

Personal details

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Assumptions

In this assignment we have the following assumptions:

- All the input images have 3 channels which are RGB.
- The images have color values in between 0 and 255.
- Images are in such file format that can be converted to *numpy array* by using *np.array()* method.

Methodology

In this assignment of Digital Image Processing we are processing the images such that we can do the following:

Seam carving using classical method:

~Information generation:

In this part we extracted the edges and prominent features from the image
We use classical methods for extraction of features

~ Cumulative energy map generation

We use dynamic programming paradigm for generation of the energy map

Seam carving using Deep learning method:

~ Data generation for training data

We implement the part-1 code on the dataset provided to get image to image correspondences

~ Implementing the architecture

We implement the pix2pix architecture given in the Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks [paper](#)

In this assignment we implemented seam carving on the given images using classical and generative method

Part 1: Using classical method

We process the images to extract the edges and dominant features from the image



Resolution: 600,406

Size: 130 Kb

Type: Input Image



Resolution: 600,406

Size: 44.8 Kb

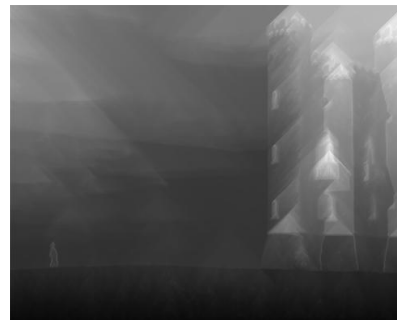
Type: Marked Image



Resolution: 573,406

Size: 44.8 Kb

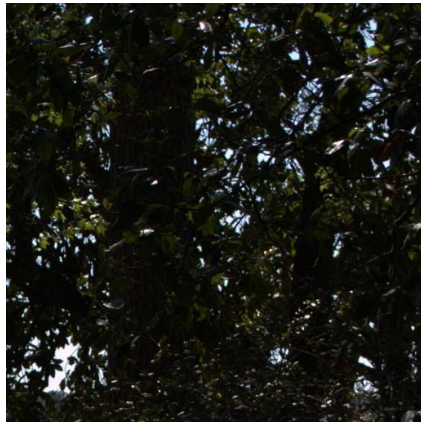
Type: Result of
Vertical carving



Resolution: 573,406

Size: 8.44 Kb

Type: Energy map
of vertically carved
image



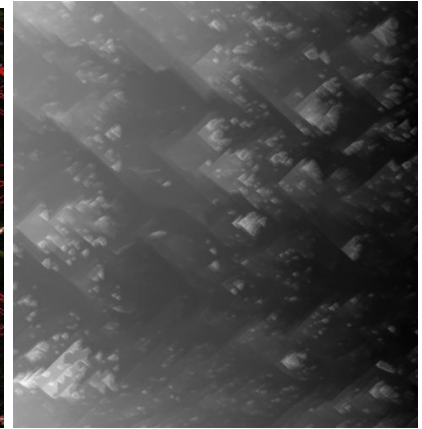
Input image:-

