Neural Networks for Classifying Noise in Point Clouds

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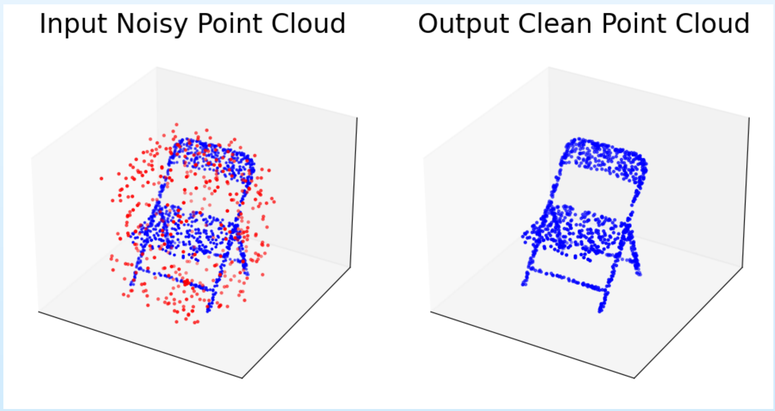
Task Statement

- Point clouds are used in many domains, but commonly are polluted with inaccurate, noisy points
- **Input:** a noisy point cloud of shape (N x 3), where N is the number of points
- **Output:** N points classified as noise, or not noise (N x 1)

Data Set



- Dataset comprised of nearly 5,000 noisy point clouds
- Point clouds sampled from ModelNet10, which consists of objects like chairs and tables
- https://modelnet.cs.princeton.edu/

Methods

Multi-Layer Perceptron (MLP) Model

- Calculate the nearest neighbors
- Compute logits
- Generate output labels

Pointwise Convolution Model

- Extract features with convolution
- Refine features using convolution
- Generate output labels

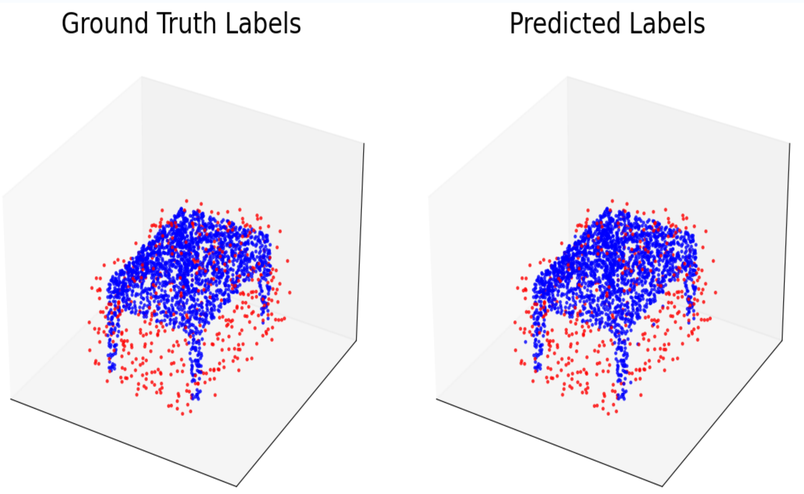
MLP With Positionwise Pre Predictions

- Calculate the nearest neighbors
- Predict pre-predictions
- Generate output labels

PointNet Model

- Align point cloud via TNET layer
- Extract features using shared MLP
- Generate output labels

Evaluation Results



	Train Accuracy	BCE	Test Accuracy
MLP	0.8038	0.4944	.8038 ± .0000
MLP with PFF Pre-Predictions	0.8038	0.5219	.8038 ± .0163
Pointwise Convolution	0.8669	0.3263	.8607± .0015
PointNet MLP	0.9609	0.1037	.9628± .0006

Code & Data

https://github.com/JoeWilder/DenoiseNet