COMP/EECE 7/8740 Neural Networks
Fall 2021: 5:30-6:55 PM TR,
Room No.: Dunn Hall 249

Objectives

The course aims to describe the basic and advanced neural networks models. In the Fall 2021 rendition, we will cover state-of-the-arts techniques and methods in the field, together with specific applications.

Course Description

Learning algorithms for multilayer perceptrons, least-mean squares, backpropagation and its variants, cascade-correlation, other supervised learning algorithms; unsupervised methods, including Hebbian, competitive, and reinforcement learning; applications to associative memories, combinatorial optimization, component analysis, function approximation, pattern classification; theory of neurodynamic, including equilibrium, stability, and computational power.

Syllabus

Week 1: Introduction
- Evolution of neurocomputing

Week 2: Fundamentals of Machine Learning
- Computational Platforms (e.g., R, Python)

Week 3: Supervised Learning: Perceptrons
- Deep Neural Network (DNN)
- Training methodology

Week 4: Deep Convolutional Neural Network (DCNN) Part 1:
- DCNN architectures for classification segmentation, and detection approaches.

Week 4: DCNN Part 2:
- Pre-processing
- Data augmentation
- Model initialization approaches
- Advanced activation functions
- Regularization methods
- Model optimization and so on.

Week 5: DCNN Part 3:
- 3D-CNN models

Week 6: Transfer Learning (TL) and
- Fine-tuning the models, and
- Model ensembling

Week 7: Recurrent Neural Networks (RNNs) Part 1:
- Vanilla RNNs
- Long Short Temp Memory (LSTM)
- Gated Recurrent Unit (RGU)

Week 8: Case Studies
Week 9: RNNs Part 2:
- Convolutional Recurrent Neural Network (ConvLSTM)
- Temporal Convolutional Neural Network (TCNN)

Week 10: Unsupervised learning part 1:
- Hebbian and SOMs
- Auto-Encoder (AE) and its variants

Week 11: Unsupervised deep learning part 2:
- Deep Belief Network (DBN)
- Generative Adversarial Network (GAN) and its variants

Week 12:
- Deep Learning for Information retrieval and visualization

Week 13: Incremental and Lifelong Learning
Week 14: Reinforcement Learning (RL)
Week 15: Term Project Presentations

DL Implementation and datasets:
- Language: Python
- Frameworks for Deep learning: Keras, Tensorflow, and PyTorch.
- Publicly available datasets such as MNIST, CIFAR-10, CIFAR-100, Tiny ImageNet and many more.

Instructor

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Office Hours

Please send me an email to set up an appointment.

Course Text

a) Neural Networks: A systematic Introduction, Raul Rojas. Springer-Verlag, 1996.
b) Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville (available at http://www.deeplearningbook.org/).

Course Webpage

We will be using xxxxxxx for this course.

Evaluation

Your final grade for this course will be determined by the following averaging procedure (subject to change):

Assignments	≈ 50 %
Examination	≈ 10 %
Progress Reports	≈ 10 %
Term project	≈ 30 %

Plagiarism

(cheating behavior) in any form is unethical and detrimental to proper education and will not be tolerated. All work submitted by you the student (projects, programming assignments, lab assignments, quizzes, tests, etc.) is expected to be a student's own work. Plagiarism is incurred when any part of anybody else's work Is passed as your own (no proper credit is listed to the sources in your own work) so the reader is led to believe it is therefore your own effort. Students are allowed and encouraged to discuss with each other and look up resources in the literature (including the internet) on their assignments, but appropriate references must be included for the materials consulted, and appropriate citations made when the material is taken verbatim. By taking this course, you agree that any assignment turned in may undergo a review process and that the assignment may be included as a source document in Turnitin.com's restricted access database solely for the purpose of detecting plagiarism in such documents. Any assignment not submitted according to the procedures given by the instructor may be penalized or may not be accepted at all.

If plagiarism or cheating occurs, the student will receive a failing grade on the assignment and (at the instructor's discretion) a failing grade in the course. The course instructor may also decide to forward the incident to the University Judicial Affairs Office for further disciplinary action. For further information on U of M code of student conduct and academic discipline procedures, please refer to http://www.people.memphis.edu/~jaffairs/">http://www.people.memphis.edu/~j affairs/