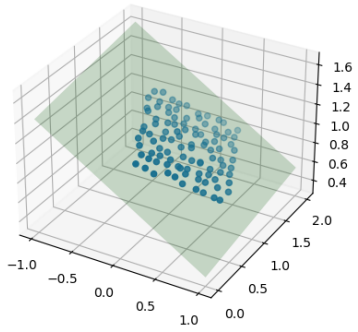
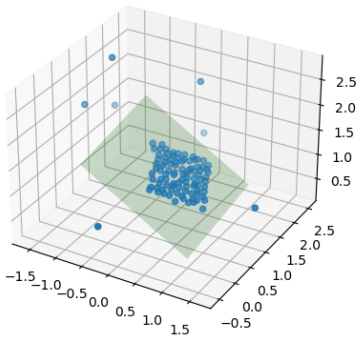
RSS
HOMEWORK 4

Q1. a)



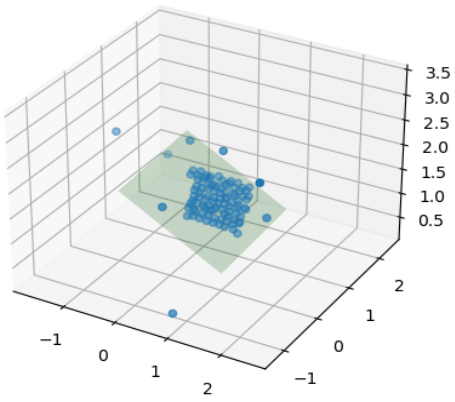
b)



b)when we introduced / added outliers in part b, then it affects the values of covariance matrix and mean. Outliers can shift away the mean from its center value. This will also affect normal vectors not perpendicular to the plane. Hence, the plane won't fit the data well. The calculated normal vec and centers in Q1 a part, will not accurately tell us about the data which contains outliers. This results in not fitting data in part b.

Hence, to handle these outliers we need RANSAC.

c)
inliers = 93



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Weaknesses –

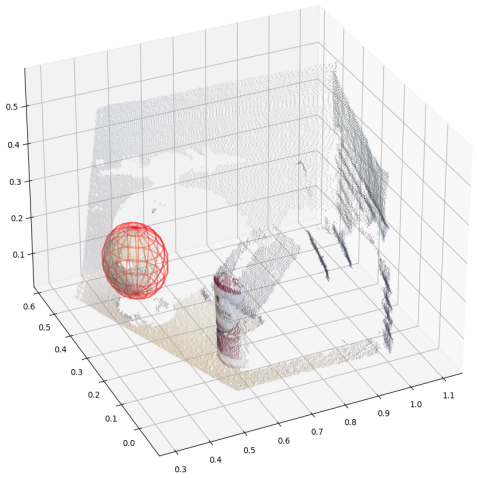
1. It requires threshold/ epsilon tuning unlike : least square method
2. Sometimes, tuning all the hyper parameters like epsilon, max_iterations results in good matching with maximum inliers. But if you fail to tune in these parameters then, you might not get good results
3. Computational cost: expensive

Strengths –

1)Works well for data containing outliers.

2)We can fit many geometrical models using ransac.

Q2)



