EEL6814-1845(14372) - Neural Net Deep Learn

EEL 6814

Neural Networks and Deep Learning (3)

Tuesday (1st& 2nd periods) and Thursdays (2nd period)

New Eng Bdg NEB 409

Fall 2019

Department of Electrical and Computer Engineering, University of Florida

Instructor: Jose C. Principe, Distinguished Professor of Engineering

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Office hours: We 14:00-16:00

Description Nonlinear modeling using neural networks. Gradient descent learning in the additive neural model. Statistical Learning Concepts. Information theoretic cost functions. Convolution neural networks. Recurrent neural networks. Foundations of Deep Learning. Importance of Deep learning for representation. Current models for image and speech recognition. Adversarial Networks. Challenges of Deep Learning.

Pre reqs: EEL 5840 Elements of Machine learning or equivalent.

Objectives: Understand and utilize the concepts of machine learning for data science and electrical engineering. Focus on tools for multivariate data analysis and how to handle uncertain data with probability models. Both static and time varying data fitting and classification problems will be covered. Neural network implementations will also be used in the course.

Website: Canvas

Text Book: “Machine Learning: A Constraint-Based Approach” by Marco Gori, Elsevier 2018 ISBN-13: 978-0081006597 + notes of the instructor.

References: Neural and Adaptive Systems: Fundamentals Through Simulation, Principe, Euliano and Lefebvre, Wiley, 2000.

Information Theoretic Learning, Principe, Springer, 2010.

Neural Networks for Pattern Recognition, Bishop, Oxford, 1998.

Deep Learning by Goodfellow, Bengio & Courville, MIT Press 2016

Goals: Understand and utilize neural network concepts in pattern recognition and deep learning. Neural networks models will be explained from the point of view of nonlinear adaptive models. Emphasis on time varying models and deep learning. Figures of merit for

neural network design will also be covered.

Schedule: This is an approximate schedule

Week 1: History of Neural Networks

Week 2: Introduction to machine learning problems and methodologies

Week 3: Perceptrons

Week 4: Backpropagation

Week 5: Multi-Layer Perceptrons

Week 6: Tricks of the Trade for successful learning

Week 7: Unsupervised Learning Models

Week 8: Recurrent Neural Networks

Week 9: Convolution Neural Networks

Week 10: Deep representations

Week 11: Taxonomy of Memory Networks

Week 12: Stacked AutoEncoders

Week 13: Generative Deep Neural Networks

Week 14: Information Theoretic Learning for cost functions

Week 15: Understanding the Dynamics of Learning with ITL

Week 16: Reinforcement Learning

Grading:

Assignment	Total Points	Percentage of Final Grade
Homework Sets (8)	10 (each)	40%
Project I	Letter grade	30%
Project 2	Letter grade	30%

Project 1: Content Based Image Retrieval

Project 2: Speech Recognition

Grading Policy:

Percent	Grade	Grade Points

93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

Software: Homework and projects will be a mixture of programming and write-ups

of your results and analyses. You are free to use any programming language for these assignments. You will need access to a fast personal computer to develop and run your code on real-world datasets that we provide.

Course Summary:

Date	Details