The camera calibration and fundamental matrix estimation

Chinese Name:　林郅璇

Student ID: 1210034289

(5 points) Report M for the data in task1/.

Distance: 0.002227

Describe what relationship, if any, there is between Equation 2 as above and Equation 6 in the HW5 Notes

Final Thoughts on the Code and Equations

Equation 2 provides the theoretical model for the transformation of 3D points to 2D image coordinates.

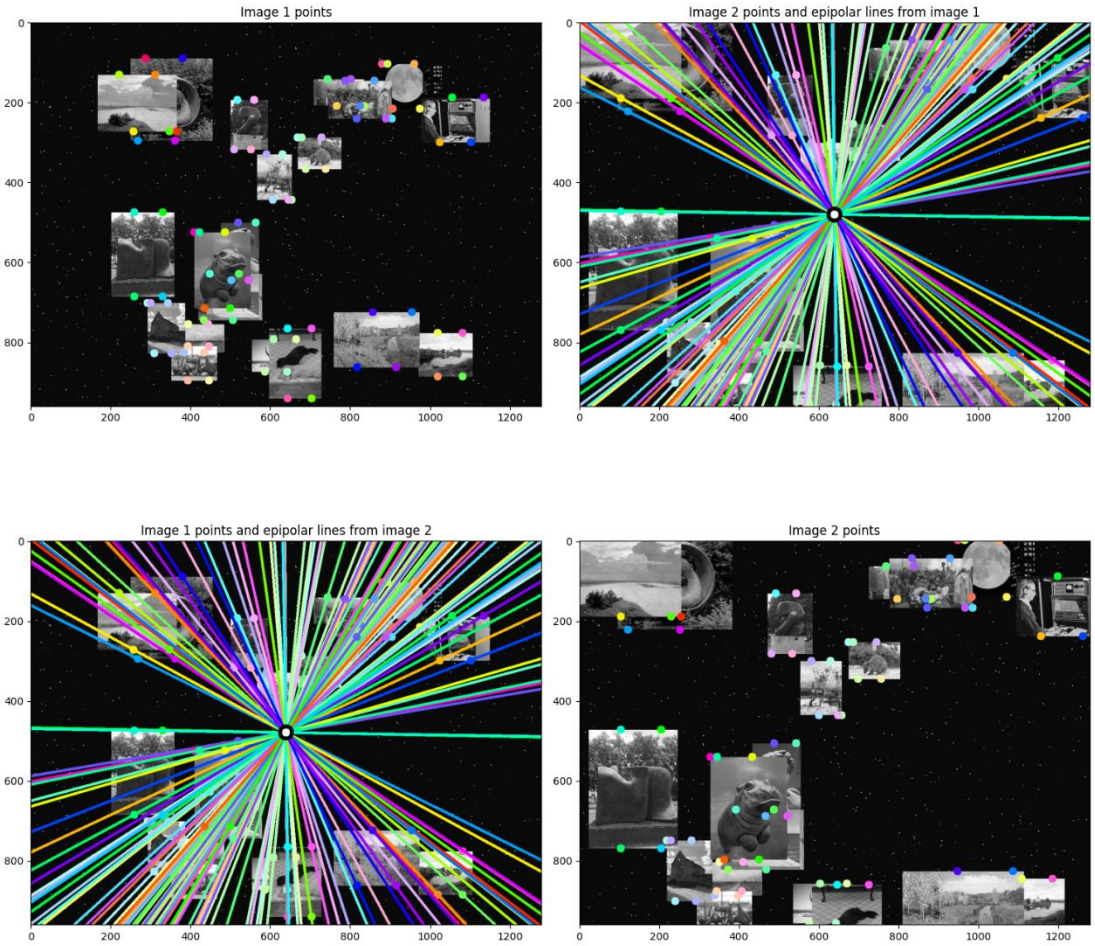
Equation 6 is the practical system derived from multiple 2D-3D correspondences, which is solved to find the camera projection matrix M*M*.

The find_projection() function in the code is essentially implementing the solution to Equation 6.

The compute_distance() function uses the projection matrix M*M* (found through Equation 6) to project 3D points into 2D and calculate the error (average distance) between the projected points and actual 2D points.

Thus, the relationship is that Equation 6 provides the method to compute the matrix M*M*, and Equation 2 describes how to use M*M* to project 3D points into 2D image coordinates. The code demonstrates both the process of computing M*M* and using it to evaluate the projection accuracy.

