Mapper

Jana Řežábková, Jan Joneš

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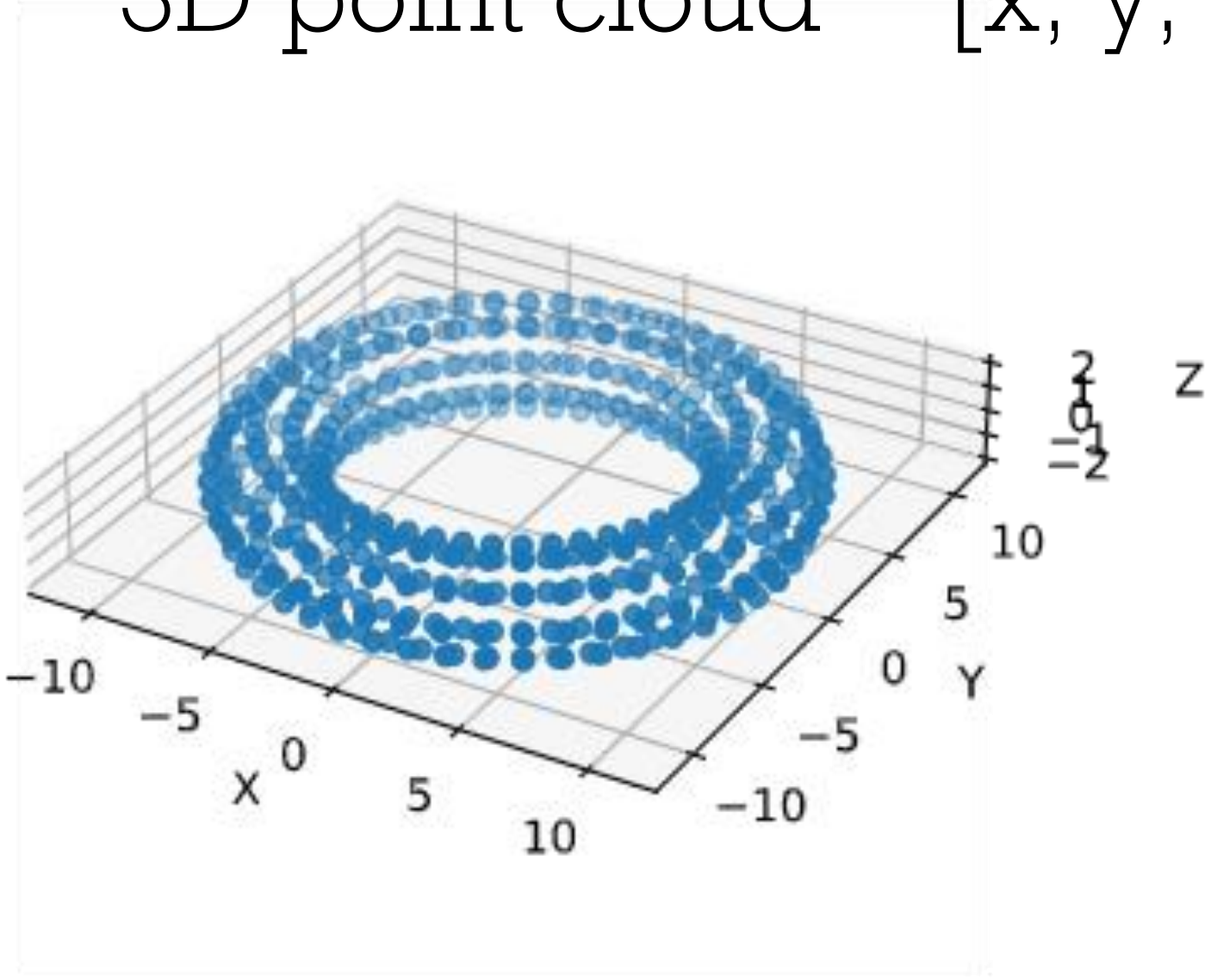
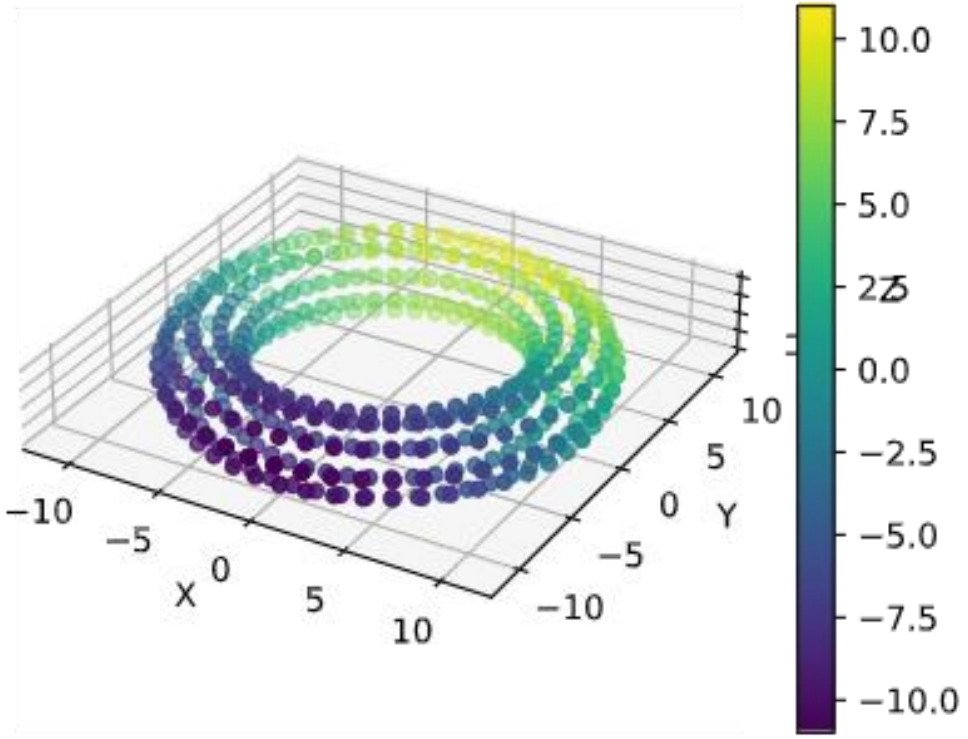
Input 3D point cloud [x, y, z]

