

# State University of New York Polytechnic Institute

## CS 538 : Recurrent and Adversarial Neural Network

**Instructor:** Dr. Chen-Fu Chiang  
**Semester:** Spring 2022  
**Time:** MW 12:00 pm - 1:15 pm  
**Location:** Kunsela Hall C104  
**Office Hours:** MW: 1:30 pm - 4:00 pm || By appointment  
**Office :** Location: Kunsela C225 || Phone: (315) 792-7379  
**Email:** [chiangc@sunyply.edu](mailto:chiangc@sunyply.edu) ([best way to reach me](#))  
**URL:** <http://www.cs.sunyit.edu/~chiangc>

### Required Text

Optional: Deep Learning (<http://www.deeplearningbook.org/>) MIT Press

Optional: ISBN-13: 978-1530826605 (Make Your Own Neural Network by Tariq Rashid)

### Useful Online Reference & Lab for Lecture Notes

1. Google Machine Learning Course

<https://developers.google.com/machine-learning/crash-course>

### Course Description

This course is designed to give a graduate-level student a thorough grounding in the formulation of optimization problems and Recurrent Neural Network (RNN). We explore data structures and deploy efficient solution methods for these optimization and real-world problems. We will introduce methods of optimization and RNN to computer science students, including linear programming, randomized algorithms (Markov Chains and Random Walks), Gated Recurrent Unit (GRU), Long Short-Term Memory (LSTM), Generative Adversarial Network (GAN) and Monte Carlo based algorithms. The goal is to maintain a balance between theory, numerical computation, problem setup for solution by optimization and recurrent neural network. These general concepts will also be illustrated through applications in statistics, machine learning, AI, computer vision and robotics.

### Student Learning Outcomes

Upon completion of this course the student should be able to:

- Understand the basic concepts associated with the field of optimization in neural network
- Analyze specific problem areas of study within neural network models
- Explore current state-of-the-art approaches and techniques used in research in this field

### Topics

Each topic should last for 2 or 3 lectures, based on the progress in the class. The instructor will speed up or slow down the lectures according to students' understanding of the material. It is recommended that the students read the material (and the original papers) ahead before the lecture.

seq #	Topics	seq #	Topics
1	Neural Network : Introduction	2	Forward and Backward Propagation
3	Gradient Descent	4	Learning Rate + Linear Regression
5	Recurrent Neural Network (RNN)	6	Gated Recurrent Unit
7	Long Short-Term Memory	8	Build RNN in TensorFlow 2
9	Precision and Overfitting	10	Generative Adversarial Network (GAN)
11	Loss Functions	12	Generator and Discriminator
13	Common Issues	14	GAN Variations
15	Build GAN in TensorFlow 2	14	Models for Future Prediction

### Grading (Tentative)

The lecture format will be the basic mechanism used in the course. Computer demonstrations in the classroom will be used whenever appropriate. Assessment of student performance will use a criterion-referenced model which will include written assignments (30%), regular examinations (midterm 25%), presentation along with a short report regarding either algorithms or implementation (20%), and a comprehensive final exam (25%). **Late assignment will not be accepted unless you have made prior arrangements with me.** The acceptable format of your solution will be specified in the assignment. All examinations are closed-book. **Percent and Grade:**

89.5-100    A            79.5-89.5    B            69.5-79.5    C            59.5- 69.5    D            Below 59.5    F  
 (+/- modifiers will also be used ; for instance, [95.5-100]: A+, [92.5-95.5): A, [89.5-92.5): A-)

### Attendance Policy

Attendance and active class participation are required. Be prepared to participate by asking and answering questions during class meetings. Please send me an email if you know you have to miss a class.

### Academic Integrity/Policy

Plagiarism and Cheating of any kind on an examination, quiz, or assignment will result at least in an F for that assignment (and may, depending on the severity of the case, lead to an F for the entire course). I will assume for this course that you will adhere to the academic creed of this University and will maintain the highest standards of academic integrity. In other words, do not cheat by giving answers to others or taking them from anyone else. The code of academic conduct is detailed on the SUNY Poly student handbook. Make-ups are only given under extreme circumstances. I will also adhere to the highest standards of academic integrity, so please do not ask me to change (or expect me to change) your grade illegitimately or to bend or break rules for one person that will not apply to everyone.

### Plagiarism Warning

**The work you submit must be your own.** You will not receive credit for work which is not your own. You may ask others (classmates/friends/instructors) for advice or help regarding the subject matter of a problem set. However, your answers and the actual design, coding, entry, and running of your programs must represent your own work. All sources of ideas that are used in any way (quoted, paraphrased, or summarized), including ideas taken from the text, must be acknowledged in problem set program

documentation. Failure to provide proper attribution constitutes academic dishonesty, and it will result in a failing course grade. Substantially identical program submissions by multiple students, even with attribution, may result in a failing course grade to all who submit the same program. Submitting a program written by someone else, even with attribution, is strictly prohibited and will result in a failing course grade. Students are further reminded that it is their responsibility to take reasonable precautions to prevent copying of their work by other students and that there are now criminal penalties for computer trespass and computer tampering.

### **Cancellation of Classes Due to Inclement Weather or Other Emergency**

SUNY Poly has a 24-hour hotline to inform students, faculty and staff when severe winter weather prompts the cancellation of all classes. On-campus, you can call the “Snowline” by dialing ext. 7669 (“SNOW”). Off-campus, Snowline can be reached by calling 315-792-7385. Snowline cards are available at various locations on campus. In the event of severe weather, Snowline will announce only the cancellation of ALL classes. The cancellation of all classes will also be posted online, at [sunypoly.edu](http://sunypoly.edu), and will be broadcast on radio and television stations in the Utica-Rome, Syracuse, and Albany areas. Individual class cancellations are always available at [sunypoly.edu/apps/canceled\\_classes](http://sunypoly.edu/apps/canceled_classes) .

### **Accommodations for Students with Disabilities**

Your access in this course is important to me. In compliance with the Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act, SUNY Polytechnic Institute is committed to ensuring comprehensive educational access and accommodations for all registered students seeking access to meet course requirements and fully participate in programs and activities. Students with documented disabilities or medical conditions are encouraged to request these services by registering with the Office of Disability Services. Please request accommodations early in the semester, or as soon as you become registered with Disability Services, so that we have adequate time to arrange your approved academic accommodation/s. Once Disability Services creates your accommodation plan, it is your responsibility to provide me a copy of the accommodation plan.

If you experience any access concerns that may require the need for adaptive or alternate format/presentation of materials, reach out to me or Disability Services right away.

For information related to these services or to schedule an appointment, please contact the Office of Disability Services using the information provided below. The Office of Disability Services can accommodate virtual meeting requests. The website has helpful information, and the link can be found here: <https://sunypoly.edu/student-life/diversity-equity-inclusion/disabilities-services/contact-us.html>

Leslie K. Reid, Director (she/her/hers)  
Office of Disability Services  
[reidl@sunypoly.edu](mailto:reidl@sunypoly.edu)  
(315) 792-7170

Utica Campus  
Peter J. Cayan Library, L145

Albany Campus  
Suite 309, Students Services Office  
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