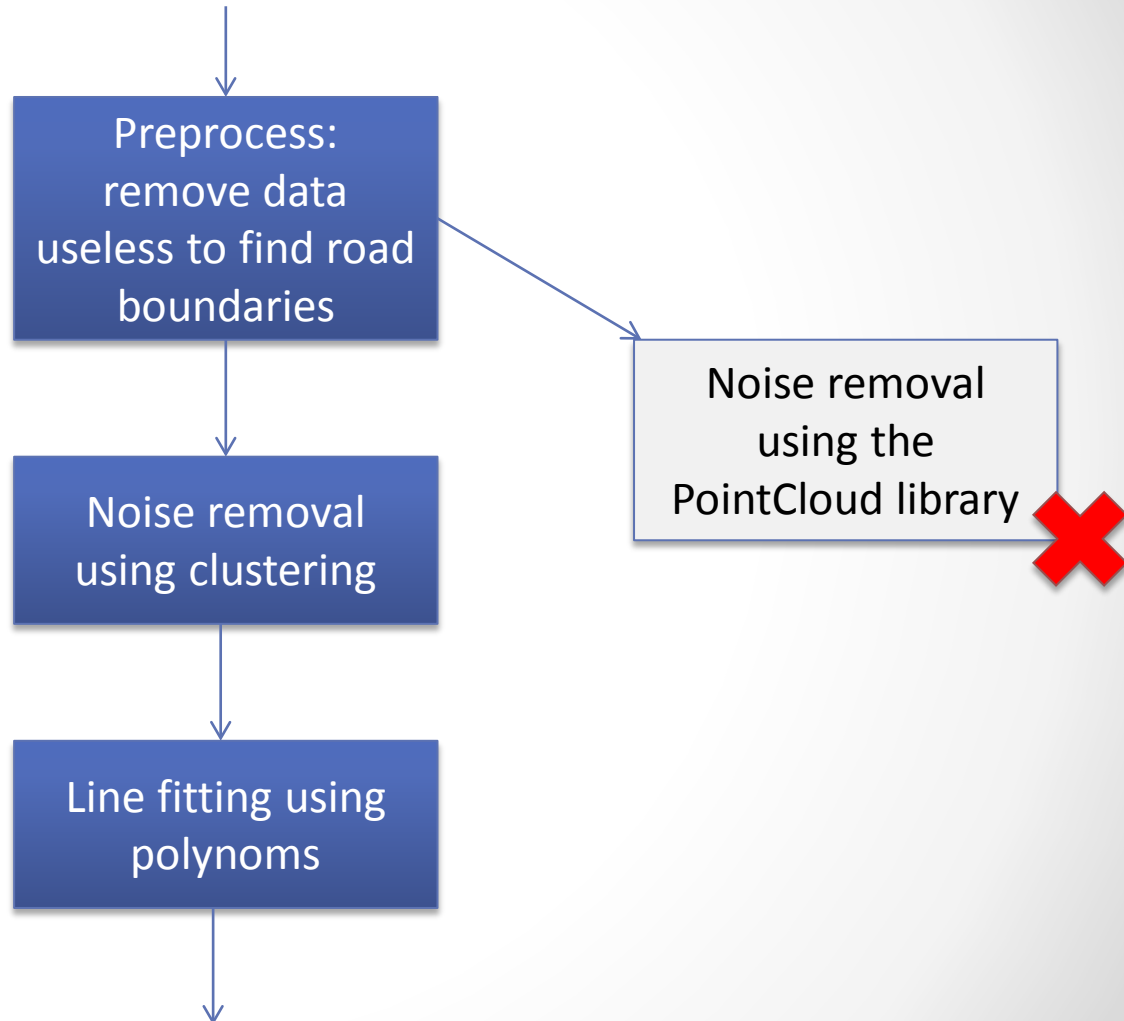


# Geospatial Vision and Visualization Project

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# Process overview

Original Nokia HERE data



Piece-wise polynoms describing  
the curve of the road

# Preprocess: remove useless data

**Idea:** reduce the amount of points in the point cloud to make it more easy to process.

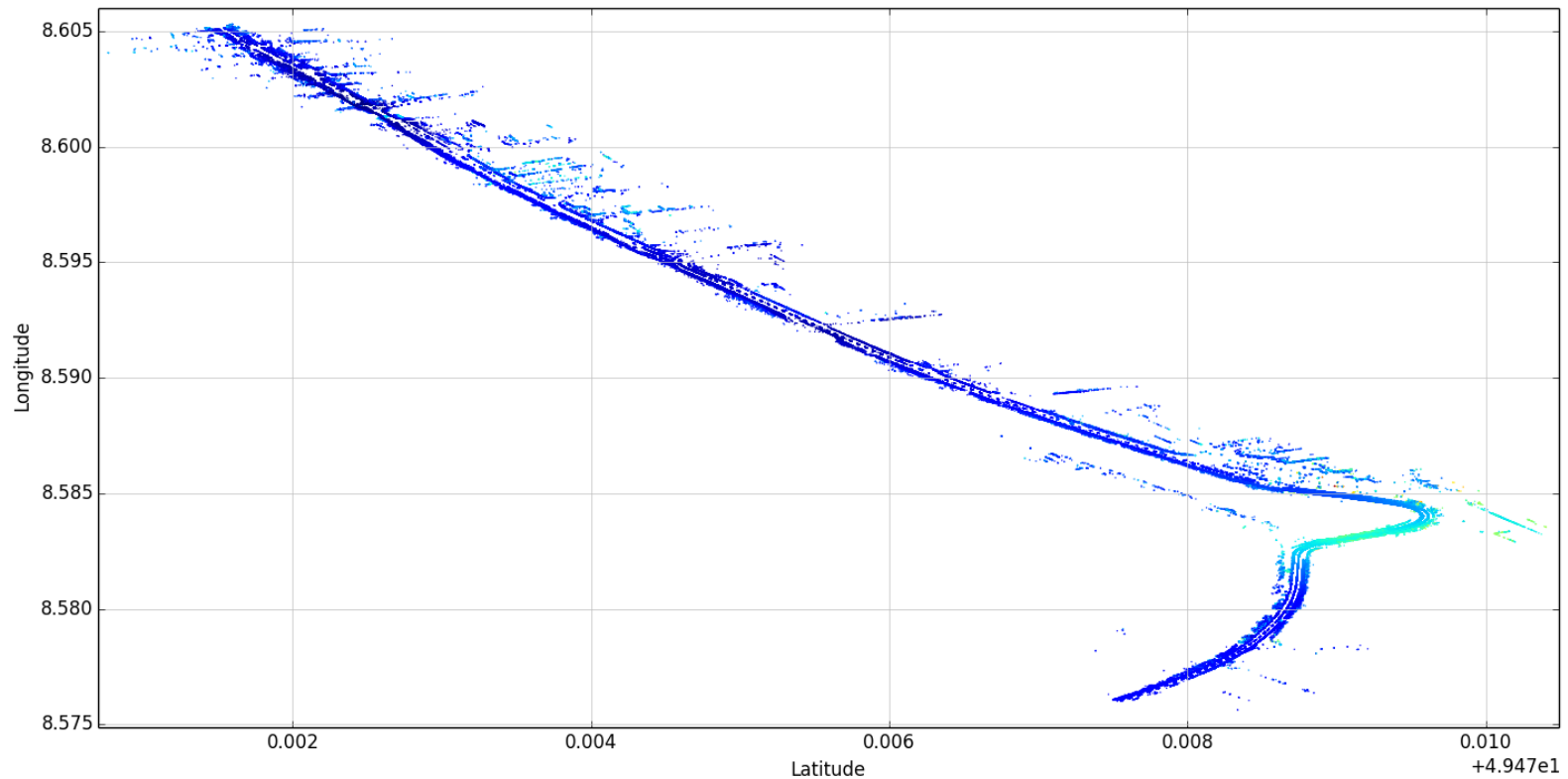
**Solution:** delete points that won't help to find the road boundaries.

**Criteria:**

- Remove points that have an intensity value less than a threshold
- Remove points that are below/above a threshold

**Problem:** The car elevation is not the same during the entire data acquisition, it changes with the road elevation → preprocess the chunk one by one and use a variable threshold for the elevation: keep only the points that have an elevation between the 35th percentile and the 65th percentile.

# Preprocess: remove useless data



# Noise removal

**Idea:** delete the noise we have on the previous results to improve the process of line fitting.

**First try:** use the Point Cloud Library (PCL) that provides functions of noise removal, but not used to work with it and did not know what it does.

