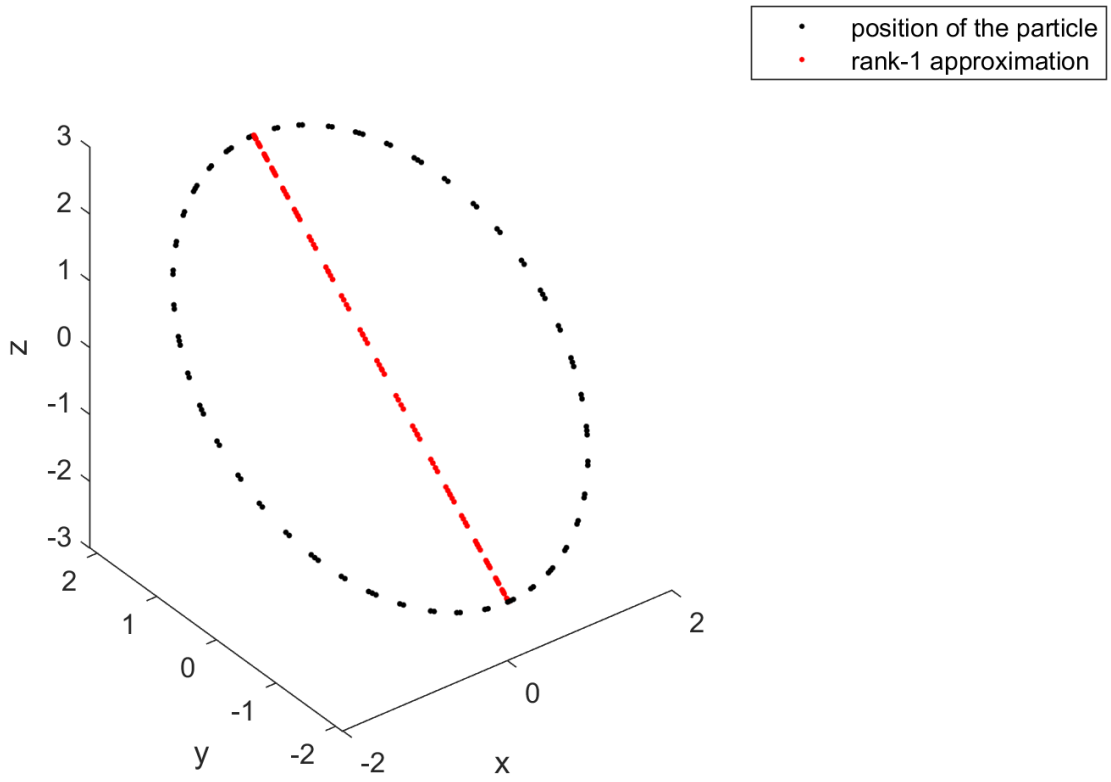
Yiming Ge

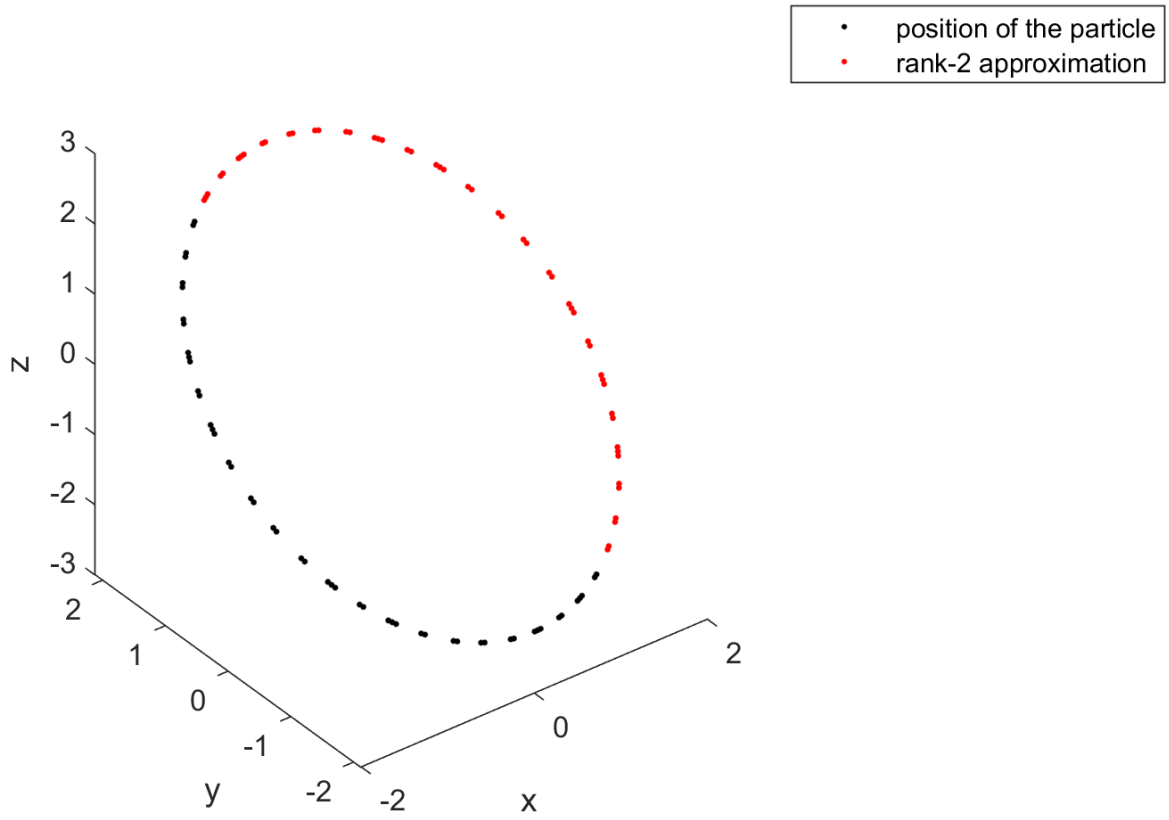
1560672

HW7 WRITEUP

Problem2



The points in the rank-1 approximation all fall on a single line. Each red point in the rank-1 approximation corresponds to one of the black data points. To get the position of the red point, you trace a path from the data point to the line on the which all of the red points fall. The path should be perpendicular to the line.

