Class Meetings: Tue, Thu 9:00–10:20am, ARC 101
Instructor: Razvan Bunescu
Office: Stocker 341
Office Hours: Tue, Thu 10:30–11:00am, or by email appointment
Email: bunescu @ ohio.edu
Class Website: http://ace.cs.ohio.edu/~razvan/courses/dl6890

Prerequisites:
Previous exposure to basic concepts and models in machine learning, such as: supervised vs. unsupervised learning, classification vs. regression, linear regression, logistic and softmax regression, cost functions, overfitting and regularization, gradient-based optimization. Experience with programming and familiarity with basic concepts in linear algebra and statistics.

Textbook:
Deep Learning
by Ian Goodfellow, Yoshua Bengio and Aaron Courville. MIT Press, 2016

Recommended introductory resources:
Machine Learning @ Stanford video lectures:
Machine Learning @ OU course web site:
http://ace.cs.ohio.edu/~razvan/courses/ml6830
Links to other online reading materials will be made available on the course web page.

Course Description:
This course will introduce a number of approaches for learning representations of data that have been shown to substantially improve the performance of machine learning algorithms on a wide array of tasks in computer vision, speech recognition, and natural language processing. Basic features, such as edge detectors in computer vision, will be induced automatically from unlabeled data using sparse or denoising autoencoders. These features can be assembled into increasingly more complex representations by greedy layering in hierarchical architectures. Learning high-level representations that are expressed in terms of other, simpler representation is the hallmark of deep learning. The course will introduce the multi-layer perceptron, a common deep learning architecture, and its gradient-based training through the backpropagation algorithm. The later part of the course will explore specialized neural network architectures such as convolutional neural networks (for images), recurrent neural networks (for sequences), and memory-augmented neural networks. The lectures will cover theoretical aspects of deep learning models, whereas homework assignments will give students the opportunity to build and experiment with shallow and deep learning models, for which skeleton code will be provided.
Proposed Topics:
Logistic and Softmax Regression, Feed-Forward Neural Networks, Backpropagation, Sparse Autoencoders, Denoising Autoencoders, Linear Decoders, Vectorization, PCA and Whitening, Self-Taught Learning, Deep Networks, Convolution and Pooling, Recurrent Neural Networks, Long Short-Term Memory, Gated Recurrent Units, Neural Attention Models, Sequence-to-Sequence Models, Memory Networks.

Implementation Platforms:

Grading:
35%: Homework Assignments
5%: 1 Class Presentation
30%: 2 Exams (Mar 2 and Apr 20, in class)
30%: Final Project

Important Dates:
Tuesday, Mar. 7: Spring Break, no class.
Thursday, Mar. 9: Spring Break, no class.
Thursday, Apr. 20: Last day of this class.

Course and Attendance policies:
Assignments: All homework assignments are due before the class. No late submissions will be accepted without prior approval.
Attendance: It is in your best interest to attend all the lectures. Some of the material will not be found in the reading materials. Extra credit will be awarded for class activity. Also, be sure to check your OU email for important announcements on a regular basis.

Academic Dishonesty Policy:
All work must be the student’s own. All external references used in reports must be properly cited. No credit will be given for duplicate or plagiarized work. Additional measures may be imposed by the Office of Community Standards and Student Responsibility, when conditions warrant. Students may appeal academic sanctions through the grade appeal process. The OU Student Code of Conduct Policy is available online at:
http://www.ohio.edu/communitystandards/academic/students.cfm

Disability-based Accommodation:
Any student who suspects s/he may need an accommodation based on the impact of a disability should contact the class instructor privately to discuss the student’s specific needs and provide written documentation from the Office of Student Accessibility Services. If the student is not yet registered as a student with a disability, s/he should contact the Office of Student Accessibility Services.

Other Policies:
Be sure to notify the professor of any exam conflicts or other extenuating circumstances well in advance. No missed exams will be made up without prior approval.