

MSAI 349: Final Project Preliminary Results - Fall 2024

Authors: Zhengyang Kris Weng, Zhengxiao Han, Ben Benyamin

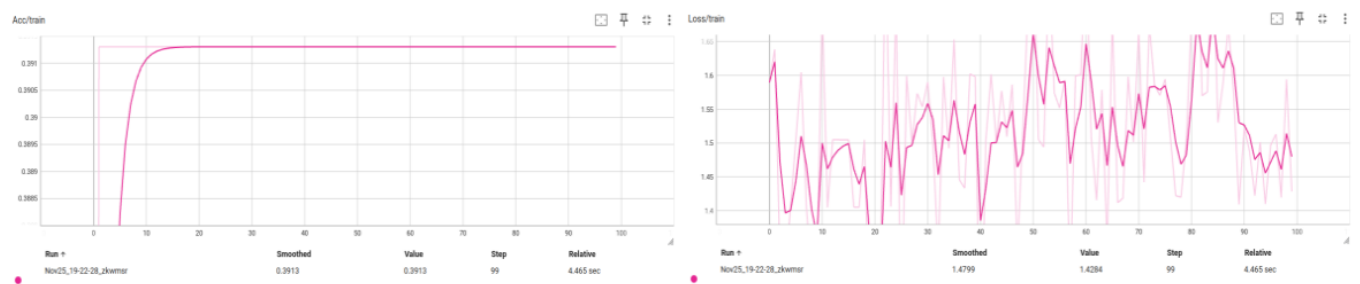
Task

Our project focuses on classifying everyday objects using point cloud data. To achieve this, we constructed and trained a custom PointNet[1] model for point cloud classification. Additionally, we generated synthetic data for training and testing the model.

Results

We implemented a simple PointNet model using PyTorch and developed utility scripts to facilitate training and data generation. Below are visualizations of our preliminary training results, generated using TensorBoard:

Training Accuracy and Loss



As shown in the accuracy graph above, training accuracy plateaus around **0.4** and does not improve significantly as epochs progress. Similarly, the loss graph does not exhibit a consistent decreasing trend. These observations suggest a potential issue in our implementation of the PointNet algorithm. Specifically, we suspect the **T-Net layers** (used to compensate for geometric deviations) may not be functioning correctly between the MLP layers. This hypothesis will be investigated further as the project progresses.

Analysis

Key observations and next steps:

- **Model Implementation:** Successfully built a basic PointNet model using PyTorch.
- **Training Behavior:** Accuracy shows improvement initially but plateaus at ~0.4. Loss does not decrease consistently.
- **Suspected Issue:** Potential errors in the T-Net layer implementation between MLP layers.
- **Next Steps:** Investigate and debug T-Net layer functionality.

[1]R. Q. Charles, H. Su, M. Kaichun and L. J. Guibas, "PointNet: Deep Learning on Point Sets for 3D Classification and Segmentation," 2017 IEEE CVPR 2017, pp. 77-85