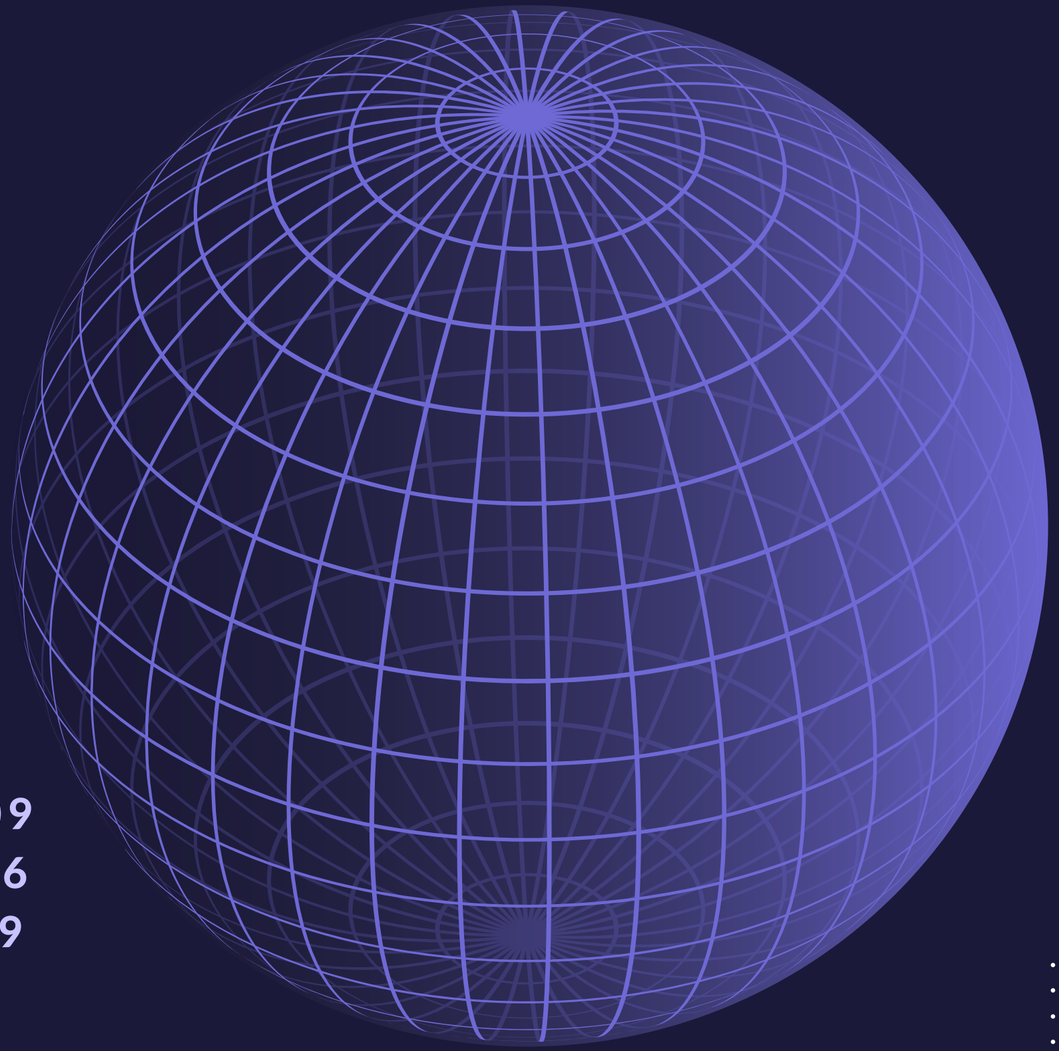
001

SEAM CARVING



JAY GUPTA 19BPS1009
AMAN KUMAR SINHA 19BPS1026
PRITISH VILIN ZUNKE 19BPS1119

IMAGE PROCESSING | CSE4019 | VIT CHENNAI

WHAT IS SEAM CARVING?

- Seam carving (or liquid rescaling) is an algorithm for content-aware image resizing, developed by Shai Avidan.
- It functions by establishing a number of seams (paths of least importance) in an image and automatically removes seams to reduce image size or inserts seams to extend it.
- Seam carving also allows manually defining areas in which pixels may not be modified, and features the ability to remove whole objects from photographs.

TYPES OF SEAM CARVING

SEAM REMOVAL

Establish a number of seams (paths of least importance) in an image and automatically removes seams to reduce image size.

SEAM INSERTION

Seam insertion can be thought of as inversion of seam removal and insert new artificial pixels/seams into the image.

