NTU DLCV (Autumn, 2022) HW1 Report

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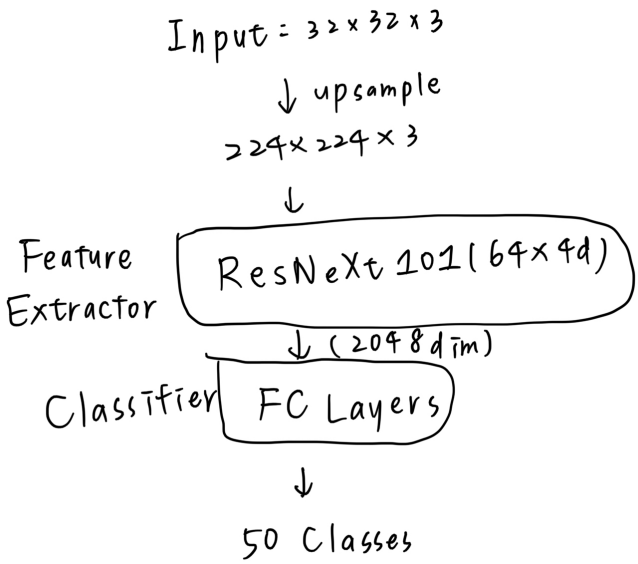
Problem 1

1. Model B (`ResNeXt101(64x4d)`)



2. 1@Acc Comparison

Model Name	Model A	Model B
1@Accuracy	0.5544	**0.8976**

3. **Model A**
   Architecture:
   - 2 groups of (`Conv()` Layer, 2D BatchNormalization, `ReLU()`, and 2D max-pooling layer) for feature extraction,
   - Followed by 3 fully connected layers and 2 `ReLU()` for MLP.

   Optimizer: `SGD` (momentum = 0.9, learning rate = 0.01, weight_decay = 0.0001)

   (Scheduler is not used here.)

Loss function: Cross Entropy Loss

Training epochs: 90

4. **Model B**
   Backbone: Use ResNeXt-101 (64x4d) in `torchvision.models` as main architecture.

   Optimizer: `SGD` (momentum = 0.9, learning rate = 0.01, weight_decay = 0.0001

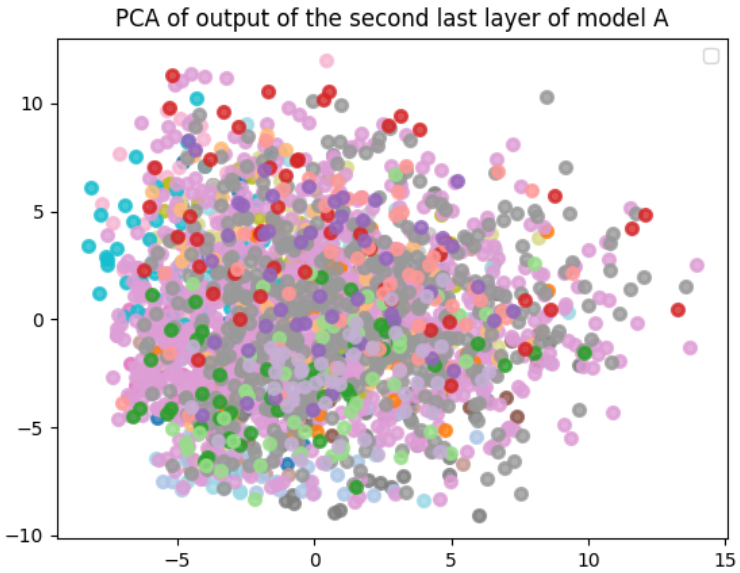
   (Scheduler is not used here.)

