

# Homework 3

Release: 02/23/2021

Due: Mon. 03/08/2021, 11:59 PM

- You are **allowed** to consult any external resources but you must cite them. You are also **allowed** to discuss with each other but you need to acknowledge them. However, your submission must be your own work; specifically, you must **not** share your code or proof.
- Your submission has 3 parts. The first part is a single PDF file containing your short report on your method. The second part is a zip file containing your code. The third part is a submission to the leaderboard.
- This homework is worth 20/100 of your final grade.

**Problem 1.** [10 points] In the next problems, you will use a network to do object detection/segmentation in a dataset. The training data is the same as before. We additionally added testing for this problem with the name “testing\_data\_perception.zip”. The dataset link does not change:

<https://drive.google.com/drive/folders/11TPw-XOypMLEgZLXUwFdBEHBPami0VCs?usp=sharing>

You can download the data or directly use it in Google Colab by mounting the folder.

**Read the following carefully and ask on Piazza immediately if you have questions.**

1. The task is to detect/segment objects for all the objects of interest in the scene given the image and the depth map. Essentially, the input is “xxx\_color\_kinect.png” and “xxx\_depth\_kinect.png”, and you need to output “xxx\_label\_kinect.png”. For dataset description, please refer to the last homework.
2. Model requirements. You are **required** to use a network with 3D components. If you only use 2D detection/segmentation networks, your maximum score for the report will be 3/5. We recommend implementing Frustum PointNet: <https://arxiv.org/abs/1711.08488>, as it is probably the simplest and the performance is very strong. You need to describe your method in the report.
3. Output format. The submission to the leaderboard should be a zip file containing 500 images, their names should be “{level}-{scene}-{variant}\_label\_kinect.png”.

4. Evaluation. [5 points]

Your score is computed as the higher of the absolute and relative score.

Absolute score

- 5 points: if you achieve higher than **80%** average IOU.
- 4 points: if you achieve higher than **60%** average IOU.
- 3 points: if you achieve higher than **40%** average IOU.
- 2 points: if you achieve higher than **20%** average IOU.
- 1 points: Make a submission

Relative score

- 5 points: rank 1-5.
- 4 points: rank 6-15.
- 3 points: rank 16-20.
- 2 points: rank 21-25.
- 1 points: the rest.

5. Report. [5 points]

The report should contain explanation of your network model and experiments. 1-2 pages with pictures should be enough. Things to include: network architecture, experiment setups, training details, validation and test scores, visualizations.

6. Submission. The submission has 3 parts

- A short report describing your method and result. (A short version of “our method” and “experiments” section of academic publications. 1 page should be enough, but you may write more if you have interesting findings.)
- A .zip archive containing your code.
- You need to submit your results on testing data to our internal benchmark.

<https://storage1.ucsd.edu/cse291ibenchmark/benchmark2>

The benchmark will be online shortly after the late due date of HW2.

A benchmark submission will take about 20s, please be patient and please avoid trying to submit multiple times.

7. The benchmark suite (IOU) is uploaded to piazza resources “benchmark\_pose\_and\_detection.zip”.
8. You should always assume each neural network experiment will take 1 whole day on a GPU. So you should start solving the problems **as early as possible**. If you are using the free version of Colab, make sure you save and load the network weights often as there is a running time limit.