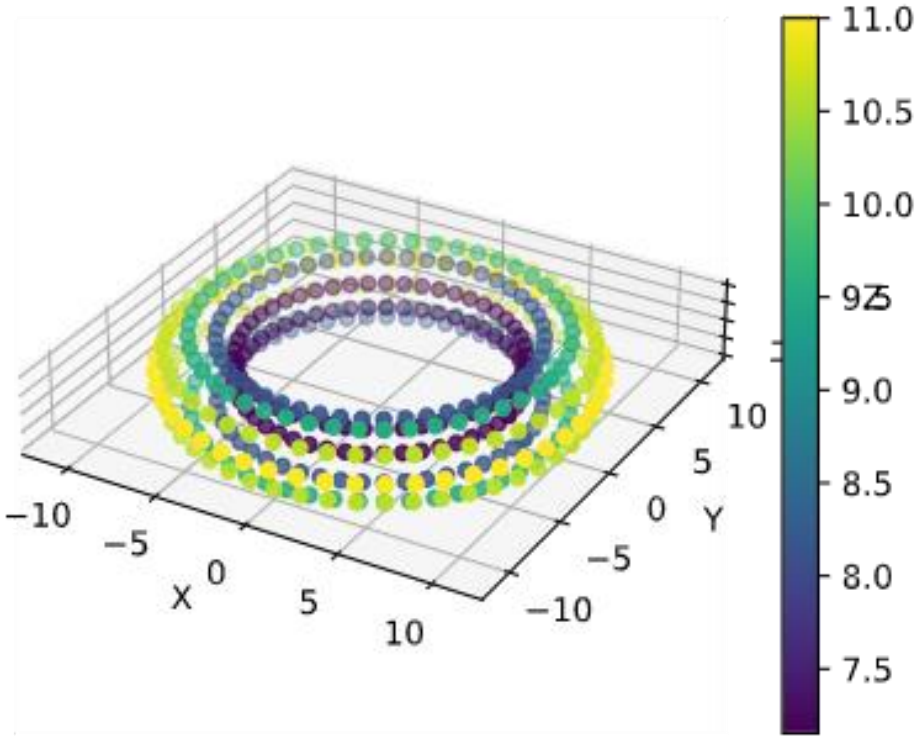


Filter map to real space

y coordinate

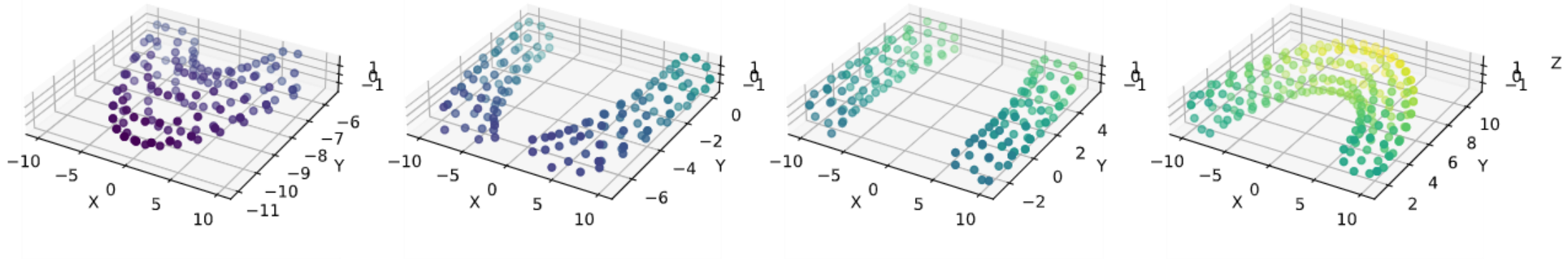


distance from origin

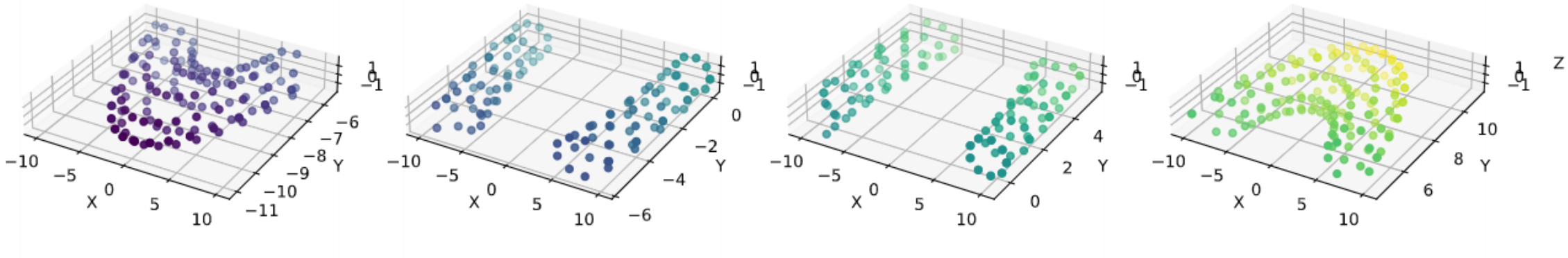


Cover overlapping intervals

4 bins, 25 % overlap

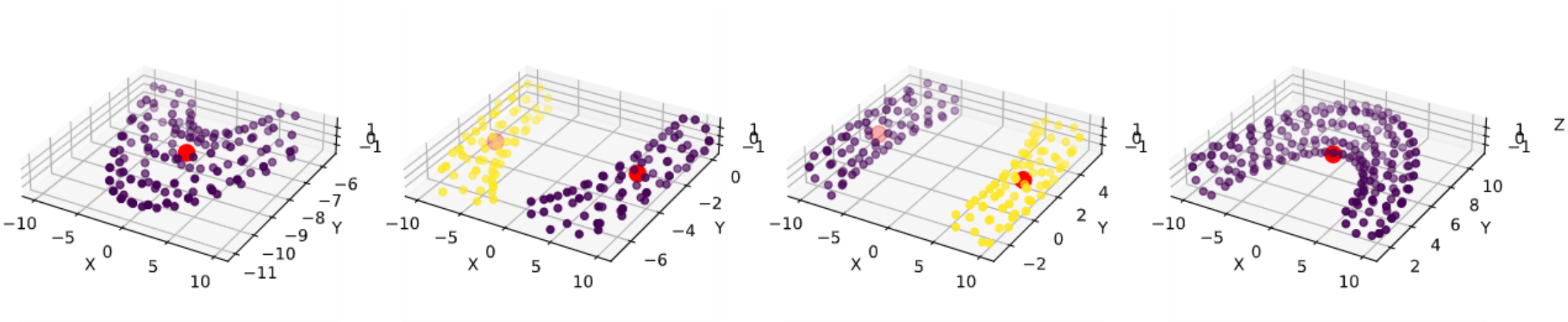


4 bins, 5 % overlap



