This document includes information about course project for the undergraduate course Deep Learning, from School of Computer Science and Engineering, Sun Yat-sen University, 2024.

Course project requirements:

In the course project, you need to develop a deep learning model or method to solve one visual classification task. To solve the classification problem, you are required to apply multiple techniques learned in class, including

- (20%) Various training tips and tricks to improve model performance: e.g., see first 4 class slides
- (5%) Transfer learning: fine-tune pretrained model
- (15%) Synthetic images by generative models for data augmentation: GAN, diffusion models etc.
- (15%) ViT model backbone vs. CNN backbone: explore how to effectively use ViT
- (15%) Explore vision-language model (VLM) to help improve performance
- (10%) Interpretability of the model: to visualize and analyze correct and incorrect predictions
- (10%) Evaluate robustness of the model: adversarial examples as input
    - (Optional 5%) try to improve robustness of model
- (Optional 5%) obtain lightweight model with comparative performance
- (10%) Empirical evaluation: on multiple datasets/settings, hyper-parameter sensitivity, etc.

In addition, you are encouraged to develop your own novel method which can be novel in any aspect, e.g., model structure, training strategy, or any point in the above list.

Project 1: Fine-grained classification

The challenge in fine-grained classification is that images from different classes often look similar and images from a single class could look different. Try your best to achieve the performance at least with accuracy 90% on the following two datasets. You may learn more recent advances in fine-grained classification from https://paperswithcode.com/task/fine-grained-image-classification .

CUB200 Bird Dataset: http://www.vision.caltech.edu/datasets/cub_200_2011/

Stanford Dogs Dataset at http://vision.stanford.edu/aditya86/ImageNetDogs/

Project 2: created by yourself

You are encouraged to explore and create your own project. The main task of your project should be relevant to visual classification. You need to discuss with me to double check the feasibility of your project. Note that you should finish all the must-do points listed above in your own project.

Important dates:

Week 3 (2024.03.16): build your team (1-3 members per team);

Week 4 (2024.03.23): choose or create your project;

Week 8 (2024.04.20): finish the first 3 points in the list;

Week 12 (2024.05.18): finish the first 5 points in the list;

Week 16 (2024.06.15): finish all must-do points in the list;

Week 18 (2024.06.29): submit final report together with source code.

In addition, we will have conditionally optional 1-1 **meetings** probably at Week 9, 13, 17 to help develop your project.

About your project report:

- Scoring: finish all listed requirements, include all report sections (Title, Abstract, Introduction, Related work, Method, Experiments, Conclusion, Reference list), organize and write clearly, novelty.
- Prepare your report draft as early as possible, e.g., after you finish the first must-do point.
- Summarize any possible novelty at the end of Introduction, if there exists.
- **Each team member** provides your own source code and running files
- Provide member contribution ratio after Conclusion section, e.g., Member A: 40%, Member B:30%, Member C:30%.