National Tsing Hua University
Spring 2025
11320 IEEM 513600
Deep Learning for Industrial Applications

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Course Overview

In this course, we will integrate deep learning theories with practical industrial applications: (1) Students will build a strong foundation in deep learning by combining online course resources and assessments (Quiz, Midterm). (2) Hands-on lab exercises will cover common data types and real-world applications (Assignment). (3) Through industry guest lectures or site visits, students will gain deeper insights into the industry and explore how deep learning techniques can address common industrial challenges (Question). Additionally, (4) we provide opportunities to obtain free official certificates from Nvidia Deep Learning Institute and DeepLearning.AI on Coursera, which may be beneficial for students' future career development.

Tentative Calendar: Thursday, 15:30 – 18:20 | R205 – General building II

Week	Date	Topic		
1	02/20	Course Overview		
2	02/27	Neural Network Basics (Part I & II)	GitHub & Nvidia Workshop	
3	03/06	Guest Lecture I – Nvidia (Metaverse & AI Agents)		
4	03/13	Improving Deep Neural Networks & Deep Learning Strategy	Applications of Tabular Dataset	Quiz 1
5	03/20	Guest Lecture II – UMC (Semiconductor Manufacturing Industry)		
6	03/27	CNN (Part I & II)	Tasks of Computer Vision	Quiz 2
7	04/03	Holiday – Tomb Sweeping Festival (no class)		
8	04/10	Guest Lecture III – AUO (LCD Display Industry)		
9	04/17	Recurrent-based and Transformer-based Model	Applications of Serial Dataset & Mid-term Review	Quiz 3
10	04/24	Mid-term Exam		
11	05/01	Guest Lecture IV – DELTA Electronics (ICT Industry, Robotics, EV)		
12	05/08	Guest Lecture V– DELTA Electronics		
13	05/15	Guest Lecture VI – King Steel (Machinery and Equipment Manufacturing Industry)		
14	05/22	Final Presentation		
15	05/29	Final Presentation		
16	06/05	Final Presentation		

Grading

- **Homework (25%)**: Assignments to get familiar with basic deep learning programming.
- **Midterm (25%)**: Basic concepts of deep learning and related mathematical derivation.
- **Final Project Presentation (25%)**: A project presentation of a research paper related to the deep learning application in industries and the code implementation.
- **Quiz (20%)**: Simple quiz from the online materials and lectures.
- **Questions for Guest Lectures (5%+bonus 2%)**: Each student must ask at least one question in any of the guest lectures during the semester and submit the record of question along with the guest's response. Additional question in different guest lectures can get 1 extra point for your final scores (up to 2 points).

References

- Goodfellow, Y. Bengio, and A. Courville, "Deep Learning," 2016.
- Francois Chollet (creator of Keras), "Deep Learning with Python," 2017.
- J. Schmidhube, "Deep Learning in Neural Networks: An Overview," Neural Networks 61: 85-117, 2015.
- Y. Bengio, Y. LeCun, and G. Hinton, "Deep Learning," Nature 521: 436-44, 2015.

Online Resources

- Goodfellow, Y. Bengio, and A. Courville, "Deep Learning," 2016.
  http://www.deeplearningbook.org
- Deep Learning Specialization by Andrew Ng
  https://www.youtube.com/c/Deeplearningai/playlists
- Stanford CS231n: Deep Learning for Computer Vision
  http://cs231n.stanford.edu/schedule.html
- Google: Machine Learning Crash Course with TensorFlow APIs
  https://developers.google.com/machine-learning/crash-course
- A Zhang, ZC Lipton, M Li, AJ Smola, "Dive into Deep Learning," Cambridge University Press, 2023.
  http://d2l.ai
- NVIDIA Deep Learning Institute
  https://www.nvidia.com/en-us/training/
- NVIDIA NGC
  https://www.nvidia.com/zh-tw/gpu-cloud/containers/
- TensorFlow 2 quickstart for beginners
  https://www.tensorflow.org/tutorials/quickstart/beginner
- Python Numpy Tutorial (with Jupyter and Colab)
  https://cs231n.github.io/python-numpy-tutorial/
- Python Basics for Data Science
  https://www.edx.org/course/python-basics-for-data-science
- Python Tutorial
  https://www.w3schools.com/python/
- 莫烦 Python
  https://mofanpy.com/