Show epipolar lines for temple, reallyInwards, and another dataset of your choice.



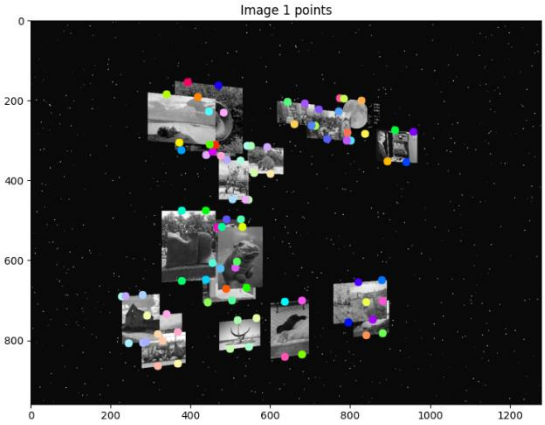


Image 1 points
0
200
400
600
800
0
200
400
600
800
1000
1200

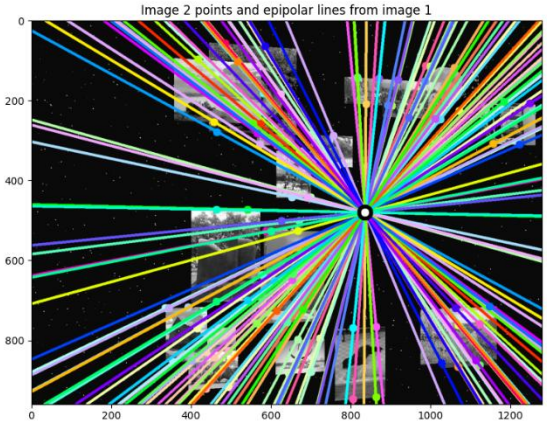


Image 2 points and epipolar lines from image 1
0
200
400
600
800
0
200
400
600
800
1000
1200

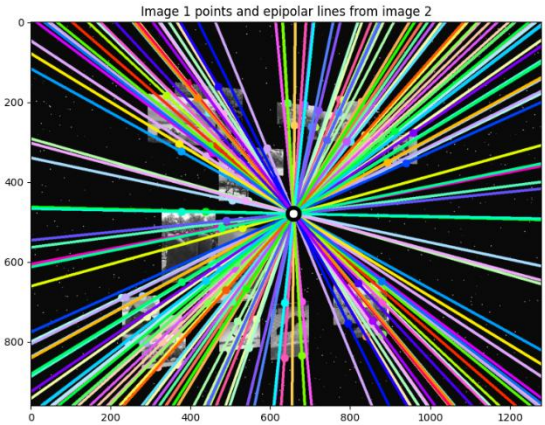


Image 1 points and epipolar lines from image 2
0
200
400
600
800
0
200
400
600
800
1000
1200

