Task 2

Using template1(average_face.png), we get:

true positive: 29 ,false positive: 339 ,false negative: 36
number of boxes: 368 = true positive + false positive
number of faces from ground_truth file: 65 = true positive + false negative

Using template2 (average_face_cropped.png) , we get:

true positive: 28 ,false positive: 54 ,false negative: 37
number of boxes: 82 = true positive + false positive
number of faces from ground_truth file: 65 = true positive + false negative

Looking at the statistics that we got, I would choose template2 as it gives relatively the same number of true positive cases butt reduces false positive by a significant amount. It, in general, is not a good idea to choose algorithm that gives us less number of true positives but in this case, the difference is only one while the false positive which acts as noise in data and colludes the actual data which is number of faces decreases by a huge amount from template1 to template2.

So, I would choose template2 (average_face_cropped.png).

Task 5

I wanted to explain my approach for task 5.
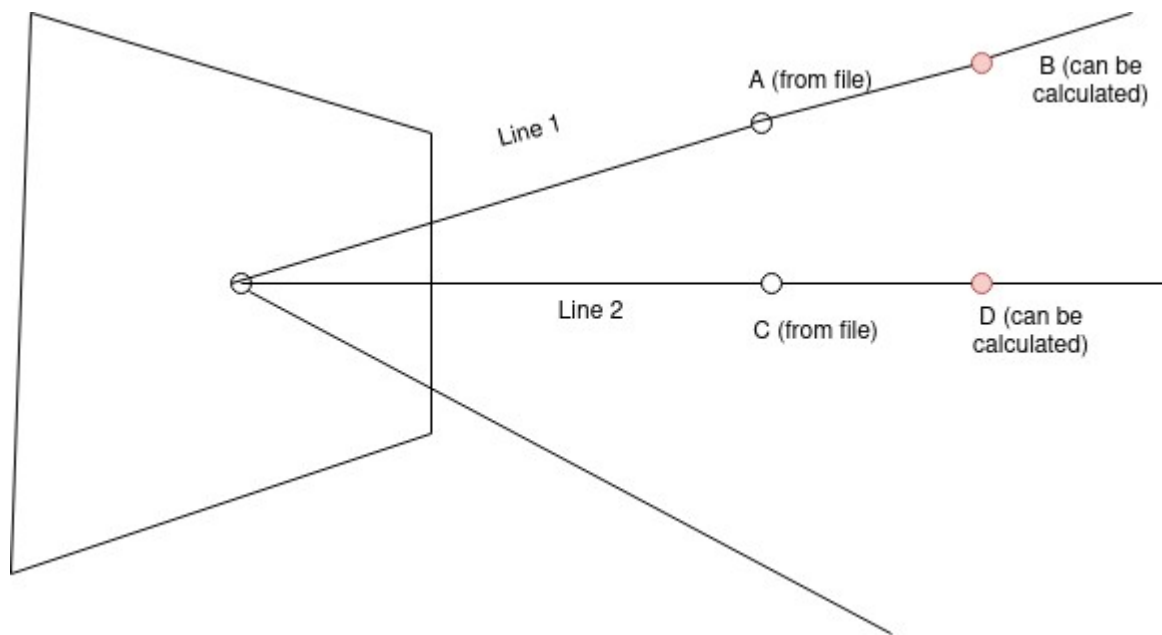
As can be seen from the picture above, for a single camera with two rays coming from two different points in space only intersect with each other at pinhole unless they overlap with each other. So, I used similar approach as Task 4 and got the equation of two lines as shown in picture and calculated their intersection.

Another approach, which is even easier, I could have taken was that I could just call the *estimate_3D_point* from Task 4 with both camera_matrix parameters as same matrix and u1,v1,u2,v2 being u's and v's from different rows in correspondences matrix. But, I wanted to calculate a little more precise value which is why I used system of linear equations to solve the problem. Later, I found out the value that I got from both approach were almost same.