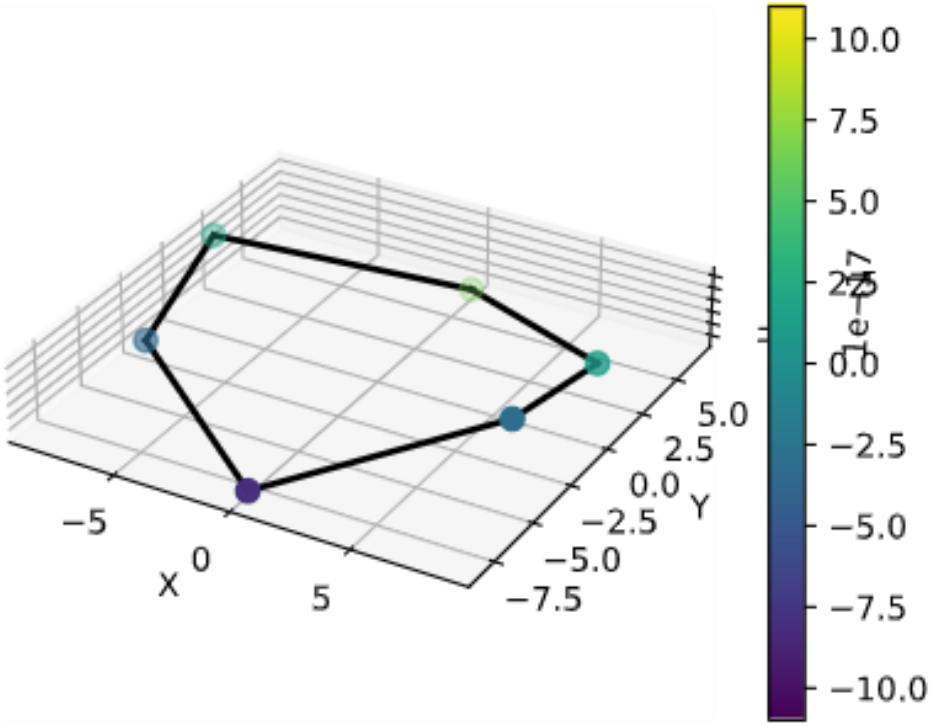
Clustering of each interval

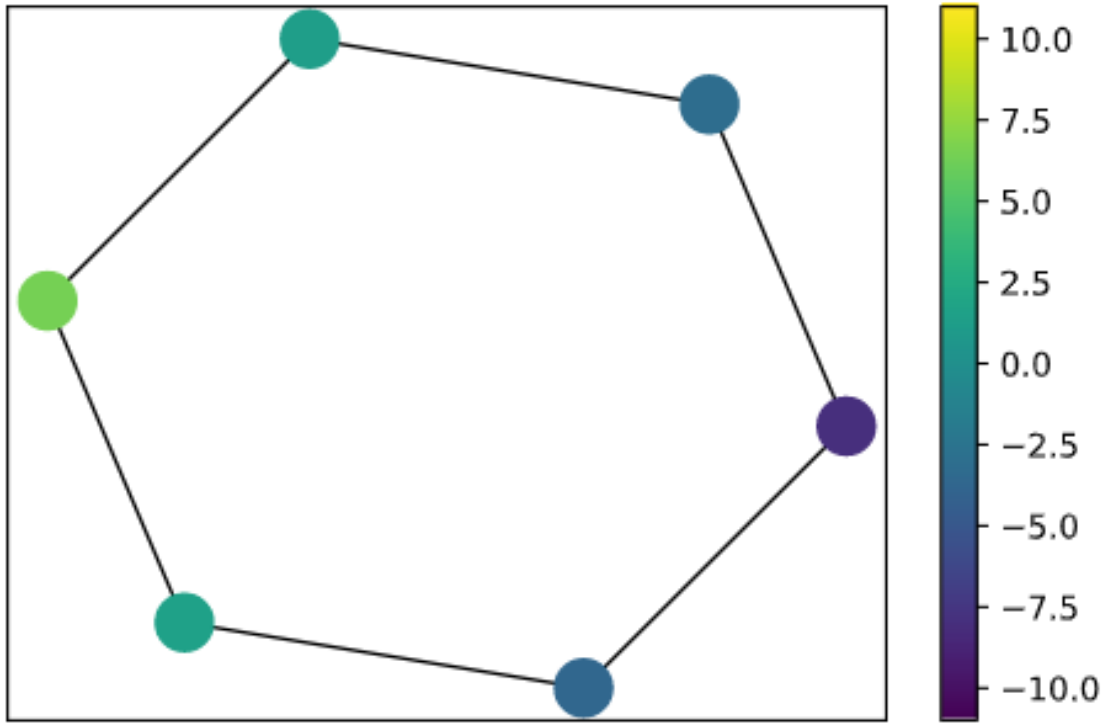
ToMATo / Gudhi
(Agglomerative, K-Means, …) / scikit-learn



Mapper nerve of clustered cover

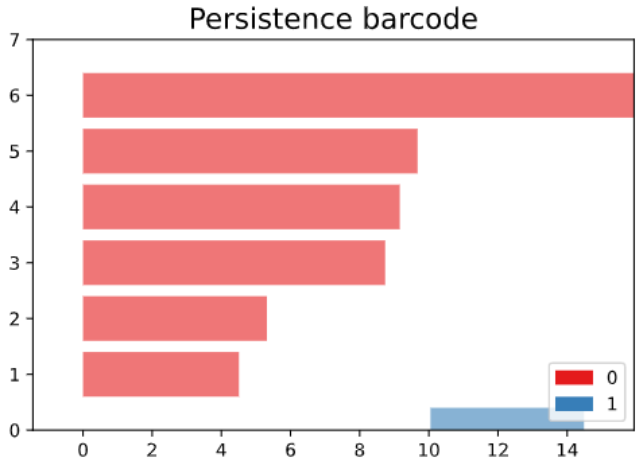
Vertices: centres of individual clusters
Edges: join overlapping clusters