   Loss function: Cross Entropy Loss

   Training Epochs: 200

   Difference from Model A:

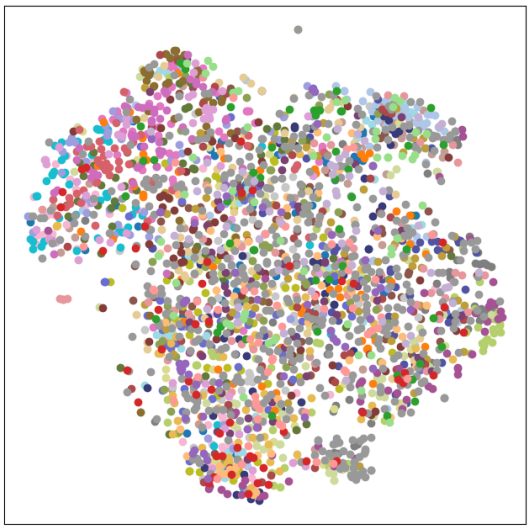
   - Number of parameters is much more than Model A.
   - Use Residual Computation (Skip Connection) for better performance.
5. Figure 5-1: PCA on the output of the second last layer of **model A** on `val_50`



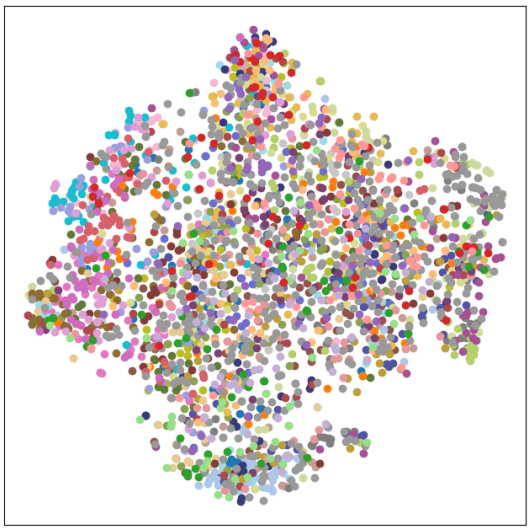
   Explanation:
   Since the classification performance is not ideal, the clusters of the same classes cannot be apparently recognized.

6.

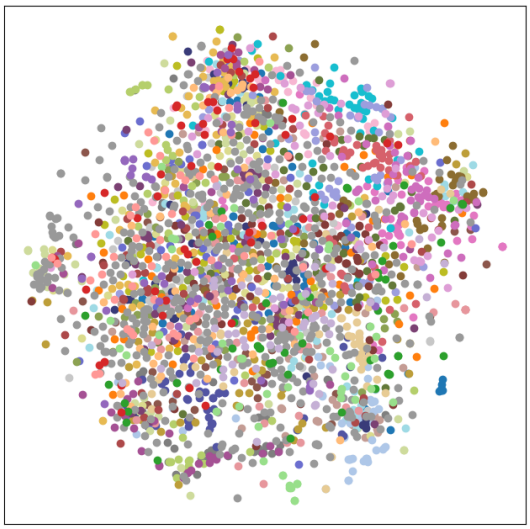
   - Figure 6-1: t-SNE on the output of the second last layer of **model A** on `val_50` (epoch 1)



- Figure 6-2: t-SNE on the output of the second last layer of **model A** on `val_50` (epoch 36)



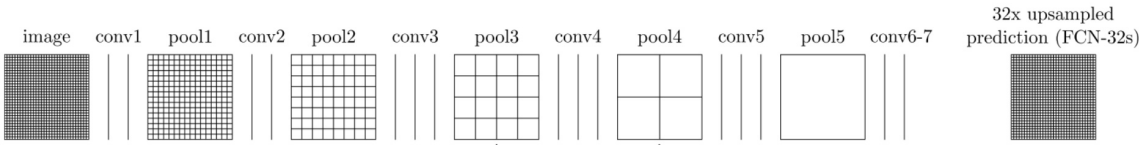
- Figure 6-3: t-SNE on the output of the second last layer of **model A** on `val_50` (epoch 90)