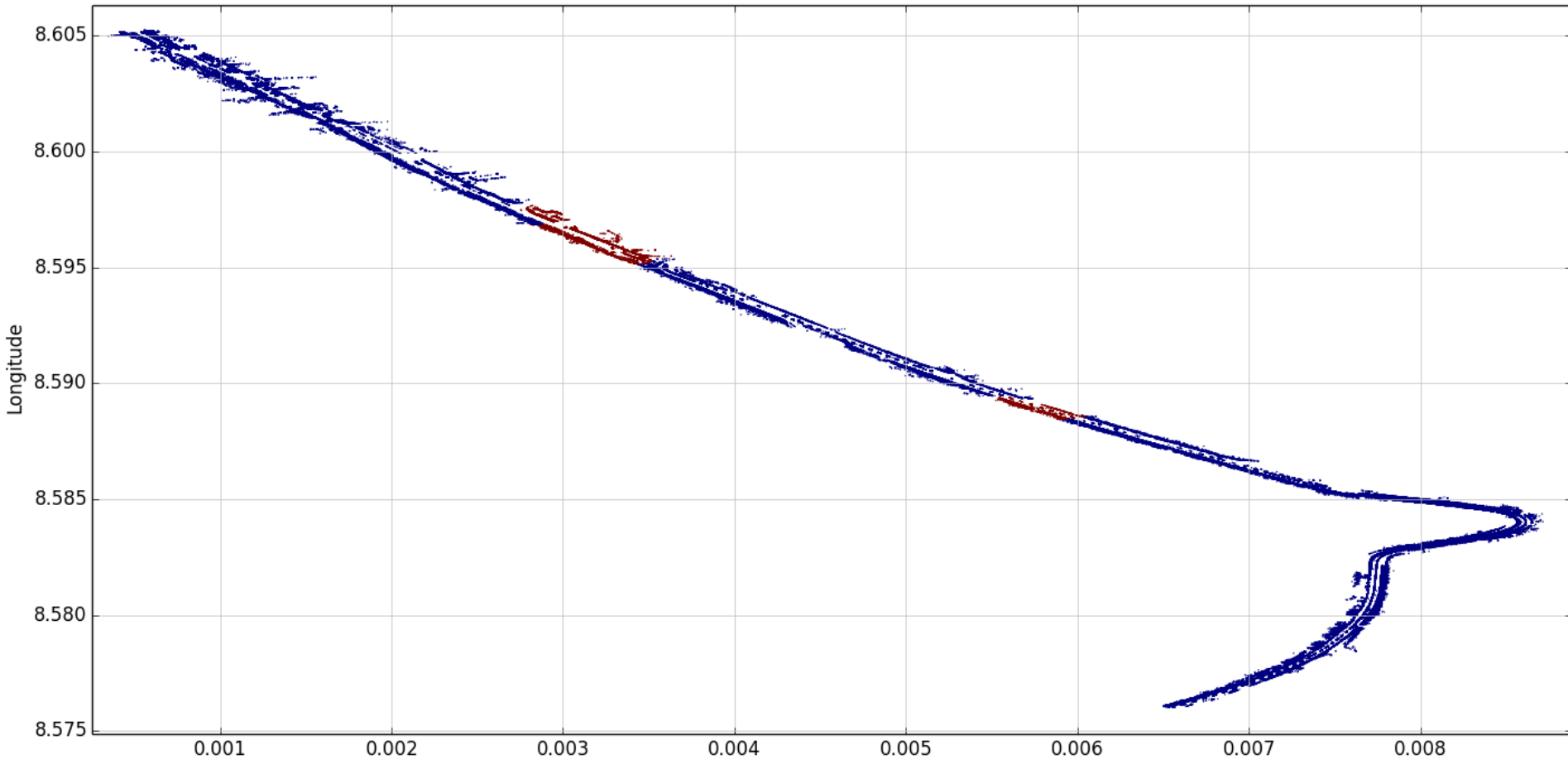
**Alternative solution:** use the scikit-learn toolkit

- Divide the points in  $n$  subsets of points
- For each subset, keep the points as if they were in a plane, run a clustering algorithm
- Keep the largest clusters

**How to choose the clustering algorithms:** choice amongst K-Means, Affinity Propagation, DBSCAN, Ward, and Mean Shift.

- Want an algorithm that do not take a number of clusters as an input
  - Want an algorithm that scale with our amount of data
- ➔ DBSCAN: Density-based spatial clustering of applications with noise