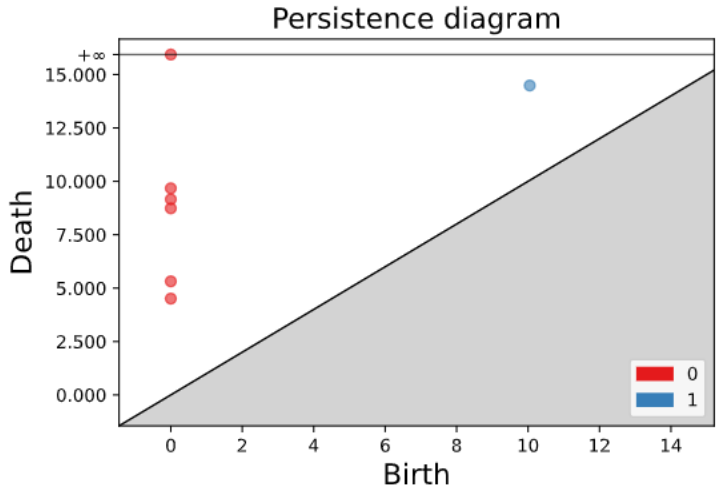




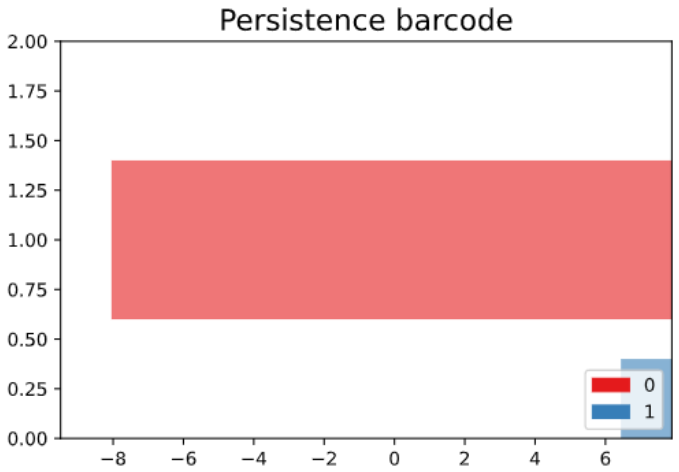
Persistent homology

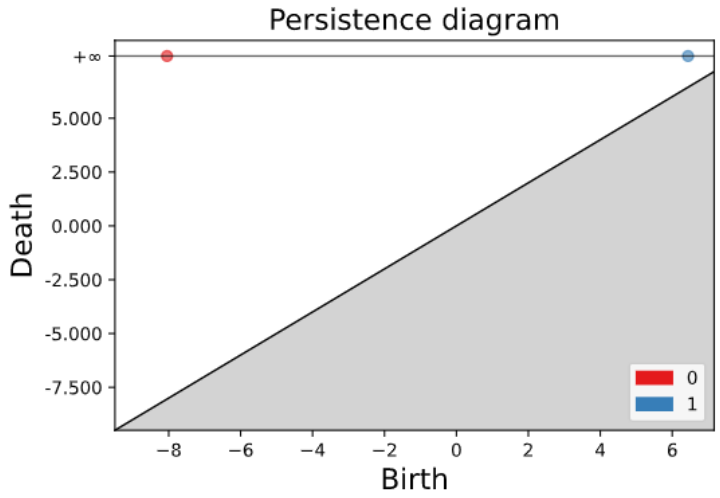
Rips filtration



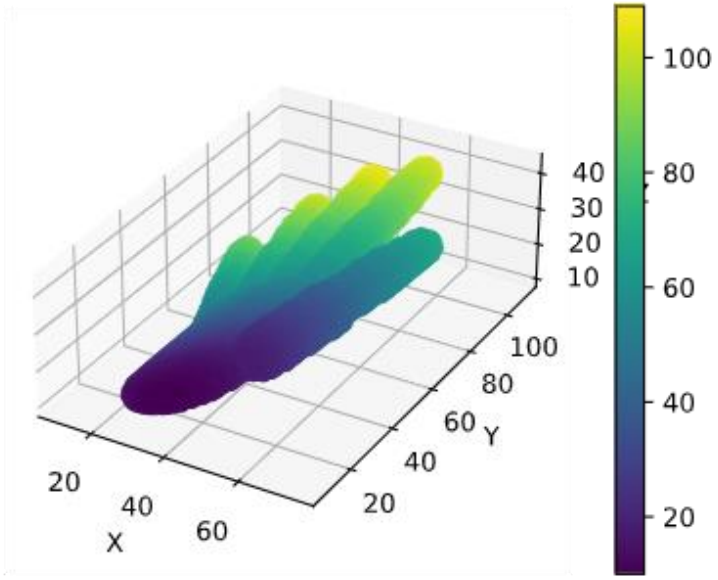


