I tried simple Lasso on the following model to find the rule of coefficients.

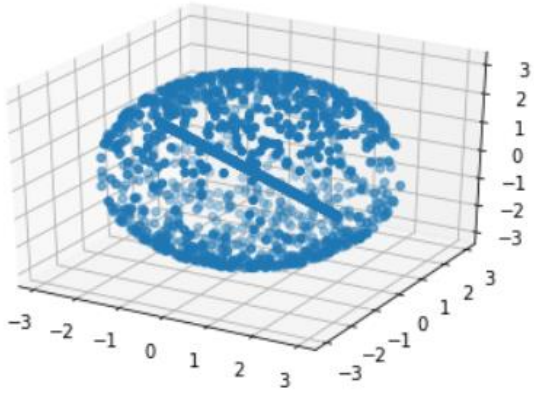

Figure 1 *A line inside a sphere, separate*

I set the parameter $\lambda = 0.0001$. This is a small value that emphasize the value of $||y - X\beta||^2$. Then something interesting happens. I check the coefficient for some points. There exist some points on the line, their coefficients for other points on the line are all 0 which means they only connect to points on the sphere. And for points on the sphere, their coefficients for points on the line are all 0, which means they only connects to sphere too. This sounds reasonable, but the result from second smallest eigenvector is not very reasonable.

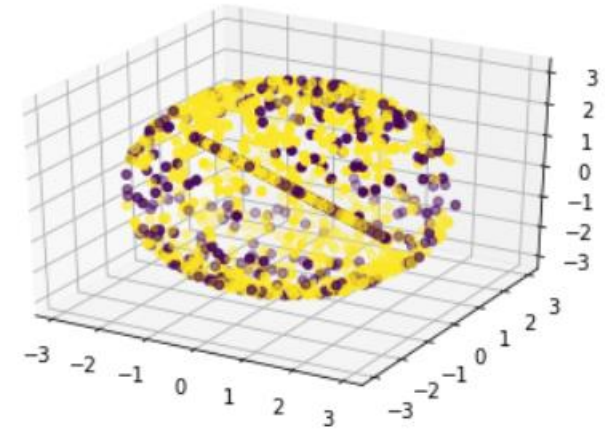

Figure2 *The color seems to be random without any rules.*

I can be sure that the code itself is correct, maybe Lasso does not perform well in this model.

And there is another question making me confused. I checked some points, but their coefficients were entirely 0. The maximum number of iteration is set to be 10000, which I think is large enough. All 0 means it performs bad, right? Points like this exist on both line and sphere. I am still thinking why this happens.

After simple lasso, I tried some combination of parameters in OWL, like $\alpha = 0.001, \beta = 0.01$ and $\alpha = 0.001, \beta = 0.0001$. Here α is λ in OSCAR weights and β is the gap. For the first combination, OWL merely did anything, because I found coefficients for most points are entirely 0 and I could not do clustering on this similarity matrix. The latter combination works better but still exists some points with all-0 coefficients and the clustering result is bad—only one clustering. I am a little puzzled about the all-0

situation. Does all-0 means this optimization problem has no solution? Or I should increase the iterations? Though I think 10000 iterations are enough. I will check the code again and maybe I could consult Urvashi Oswal. Maybe she once faced this kind of problem as well.