Resolution: 512,512



Horizontal marked:-

Resolution: 512,512



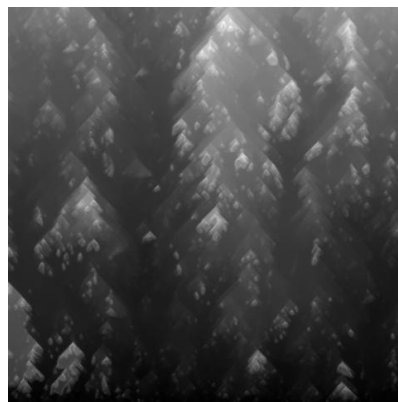
Cumulative energy map:-

Resolution: 384,512



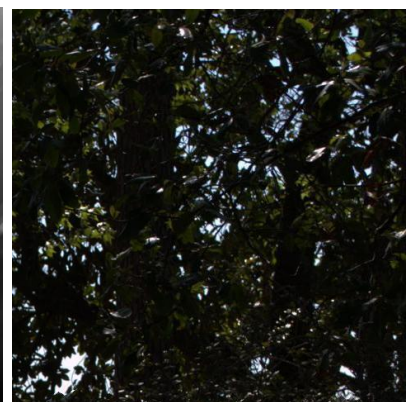
Vertical marked:-

Resolution: 384,512



Cumulative energy map:-

Resolution: 384,384



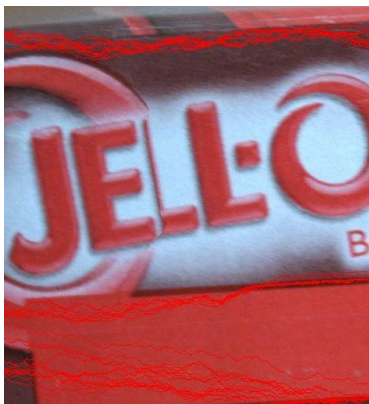
Output Image:-

Resolution: 384,384



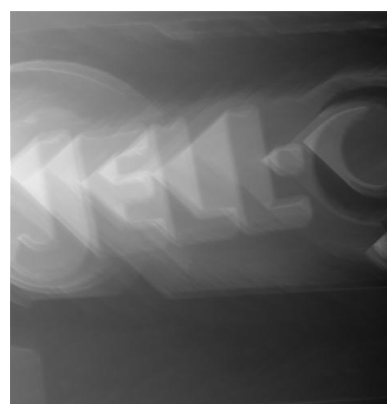
Input image:-

Resolution: 512,512



Horizontal marked:-

Resolution: 512,512



Cumulative energy map:-

Resolution: 384,512



Vertical marked:-

Resolution: 384,512



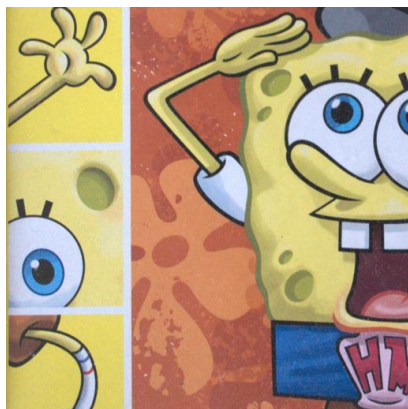
Cumulative energy map:-

Resolution: 384,384



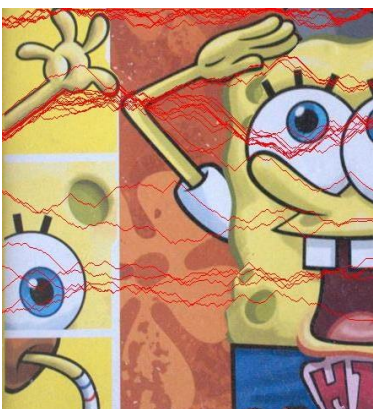
Output Image:-

Resolution: 384,384



Input image:-

Resolution: 512,512



Horizontal marked:-

Resolution: 512,512



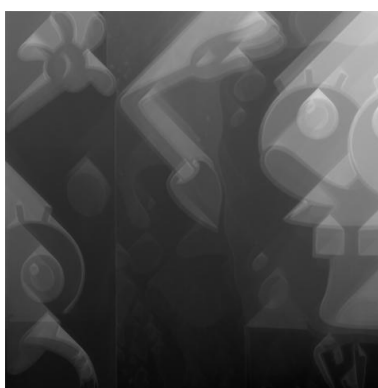
Cumulative energy map:-

Resolution: 384,512



Vertical marked:-

Resolution: 384,512



Cumulative energy map:-

Resolution: 384,384



Output Image:-

Resolution: 384,384

Part 2: Using Deep networks

Here we have implemented seam carving using a Generative deep neural network, namely [pix2pix](#).

Generator: In this part we take the input image (512, 512, 3) and then apply convolution filters and then applied transpose convolution. The resultant image will be referred to as generated image.

Discriminator: In this, there are three parts.

- a) We take the generated image and concatenate it with the target (actual image) (384, 384, 3) then apply convolution filters.
- b) We take the target image and concatenate it with the target image again then apply convolution filters.
- c) We then apply loss on the two images and find gradients.

