Submission requirement: a.) report contains the results (metrics, plot, segmentation examples; b.) code with a readme file.

Problem 1 （30%）

In this problem, you are required to implement a 3D segmentation network (e.g., 3d unet), including the model, dataloader, training/testing **(10%)**. In addition, you need to

1. Report 4 evaluation metrics on the test set: dice (≥ 80%), jaccard, the average surface distance (ASD) and the 95% Hausdorff Distance (95HD);   **(5%)**
2. Plot the the training loss curve;   **(5%)**
3. Show at least 4 segmentation results (2D slices) compared with the ground-truth label (i.e., 4 2D slices with GT and predictitons).   **(5%)**
4. Explore at least three different training configurations (such as batch size, augmentation. optimizer, loss function and etc.) and report their results. Try to find the best performance. **(5%)**

Some information about dataset (`problem1_datas`);

1. datas are stored in the format of .h5.
2. training data: ./datas/train/*.h5; testing data: ./datas/test/*.h5.
3. images have different shapes, so we suggest to randomly crop a sub-image with the same size (e.g., 112x112x80) as the input.
4. if your gpu/cpu has no enough memories, reduce the batch size or reduce the cropping size.

Problem 2 （35%）

Skin Lession Dataset. In this dataset, there are totally 404 images, 305 for training and 99 fortest. Each image has a diseases label (from 0 to 6). There are 7 classes in this dataset. See in `problem2_datas`

In this problem, you are required to implement a classfi cation network (e.g., ResNet50) toclassify the skin diseases, including the model, dataloader, training/testing **(10%)**. In addition,you need to

1. Report accuracy on the test set, and achieve at least 85% accuracy.**(5%)**
2. Add the contrastive loss to the standard cross-entropy loss. **(5%)** and report the result **(5%)**.
3. Plot the the training & test loss curves, training & test accuarcy curves for 1.) and 2.); **(5%)**
4. Explore at least three different training configurations (such as batch size, augmentation. optimizer, loss function and etc.) and report their results. Try to find the best performance. **(5%)**

Problem 3 （35%）

Surgical Dataset. There are 6 videos in this dataset, which are sampled from Cholec80. Among them, 1-5 videos for training, and 41 video for test. For training easily, for each video, we sample every 100frames.. See in `problem3_datas` . In this problem, you are required to implement a temporal recognition network (e.g.,ResNet50+LSTM) to classify the surgical phase recognition, including the model, dataloader,training/testing. In addition, you need to

1. Use ResNet50 to classify the each frames **(10%)** and report accuracy on the test set, andachieve at least 70% accuracy **(5%)**.
2. Use ResNet50 to extract features for each frame and LSTM to capture temporal framesamong at least three (you can choose a larger number) nearby frames, i.e., the *i*-th, (*i+1*)-th and (*i+2*) frames **(5%)**. Achieve at least 70% accuracy **(5%)**.
3. Plot the the training & test loss curves, training & test accuarcy curves for 1.) and 2.). **(5%)**
4. Explore at least three different training configurations (such as batch size, augmentation. optimizer, loss function and etc.) and report their results. Try to find the best performance. **(5%)**