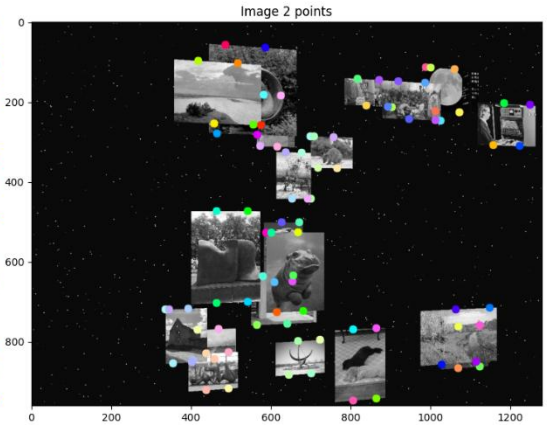


Image 2 points
0
200
400
600
800
0
200
400
600
800
1000
1200

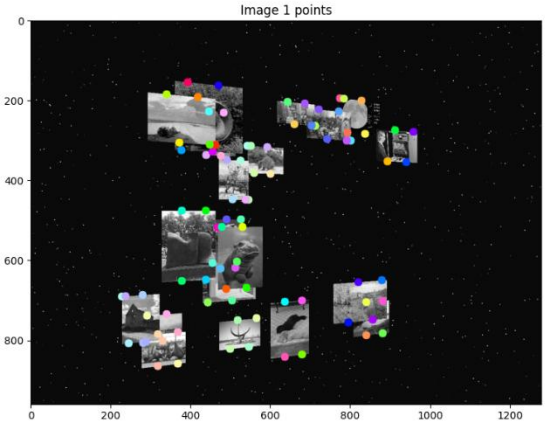


Image 1 points
0
200
400
600
800
0
200
400
600
800
1000
1200

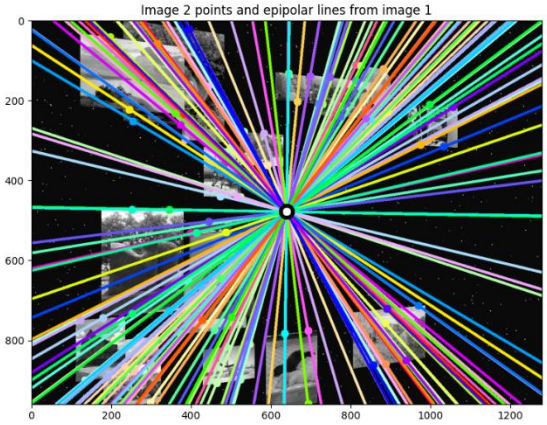


Image 2 points and epipolar lines from image 1
0
200
400
600
800
0
200
400
600
800
1000
1200

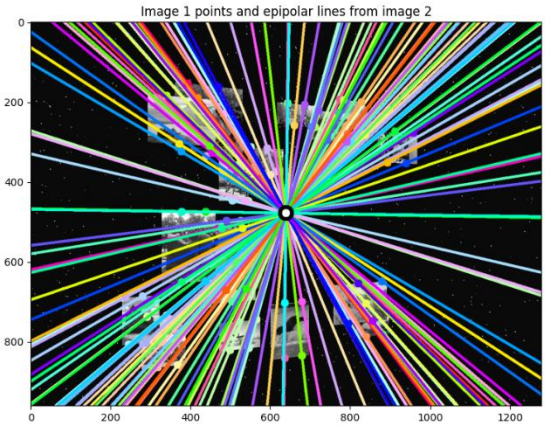


Image 1 points and epipolar lines from image 2
0
200
400
600
800
0
200
400
600
800
1000
1200