SEAM REMOVAL

SEAM INSERTION

SEAM CARVING STEPS

1 Energy Calculation

The first step is to calculate the energy of each pixel, which is a measure of the importance of each pixel—higher the energy, the less likely that the pixel will be included as part of a seam. For energy calculation we will use the dual-gradient energy function.

2 Seam Identification

The next step is to find a vertical or horizontal seam of minimum total energy.
For this we find the shortest path from any of the W pixels in the top row to any of the W pixels in the bottom row

3 Removal/Insertion

The final step is to add or remove from the image all of the pixels along the seam, which results in increase or decrease in dimensions of the image.

ENERGY MAP

The purpose of an energy function is to assign to each pixel a value, e(i,j), indicating its importance to the image.Unnoticeable pixels that blend with their surroundings should have low energy values.

Here, after we use the energy function we assign energy values to each and every pixel, distinct features of the image are isolated after this conversion, cost of the streams/lines/paths
are calculated horizontally or vertically and then, path with minimum cost is considered for removal.
For the path calculation we use 8-path.

AUTO ENCODER

An autoencoder is an unsupervised learning technique for neural networks that learns efficient data representations (encoding) by training the network to ignore signal “noise.” Autoencoders can be used for image denoising, image compression, and, in some cases, even generation of image data.
Autoencoders consist of 3 parts:

1. **Encoder**: A module that compresses the input data into an encoded representation that is typically several orders of magnitude smaller than the input data.

2. **Bottleneck:** A module that contains the compressed knowledge representations and is therefore the most important part of the network.

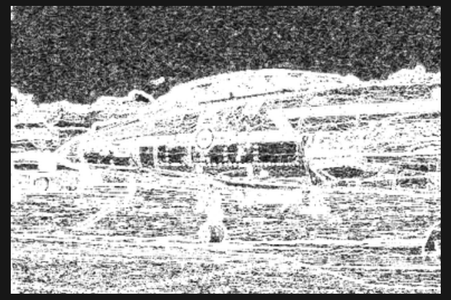
3. **Decoder:** A module that helps the network“decompress” the knowledge representations and reconstructs the data back from its encoded form. The output is then compared with a ground truth.

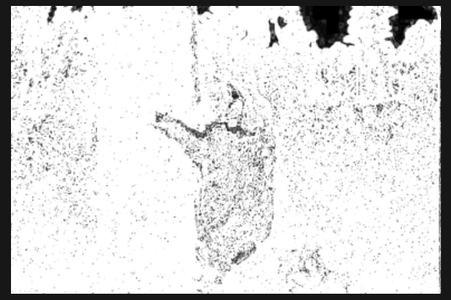
AUTO ENCODER

In this project we have used auto encoder to train the model to generate energy map for a given input image.

Auto Encoder	Unit Level	Conv Layer	Filter	Stride	Output size
Encoding	Level 1	Conv 1	3x3/32	1	256x256x32
		Conv 1	3x3/32	1	256x256x32
Encoding	Level 2	Conv 2	3x3/64	2	128x128x64
		Conv 2	3x3/64	1	128x128x64
Encoding	Level 3	Conv 3	3x3/128	2	64x64x128
		Conv 3	3x3/128	1	64x64x128
Encoding	Level 4	Conv 4	3x3/256	2	32x32x256
		Conv 4	3x3/256	1	32x32x256
Bridge	Level 5	Conv 5	3x3/512	2	16x16x512
		Conv 5	3x3/512	1	16x16x512
Decoding	Level 6	De-Conv1	3x3/256	1	32x32x256
		De-Conv1	3x3/256	2	32x32x256
Decoding	Level 7	De-Conv2	3x3/128	1	64x64x128
		De-Conv2	3x3/128	2	64x64x128
Decoding	Level 8	De-Conv3	3x3/64	1	128x128x64
		De-Conv3	3x3/64	2	128x128x64
Decoding	Level 9	De-Conv4	3x3/32	1	256x256x32
		De-Conv4	3x3/32	2	256x256x32
Output		De-Conv5	1x1	1	256x256x1

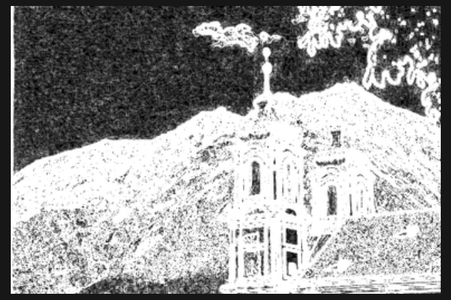










Thank you!