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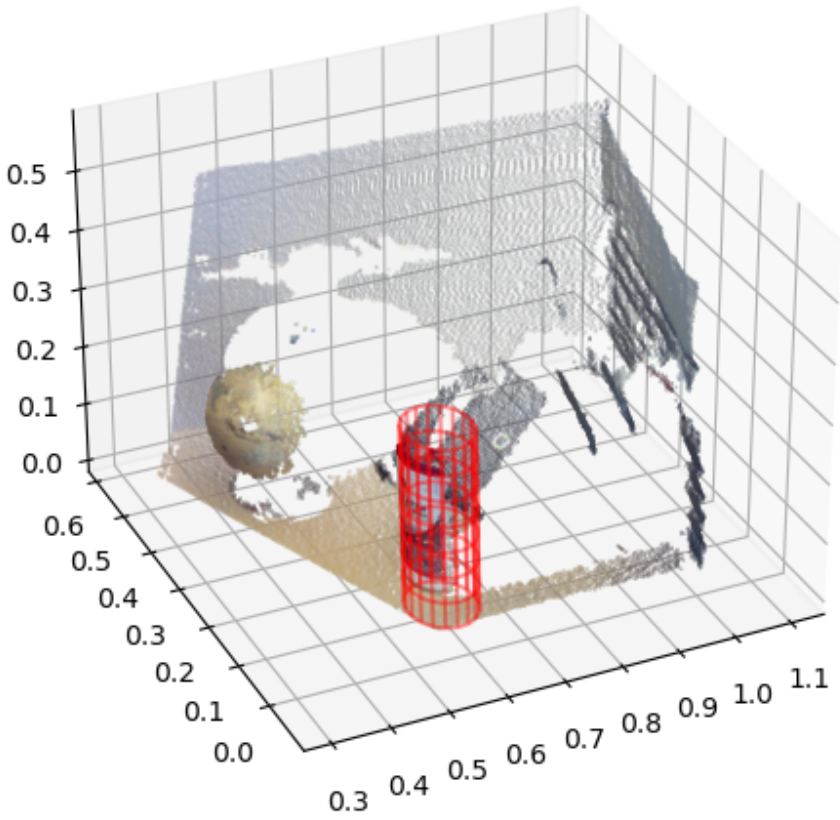
Q3)
final_axis = [-0.01226217 -0.03094715 -0.9994458]
final_radius = 0.06144475674833514
max_inliers = 16484
Total points : 16922
% inliers = 97. 41 % though the % will drop if you reduce the value of EPSILON



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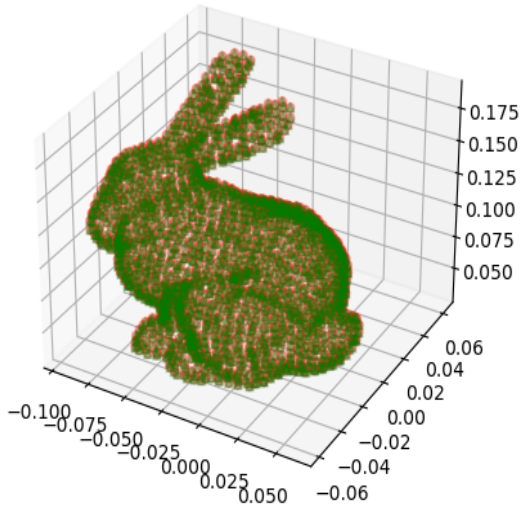
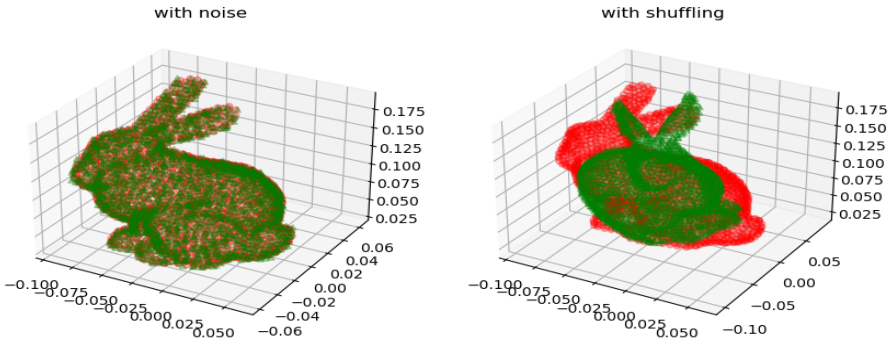
Q4 a)



b)



When Gaussian noise is added to one of the point clouds, it only affects the positions of the points but does not change their correspondence between the two point clouds.
Hence, the transformation matrix works well and aligns the 2 point clouds.
But, consider the shuffling data,
That is shuffling the order of data points, which results in the change of correspondence.
Hence, the transformation matrix wont work in this case, as it fails to correct the

transformation mat and align 2 shuffled point clouds.

c)
Not getting perfectly aligned data, but after trial and errors i was able to get this result which almost tries to align them using ICP.