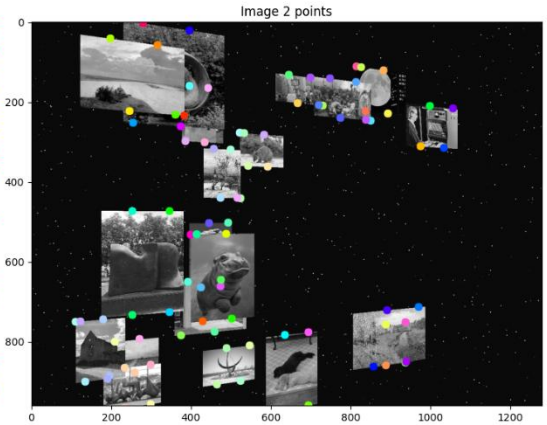


Image 2 points
0
200
400
600
800
0
200
400
600
800
1000
1200

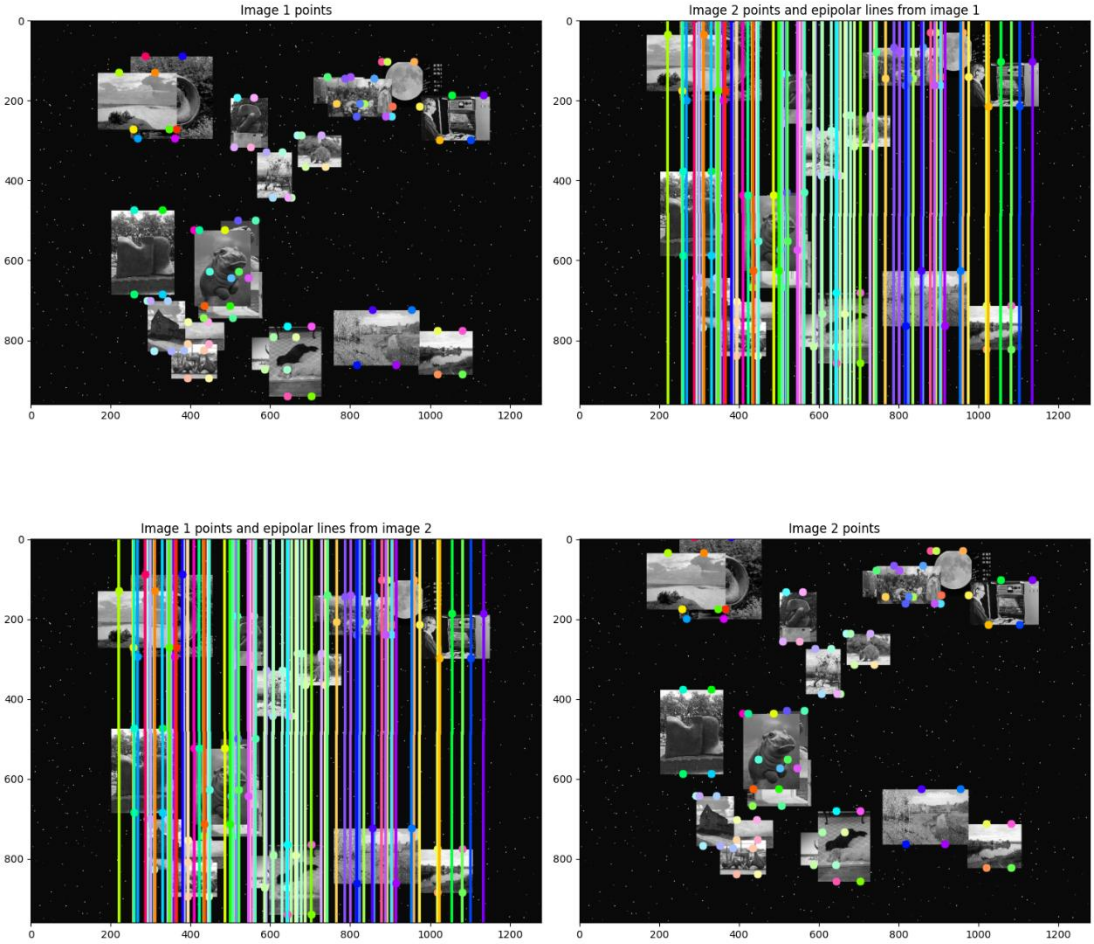


Image 1 points
Image 2 points and epipolar lines from image 1
Image 1 points and epipolar lines from image 2
Image 2 points
0
200
400
600
800
1000
1200

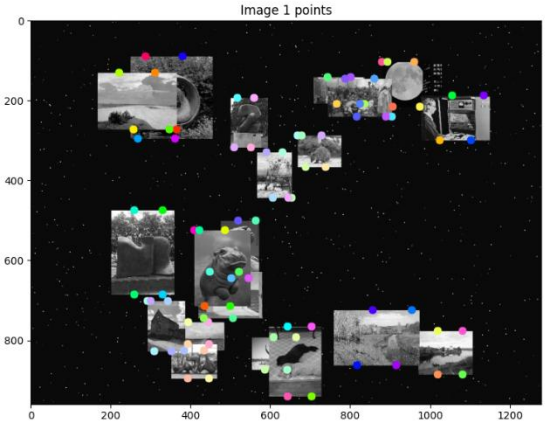


Image 1 points
0
200
400
600
800
0
200
400
600
800
1000
1200

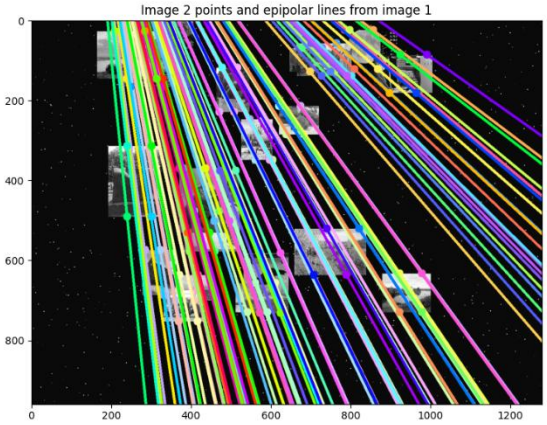


Image 2 points and epipolar lines from image 1
0
200
400
600
800
0
200
400
600
800
1000
1200

