State University of New York Polytechnic Institute
CS 548 : Deep Learning

Instructor:	Dr. Chen-Fu Chiang
Semester:	Fall 2023
Time:	MW 6:00 pm - 7:15 pm
Location:	Kunsela Hall A133
Office Hours:	Monday : 2:00 pm - 4:00 pm || Wednesday : 2:00 pm - 4:00 pm || By appointment
Office :	Location: Kunsela C225 || Phone: (315) 792-7379
Email:	chiangc@sunyply.edu (best way to reach me)
URL:	https://sunypoly.edu/faculty-and-staff/chen-fu-chiang.html

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 filed 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	Application: Homomorphic Computatoin

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, 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 .

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 Student Accessibility Services. Please request accommodations early in the semester, or as soon as you become registered with the Office of Student Accessibility Services, so that we have adequate time to arrange your approved academic accommodation/s. Once Accessibility Services creates your accommodation plan, it is your responsibility to provide me a copy of the accommodation plan. If you experience any access barriers in this course, such as with printed content, graphics, online materials, etc., reach out to me or Accessibility Services right away. For information related to these services or to schedule an appointment, please contact the Office of Student Accessibility Services using the information provided below.

Office of Student Accessibility Services
SAS@sunypoly.edu
(315) 792-7170
Peter J. Cayan Library, L113