Statistics of the model:

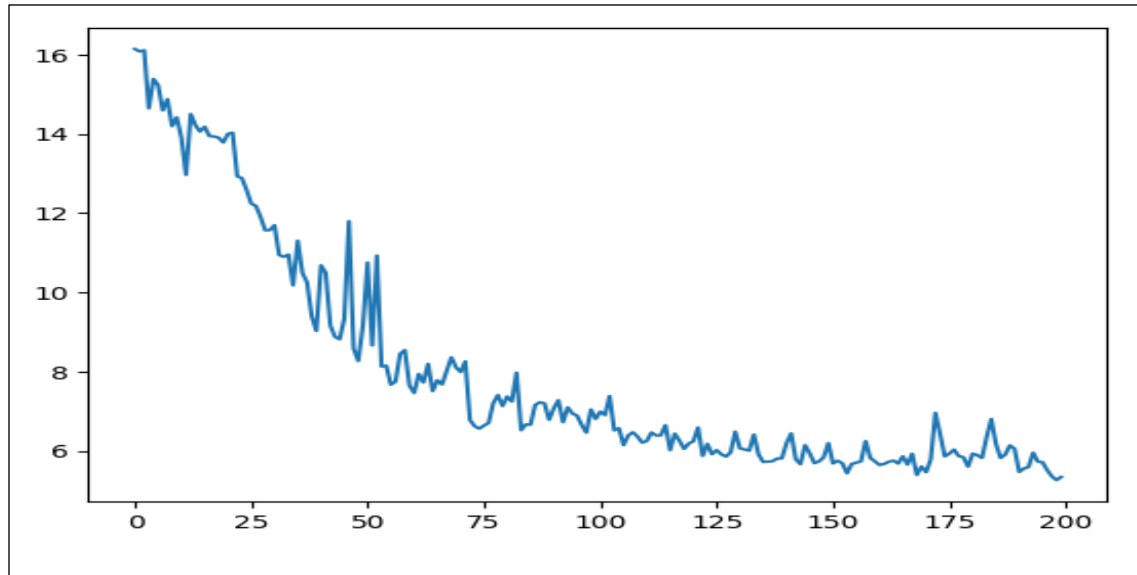
- Learning rate(lr) = $2e-3$ (generator) and $2e-3$ (discriminator)
- No. of epochs = 200
- Batch size = 32
- Hyperparameters:
 - Loss function: MSE – 0.0025055
 - Optimizer: Adam, RMSprop
 - Activation function: relu, leakyRelu
 - No. of params: 46302467(gen)

NMI value of all images (296): 0.5496423

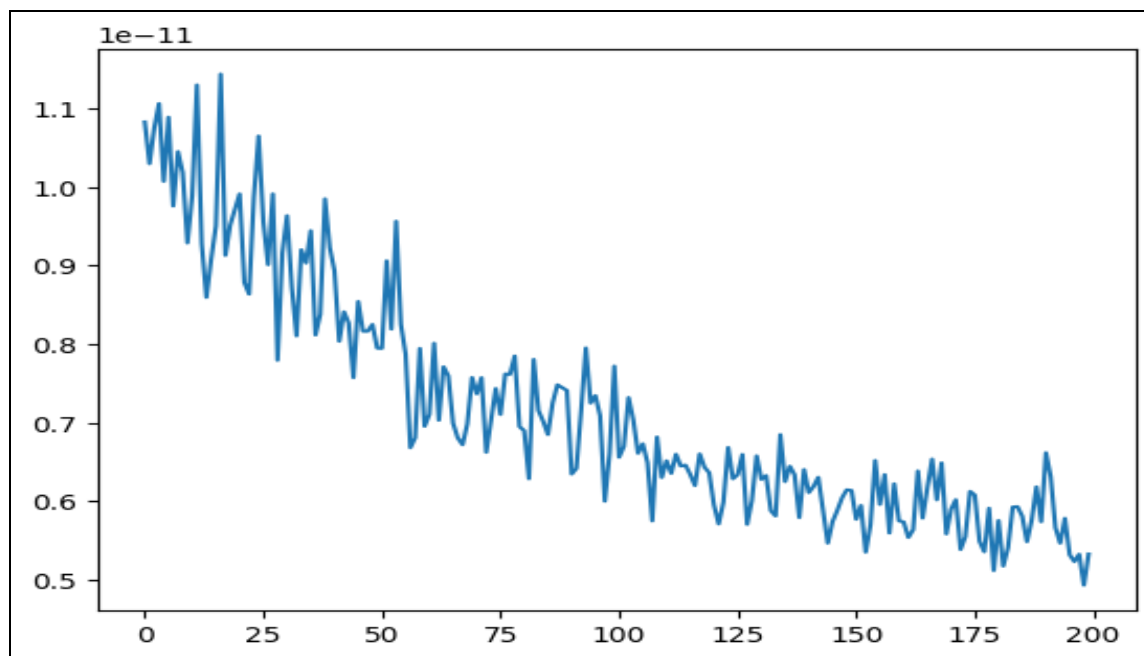
RMSE value of all images (296): 62.06626

