**Technical Report**

This document is a guide to understanding, accessing, and operating the Registration Experiment code used in my Ohio University MSCS Final Project. It outlines its functionality, the required prerequisites, how to interpret outputs, and troubleshooting any errors that may occur during its execution.

The goal of this work is to provide a comprehensive testing routine for point cloud registration algorithms. With an emphasis on rigorous scientific testing that is repeatable and modifiable for evaluating performance under a range of conditions.

The code is stored in https://github.com/gambitshub/fp.

The report for this work can also be found in the repo.

To run the code, please follow the following steps:

1. Install all dependencies:

Pip install open3d, pandas, numpy, torch, gc, tabulate, matplotlib, seaborn, six, requests, gdown, scipy

1. Download source data:

Run download\_data.py

This will download the datasets used from source to /data

1. Evaluate performance of registration methods using:

Run main.py

This will perform the following, pre-process the data generating testing pairs, run the experiments using default parameters for datasets and algorithms (with additional parameters for down sampling, overlap, magnitude of transformations parameters). As default the results will be stored to results\_summary.csv and graphed results will be in /graphresults/.

To use the package you can add the parameters below; choosing the datasets, methods, voxel down sampling, initial misalignment translation and range.

python main.py --datasets [your\_datasets] --algorithms [your\_algorithms] --voxelsize [your\_voxelsize] --overlap [your\_overlap] --range\_t [your\_range\_t] --range\_r [your\_range\_r] --rte-thresholds [your\_rte\_thresholds] --rre-thresholds [your\_rre\_thresholds] -o [your\_results\_filename]

1. To test your own data or algorithms, add the necessary datasets and algorithms to follow the following format.

This document describes the requirements at a high level. For more detailed documentation, please refer to the docstrings in each file:

* Download\_data.py
* Main.py
* Data\_processing.py
* Run\_experiments.py
* Evaluation\_metrics.py
* Transformation.py
* Registration\_algorithms.py
* Utils.py

These documents include information about what each function does, its inputs, outputs, and how it's used in the context of the larger application.

Data manual:

Explains the format of the source data and outlines the procedure used to process the data for use in the testing program.