COMP 4741 / 6741: Intro to Neurocomputing – Fall 2020

**Basic Information**
*Time & Place:* MW 17:30--18:55 PM, FIT226
*Instructional mode:* online for the first month, to be determined afterwards
*Instructor:* Weizi Li, 321 Dunn Hall, Email: wli@memphis.edu
*Office Hours:* M 16:30--17:30 pm, or by appointment

**Course Overview**
The course introduces models and methods related to neurocomputing, once conventional computers had acquired sufficient power to enable their massively parallel models. 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 data analysis, forecasting, decision making and, more recently, 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 connectionist data-driven AI; Learning algorithms; Least-mean squares; Supervised learning algorithms (perceptrons, backpropagation and its variants, recurrent neural nets); Unsupervised methods (Hebbian, competitive and reinforcement learning); Deep Learning; Computing platforms for neural nets; case studies.

**Prerequisite**
COMP 2150 and MATH 3242, or permission of instructor.

**Textbook**
No textbook is required.

**Tentative Schedule**
*Week 1:* Course Overview and Computational Platforms (e.g., Python)
*Week 2:* Fundamentals of Machine Learning: Mathematics
*Week 3:* Fundamentals of Machine Learning: Mathematics and Concepts
*Week 4:* Machine Learning Concepts and Linear Classification
*Week 5:* Machine Learning Concepts and Linear Regression
*Week 6:* Non-linear Classification/Regression and Neural Networks Basics
*Week 7:* Neural Networks: Convolutional Neural Networks
*Week 8:* Neural Networks: Recurrent Neural Networks
*Week 9:* Unsupervised Learning: Hebbian Theory
Week 10: Unsupervised Learning: Competitive Learning
Week 11: Reinforcement Learning: Basics
Week 12: Reinforcement Learning: Deep RL
Week 13: Term Project Presentations

**Evaluation**
Grades will be computed as follows:
10% Class participation
40% Four Homeworks
20% Progress Report
30% Term Project 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 no-penalty 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 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 and project reports. A word processing software (e.g., LaTeX or Word) is recommended.

**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/).