

MSA 8600

Deep Learning Analytics

1. Instructor Information

Dr. Yuan Long

Office: GSU Buckhead Center

Office Hours: Tuesday 6 pm to 7 pm or by appointment

2. Class Information

- **Location:** GSU Buckhead Center
- **Time:** 03:00 pm – 05:45 pm (CRN 21245)
07:00 pm – 09:45 pm (CRN 22371)

3. Catalog Course Description:

This is an introductory and review course on historical development of neural networks and state-of-the-art approaches to deep learning. Students will learn the various deep learning methods, know how to design neural network architectures and training procedures through hands-on assignments. The course covers a variety of topics including neural network basics, deep learning strategies, convolutional networks, recurrent neural networks, the long short-term memory and other gated RNNs and unsupervised deep learning. Applications of using deep learning into natural language processing and image recognition will be discussed throughout the course.

4. Course Outcomes

By the end of the semester students will be able to:

- Understand the basics of neural networks

- Grasp various deep learning strategies
- Know the basic optimization approaches for training deep models
- Understand inputs, outputs and algorithms of convolutional networks
- Know recurrent neural networks and the long short-term memory and other gated RNNs
- Understand the basic methods of unsupervised deep learning

5. Textbooks and Resources

Lecture notes will be posted on *iCollege*.

Textbook:

- Ian Goodfellow, Yoshua Bengio and Aaron Courville. Deep Learning, The MIT Press, 2016.
- LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton. “Deep learning.” *Nature* 521.7553 (2015): 436.

6. Grading

Percentages of course works in students’ final scores are as follow:

Course Work	Percentage
Participation (Intellectual Contribution)	10%
Presentation 1	15%
Project A and Presentation 2	20%
Project B and Presentation 3	20%
Midterm Exam	35%

Late Assignments

All assignments are due at the beginning of class on the due date. Late assignments are **not** accepted or graded.

Missing Exams/Presentations

The time and place for taking an exam is not negotiable. There are *no make-up* exams except extreme emergence cases.

Grading Disputes

While the graders and the instructor make every effort to grade your work accurately, grading errors occur. Students with questions about grades should contact the instructor. If re-grading is requested, the paper or exam will be re-graded in its entirety such that all grading errors will be corrected. Grading errors can occur both ways. As a result, your grade may go up or down after the re-grading.

Student Groups

The instructor will assign students into groups. The groups are assigned for the entire term and group members should ***sit together*** in class. Groups will complete the group projects and other group assignments together.

7. Class Attendance and Participation

Regular attendance is expected and required. *Missing each session* will cost 1.5% of your credit. Any material discussed in class, including material beyond that covered in the textbook, can be included on assignments and exams. You cannot expect to be successful in this course without regular attendance. However, physical attendance is not equal to *participation*. *Participation* is essential for active learning in this course.

Instructor Evaluation of In-Class Participation

The keys to successful problem- and case-based learning are preparation, attendance, participation, and attitude. While the instructor encourages preparation within study groups, each student is responsible for daily preparation and participation in class when called on. The instructor seeks to engage the class in a mixture of activities. During class discussion you should discuss, challenge, and criticize ideas. You should express your thoughts and defend your beliefs using reason and logic.

The instructor expects active class participation from all students. Participation involves contribution to class discussion. Contribution has both quality and quantity attributes – quality takes precedence over quantity. While the instructor expects all students to be steady contributors over the term, individual student contribution will obviously fluctuate from class to class.

There may be some in-class work, such as pause and reflect exercises, which will count toward the class participation grade. Attendance alone is not sufficient to earn class participation points. However, missing classes without compelling reasons will adversely affect your participation grade as you can neither contribute nor benefit from others' contributions when you are not present.