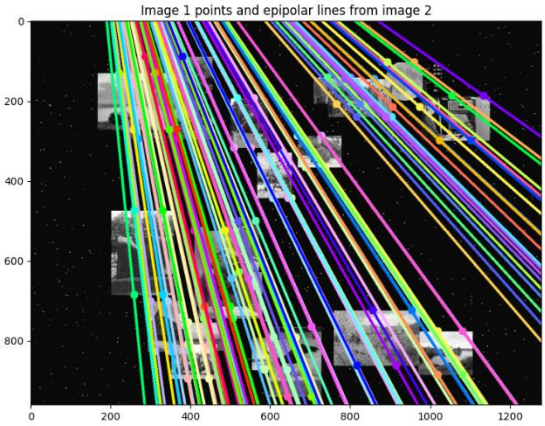


Image 1 points and epipolar lines from image 2
0
200
400
600
800
0
200
400
600
800
1000
1200

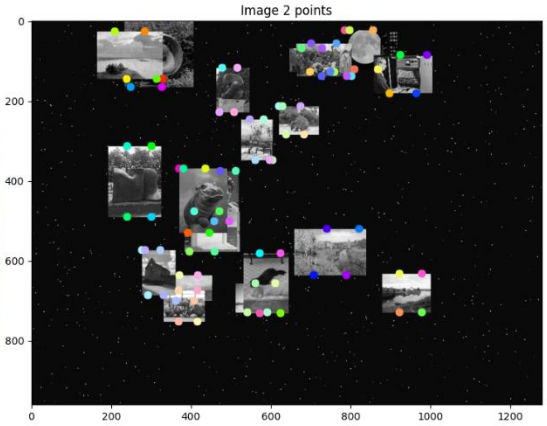


Image 2 points
0
200
400
600
800
0
200
400
600
800
1000
1200

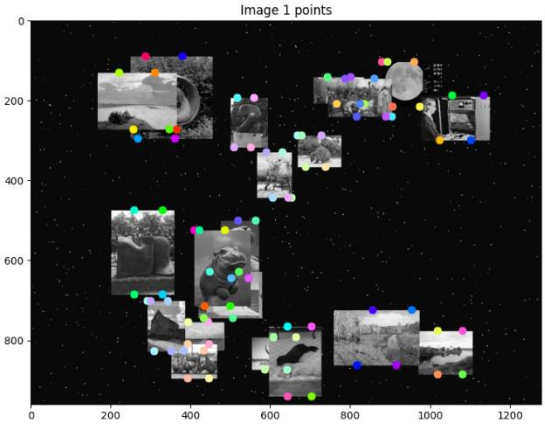


Image 1 points
0
200
400
600
800
0
200
400
600
800
1000
1200

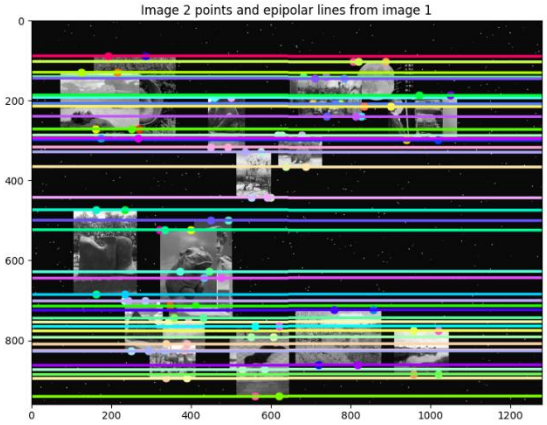


Image 2 points and epipolar lines from image 1
0
200
400
600
800
0
200
400
600
800
1000
1200

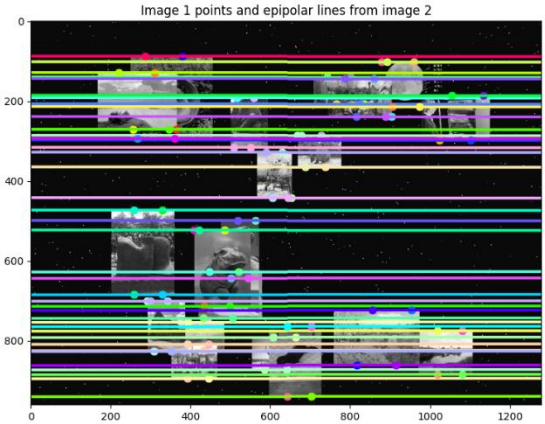


Image 1 points and epipolar lines from image 2
0
200
400
600
800
0
200
400
600
800
1000
1200