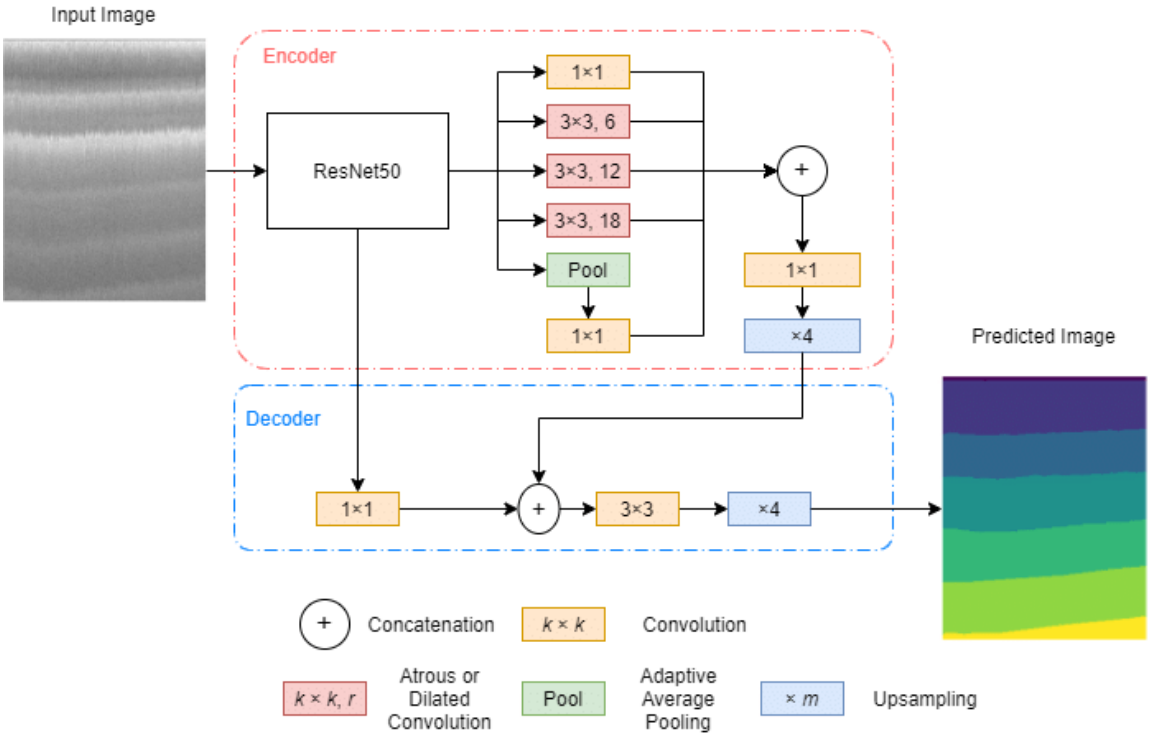
Explanation:
We could find out that in the final stage, the distance of items with same classes are closer than the early / middle stage.

Problem 2

1. VGG16-FCN32s Architecture



2. DeepLabv3 ResNet50 Architecture



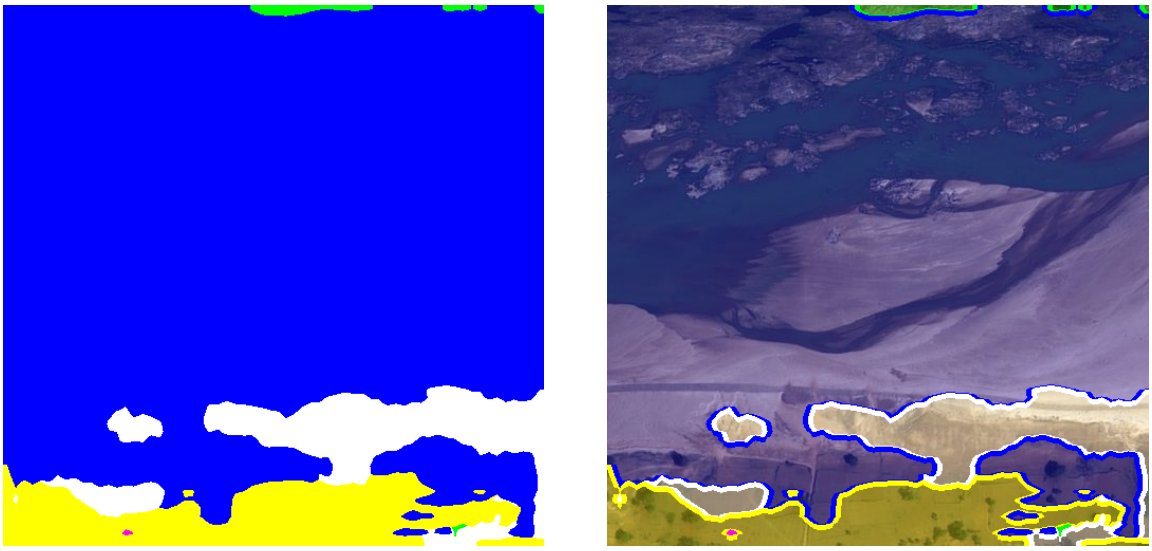
3. Mean IoU Score Comparison (`Validation`)

