Dataset

- Ellipses (4000, 128*128)
- Helsinki
- Limited Angle Helsinki

The dataset, we will be working consist of merged geometric shapes, with a degree of randomness

Unet Variants

- Unet++(better detail capture with adv connections)
- UnetR(best for images with tricky lighting)
- AttUnet(focuses on important parts)
- ResUnet(keeps details clear)
- DenseUnet(packs features tightly)

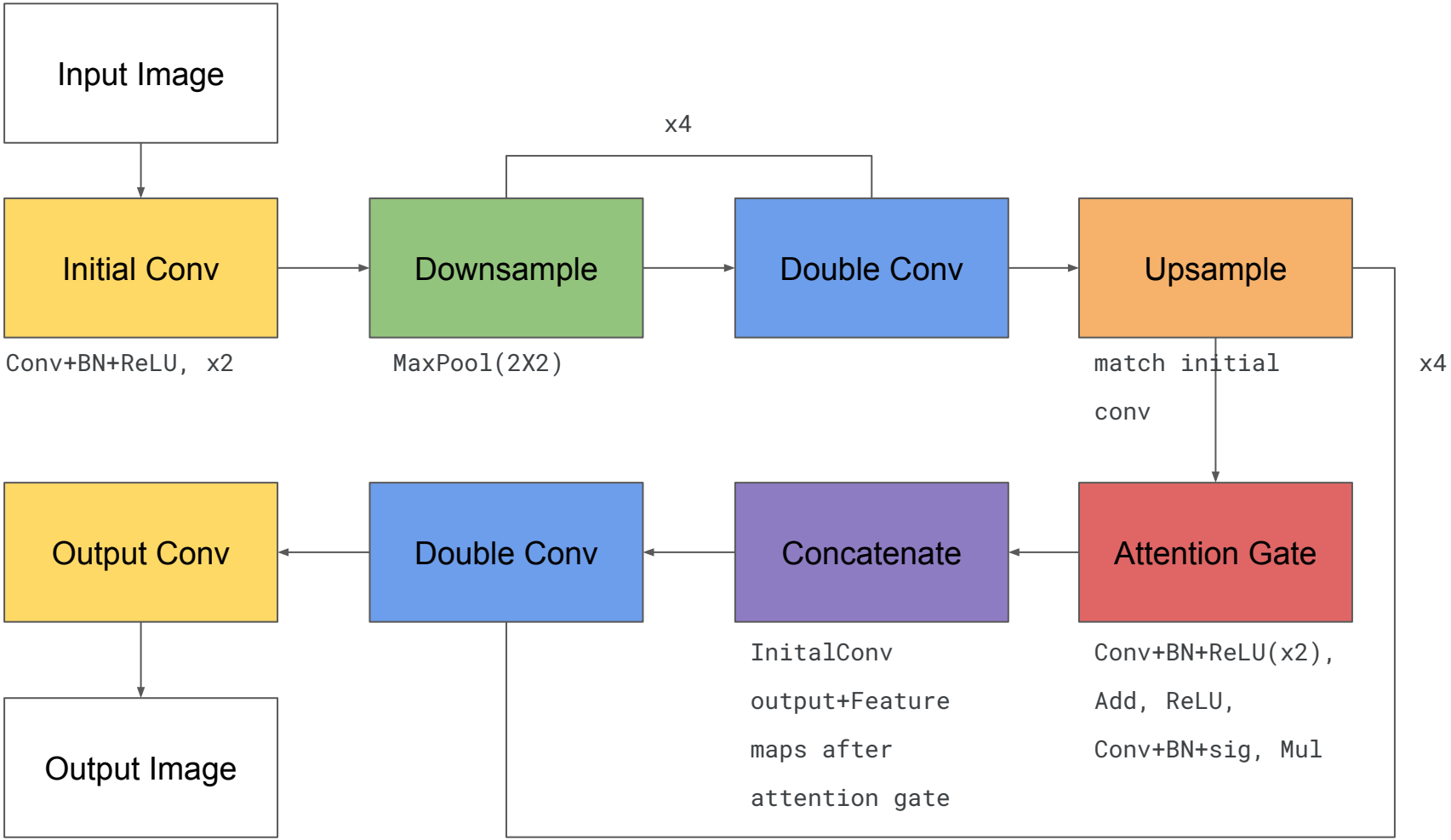
Chose **AttUnet** and **ResUnet**, based on the need to focus on specific structures with clarity and detail.

