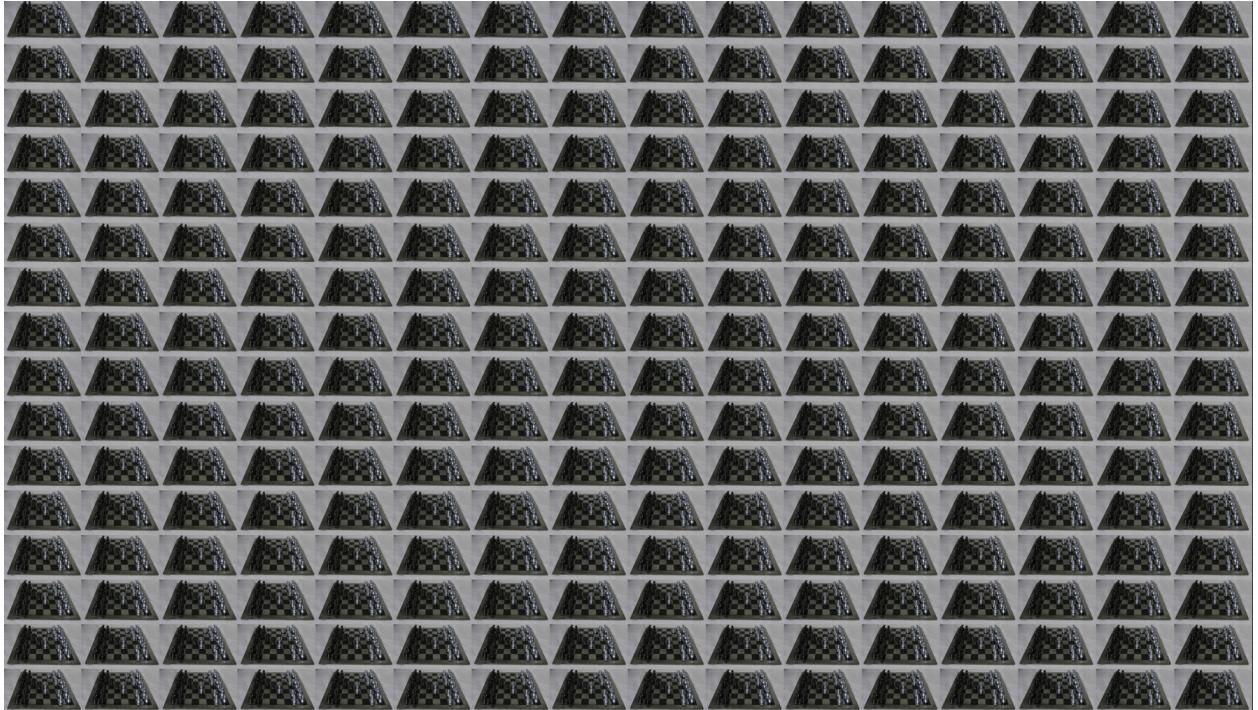
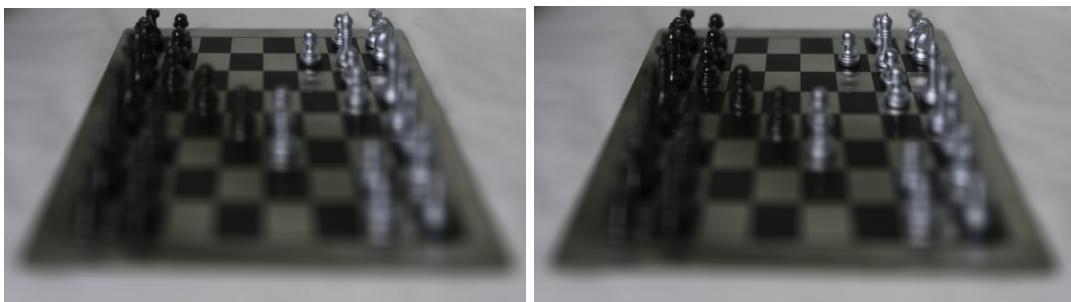