SSIM value of all images (296): 0.6590725

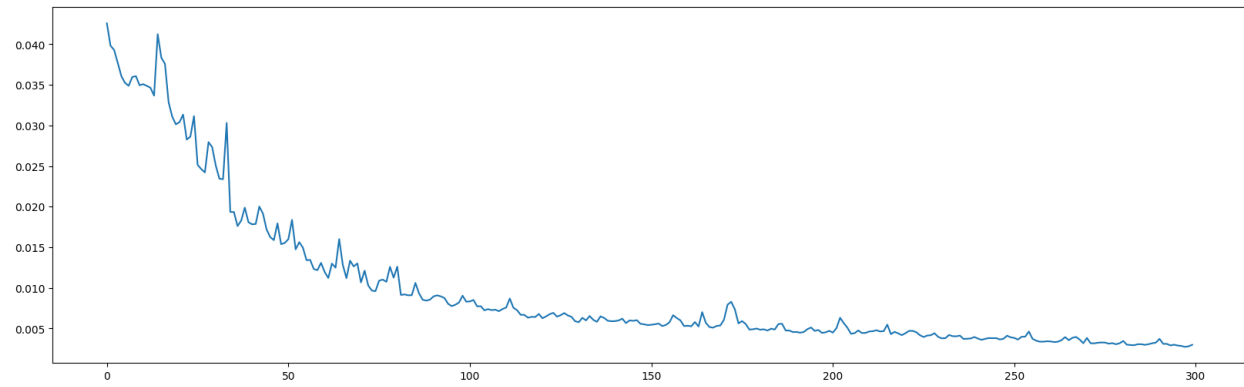
Generator loss



