Syllabus
ECE8720: Artificial Neural Networks
Spring 2020

R.J. Schalkoff

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INSTRUCTOR: Dr. R.J. Schalkoff, EIB 334, 656-5913, *rjschal@g.clemson.edu*.

LECTURE TIME & LOCATION: 5:00 pm - 6:15 pm, Tues/Thurs, Riggs Hall 226. Occasionally, a lecture video may be substituted for an in-class lecture. This will be available on Canvas and may be viewed asynchronously.

PREREQUISITES - graduate standing.

OVERVIEW: The notion of 'computing' takes many forms. Usually, procedural algorithms are designed and subsequently implemented using the currently-dominant architecture. An alternative viewpoint arises when considering the 'computing' necessary in biological systems. For example, the computation in the human brain is much different from the aforementioned paradigm, in the sense that:

- The computation is massively distributed and parallel;
- The computation involves (relatively) simple building blocks;
- The computation is not obvious, from an I/O perspective; and
- Learning replaces apriori algorithm/program development.

These observations lead to a biologically-motivated computing paradigm called *Artificial Neural Networks* (ANNs). This course explores theoretical

and practical aspects related to ANNs. We will try to get comfortable with the emerging concept of 'neural engineering', especially through applications to engineering problems.

TEXT : Schalkoff, R.J., *Artificial Neural Networks*, McGraw-Hill, 1997, ISBN 0-07-057118-X. Campus Copy Shop (http://campuscopyshop.com/) is handling this. REQUIRED.

Campus Copy Shop
189 Old Greenville Hwy.
Clemson, SC 29631
Phone: 864-654-3863

OFFICE HOURS: Primary office hours are via email. On-campus office hours will be announced in advance.

WEB SUPPORT: We will be using Canvas. You will find this syllabus as well as other related materials and resources on the ECE 8720 Canvas page. *Be sure you can access this, since it will be the source of handouts, assignments and other information.* This repository will evolve over the semester.

COURSE CONTENT BY TOPICS-

I. INTRODUCTION TO NEURONS AND NEURAL NETS
II. 1^{st} GENERATION NEURAL NETWORK-BASED PATTERN ASSOCIATORS
III. FEEDFORWARD NETWORKS AND LEARNING (TRAINING)
IV. RECURRENT ARCHITECTURES AND APPLICATIONS
V. UNSUPERVISED LEARNING/TRAINING- SELF-ORGANIZING NETWORKS
VI. RADIAL BASIS, TIME DELAY AND CONVOLUTIONAL NEURAL NETWORKS

OTHER PROCEDURAL ASPECTS (Grading:)

Quizzes (3), Simulation/Takehome (2), Final Exam (1). There are 6 scores recorded. Quizzes are weighted at 25% (each), Simulations are weighted at 10% (each), and the Final Exam is 5%. No re-tests or 'extra credit assignments' are given. No scores are dropped.

Basically, we need to be careful about the conditions under which collaboration may occur. To this end: Simulations are an *individual effort* and will be pledged.

Assignment and Due Dates of Takehomes

Takehome	Assigned	Due
1	1/23	2/20
2	3/5	4/9

Notes:

- No in-class or video lecture is scheduled on a day when a Takehome assignment is due. All Takehome Assignments **must** be submitted before the deadline and only to CANVAS.
- There is a 0-credit Takehome 0, which is simply a test of your ability to submit an assignment to Canvas. This must be completed for you to continue in the class. For most students, it takes less than 10 minutes.

In-Class Quiz Dates

- Quiz 1: 1/30
- Quiz 2: 2/27
- Quiz 3: 3/12
- Final Exam: Thursday, 4/30, 7:00-9:30PM.

ATTENDANCE: Necessary. You are responsible for anything covered in lecture, whether you are there or not. Students intending to drop a class should request the course be dropped and should not assume they will be dropped due to lack of attendance.

STUDENTS WITH ACCOMMODATIONS

Students requesting accommodations must provide me a copy of your Accommodations Letter at least two weeks prior to the first in-class quiz. Accommodations are not retroactive and do not apply to the simulation assignments. **If your Accommodation Letter concerns special provisions for in-class quizzes, you MUST arrange to take ALL quizzes, including the final exam, through the Clemson Testing Center.**

Title IX Statement

This is now addressed in the ECE Common syllabus.

Additional Remarks and Incorporation

- Any additions or corrections to this syllabus will be posted on Canvas.
- The *Clemson University Announcements* and the ECE Common syllabus contain additional information and guidelines on a number of important and related topics, including attendance, special needs, emergency procedures and academic integrity.

ADDITIONAL REMARKS

Students are required to monitor their university email. See:
`http://www.clemson.edu/studentaffairs/student-handbook/universitypolicies/email-communications.html`

My teaching philosophy may be summarized in these remarks:

- The class (you) and I are "in this together" throughout the semester.
- However, your progress is largely up to you.
- All our interactions should be conducted within a framework of mutual respect.