

# CS 3630 Project 6

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# 1. What data was given to you to complete this project? How did you use it?

We were given 180 Lidar scans. From a given point cloud I convert each point to homogenous point then apply homogenous transformation. Then find closest point in the other scan to form a pair. Finally calculate the transform between the two point clouds

2. If you used LIDAR information from just one frame to create a map, what would the map be missing that make it not-so-helpful?

It could be missing some critical details which is blocked by obstacles: cars, corner of the buildings. Which is not comprehensive in terms of environment awareness of the vehicle.

### 3. What is the Iterative Closest Point (ICP) algorithm? Explain briefly.

ICP algorithm aims to minimize the difference between two clouds of points which is achieved by iteratively finding the most probable correspondence between two transformed point clouds

## 4. How did you use the ICP algorithm in this project?

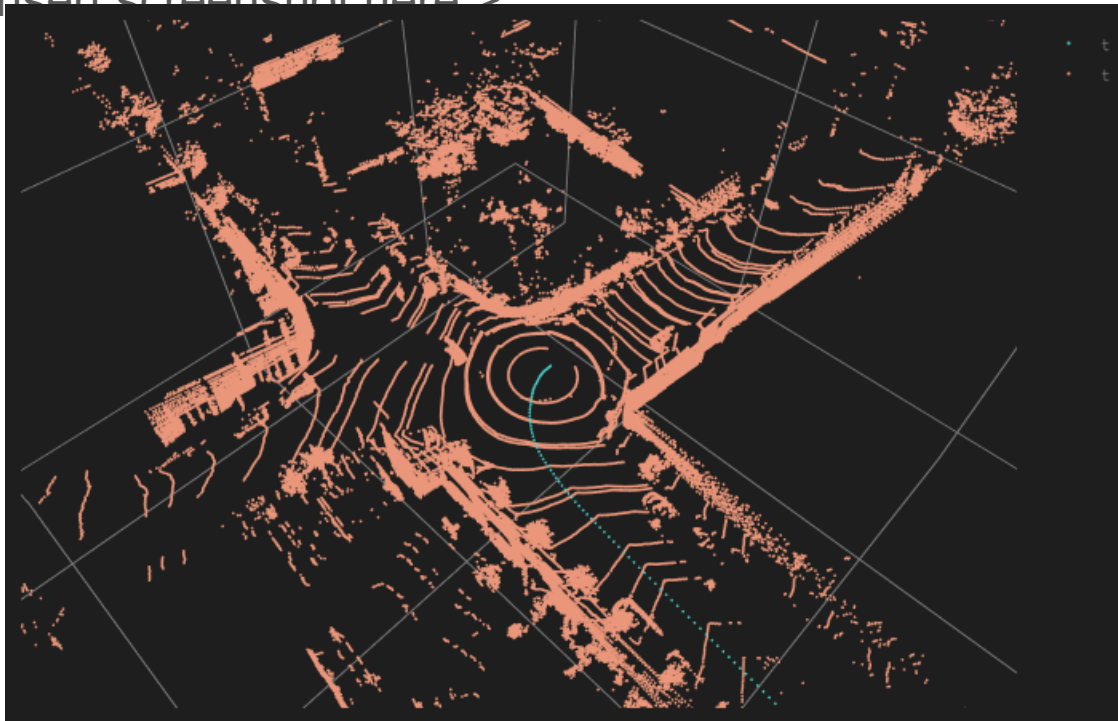
In this project I use ICP to go through all the non-consecutive point clouds and run icp pair-wise to find the relative movement of the car, and add the transform to the factor graph.