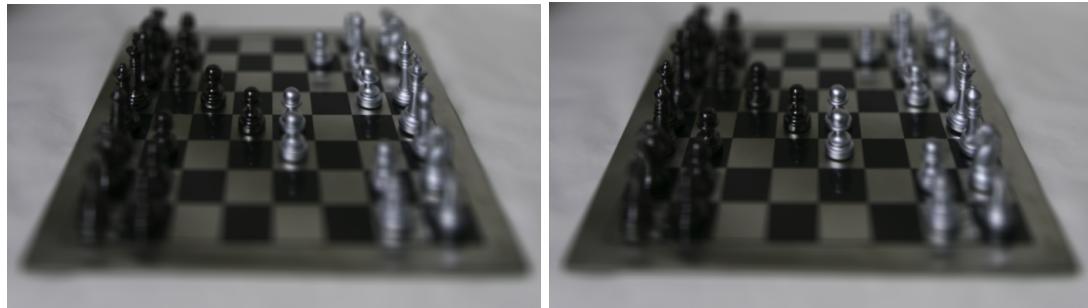
Answer 1



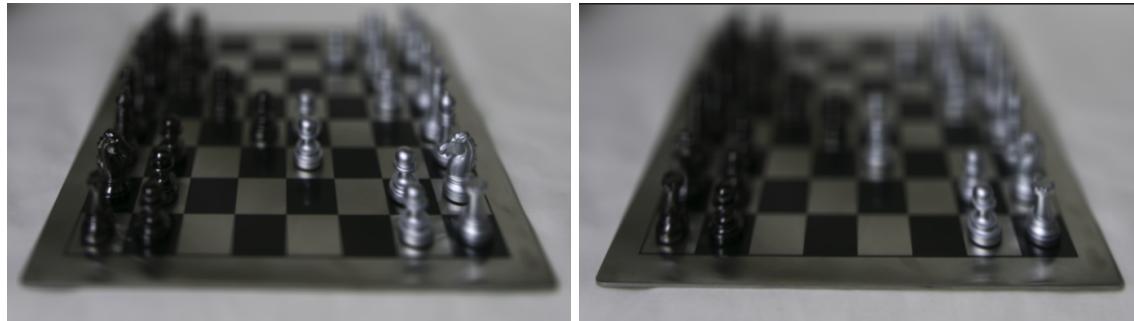
The mosaic of sub-aperture views. The rows correspond to increasing values of u and the columns correspond to increasing values of v (data/viewpoint.png)