Some characteristics of effective class participation include:

- Are the points that are made substantive and relevant to the discussion in terms of increasing everyone's understanding, or are they merely regurgitation of facts? Do the comments provide useful insights?
- Do the comments take into consideration the ideas offered by others earlier in the class, or are the points isolated and disjointed? The best contributions tend to be those which reflect not only excellent preparation but also good listening, interpretative and integrative skills.
- Do the comments show evidence of a thorough reading and analysis of the required readings/cases and of prior class information?
- Does the person distinguish among different kinds of data (facts vs. opinions vs. assumptions) and provide reasonable substantiation of arguments?
- Do the comments take the discussion into a new and relevant direction, without a disregard for the current flow of the discussion?
- Is there a willingness to test new ideas or share uncertainties, or are all comments "cautious" or "safe" (sharing uncertainties about an issue can be valuable and can in fact lead the discussion in interesting directions)?

- Is the person willing to interact with classmates by asking questions or challenging conclusions in a courteous manner?

Here's a general idea of how I plan to grade your class participation over the course of the semester:

- **Outstanding Contributor (A±):** Contributions to large-group discussions reflect thorough preparation. Ideas offered are usually substantive, provide good insights and sometimes change the direction of the class for the better. Arguments, when presented, are generally well substantiated and often persuasive. If this person were not a member of the class, the quality of the large-group discussions would be diminished significantly.
- **Good Contributor (B±):** Contributions to large-group discussions reflect satisfactory preparation. Ideas offered are usually substantive, generally provide useful insights, and occasionally offer a new direction for the discussion. Arguments, if presented, are reasonably well substantiated. If this person were not a member of the class, the quality of the large-group discussions would be diminished.
- **Marginal Contributor (C±):** Contributions to large-group discussions reflect some minimal preparation. Ideas offered are occasionally substantive but seldom provide clear insights or new directions for the discussion. Arguments may be occasionally presented but are generally not well substantiated. If this person were not a member of the class, the quality of the large-group discussions would be diminished only slightly.
- **Non-participant (D):** This person has maintained attendance to some extent but has said little or nothing in class; hence there is no adequate basis for evaluation. If this person were not a member of the class, the quality of the discussions would be unchanged.
- **Disruptive Contributor (F):** If present in class at all, contributions to discussions reflect inadequate preparation. Ideas offered are rarely substantive, provide few, if any, insights and never offer a constructive direction. Integrative comments and effective arguments are absent. At best, contributions are obscure, confused, and indicate a lack of familiarity with the fact of the issues under discussion. At worst, comments demonstrate disrespect for others. If this person were not a member of class, valuable airtime would be saved.

8. Misc. Items

- ***Absolutely no lame excuses please***, such as “I have to go home early, allow me to take the quiz on Apr 1”, or “I had a fight with my girlfriend, which affects my performance”. Even when they are true, they are still lame.
- **The course syllabus provides a general plan for the course; deviations may be necessary.**
- Please advise the instructor if you have a documented disability that needs to be accommodated.
- No extra work in the next semester given to improve your grade. Any queries about the grades should be brought to the attention of the instructor within a week after the graded students' works have been returned to the class
- Turn off cell phones and keep them off the desk during the lectures. Text messaging during class is strictly prohibited and grounds for dismissal.

- Assignments and exams (except final exam) will be graded and returned in approximately one week after it was collected or given respectively. Should there be a delay, the students will be notified.

9. Course Schedule and Topics¹

Class	Content	Readings	Note
Session 1	Introduction to neural networks	Textbook: Chapter 1, 5, 11	
Session 2	Machine learning Basics and Practical Methodology Deep Feedforward Networks	Textbook: Chapter 1, 5, 11 Chapters 6	Reading list for Presentation 1
Session 3	Deep Feedforward Networks * Presentation 1	Textbook: Chapters 6	Project A
Session 4	Midterm Convolutional neural network	Textbook: Chapters 9	
Session 5	* Presentation 2 Convolutional neural network	Textbook: Chapters 9	Project A due Project B
Session 6	* Presentation 2 Recurrent neural networks Long short-term memory and other gated RNNs	Textbook: Chapters 9 Textbook: Chapter 10	Project A due Project B
Session 7	Recurrent neural networks Long short-term memory and other gated RNNs Unsupervised deep learning	Textbook: Chapter 10 Textbook: Chapter 14	
Session 8(Apr. 30)	* Presentation 3		Project B Due

¹ The schedule is tentative