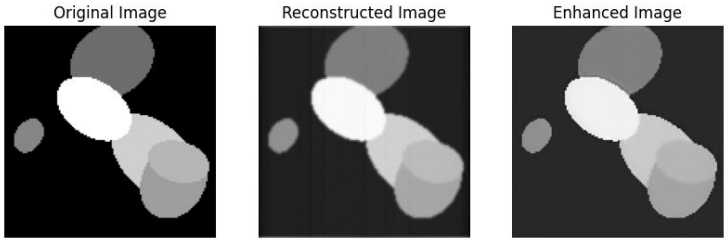
Preprocessing

- reshaped to fit the model’s input req [batch, channels, height, width]

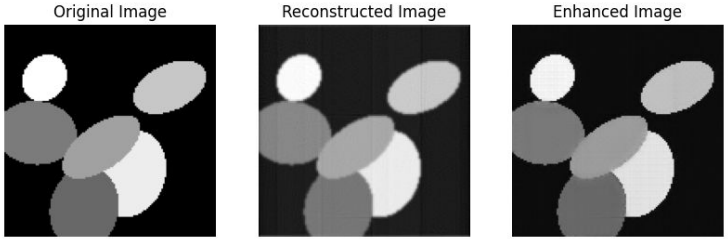
Training Process

- Data Loader with a batch size of 64
- Splitting dataset into training(80%) and testing(20%)
- Adam optimizer, 0.001 learning rate, MSE loss

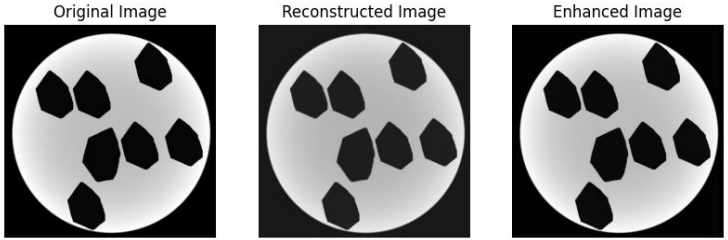

Input Image
Initial Conv
Conv+BN+ReLU, x2
x4
Downsample
MaxPool(2X2)
Double Conv
Upsample
match initial
conv
x4
Attention Gate
Conv+BN+ReLU(x2),
Add, ReLU,
Conv+BN+sig, Mul
Concatenate
InitalConv
output+Feature
maps after
attention gate
Double Conv
Output Conv
Output Image



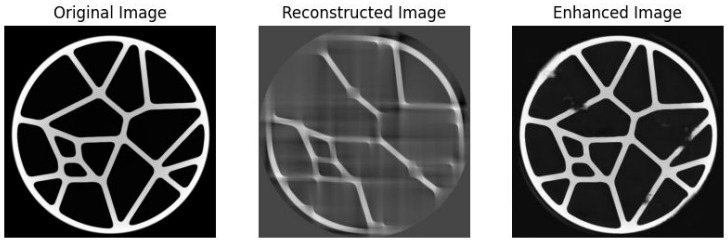
Average SSIM: 0.9466
Average PSNR: 32.6017
Average SSIM: 0.8887
Average PSNR: 26.4050



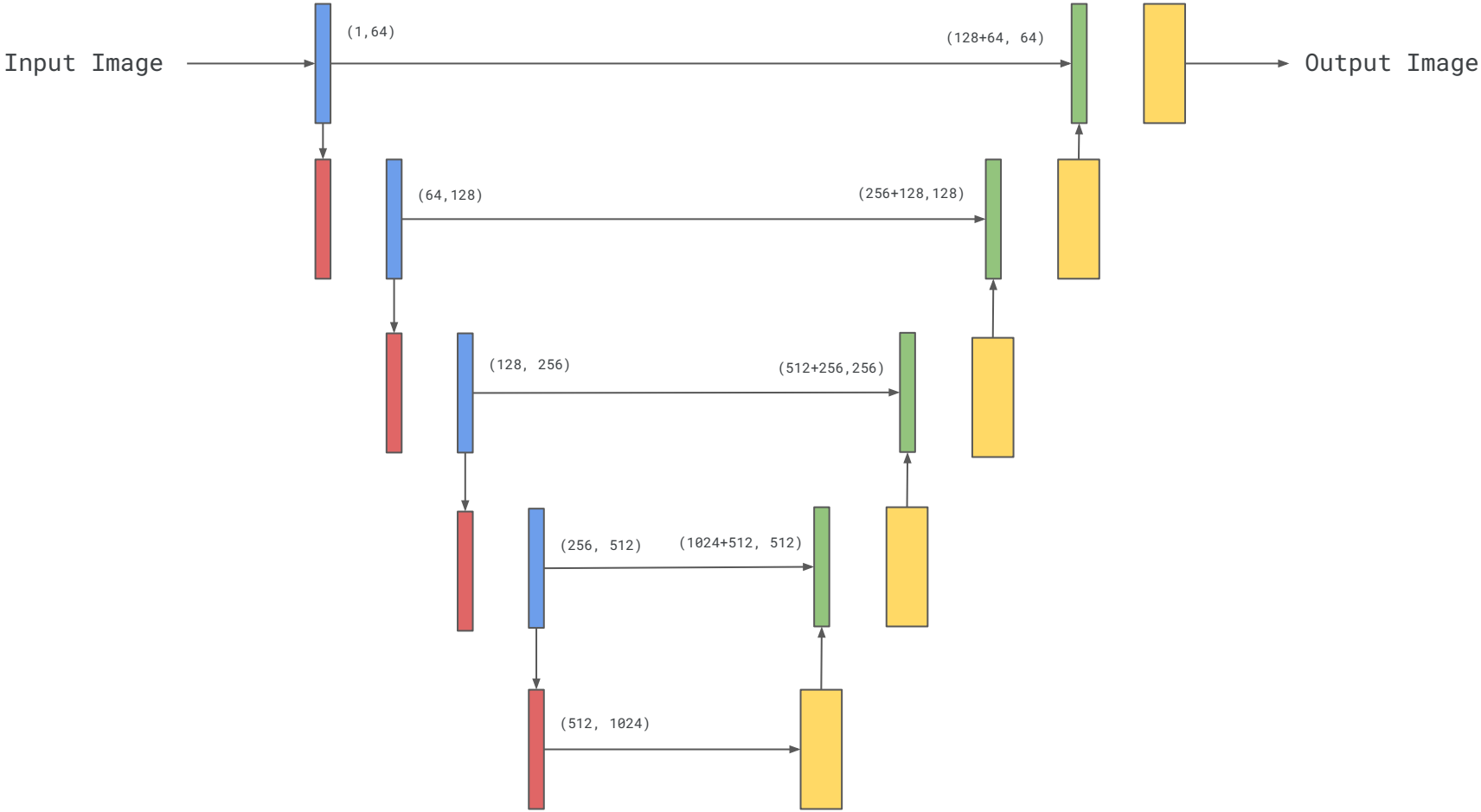
Average SSIM: 0.9523
Average PSNR: 36.2188
Average SSIM: 0.8904
Average PSNR: 26.5113