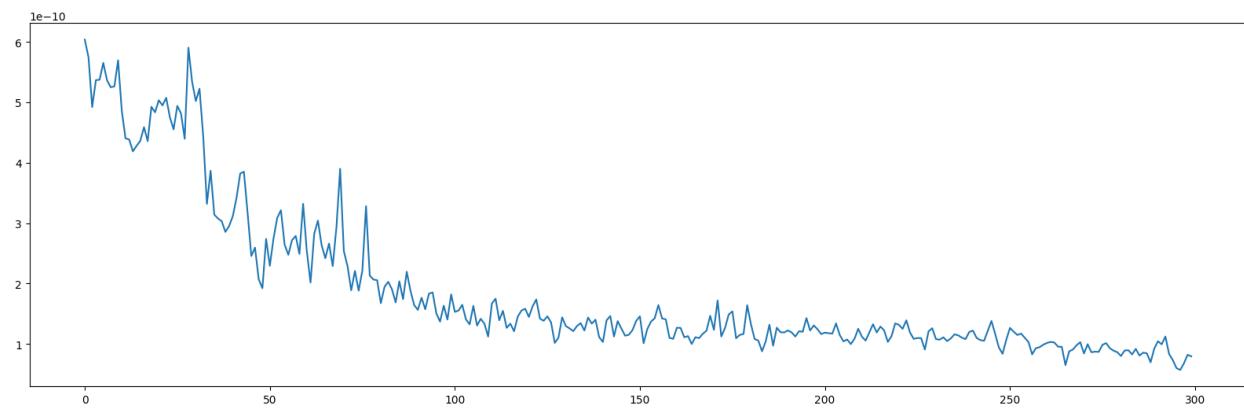
Discriminator loss

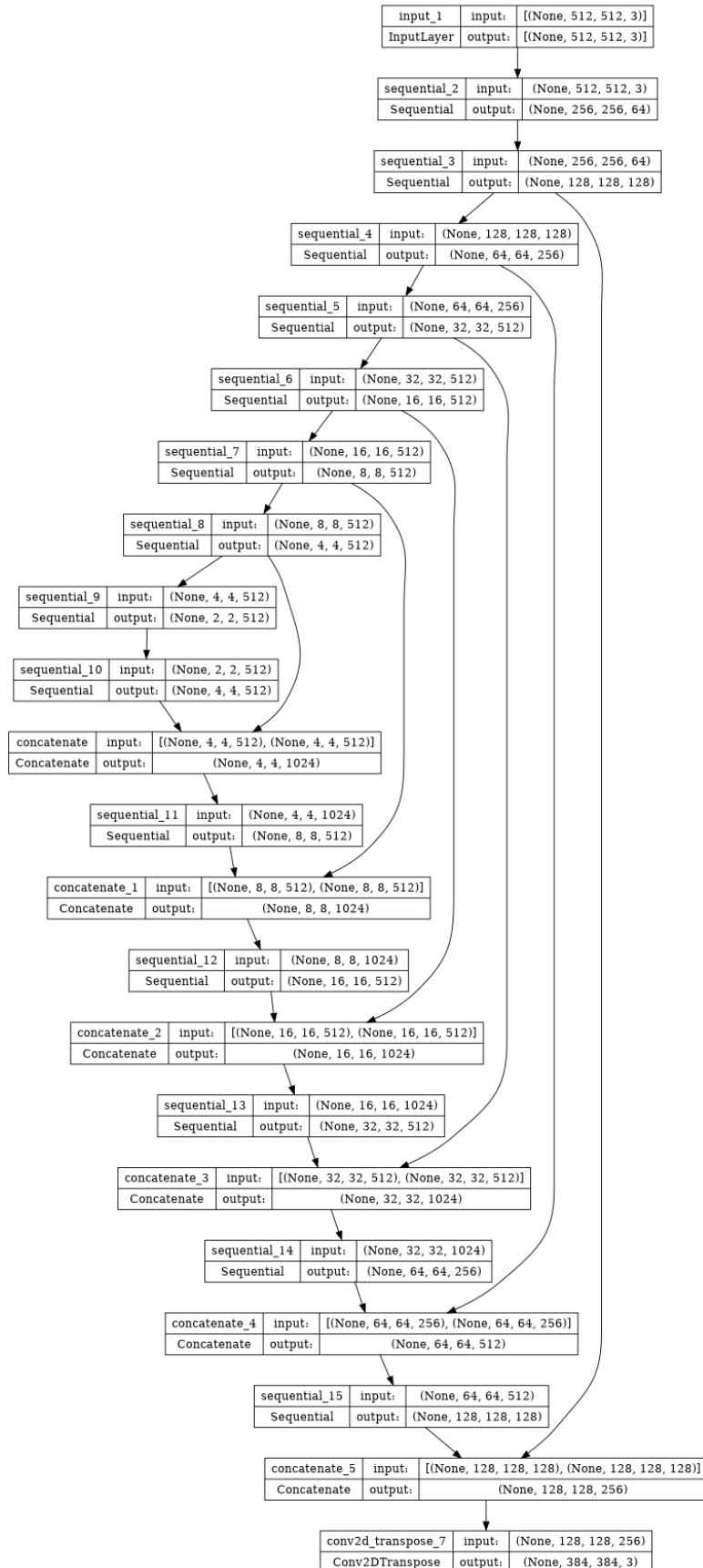