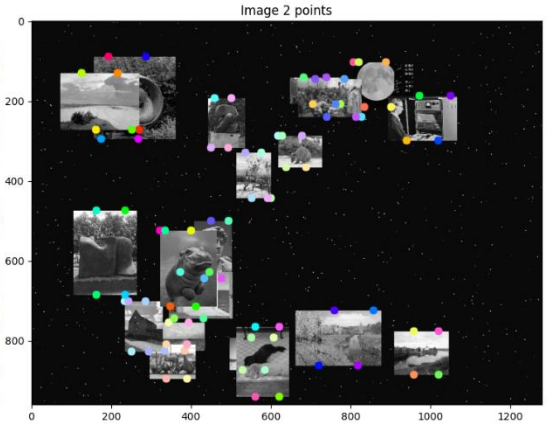


Image 2 points
0
200
400
600
800
0
200
400
600
800
1000
1200

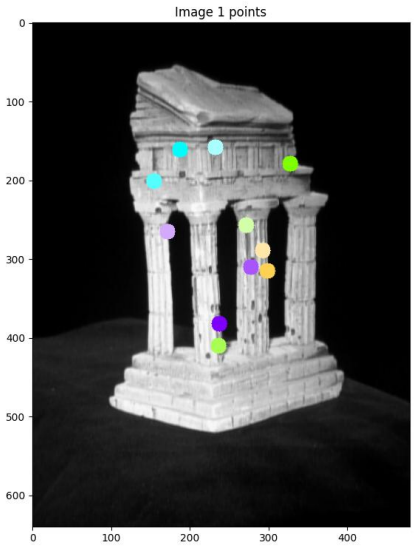


Image 1 points

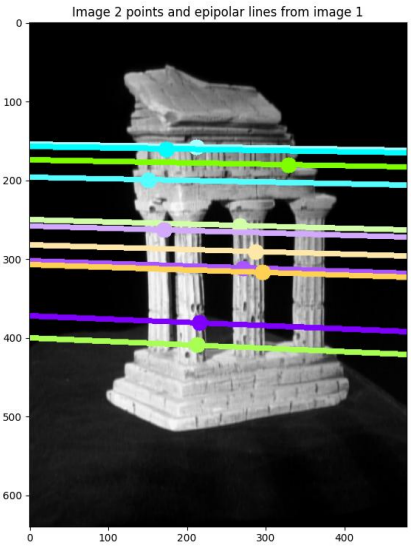


Image 2 points and epipolar lines from image 1

