3DP Lab4 - Point Cloud Segmentation

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1 Introduction

The goal of this laboratory is to segment a point cloud taken from the famous Semantic-Kitti dataset using PointNet.
The original dataset counts about 30 labels, but for this assignment we remap them to only 3:

- Traversable (road, parking, sidewalk, ecc.)

- Not-Traversable (cars, trucks, fences, trees, people, objects)

- Unknown (outliers)

The remap process is done using a key-value dictionary that maps an original label to the correspondent reduced label set.

2 Implementation Details
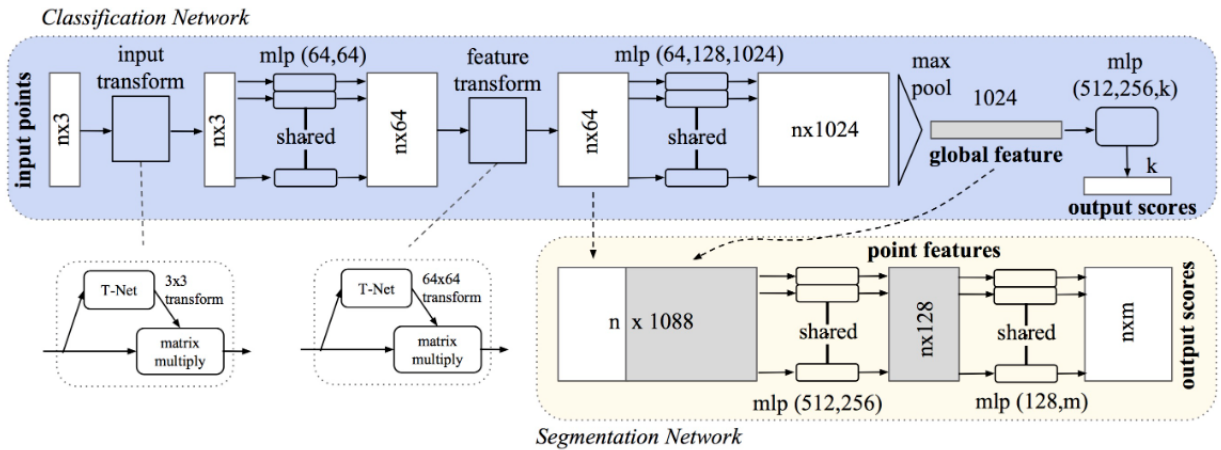
In order to complete the assignement I had to complete *init* and *forward* method for 2 classes:

- PointNet

- PointNetSeg

After that I had to train the *PointNetSeg* on training set and then evaluate it on the test set.
In order to complete the two aforementioned classes I followed the original implementation that can be found in the paper shared by the professor (pointnet github) specifically: *PointNetSeg.py*

3 Results

The results obtained in the test set are:

- 30it [00:21, 1.41it/s]

- Test accuracy: 91.952

- total time: 21.273188591003418 [s]

- avg time : 0.7091062863667806 [s]

4   Test Different Models

I tried to remove the $MLP(128, 128)$ inside the $PoinNetSeg$ class just to see how the results and the time change with respect to the real PointNetSeg.
Below I reported the results obtained:

- 30it [00:12, 2.34it/s]

- Test accuracy: 85.49033333333334

- total time: 12.830955982208252 [s]

- avg time : 0.4276985327402751 [s]

I rewrite some parts of the code just to not modify the real one (as requested I put them all at the end of the notebook).
As we can see from the results obtained we have a trade-off between accuracy and time.
In the second model we get an accuracy of 85.49 % (compared to 91.95 % of the real one) but we need only about half of the time needed by the previous one.