filter function filtration

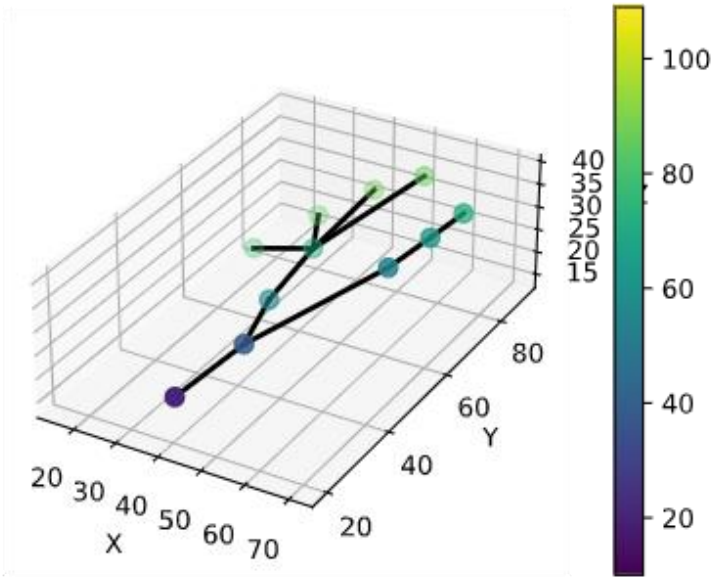




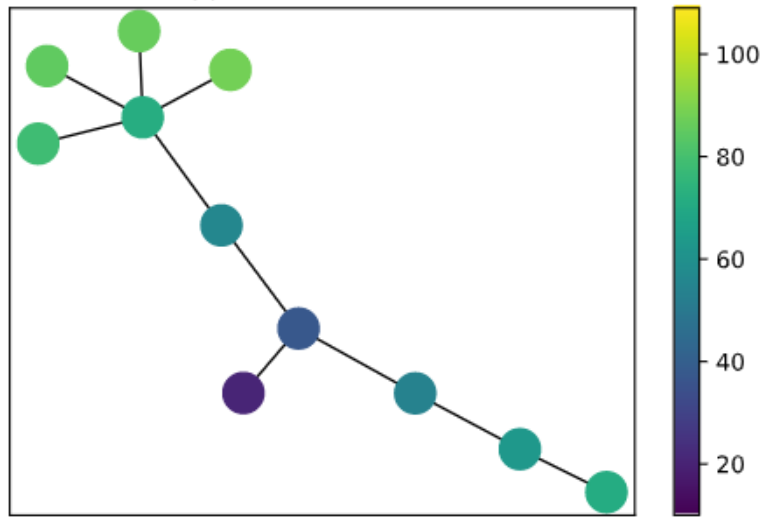
Vertices (12681)



Mapper [V = 11, E = 10]

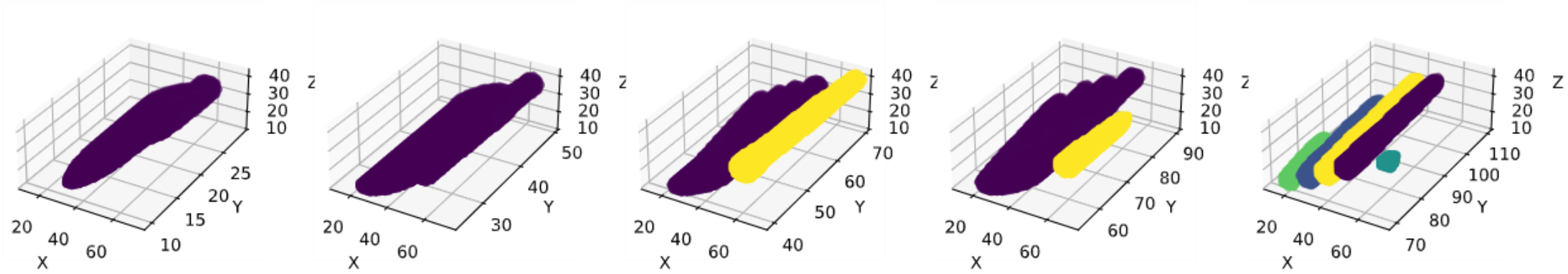


Mapper [V = 11, E = 10]