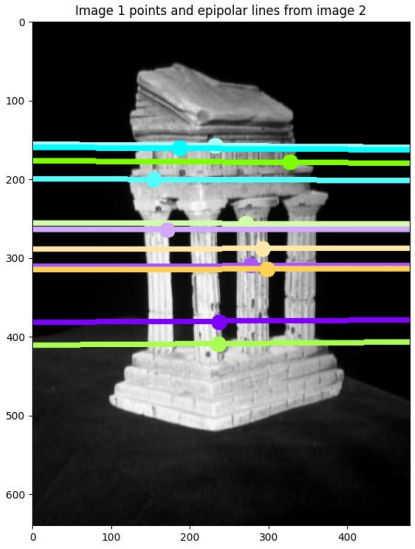


Image 1 points and epipolar lines from image 2

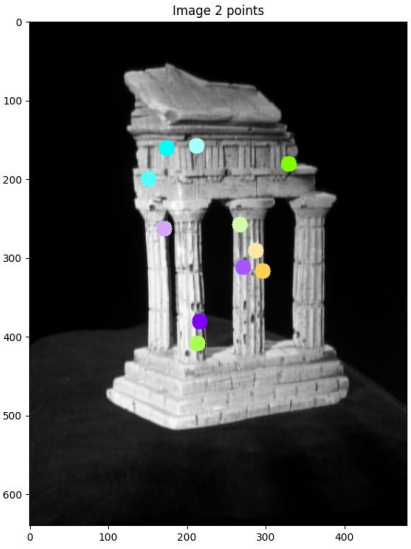


Image 2 points

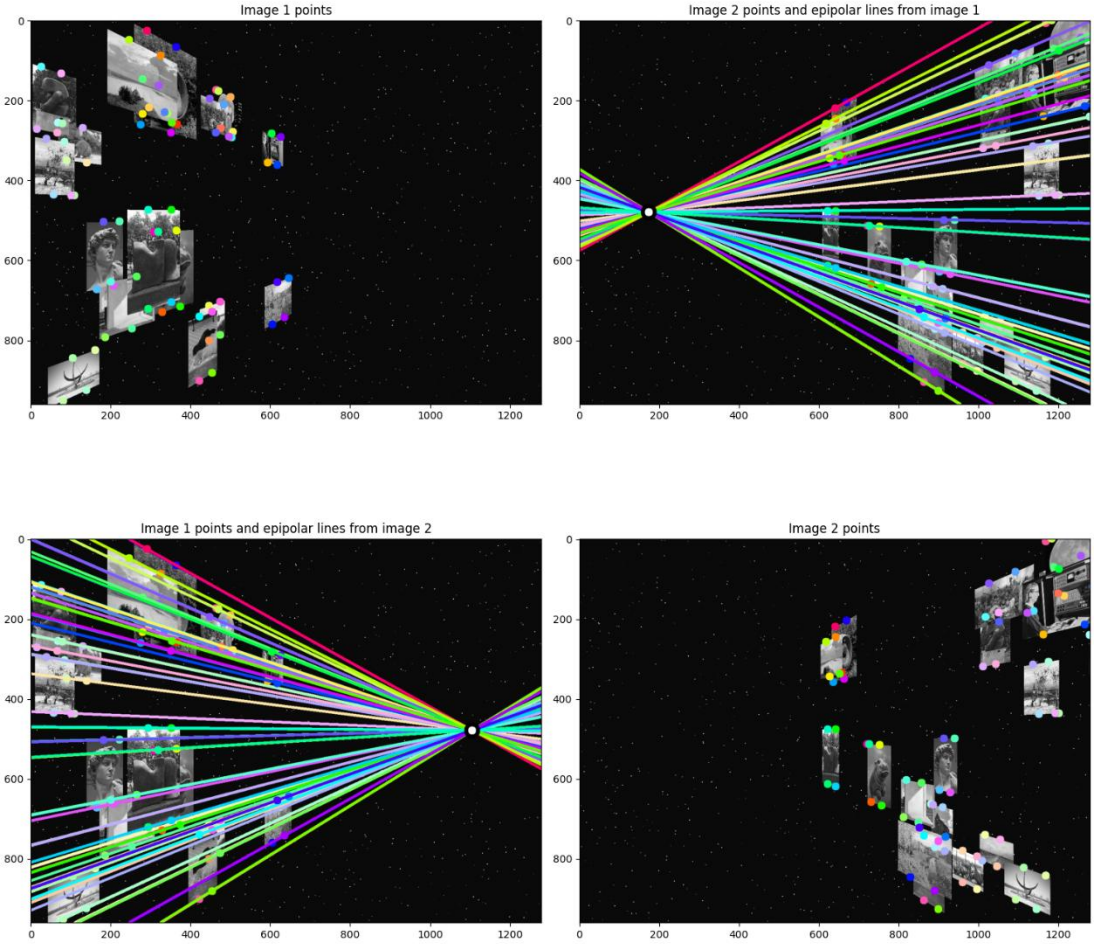
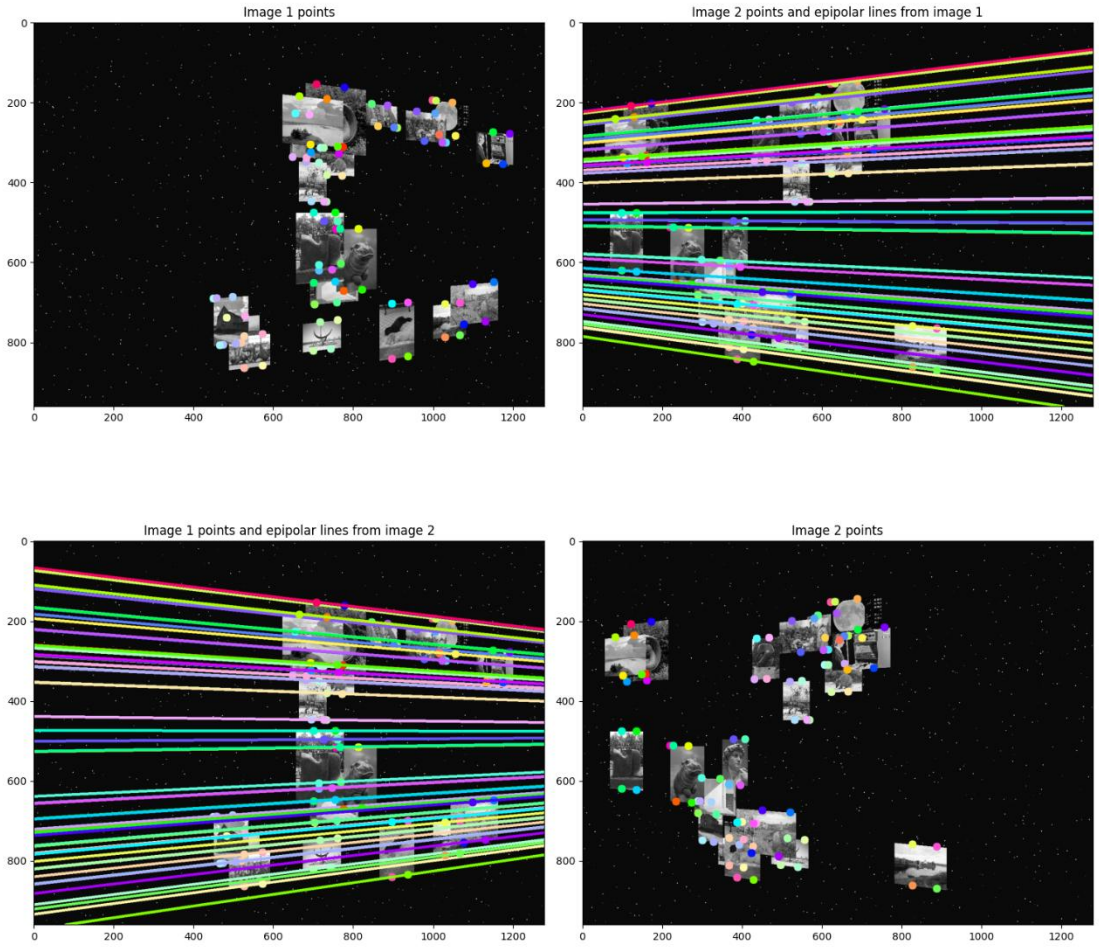


