2023 NVLab Summer School

I. 期間: 7/4-9/5
II. 時間: 每週二 (14:00-16:00)
III. 地點: 線上授課
IV. 大綱: Image Processing, Deep Learning, Computer Vision, 程式實作訓練及論文報告
V. 主要學習內容:
    1. Courses Related to Computer Vision
    2. Code Implementation (Python and PyTorch)
    3. Read and Survey Papers
    4. Paper Presentation
VI. 作業: Including Code, Readme, and Report
    1. Image Processing with Python (cv2, Albumentations, and Torchvision)
    2. Linear Model with Numpy (from scratch)
    3. Comparison of AE and VAE (PyTorch)
    4. Final Project
VII. 新生開放式課程讀書會
    1. 30 - 40 minutes for each presenter
    2. 內容以介紹為大方向概念與經典模型架構等，不用過度深入地介紹
VIII. 論文報告
    1. 簡報內容包含 Introduction, Related Work (2 篇), Methods, Experiments (Results, Comparison, Ablation Study), Conclusion
    2. 內容僅須包含文字與圖片，不用背景與主題
    3. 簡報之文字為全英文，請注意文字格式與排版
    4. Introduction 與 Conclusion 報告時需使用英文與中文各報告一遍，其餘僅需使用中文報告。請注意使用的中文詞彙。
IX. Schedule

Date	Content	Notes
Week 1 7/4	1. 自我介紹 2. 新生訓練說明 3. LAB 研究方向介紹 4. 報告注意事項說明 5. Survey Paper 技巧說明	1. 作業 1 Release 2. 選定論文
Week 2 7/11	新生開放式課程讀書會 (30 minutes for each presenter) A. Linear Regression and Gradient Descent B. Logistic Regression and Classification	1. Project 分組
Week 3 7/18	新生開放式課程讀書會 (30 minutes for each presenter) A. Deep Neural Network: 1. Backpropagation 2. Gradient Vanishing, Optimization, Regularization 3. Epoch, Batch, Normalization, Gradient Accumulation 4. Loss Functions B. Convolution Neural Network: 1. VGG16, ResNet, DenseNet, … 2. Training Tricks: (1) Data Augmentation	1. 作業 1 Deadline 2. 作業 2 Release 3. Project 分組 Deadline 4. Project Release

	(2) Tips for Training Networks (3) Transfer Learning	
Week 4 7/25	新生開放式課程讀書會 (30 minutes for each presenter) A. Recurrent Neural Networks: 1. RNN 2. LSTM B. Transformer 1. Mechanism of Transformer 2. Vision Transformer (ViT) 3. Swin Transformer (Swin-T)	
Week 5 8/1	新生開放式課程讀書會 (30 minutes for each presenter) A. Other Learning Methods (Part 1) 1. Semi-supervised and Self-supervised Learning 2. Unsupervised Learning 3. AE and VAE B. Other Learning Methods (Part 2) 1. Few-shot Learning 2. Zero-shot Learning 3. Meta-Learning 論文報告*1 (30 minutes for each presenter)	
Week 6 8/8	新生開放式課程讀書會 (30 minutes for each presenter) A. Generative Adversarial Network 1. Generative Adversarial Learning 2. Wasserstein GAN B. Diffusion Model 1. Denoising Diffusion Probabilistic Models 論文報告*1 (30 minutes for each presenter)	1. 作業 2 Deadline 2. 作業 3 Release
Week 7 8/15	論文報告*2 (30 minutes for each presenter)	
Week 8 8/22	論文報告*2 (30 minutes for each presenter)	
Week 9 8/29	論文報告*2 (30 minutes for each presenter)	作業 3 Deadline
Week 10 9/5	Project Presentation	Final Project Deadline

X. Reference:

A. Machine Learning (ML):

1. ML Lecture 2016 (李宏毅)
2. ML Lecture 2021 (李宏毅)

B. Transformer:

1. Transformer (李宏毅)

2. AN IMAGE IS WORTH 16X16 WORDS: TRANSFORMERS FOR IMAGE RECOGNITION AT SCALE
3. Vision Transformer

C. Diffusion:
1. https://youtu.be/ifCDXFdeaaM (李宏毅)
2. https://openaccess.thecvf.com/content/CVPR2022/papers/Rombach_High-Resolution_Image_Synthesis_With_Latent_Diffusion_Models_CVPR_2022_paper.pdf

D. Computer Vision:
1. 陳煥宗教授電腦視覺特效

E. Code Implementation:
1. 莫煩 Code 教學
2. Python (莫煩)
3. PyTorch (Official)
4. PyTorch (莫煩)
5. PyTorch Lightning (Official)
6. PyTorch Lightning (AI 葵)
7. Albumentations (Official)

F. Paper:
1. Paper with code (慎重挑選)
2. Conference: CVPR, ECCV, ICCV, AAAI,
3. Journal: TIP, PAMI, TMM, IJCV

G. Chinese Search Engine
1. 知乎
2. CSDN