(left to right) Focussing at $d = -0.2$ and $d = 0.0$



(left to right) Focussing at $d = 0.4$ and $d = 0.6$

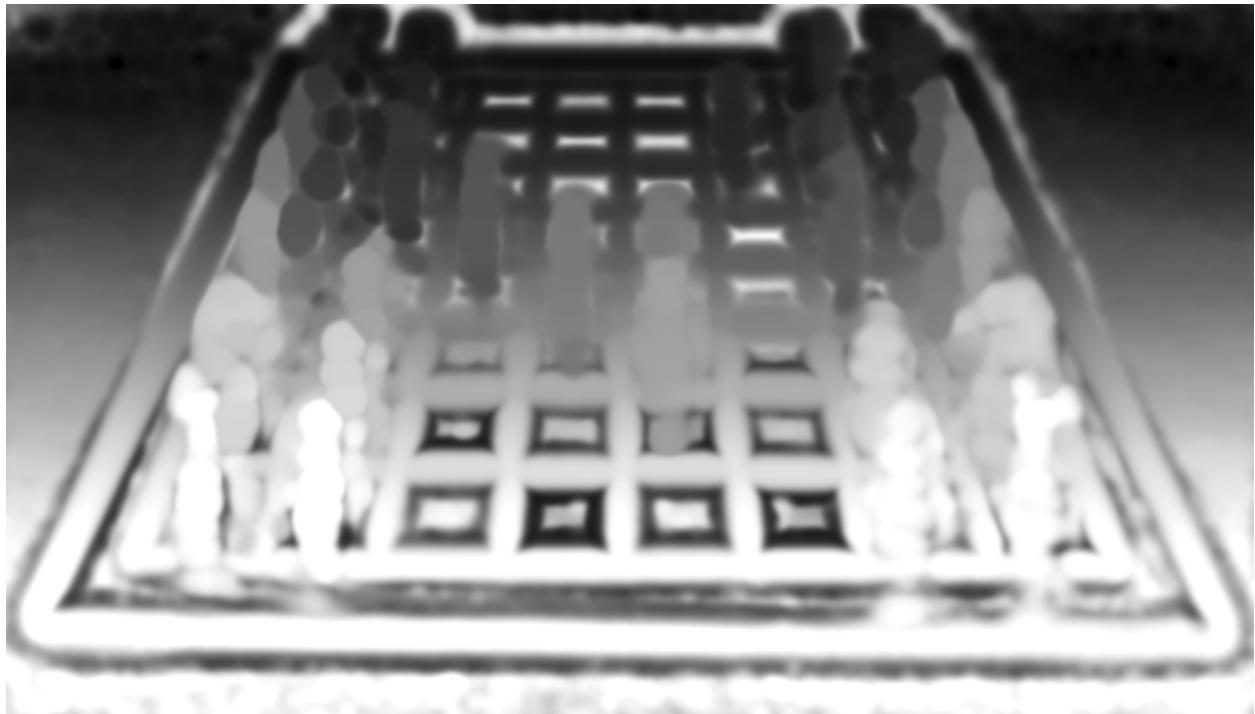


(left to right) Focussing at $d=1.0$ and $d=1.8$

All the refocused images are at `data/refocused_images/`



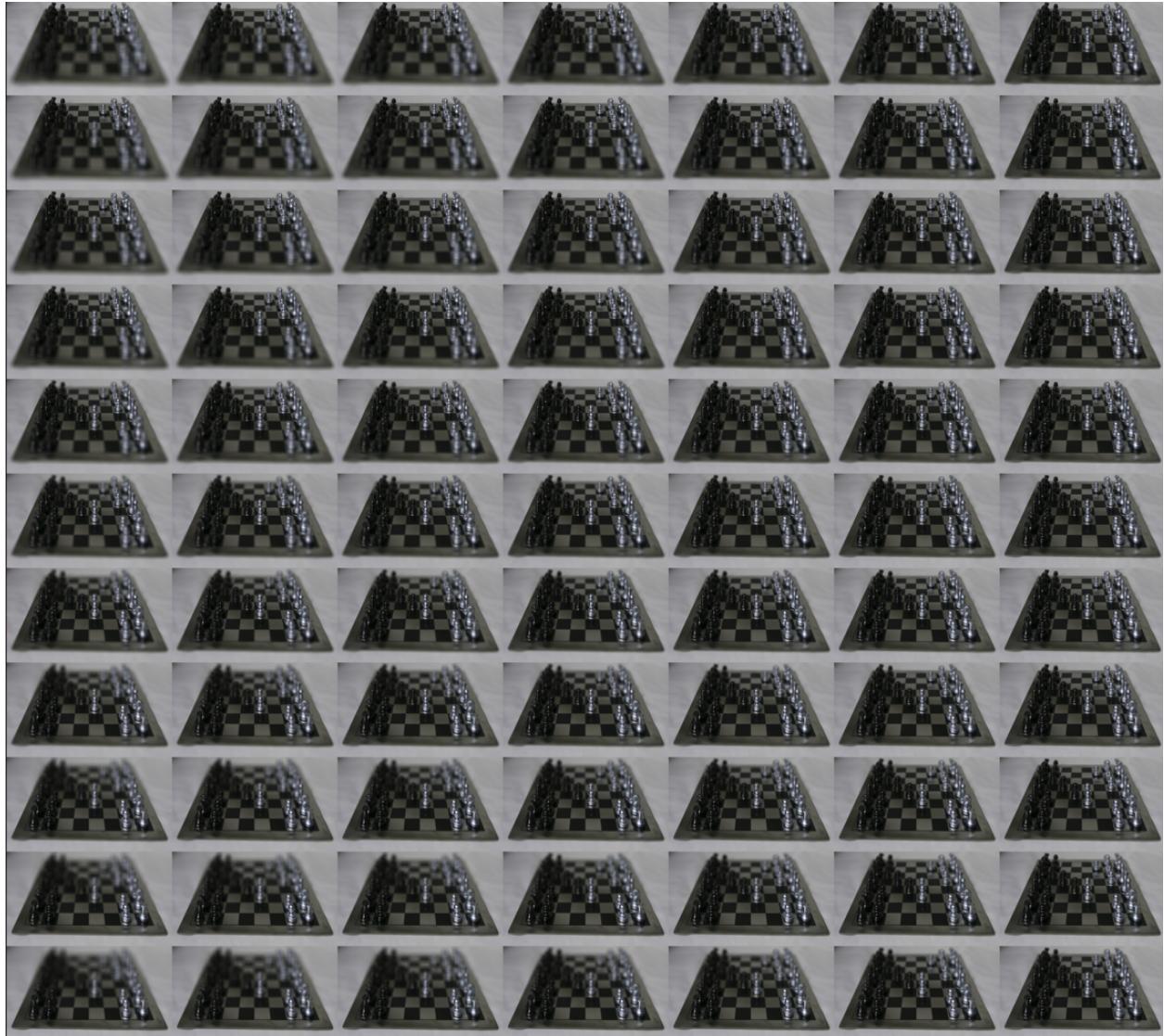
All in focus image obtained with $\sigma_1 = 1$ and $\sigma_2 = 3$ which gave the best result
(`data/allfocus_image_s1_2_s2_3.png`)



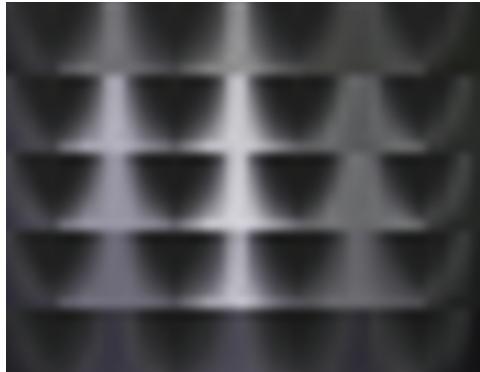
Corresponding depth map image (data/allfocus_depth_s1_1_s2_3.png)

The most prominent areas where the depth map is incorrect is on the squares of the chessboard, due to their flat texture. It's also incorrect in the background, where the texture is also flat and at the sharp edges of the chessboard. The lack of texture makes the difference between the original image and Gaussian blurred image indiscernible, which leads to the failure of the depth estimation.