Generator

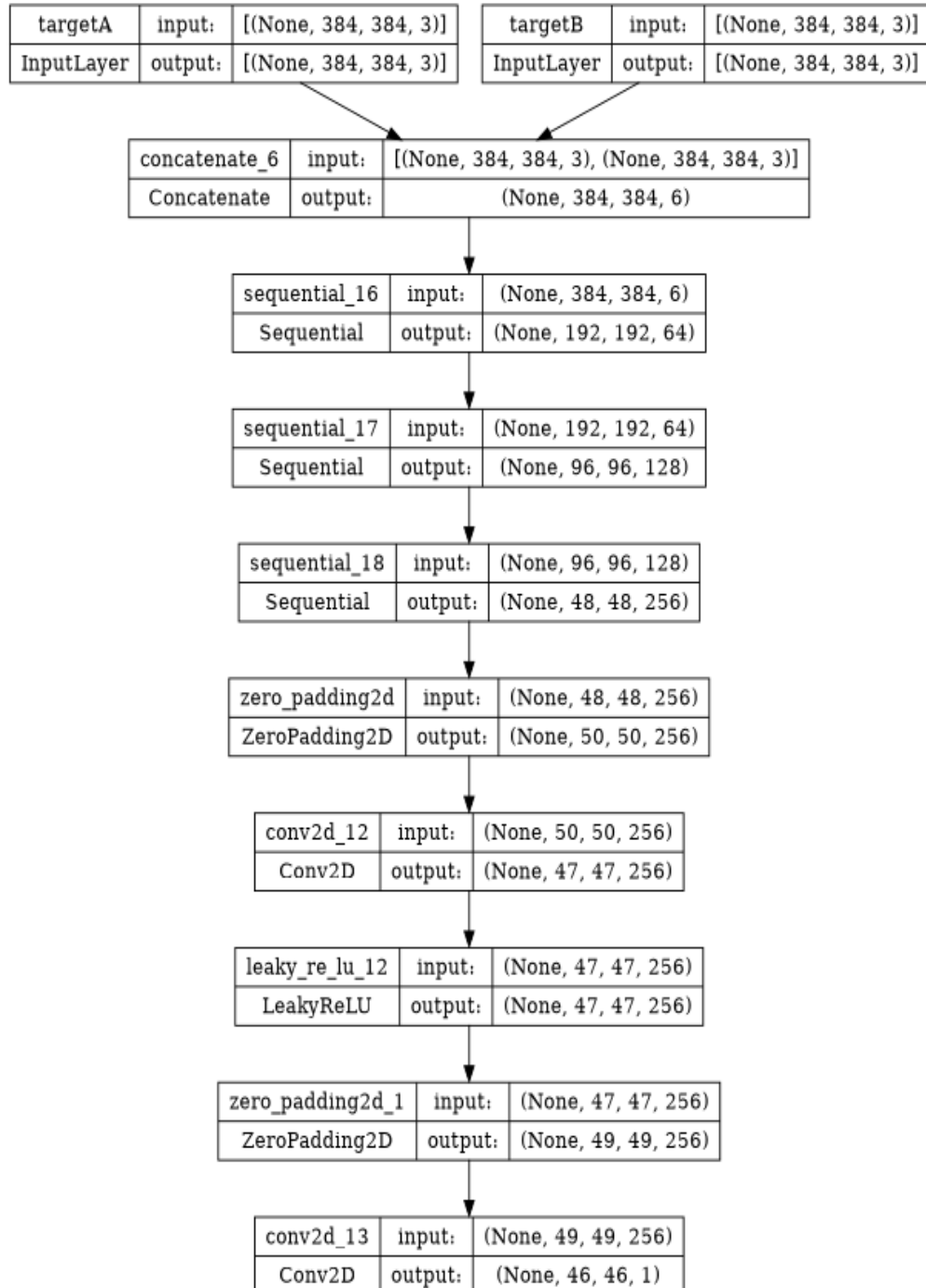


Discriminator





Generator



Discriminator

