

COMP 4741 / 6741: Intro to Neurocomputing – Fall 2021

Basic Information

Time & Place: TR 11:20 AM--12:45 PM, Engr Science Bldg 220

Instructor: Weizi Li, Dunn Hall 321, E-mail: wli@memphis.edu

Office Hours: immediately after lecture or by appointment

Course Overview

The course introduces models and methods related to artificial neural networks and deep learning, which are enabled by the increased computational power and massive datasets. The introduced machine learning algorithms are based on data rather than traditional analysis and programming. Applications will be described to a variety of problems in prediction, decision making, and modeling complex phenomena. Students will get hands-on experience on software packages to solve a practical problem in a term project of their choice.

Topics include machine learning basics; linear models; non-linear models; supervised learning (perceptron, convolutional neural network, recurrent neural network); unsupervised learning (autoencoder, variational autoencoder, generative adversarial network); reinforcement learning (deep reinforcement learning); and other advanced topics.

Prerequisite

COMP 2150 and MATH 3242, or permission of the instructor

Textbook

No textbook is required.

Tentative Schedule

Week 1: Course Overview and Foundations: Machine Learning Basics

Week 2: Foundations: Linear Models

Week 3: Foundations: Non-linear Models

Week 4: Supervised Learning: Neural Networks Basics

Week 5: Supervised Learning: Convolutional Neural Networks

Week 6: Supervised Learning: Recurrent Neural Networks

Week 7: Supervised Learning: Optimization and SGD

Week 8: Unsupervised Learning: Autoencoders and Variational Autoencoders

Week 9: Unsupervised Learning: Generative Adversarial Networks

Week 10: Reinforcement Learning: Basics

Week 11: Reinforcement Learning: Deep Reinforcement Learning

Week 12: Additional Topics: Adversarial Training

Week 13: Additional Topics: Explainable AI and Meta Learning

Week 14: Project Presentations

Evaluation

Grades will be computed as follows:

10% Class participation

30% Three homework

10% Project proposal

10% Peer feedback for project proposal

10% Final project presentation

30% Final project quality and report

≥ 87%: A+ or A or A-

≥ 79%: B+ or B or B-

≥ 68%: C+ or C or C-

≥ 60%: D+ or D

< 60%: F

Plus/minus grading will be used based on significant performance differences on the project within each range. Students taking the class at the 6000 level are expected to engage in more encompassing projects, as well as to turn in solutions of a higher quality.

Late Policy. There will be in total four free late days for students to freely distribute to the four homeworks. The number of used late days should be clearly stated in the submitted homework. Students who do not use any late days will be given a 5% bonus to their final grades. Otherwise, all late submissions are subject to a penalty of 20% per day for no more than three days.

Homework and Project Report Policy. Students are required to submit the PDF file of their homework solutions, project proposal, and project report.

Plagiarism

Plagiarism or cheating behavior in any form is unethical and detrimental to proper education and will not be tolerated. All work submitted by a student (projects, programming assignments, lab assignments, quizzes, tests, etc.) is expected to be a student's own work. The 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.

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 Office of Student Conduct for further disciplinary action. For further information on U of M code of student conduct and academic discipline procedures, please refer to <https://www.memphis.edu/osa/students/academic-misconduct.php>.

"Your written work may be submitted to Turnitin.com, or a similar electronic detection method, for an evaluation of the originality of your ideas and proper use and attribution of sources. As part of this process, you may be required to submit electronic as well as hard copies of your written work, or be given other instructions to follow. By taking this course, you agree that all assignments may undergo this 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." (Office of Legal Counsel, October 17, 2005).

Disability Notice

Any student who anticipates physical or academic barriers based on the impact of a disability is encouraged to speak with me privately. Students with disabilities should also contact Disability Resources for Students (DRS) at 110 Wilder Tower (901-678-2880). DRS coordinates access and accommodations for students with disabilities (<http://www.memphis.edu/drs/>).