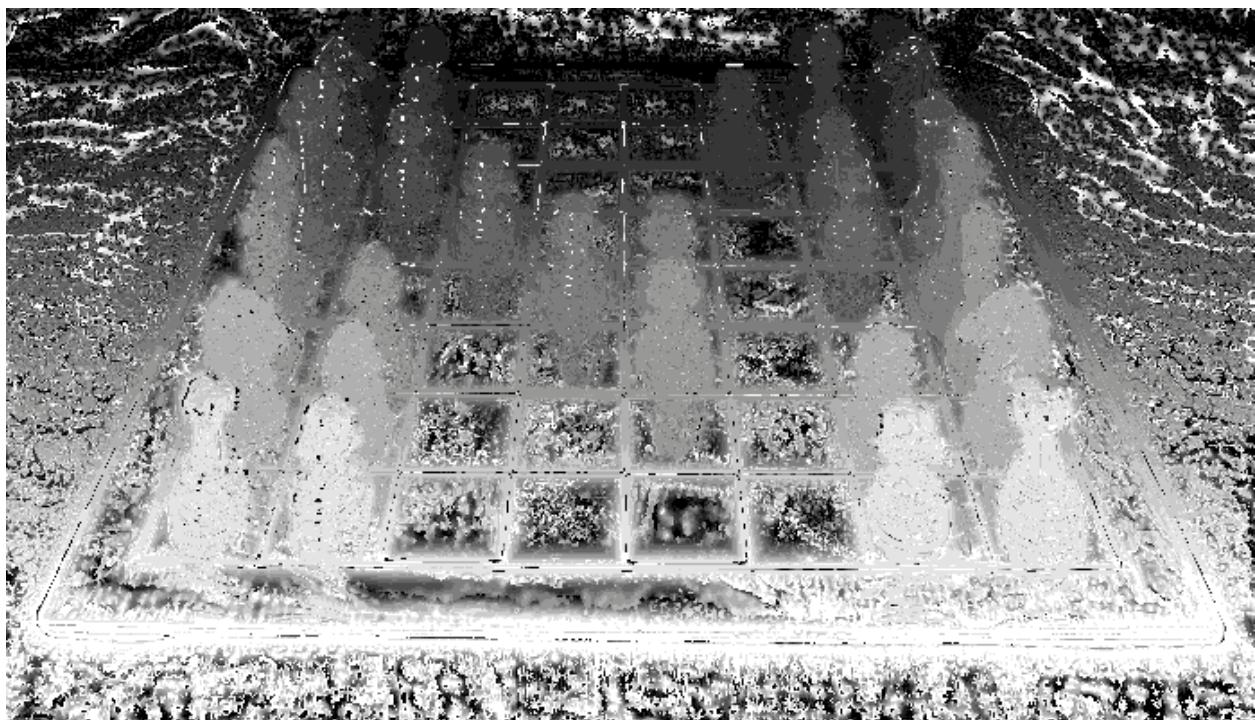
The effect of the incorrect depth estimation is not very noticeable in the all-in-focus image especially in the parts with flat texture, as it won't make a difference visually even if they are blurred. The effect of the wrong depth estimation is however noticeable at the edge of the chessboard.



Mosaic of the focus aperture stack - The columns correspond to decreasing aperture and rows correspond to increasing depth (data/focal_aperture_collage.png)



Examples of AFI for 20 pixels. The sharp boundaries indicate separation between pixels. Each AFI is 7x11 (number of apertures X number focal lengths in the focus-aperture stack)
Several other examples are at data/AFI/ and a collage is at data/AFI_mosaic.png -> you can zoom into this collage to see the AFI for every pixel



Confocal depth map (data/confocal_depth.png)

At first glance, the confocal depth map looks noisy compared to the one obtained from the focal stack. However this depth map is more accurate along the edges of the chessboard and in the background. The depth of the chess pieces is also more accurate barring the grainy noise-like artifacts.

Answer 3



Some frames from the captured video (data/video_2.mp4)

For template matching, an 80x80 patch was used around the selected focus point. The search was performed in a 200x200 window around the location of the selected point from the middle frame. Equation 9 from the writeup was then implemented using a pixel wise correlate operation, with a box filter kernel size of 3 in both cases.



(left to right) Focussing on the green bottle, the camera cover and the red bottle respectively
(data/competition_entry.png ; data/my_confocal_image_d441.png ;
data/my_confocal_image_d533.png)



Focussing on the bridge in the background led to an interesting extreme result