## 5. What is a factor graph? How was it used in this project?

A factor graph is a way to explain complex relations between interest variables in a certain model of the dependencies between variables and factors. Here, we add the factors by “skipping” transformation to avoid the problem caused by the noisy lidar scans

6. Paste a screenshot of the vehicle poses being given as output from the factor graph.

<Insert screenshot here >



7. In the generated map, what happened to the people and other cars moving around the car collecting LIDAR data?

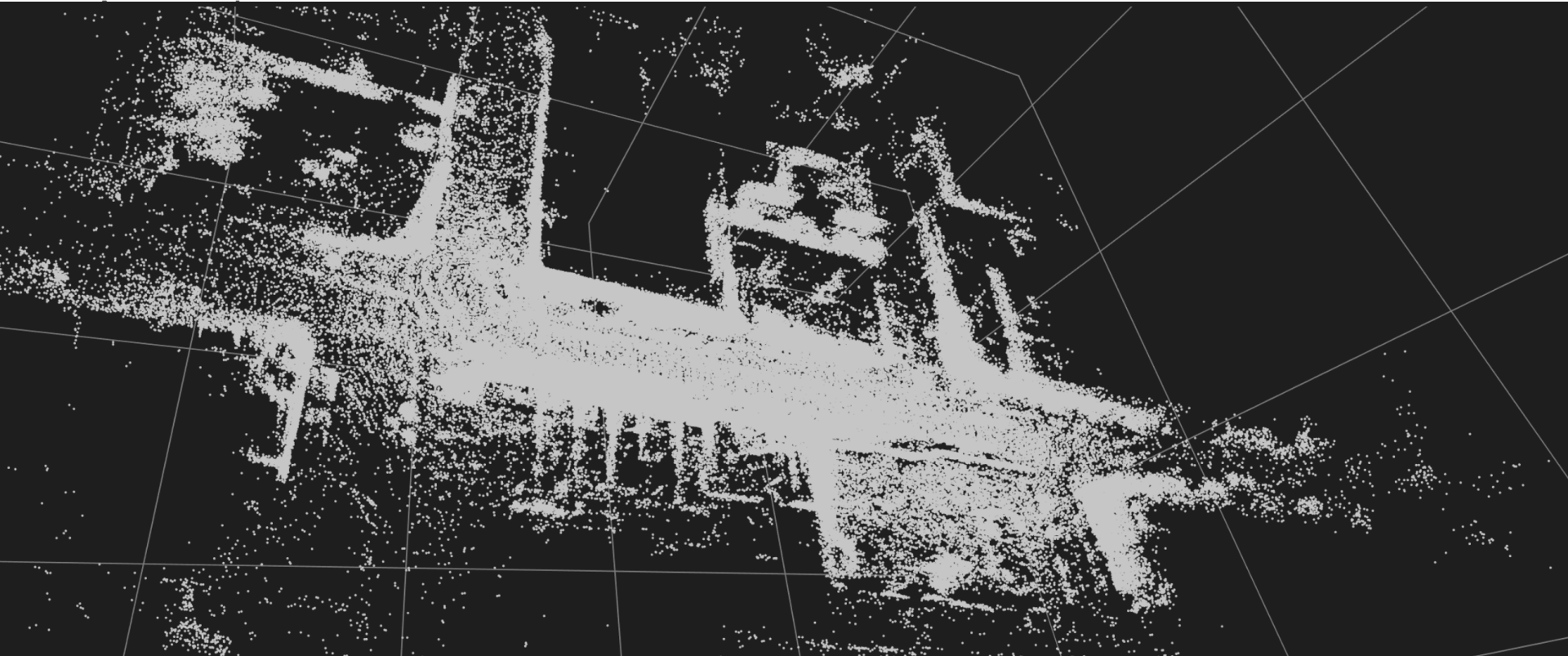
ICP is sensitive to these outliers caused by moving objects, these create the noises in the map, as they walk or drive along leaving a trace of particles that lidar scans.



## 8. What did you learn about mapping in autonomous driving in this project?

I learnt that ICP could be a great algorithm in mapping in autonomous driving as it could determine the motion of autonomous vehicles by aligning lidar scans.

9. Insert the cloud map visible to you after at the end of the project.



## 10. What do you think you could add or change to make the map better?

It could add a robust loss function to mitigate the effect of moving objects, by assigning less weight to large errors.

11. Do you feel confident that you can take up a challenge related to self-driving at ArgoAI?

Yes