

Computer Vision

Home Work 2:

Part 1:

The given problem is solved by implementation of three important parts, the first is the segmentation of the source image to extract foreground that is the animal, this is done by first creating a bank of filters(Already given) then we proceed by convolving each filter with our source image to get a feature list of responses with all the filters, absolute values of these values is taken and are reshaped together into resulting matrix X with each row displaying values of responses for each of the 48 filters for each and every pixel. Further part two consisted of clustering algorithm is used for clustering the pixels to get a clear indication of what is foreground and what is background. Here, K means clustering is used(self-implemented) and the resulting vector is then converted to the original dimensions of the image and passed to the third part that is transfer(Already given) of foreground extracted animal to a new background. The most important part is the clustering and convolution of filters which enables to detect the foreground from the pixels, the use of all forms of features used for filters was important in getting satisfactory results. The k means although important also is the part with most limitations, several images face some holes in the foreground and the primary reason is the drawbacks associated with k means when it comes to images k means clustering parameters need to be changed specific to the image a hand and even after that the output might not be satisfactory. The reason behind this is clustering with pixels involve some randomness which paired along with centroid selection and different iterations(k) becomes very empirical. Also, the time taken by the algorithm to converge is also quite random which sometimes spoils pre-defined calculations regarding iterations. This is true for also the highly optimized, self-implemented would require a lot of experiments to get to that level.

Part 2:

A self-implemented version of K-means is present.

Part 3:

For Dog, Original-



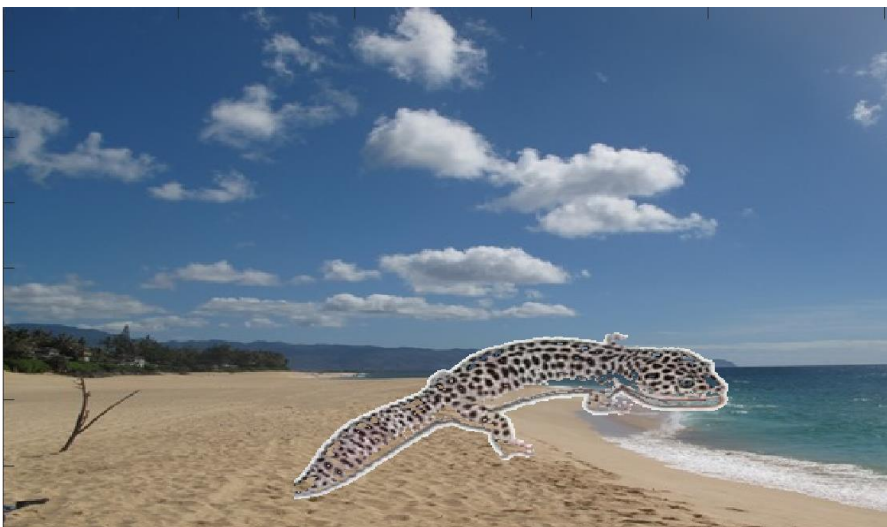
Transferred-



For Gecko, Original-



Transferred-



For Cheetah, Original-



Transferred-



Part 4:

The primary reasons for a holed image is primarily because of discrepancies in tradeoff between number of clusters and selection in foreground clusters, like the major problem I faced was with the Dog image where I had to decide between having a portion of the background creep in the new image or have the animal as having holes it can be seen in the images given below, also other problems are selecting foreground features but in few iterations of the algorithm will give very bad result images which in turn ruin the probability of getting a good segmented image. This is seen in the gecko image with almost nothing to see. Also, one of the cases is of having a value of k which is too small to get all the foreground clusters. It can be seen with the cheetah images. Improving the segmentation algorithm by adding more valid features is one of the way, also we can improve the clustering algorithm to stabilize a value of k and generalize it for animal based clustering. Also, another solution might be to trade off performance of the algorithm in exchange for complex parameters.