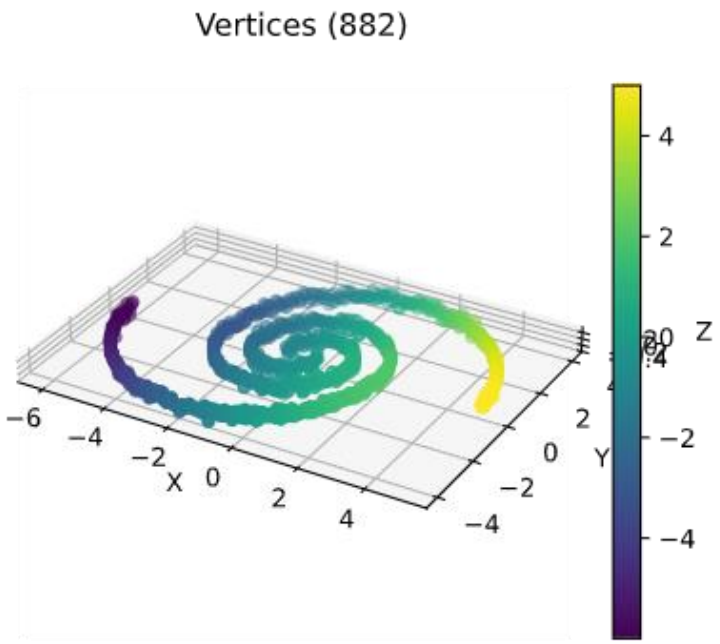


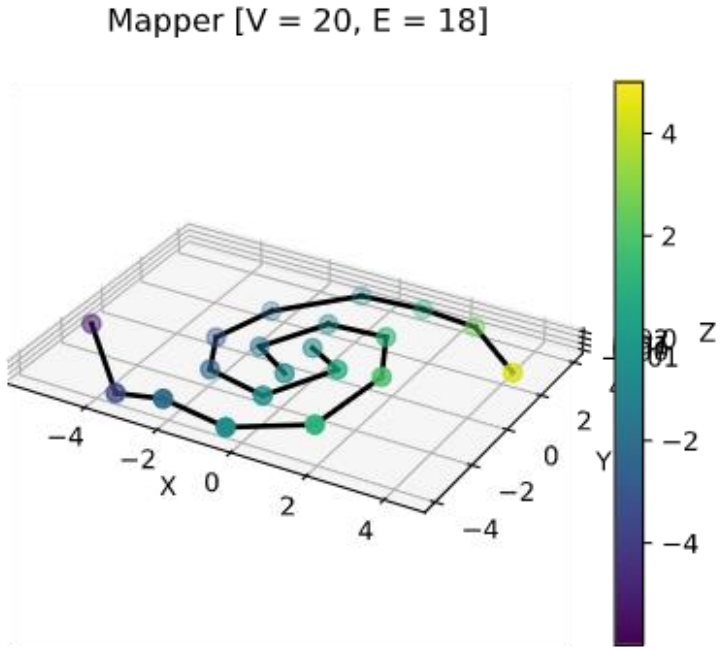
Hand

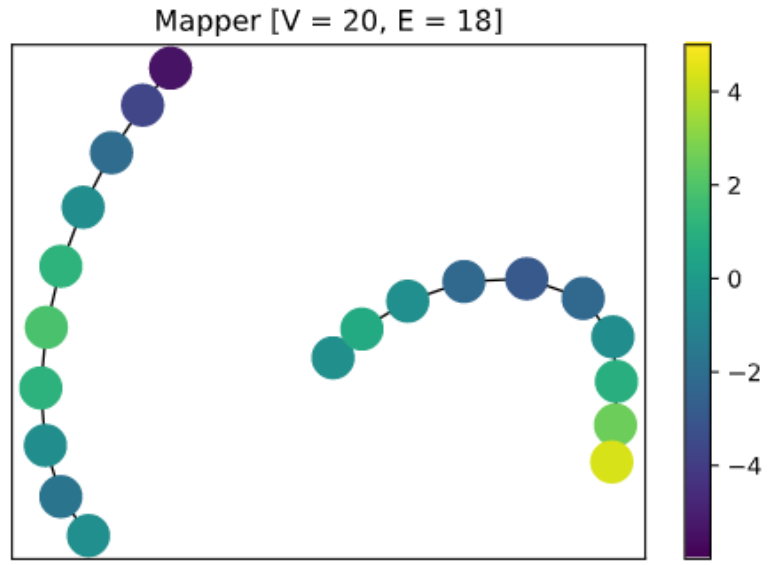
Clusters (11)

