**Point-Cloud Generator and PointNet Classifier**

I implemented two point-cloud generators and a PointNet Classifier with two classes. The classifier has achieved over 90% accuracy rate in a held-out validation set within 400 gradient updates.

Point-Cloud Generator:

A cube and a sphere point-cloud generator were implemented. The generators finally produce a point-cloud with 1024 points, and each point is represented by its 3D coordinates. Each generator uniformly sampled 1024 points from the surface of the object. For example, the sphere point-cloud generator produces a unit vector which is the normalization of three normal IID random variables. The point-clouds are further randomly transformed by random scaling, rotating, and translating.

PointNet Classifier:

The classifier model used in this starter project is basically a PointNet model mentioned in the project introduction document. The model outputs two scores instead of forty in the original model. This model also differs from the original since it does not use L2 regularization when calculating the loss. Additionally, I removed the last two dense layers for faster training.

Experiment:

I trained the classifier model with 100,000 different point-clouds. A held-out validation set was also generated with a size of 1024. The model achieved 90.9% accuracy rate within 400 gradient updates. The batch size was 256. I used Google Colab platform to train the model and the total time consumption for data generation, training and testing was more than three hours.

Potential future work:

A noise could be added to the point-clouds to simulate the real-life point-cloud data and strengthen the robustness of the model.

A line chart could be drawn to demonstrate the result and this report could be written in a Latex format.