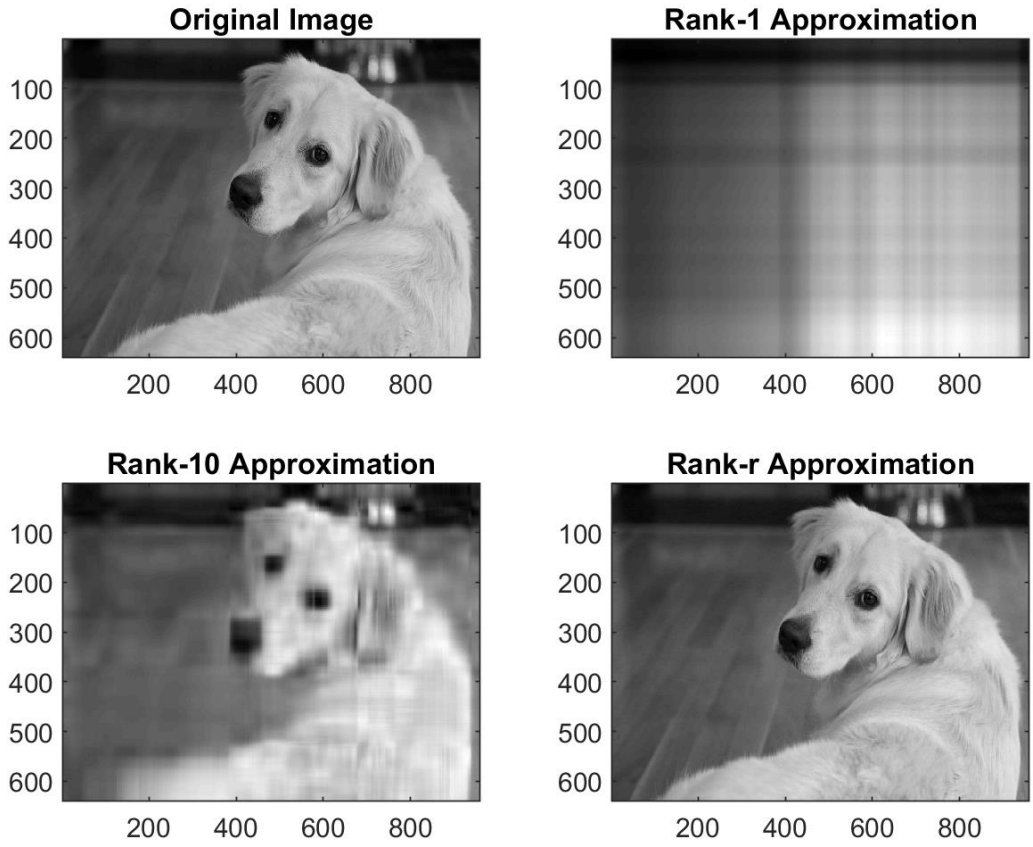


The rank-2 approximation falls on a plane. It is the plane that minimizes the perpendicular distances between the data points and the plane.

c. 2 nonzero singular values in the matrix .

It means matrix A is rank2 and the trajectory of the particles is a plane.

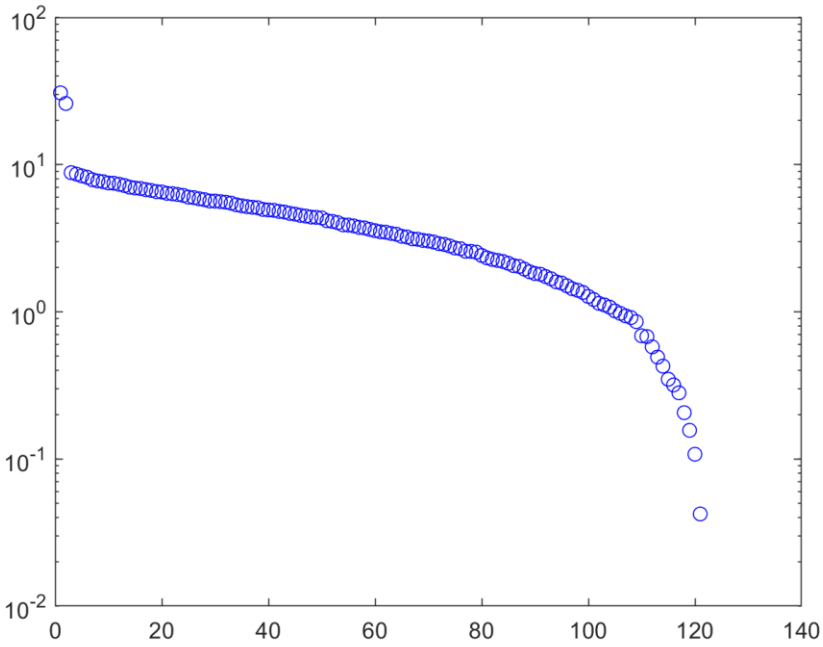
Problem4

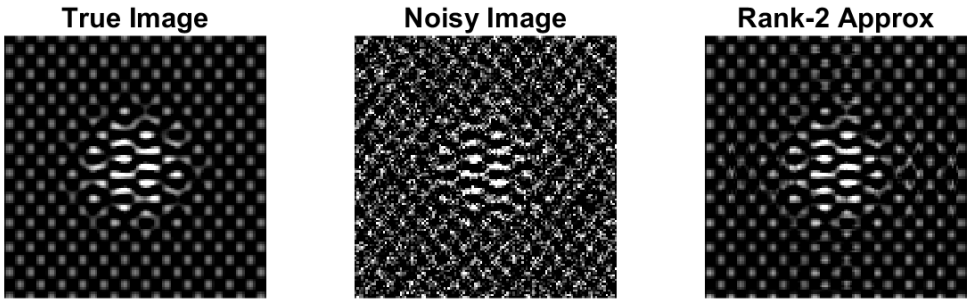


640*960=614400 pixels in the image

640*93+93+960*93=148893 values needed to store in the r-approximation

Problem 6





We can find that the first two singular values are much larger than the rest. The first two singular values carry the most information of the image but the rest carry less information.