

Course Title: Selected Topics in Deep Learning
Semester: 2021 Fall

COURSE INFORMATION

Course #: CSE 706-19023

The course is for 1-3 credits and will meet on Mondays at 1:50 – 3:50 PM.

INSTRUCTOR

Dr. Changyou Chen, Davis 113A, changyou@buffalo.edu

COURSE DESCRIPTION

Recent years have witnessed significant success on deep learning, achieving state-of-the-art results on various real-world tasks, such as large-scale image classification, natural language understanding and game playing.

In this seminar, we will review recent developments on several most proliferating topics: deep generative models, deep reinforcement learning, self-supervised learning and Transformer-based models.

Topics will be selected from the following items:

- Deep Generative Models
 - Variational autoencoder
 - Standard generative adversarial networks (GANs)
 - f-divergence GAN
 - Wasserstein GAN
 - GAN with feature matching
 - GAN with auto encoder reconstruction loss
 - GAN as distribution matching
 - Recent advances

- Deep Reinforcement Learning
 - Deep Q-learning
 - Policy gradients
 - Continuous Q-learning
 - Soft Q-learning
 - Advanced policy gradient methods
 - Variance reduction in deep RL
 - Exploration in deep RL
 - Imitation learning
 - Deep RL applications
 - Recent advances

- Self-Supervised Learning



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- Self-supervised learning in computer vision
- Self-supervised learning in reinforcement learning
- Self-supervised learning in natural language processing
- Self-supervised learning on graph

- Transformer-based models
 - Transformer in natural language processing, including BERT, GPT, DALL-E, etc
 - Transformer in computer vision, including various vision Transformers

The students are expected to have basic knowledge of machine learning and deep learning.

COURSE PURPOSE

Exposes students to recent advances in deep learning.

COURSE GOALS

The course will be in the form of seminar, where students take turns to present recent papers on these topics, and take questions by other students.

The goals of the course are:

- To introduce students concepts and main methods/algorithms of recent advances in deep learning.
- To enable students to be good readers, critical thinkers and effective communicators on research ideas.
- To enable students to gained a horizon on an up-to-date deep learning techniques, and equipped knowledge for their future research.

GRADING POLICY

- Only pass and fail.

ACADEMIC INTEGRITY

Academic integrity is a fundamental university value. Through the honest completion of academic work, students sustain the integrity of the university and of themselves while facilitating the university's imperative for the transmission of knowledge and culture based upon the generation of new and innovative ideas. For more information, please refer to the [Graduate Academic Integrity policy](#).

ACCESSIBILITY RESOURCES

If you have any disability which requires reasonable accommodations to enable you to participate in this course, please contact the Office of Accessibility Resources in 60 Capen Hall, 716-645-2608 and also the instructor of this course during the first week of class. The office will provide you with information and review appropriate arrangements for reasonable accommodations, which can be found on the web at: <http://www.buffalo.edu/studentlife/who-we-are/departments/accessibility.html>.