Nuages de Points et Modélisation 3D (NPM3D) TP6

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1 Question1

Test accuracy on ModelNet10_PLY with MLP	learning rate	nb epochs
16.6%	0.001	10

Table 1: Test accuracy on ModelNet10_PLY with MLP

The table 1 shows a test accuracy of 16.6%. This suggests that the MLP model is performing slightly better than random guessing for a 10-class classification problem (which would be 10% accuracy for random chance).

2 Question2

Test accuracy on ModelNet10_PLY with PointNetBasic	learning rate	nb epochs
79.7%	0.001	10

Table 2: Test accuracy on ModelNet10_PLY with the basic version of PointNet

The table 2 shows a test accuracy of 79.7%. This suggests that PointNetBasic is capable of capturing significant features from the point cloud data that are relevant for the classification task.(especially considering that the network was trained for only 10 epochs, which is relatively few.)

3 Question3

Test accuracy on ModelNet10_PLY with PointNetFull	learning rate	nb epochs
85.0%	0.001	10

Table 3: Test accuracy on ModelNet10_PLY with PointNetFull

As shown in the table 3, the test accuracy of 85.0% with the PointNetFull model on ModelNet10_PLY is a significant improvement compared to the earlier basic version of the model. This enhancement in accuracy indicates the effectiveness of the T-Net alignment network in preprocessing the point cloud data. By aligning the input data, the T-Net helps the subsequent layers of the PointNet to

better understand and extract the geometric features of the objects, leading to improved classification performance.

4 Question4

My new data augmentation on 3D point clouds is **Random Scaling**. Scaling the point cloud randomly can simulate the effect of objects being closer or further away from the sensor. This can help the model learn scale invariance.

	with Random Scaling(RS)	**without RS**
Test accuracy on ModelNet10_PLY with PointNetFull	87.2%	85.0%
learning rate	0.001	0.001
nb epochs	10	10

Table 4: Test accuracy on ModelNet10_PLY using PointNetFull with&without Random Scaling

As shown in the table 4, the test accuracy using the PointNetFull with Random Scaling is 87.1% while the test accuracy without Random Scaling is 85.0%.

The improvement of 2.2 percentage points in test accuracy is a substantial increase, particularly given that the only change between the two training runs was the introduction of Random Scaling. It's also noteworthy that this improvement was achieved without increasing the complexity of the network or the need for more training epochs, which demonstrates the efficacy of this augmentation technique.