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Winter 2008

CS 765-01: Foundations of Neurocomputation

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Foundations of Neurocomputation - CS 765
Winter, 2008, Wright State University

Objectives and Goals
This course is designed to help you develop a solid understanding of neural network algorithms and architectures. At the end of this course you should be able to read and critically evaluate most neural network papers published in major journals, (e.g. IEEE Transaction on Neural Networks, Neural Networks, and Neural Computation). In addition, you should be able to implement a broad range of network architectures and learning algorithms for a variety of applications.

Meeting Time and Place
Monday and Wednesday, 6:05 PM – 7:20 PM
302 Russ Engineering

Instructor
John C. Gallagher
352 Russ Engineering
(937) 775-3929
john.gallagher@wright.edu

Office Hours
7:30 – 8:00 PM Monday and Wednesday or by appointment

Textbook
Neural Networks A Comprehensive Foundation (Second Edition)
Author: - Simon Haykiin; Publisher - Prentice-Hall, 1999
http://www.amazon.com/Neural-Networks-Comprehensive-Foundation-2nd/dp/0132733501

The course will be programming language agnostic. However, MATLAB is an excellent choice of programming language for this material and many course examples will be presented in it. If you are not already familiar with MATLAB, you should run yourself through a MATLAB tutorial. Many are available for free on the Internet. Links to both free and commercial resources will be provided in class and on the course WWW page.

Additional supplementary materials will be distributed via the course WWW site.

Prerequisites
Familiarity with multivariate calculus, linear algebra and matrix algebra.
Familiarity with algorithmic complexity concepts and programming.
MATLAB experience desirable, but not necessary

Grading

Student grades will be determined by assessing each student's ability to discuss the relative merits of contemporary neural network methods; to implement and debug neural computation systems; and to identify and articulate open issues yet to be addressed by researchers. Each student will be provided with oportunities to demonstrate these abilities through written examinations, programming assignments, oral presentations, and a term project.

Grades will be computed as follows:

3 Programming Assignments	30%
1 Term Project and Presentation	20%
1 Midterm Exam	20%
1 Final Exam	30%

Programming Assignments
Programming assignments will be distributed in weeks 3, 5, and 7. Each assignment will be designed to reinforce methods and principles discussed in prior lectures. Students will have 2 weeks to complete each assignment.

Term Project / Presentation
Students will be required to complete *individual* term projects in which they apply course material or related methods to the solution of a practical problem. Students will be expected not only to create and test solutions, but also explain how their solutions fits into the big picture and what advantages and disadvantages it might have relative to other possible solution methods. The instructor will provide project topics, but it is preferred that students develop their own topics related to their own personal research interests. Deliverables include an oral presentation to the class and a written document formatted as a conference paper. Additional details, requirements, and advice will be provided in class.

Midterm Exam
The midterm exam will be given approximately half way through the quarter and will cover all material discussed in class up to the day of the exam. The exam will be designed to test breadth of knowledge on techniques and concepts. Students will be allowed ONE page of handwritten notes prepared by him/herself for the midterm. The page of notes can only fill one side of the paper, it must be an entirely hand written original, and must be unique to the student (E.G. one student making a sheet and copying it for other students to use is not permitted).

Final Exam
The final exam will be similar to the midterm, except that it will cover all material in the course and students will be permitted TWO one-sided sheets of handwritten notes.

Academic Integrity

Student-teacher relationships are built on trust. For example, students must trust that instructors have made appropriate decisions about the structure and content of the courses that they teach, and teachers must trust that students are making honest attempts to learn and are not trying to circumvent assessment and grading procedures.. Acts that undermine mutual trust undermine the educational process and are a huge disservice to all involved.

It is the policy of Wright State University to uphold and support standards of personal honesty and integrity for all students. The formal university code of student academic conduct can be viewed at :

http://www.wright.edu/students/judicial/integrity.html

PLEASE BE FAMILIAR WITH THE ACADEMIC CODE OF CONDUCT. If the instructor detects infractions, he will follow the procedures outlined in the formal university policy. Considering that the policies are plain and easily available for review, ignorance of them will not constitute a valid excuse for any infractions.

Additional Notes on Conduct for Programming Assignments and Projects
Students may discuss "general concepts" of programming assignments with each other, but may not, under any circumstances, work with anyone on their actual implementation. If you work with other student on "general concepts" be certain to acknowledge the collaboration and its extent in the assignment. (either via code comments or programming notes turned in with any code). Unacknowledged use of pre-written code is likewise not allowed. There's nothing wrong with judicious use of pre-rolled libraries or code segments. You MUST however fully document where that code came from and credit the original authors. ANY unacknowledged collaboration or use of code will be considered dishonest and a matter for judicial review.

Additional Information

Absences
Class attendance will not be a direct factor in your grade but will strongly affect the quality of your class experience. Students are expected to attend every class, as things may make less sense to students that do not attend class or arrive late. Students who miss a class are responsible for the material or announcements presented. Any extenuating circumstances which impact on your participation in the course should be discussed with the instructor as soon as those circumstances are known. Students registering after the term begins are responsible for all missed material and should not expect that due dates will be altered.

Class Lecture Materials
Copies of the transparencies used in lecture, supplementary textbooks, and additional course-related information are available on the course WWW page for student reference. Students are responsible for being aware of the WWW page's contents.. Students that do not have active computer accounts or are otherwise unable to access the course WWW page should contact the instructor so appropriate computer access arrangements can be made.

Additional Needs
Students with disabilities or any additional needs are encouraged to set up an appointment at their convenience to discuss any accommodations that may be necessary.

Topics

The following topic areas and related book chapters will be covered in the course. A detailed schedule, which will include specific milestone dates, will be provided within the first week of class.

Introduction to artificial neural networks	Ch. 1
Overview of principles and methods of neural computing	Ch. 2
Single layer networks	Ch. 3
Multilayer networks	Ch. 4
Radial-Basis function networks	Ch. 5
Self-organizing maps and vector quantization	Ch. 9
Neurodynamics	Ch. 14
Recurrent networks	Ch. 15
Applications of Neural Networks	
Project Presentations	