networks

Course Material

- Textbooks:
  - Neural Networks and Learning Machines
    - Haykin
  - An Introduction to Neural Networks
    - Gurney
  - Fundamentals of Neural Networks
    - Fausett
  - Deep Learning
    - Goodfellow, Benjio and Courville
- Supplementary materials:
  - Lecture slides
  - Some demos in Matlab
  - A workshop on deep networks

Course Web Page

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- For announcements, lecture slides and assignments:

  http://sess.shirazu.ac.ir

- For textbooks, demos, and other resources:

  Link of Google Drive in sess

Contact

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Knowledge cannot be taught; it is learned