

Subspace Sparse Clustering

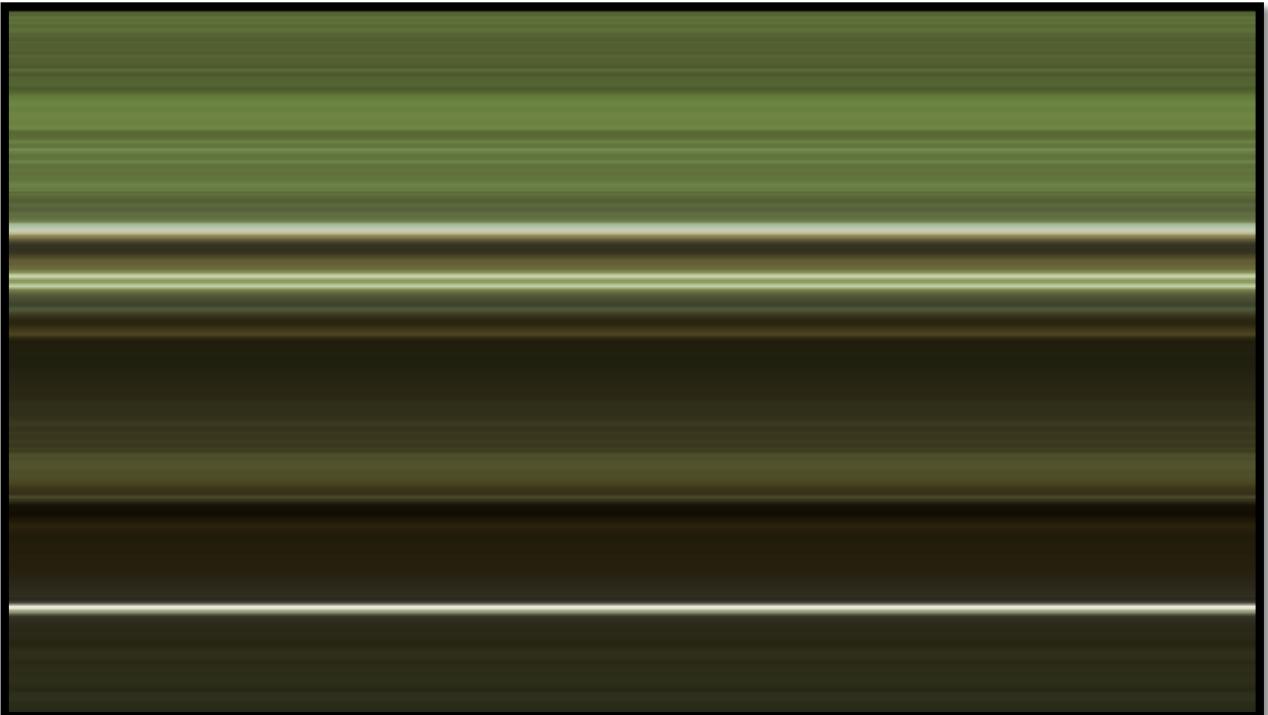
Experiment III

August 20, 2017

Idea: If a specific image \mathbf{X} from the Elephants Dream movie were selected and 50 other images were created by shifting the pixels of \mathbf{X} to the left by distinct unit pixels, how well does the SSC algorithm function? This question is very interesting to me. This is because we know that SSC algorithm is designed to be able to cluster “similar” images that are lying in a union of low-dimensional subspaces. Having constructed 50 images from the original image \mathbf{X} which all have the exact same *l1-norm* as \mathbf{X} , we can state that these 50 images are, in fact, similar to \mathbf{X} in some sense—as they all have the exact same pixels at different locations within the 360x640 picture frame.



