CSCE 823 Advanced Machine Learning

Summer 2019 Syllabus

# Course Description

# This course provides a review of major Artificial Neural Network paradigms to include feedforward networks, convolutional neural networks, and recursive neural networks. Emphasis will be placed on training methods, including optimization and regularization. Advanced deep learning topics will be explored and students will apply techniques learned in class to real-world research problems.

# Instructor & Contact info

Dr. Brett Borghetti

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# Meeting Times / Locations

Lecture: M/W, 0800 – 1000 Loc: Bldg 646, rm 220

Office Hours: Short questions – drop by office. Long Questions By appointment (contact via email).

# Textbook

(Required) Deep Learning (Adaptive Computation and Machine Learning series), Goodfellow/Bengio/Courville 1st edition, MIT Press 978-0262035613 (available for free online: <http://www.deeplearningbook.org/> )

(Required) Deep Learning with Python, Chollet, Francis, 1st edition, Manning Publications, ISBN 978-1617294433

<https://www.manning.com/books/deep-learning-with-python>

(Recommended) Introduction to Statistical Learning (1st ed, corrected 4th printing), by James, Witten, Hastie, and Tibshirani (downloadable book + content: <http://www-bcf.usc.edu/~gareth/ISL/> )

# Course Content

Additional readings & content will be provided on the course site on Canvas and the L drive (L:\Courses\CSCE\CSCE823\SU2019)

# Grading (4 credits)

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| --- | --- |
| Assignments 4 x 10 | 40 pts |
| Student Lecture | 15 pts |
| Project:  - Proposal (5) - Video (15) - Final Paper (25) | 45 pts |
| **TOTAL** | **100 pts** |

|  |  |
| --- | --- |
| ≥ 95.0 | A |
| [90.0 95.0) | A- |
| [86.0 90,0) | B+ |
| [83.0 86.0) | B |
| [80.0 83.0) | B- |
| [77.0 80.0) | C+ |
| [73.0 77.0) | C |
| [70.0 73.0) | C- |
| [65.0 70.0) | D |
| <65.0 | F |

**Learning Outcomes** - At the end of the course a student will be able to:

* Understand the biological inspiration of, know when to use, make decisions regarding architecture for, implement methods to train, apply regulation techniques for, and conduct performance evaluations on:
  + Perceptrons
  + Multi-Layer Perceptrons/Artificial Neural Networks (ANN)
  + Convolutional Neural Networks
  + Recurrent and Recursive Networks
* Learn deeply about, and practice communication on a technical topic: Prepare a pre-class and classroom session to teach peers about an advanced topic in machine learning
* Apply the skills developed in this course to make decisions from data on a non-trivial research project (preferably related to your graduate research thesis or dissertation). Present the results in both written and video form.

**Policies of the Graduate School of Engineering Management:**

1. “**Attendance**: Attendance at all class sessions and exams is mandatory for military and civilians assigned to AFIT as full-time students except for extenuating circumstances. Scheduled classes and exams are defined by the instructor and they are documented in the course schedule. Part-time students are expected to attend scheduled classes, and absences should be explained to the instructor. The student should provide advance notice, if possible. (References: Student Handbook, Graduate School Catalog)”

2. “**Academic Integrity**: All students must adhere to the highest standards of academic integrity. Students are prohibited from engaging in plagiarism, cheating, misrepresentation, or any other act constituting a lack of academic integrity. Failure on the part of any individual to practice academic integrity is not condoned and will not be tolerated. Individuals who violate this policy are subject to adverse administrative action including disenrollment from school and disciplinary action. Individuals subject to the Uniform Code of Military Justice may be prosecuted under it. Violations by government civilian employees may result in administrative disciplinary action without regard to otherwise applicable criminal or civil sanctions for violations of related laws. (References: Student Handbook, ENOI 36 – 107, Academic Integrity)”

3. “**Academic Grievance**: AFIT and the Graduate School of Engineering and Management affirm the right of each student to resolve grievances with the Institution. Students are guaranteed the right of fair hearing and appeal in all matters of judgment of academic performance. Procedures are detailed in ENOI 36 – 138, Student Academic Performance Appeals.”

4. **Testing/Make Up Policy**: Not Applicable

**Additional Course Policies:**

**Late Assignments**: Late deliverables which are not pre-coordinated by the student with the instructor may not be accepted and may receive zero credit. Extension requests may be granted on a case-by-case basis – for example, in emergencies, or circumstances beyond the student’s control. However, secondary effects of other obligations in other courses – such as having ‘too many things due that week’ is generally not considered a valid reason for an extension in this course.