Model Name	Model A	Model B
mean IoU Score	0.669958	**0.730315**

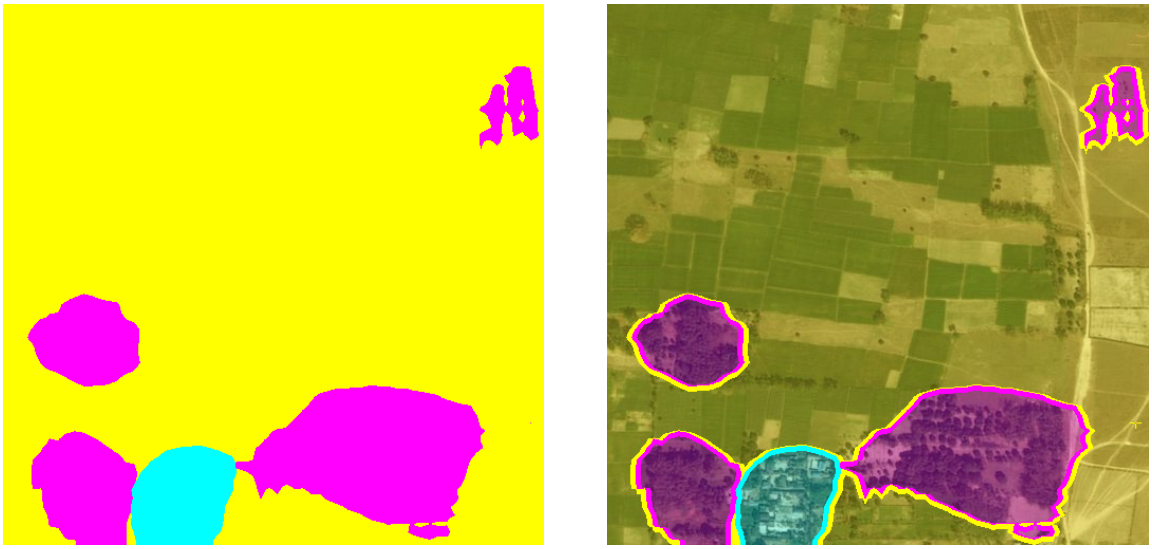
4.

- **Early Stage (mean IoU=0.548221)**

`0013_sat.jpg` Results (Left: Mask Image/ Right: Visualization Result)



`0062_sat.jpg` Results (Left: Mask Image/ Right: Visualization Result)



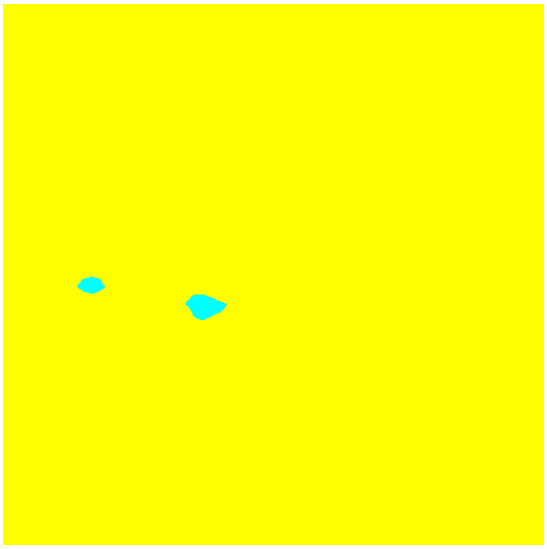
`0104_sat.jpg` Results (Left: Mask Image/ Right: Visualization Result)

- **Middle Stage (mean IoU=0.686392)**

`0013_sat.jpg` Results (Left: Mask Image/ Right: Visualization Result)


`0062_sat.jpg` Results (Left: Mask Image/ Right: Visualization Result)


`0104_sat.jpg` Results (Left: Mask Image/ Right: Visualization Result)



- **Final Stage (mean IoU=0.730315)**

`0013_sat.jpg` Results (Left: Mask Image/ Right: Visualization Result)

`0062_sat.jpg` Results (Left: Mask Image/ Right: Visualization Result)

`0104_sat.jpg` Results (Left: Mask Image/ Right: Visualization Result)