# CSCE-689 Computational Photography
Programming Assignment 4

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## Image Retargeting using Seam Carving technique

This task involves resizing the image using the concept of seam carving. In particular, one of the dimensions of the image is reduced by a given factor(0.5 in all the images used here) retaining the important content and discarding the unimportant ones.

Main steps in the implementation:
1. Energy matrix E of the given image is computed using edge detection filters. For color images, energy from all the three channels is summed.
2. From the energy matrix, the energy of the seams is calculated using dynamic programming. A separate matrix is used to keep track of the seams. From this, the seam with lowest energy along the dimension to be reduced is calculated. The implementation is fixed to do seam carving in the horizontal direction. To reduce the height of the image, the given image rotated by 90 degrees is used.
3. The seam found above is removed from the image to give a new image with one column less than before.
4. The above steps are repeated with the updated image obtained in the previous step for n number of times where n is the difference in the dimension of the original image and the retargeted image required.
5. In case of images with faces, mask is used to keep the faces intact by adding the mask to the energy matrix.
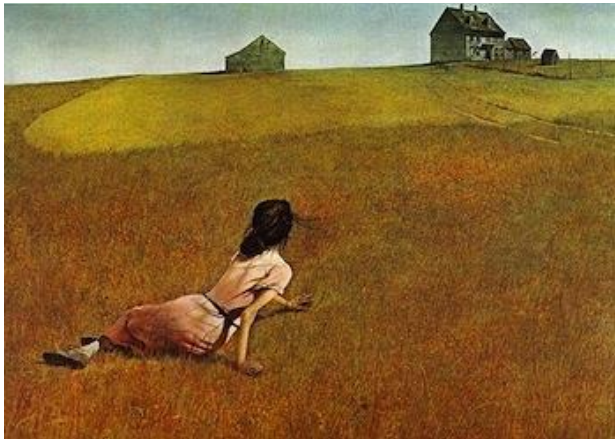
Following are the results:

Image_01

Retargeted_01
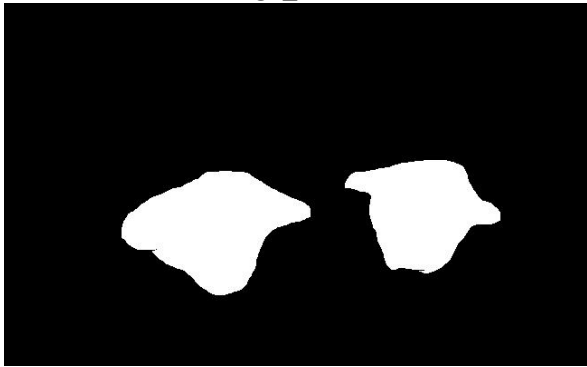
Image_02

Retargeted_02

Image_03

Retargeted_03

Image_04


Retargeted_04 (generated with mask)


Mask

**Failure Case:**

Consider the following image for reducing the width by a factor of 0.5. The result of the retargeting using seam carving is shown below.

Ideally, we would expect the parts with train to be retained mostly and portions with the greenery to be carved out. But the columns with greenery has more energy than ones with the train which is relatively smoother and hence low energy. The initial energy matrix is shown below. There is relatively more energy away from the from location of the train. Hence, those will be retained over the train regions.