

3D Data Processing - Lab 4

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1 Assignment

The request of the assignment was to segment a point cloud taken from the famous *Semantic-Kitti* dataset using **PointNet**. In particular, the original dataset counts about 30 labels, but in this assignment we had to remap them to only 3 labels:

- *Traversable* (road, parking, sidewalk, ecc.)
- *Not-Traversable* (cars, trucks, fences, trees, people, objects)
- *Unknown* (outliers)

The main request was to complete the definition of the **PointNet** and **PointNetSeg** modules by implementing the `__init__` and `forward` methods.

I used as reference for the original model the GitHub repository that you can find at this link: <https://github.com/fxia22/pointnet.pytorch/blob/master/pointnet/model.py>.

2 Experiments and Results

In this section the focus is directed towards the experiments I did when changing up the architecture.

I made two different experiments:

- **Experiment 1:** remove the third and fourth MLPs (i.e., `MLP(256,128)` and `MLP(128, self.classes)`) from the **PointNetSeg** model and replace it by directly mapping the feature maps of size 256 to the size equal to the number of classes (i.e., by adding instead a `MLP(256, self.classes)`)
- **Experiment 2:** add two MLPs `MLP(64,64)` to the **PointNet** model before `MLP(64,128)` and another MLP `MLP(128,128)` to **PointNetSeg** before `MLP(128, self.classes)`

In the following table, the results are shown.

Architecture	Original	Experiment 1	Experiment 2
Test accuracy	92.083 %	83.889 %	91.7465 %
total time	13.068161487579346 [s]	13.040106058120728 [s]	12.93287992477417 [s]
avg time	0.4356053829193115 [s]	0.43467020193735756 [s]	0.43109599749247235 [s]

As you can see, there are not great variations in terms of **avg time** and **total time**. However, the **Experiment 1** setting obtains a **Test accuracy** that is much lower with respect to other settings.