

Summer 2020

CS 677-850: Deep Learning

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CS 677: Deep learning Summer 2020

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Textbook: Not required

Grading: 40% programming assignments, 25% mid-term, 35% final exam

Course Overview: This course will cover deep learning and current topics in data science. We will begin with machine learning background and then move to CUDA and OpenCL languages for parallel programming on Graphics Processing Units (GPUs) followed by OpenMP for multi-core programming. We will then proceed to neural networks, machine learning for image recognition, convolutional filters for image recognition, convolutional neural networks, optimization algorithms to train such networks, adversarial attacks, and deep learning for text.

Course plan:

Topic	Date	Notes
Basic machine learning and Python scikit-learn		Introduction Basic Unix command sheet Instructions for AFS login Basic machine learning background with Python scikit-learn Datasets <ul style="list-style-type: none">• Linear data• Non-linear data• Breast cancer (bc.train.0) (bc.test.0)• Ionosphere (ion.train.0) (ion.test.0)• Climate simulation (climate.train.0) (climate.test.0)• Qsar (qsar.train.0) (qsar.test.0) • Fifty two datasets selected from the UCI machine learning repository.
Introduction to GPU computing		GPU coding (also see Cuda by Example by Kandrot and Sanders) Numpy tutorials Official Numpy tutorial External Numpy tutorial CUDA in Python Numba CUDA JIT in Anaconda PyCUDA (PyCUDA slides)

CUDA programming		Parallel chi-square 2-df test Chi-square 2-df test in parallel on a GPU Simulated GWAS Class labels for above data
CUDA programming		Parallel Chi-square 2-df test Assignment 1
OpenCL and OpenMP programming		CUDA to OpenCL slides libOpenCL.so (NVIDIA library file for OpenCL code) Chi2 opencl implementation OpenCL files CUDA to OpenMP slides OpenMP reference Chi2 openmp implementation Assignment 2