# Noise removal



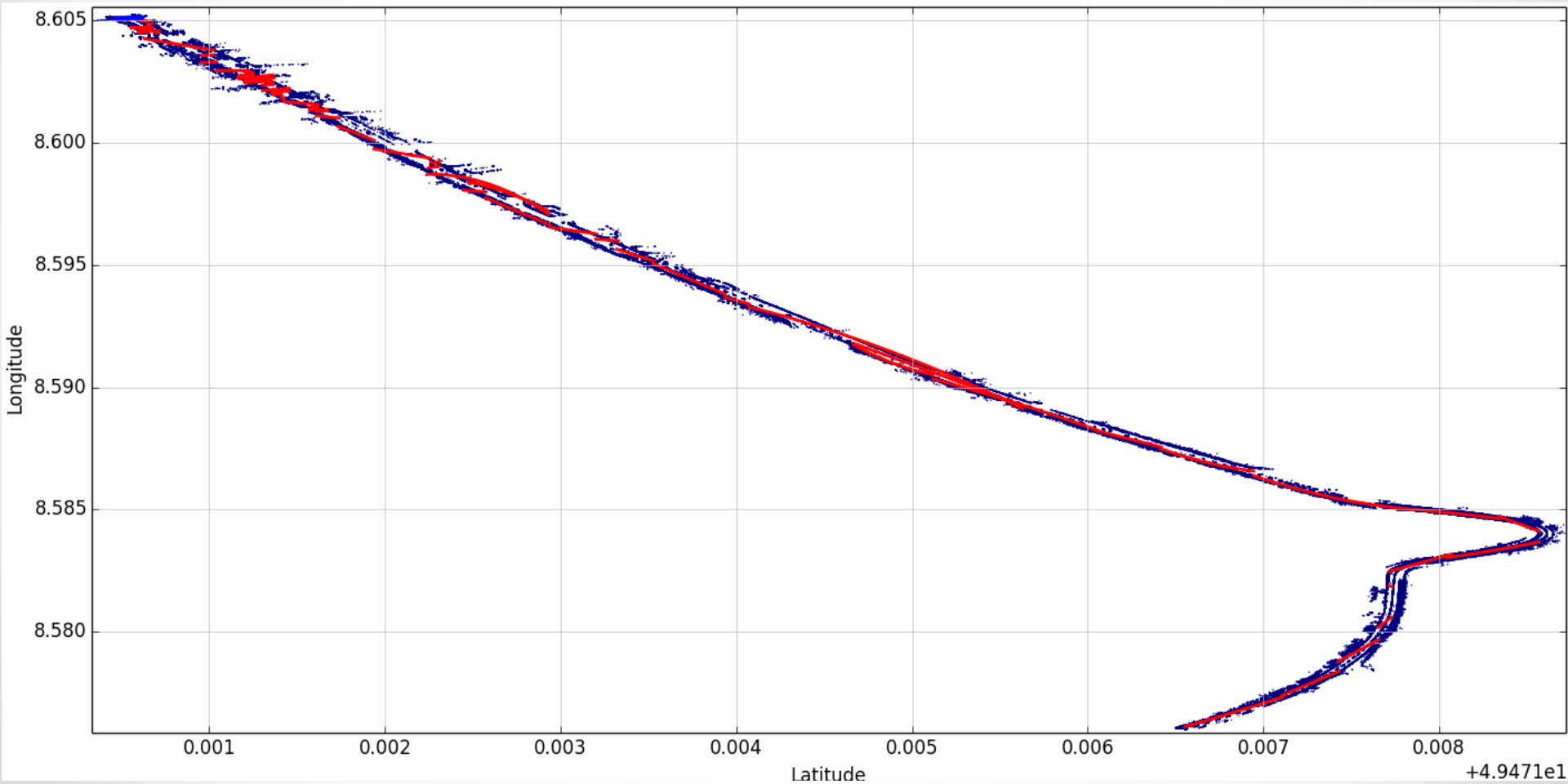
# Line fitting

**Idea:** find functions that describe the curve of the road

**Solution:**

- Divide the data in  $n$  subsets of points
- For each subset, fit the points with a polynomial of degree 3 and display the polynomial only in the interval of the subset

# Line fitting



+4.9471e1



# Conclusion

- Main part of the project is to preprocess the data to be able to improve results when fitting lines on the point cloud
- Manage to detect the curve of the road
- Process the data in two dimensions to remove noise with clustering
- Can not detect the boundaries of the road → we could implement an algorithm similar to the Hough Transform to detect lines in a point cloud.