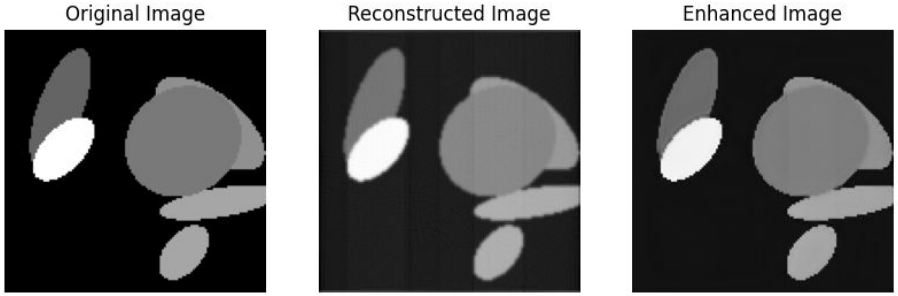


Average SSIM: 0.9957
Average PSNR: 38.2022
Average SSIM: 0.8299
Average PSNR: 33.4312



Average SSIM: 0.9239
Average PSNR: 27.5436
Average SSIM: 0.3886
Average PSNR: 9.7295


Input Image
(1,64)
(128+64, 64)
Output Image
(64,128)
(256+128,128)
(128, 256)
(512+256,256)
(256, 512)
(1024+512, 512)
(512, 1024)

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Average SSIM: 0.9812
Average PSNR: 38.1232
Average SSIM: 0.8890
Average PSNR: 26.4424
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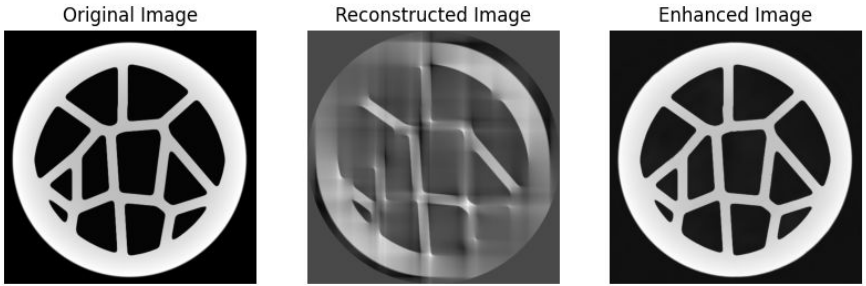
```
Average SSIM: 0.9980
Average PSNR: 46.2469
Average SSIM: 0.8265
Average PSNR: 33.3441
```




```
Average SSIM: 0.9682
Average PSNR: 35.5179
Average SSIM: 0.3874
Average PSNR: 9.7482
```

Model	Dataset	Avg. SSIM(init)	Avg. SSIM(recon)	Avg. PSNR(init)	Avg. PSNR(recon)	Diff. PSNR
AttUNet	Ellipses	0.8887	0.9466	26.4050	32.6017	6.1967
(more layers)	Ellipses	0.8904	0.9523	26.5113	36.2188	9.7075
	Helsinki	0.8299	0.9957	33.4312	38.2022	4.7710
	Lim. Helsinki	0.3886	0.9239	9.7295	27.5436	17.8141
ResUNet	Ellipses	0.8890	0.9812	26.4424	38.1232	11.6808
	Helsinki	0.8265	0.9980	33.3441	46.2469	12.9028
	Lim. Helsinki	0.3874	0.9682	9.7482	35.5179	25.7697

GitHub Link: https://github.com/har5hcodes/mtp-iitkgp