Image 1 points
Image 2 points and epipolar lines from image 1
Image 1 points and epipolar lines from image 2
Image 2 points
0
200
400
600
800
1000
1200



d) (5 points) Report the epipoles for reallyInwards and xtrans.

inwards
[-9.90142506e-01 -1.40063314e-01 -2.92177887e-04] [9.75085016e-01 -2.21831012e-01 -4.62441341e-04]

[3388.8345068 479.37684743] [-2108.55935683 479.69546011]
reallyInwards
[-9.17536702e-01 -3.97650238e-01 -8.29639118e-04] [-0.33969139 -0.94053491 -0.00196184]
[1105.94676885 479.30507302] [173.14934439 479.41457107]
temple
[-9.99832296e-01 -1.83132860e-02 -6.57542258e-05] [-9.99999963e-01 -2.50725218e-04 1.07772969e-04]
[15205.5975577 278.51116448] [-9.27876419e+03 -2.32642026e+00]
xtrans
[-1.00000000e+00 -1.24737227e-12 -2.09250367e-15] [-1.00000000e+00 -1.22586442e-12 -2.09040518e-15]
[4.77896413e+14 5.96114732e+02] [4.78376159e+14 5.86424311e+02]
xyztrans
[-0.25745578 0.9662883 -0.0018569] [0.25912035 -0.96584325 0.00185977]
[138.64786548 -520.37600745] [139.32957747 -519.33602979]
ytrans
[7.87776338e-13 1.00000000e+00 1.44328993e-15] [7.60467197e-13 1.00000000e+00 1.44328993e-15]
[5.45819880e+02 6.92861481e+14] [5.26898428e+02 6.92861481e+14]
zrtrans
[0.80038818 0.59948078 0.00125217] [-0.80044536 -0.59940442 -0.00125247]
[639.20286868 478.75498865] [639.09228036 478.57699475]
zrtransrot
[-0.80813959 -0.58898973 -0.00122691] [-0.867036 -0.49824442 -0.0010373]
[658.67761851 480.05859115] [835.85613999 480.32683581]
ztrans
[-0.79974498 -0.60033858 -0.00125132] [-0.7994553 -0.60072428 -0.0012513]
[639.12045862 479.76377148] [638.90034001 480.08055698]