Deep Learning for Big Visual Data

Class:

Thursday, 6:00–9:50 PM, ECE 125. Recordings will be available online after each class.

ZOOM LINK: https://washington.zoom.us/j/92194662122 (PLEASE REGISTER IN ADVANCE.)

Prerequisite:

Graduate Standing. Prior coursework in machine/deep learning is not required, but the background in image processing, computer vision, linear algebra, and statistical data analysis is helpful. Assumes some programming experience, though a tutorial on basic Python and usage of Pytorch will be provided.

Course Description:

The goal of this course is to introduce students to the important Foundation of Deep Learning Theories and Laboratory Components, and practical big visual IoT data applications; What Deep Learning is, Why it has become so ubiquitous, and How it relates to concepts and terminology such as Artificial Intelligence, Machine Learning, and Artificial Neural Network. Building on this foundation, practical references, and tutorials for applying a wide spectrum of proven deep learning techniques will be offered. Essential theory is covered with useful mathematics and is illuminated with hands-on Python code.

Instructor:

Prof. Jenq-Neng Hwang, (hwang@uw.edu)

Office Hours (TTh 1:00-3:00 pm): https://washington.zoom.us/j/98868881677

TAs:

Haotian Zhang, (haotian.carl.zhang@gmail.com)

TA Office Hours (Th 3:00-5:00 pm, Sat 3:00-5:00 pm): https://washington.zoom.us/j/97680204521

Yizhou Wang, (ywang26@uw.edu)

TA Office Hours (Wed 3:00-5:00 pm, Sun 3:00-5:00 pm): https://washington.zoom.us/j/96233244273

Lecture Notes & Homework Assignments:

You can find lecture notes at Notes. Homework Assignments with due dates will be posted at Homeworks.

Grading Policy:

Homework is assigned biweekly. The overall grade for the class is accumulated from the scores of five homework (100%).

- 1st Homework: Supervised & Unsupervised Learning, Practice of Python and Pytorch (20%)
- 2nd Homework: CNN & GAN (20%)
- 3rd Homework: Image-based Detection and Segmentation (20%)
- 4th Homework: Image/Video and Radar/LiDAR Related Applications (20%)
- 5th Homework: RNN, GNN & Self-Attention, Transformer for Seq2Seq Applications (20%)

The grade for the class is assigned at the end of the quarter after the final homework is graded. All missing work is awarded zero points, so be sure to turn in it on time. The written work is expected to be neat (handwritten/typing): illegible work will not be graded. Answers to problems without supporting work or solutions will receive no credit.

Homework Policy:

You are encouraged to cooperate while doing homework, but you are expected to complete the homework on your own and to write the solutions in your own words, and not contain pieces taken verbatim from elsewhere.

Materials:

There is no required textbook for this course. Several optional materials are listed below:

- Deep Learning Book: https://www.deeplearningbook.org/.

- Deep Learning with Pytorch: https://pytorch.org/assets/deep-learning/Deep-Learning-with-PyTorch.pdf.
- PyTorch Official Tutorial: https://pytorch.org/tutorials/.

Topics & Schedule

Contents	Time
Introduction to Machine Learning and Deep Learning	1 week
Backpropagation, Multilayer Perceptron and Convolution Neural Networks (Python, Colab and Pytorch Tutorial)	1 week
Convolution Neural Network for Classification and Regression	1 week
Deep Learning for Generative Adversarial Network (GAN)	1 week
Few-shot Learning and Open Long-Tailed Recognition and Domain Adaptation	1 week
Deep Learning for Detection and Segmentation	1 week
Deep Learning for Image/Video Related Applications	1 week
Deep Learning for Radar/LiDAR related Applications	1 week
Recurrent Neural Nets and Graph Neural Nets	1 week
Self-Attention and Transformer for Seq2Seq Applications	1 week