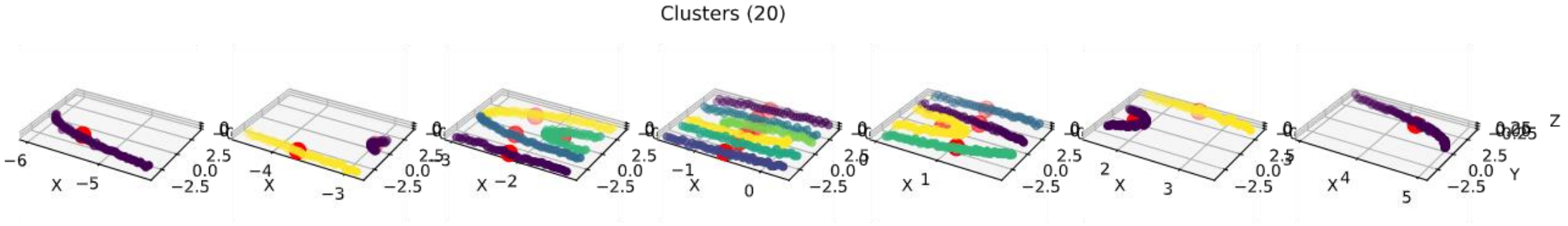


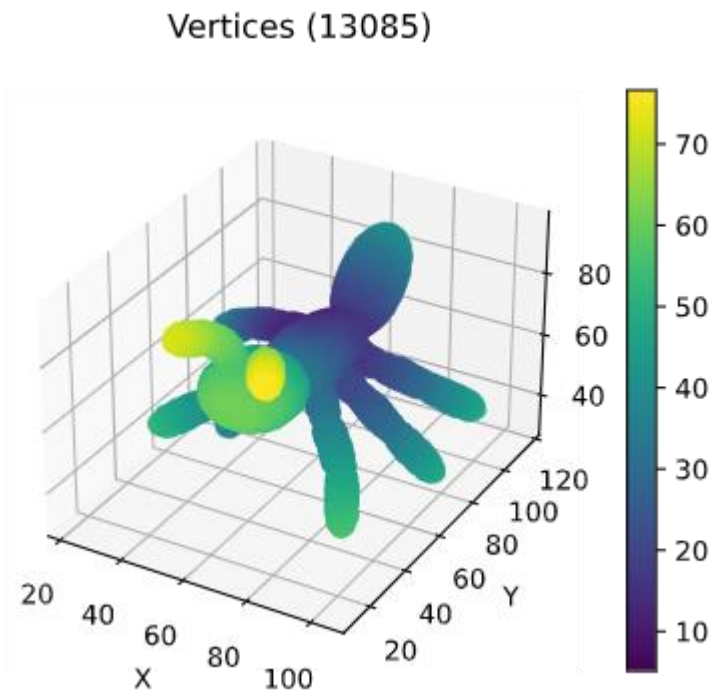
Spirals

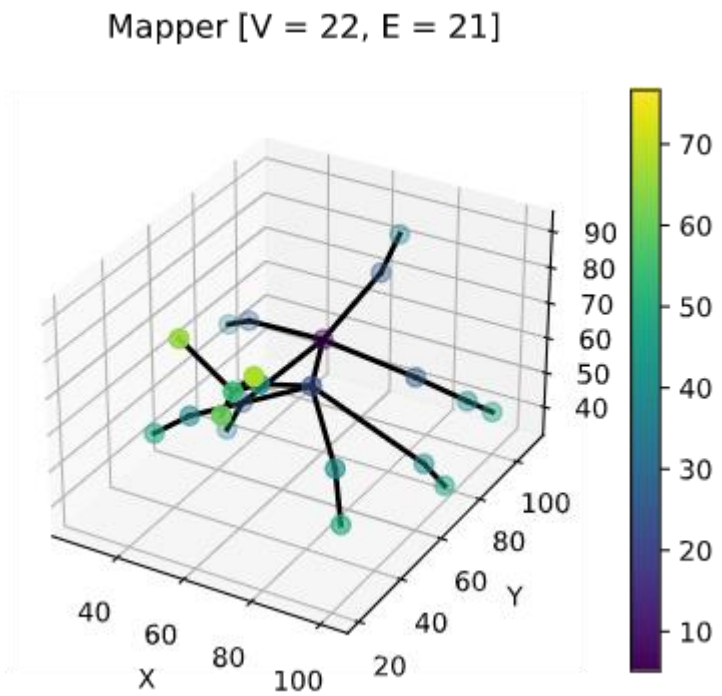

Vertices (882)
X
Y
Z

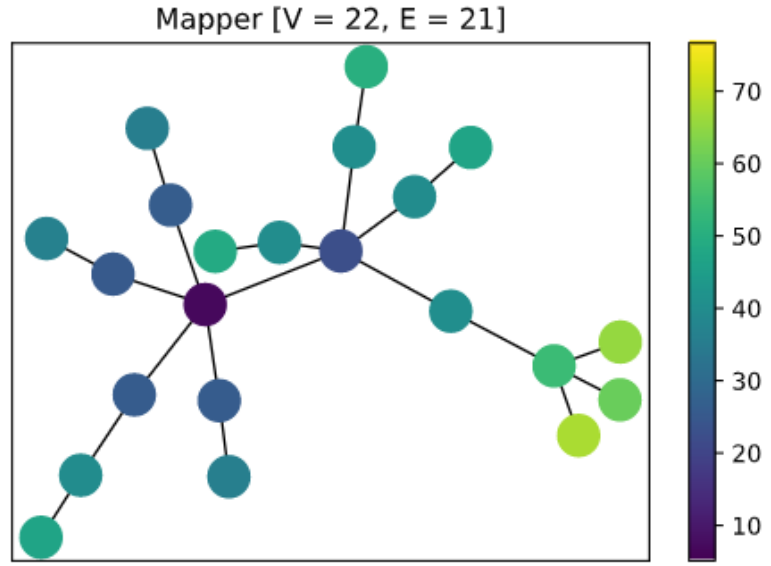

Mapper [V = 20, E = 18]
X
Y
Z


Mapper [V = 20, E = 18]

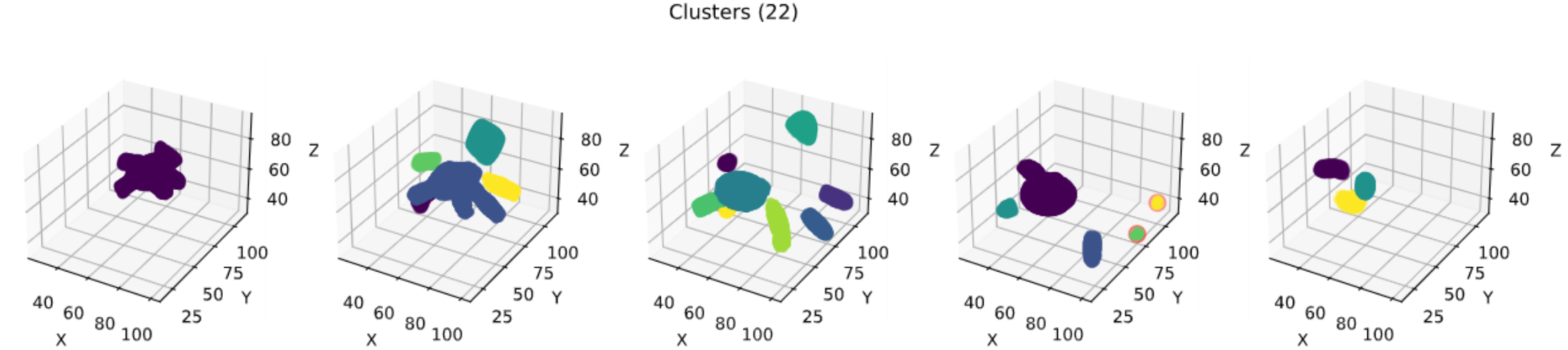

Clusters (20)
X
Y
Z


Vertices (13085)
X
Y


Mapper [V = 22, E = 21]
X
Y


Mapper [V = 22, E = 21]

Ant


Clusters (22)
X
Y
Z

Conclusion

- Filter function based on point cloud design
- ToMATo clustering works best as default
- Important to experiment with parameters

- Try it out by cloning:

https://github.com/janarez/mapper