Original Image **X**



The image generated by moving every pixel of **X** to left by one

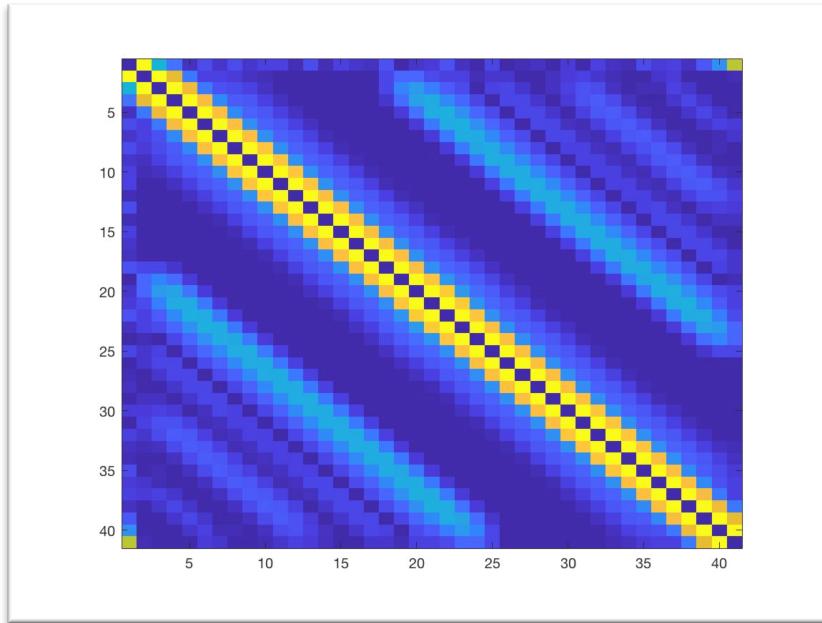


The image generated by moving every pixel of \mathbf{X} to left by two

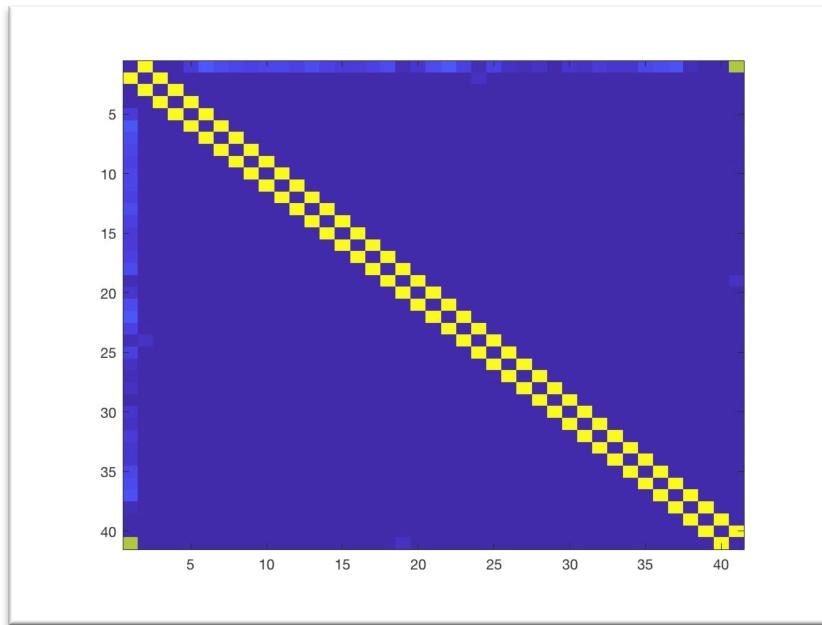


The image generated by moving every pixel of \mathbf{X} to left by three

Result:



Resulting \mathbf{W} matrix with $\rho=1000$ and $\lambda_z=1$ after 200 iter



Resulting \mathbf{W} matrix with $\rho=1000$ and $\lambda_z=0.001$ after 10000 iter

Conclusion:

As can be seen in the visual representation of the \mathbf{W} matrix above, the algorithm figured that these images are actually cluster together and every one of them have commonalities with their neighbors. This is an interesting result that simply tells us that these images are actually resemble one another. Nonetheless, one could argue that these images have no similarities whatsoever—except for their $l1$ -norms. Although it may be very rare to have such a scenario in real life—as these images are manually generated—, it is worth to notice that images that visually do not seem any similar to the naked eye might be considered otherwise by the algorithm. Having said that this sort of a situation is very unlikely to happen in real life applications, this issue **may** cause undesired results as far as clustering resembling images together is concerned.