AutoArt

How can we generate more appealing images through Neural Style Transfer?

~ By Ishita, Jen and Mona

Generally used models

VGG19

Style Loss: 0.266553

Alexnet

Style Loss: 84.393143

Resnext

Style Loss: 0.059025

Mobilenetv2

Style Loss: 0.003722

Moving forward analysis only on Mobilenetv2 ...

Our Novel Idea 1 : Fine-tuning the model

We fine-tune Mobilenetv2 as a classification task for classifying impressionist paintings from others.

Pretrained

Style Loss : 0.104357
Content Loss: 1.096774

Fine-tuned

Style Loss : 0.117117
Content Loss: 0.844769

Hyperparameter Tuning - Increasing epoch

We try a range of epochs to see which one works best for us.

Runs: 50

Style Loss : 0.193758
Content Loss: 1.02038

Runs: 100

Style Loss : 0.129759
Content Loss: 0.930155

Runs: 500

Style Loss : 0.115474
Content Loss: 0.847360

Our Novel Idea 2 : Flattening the model

We flatten the layers for Mobilenetv2 to have control over placement of style and content loss.

Unflattened

Style Loss : 0.115474
Content Loss: 0.847360

Flattened

Style Loss : 0.019978
Content Loss: 0.49232

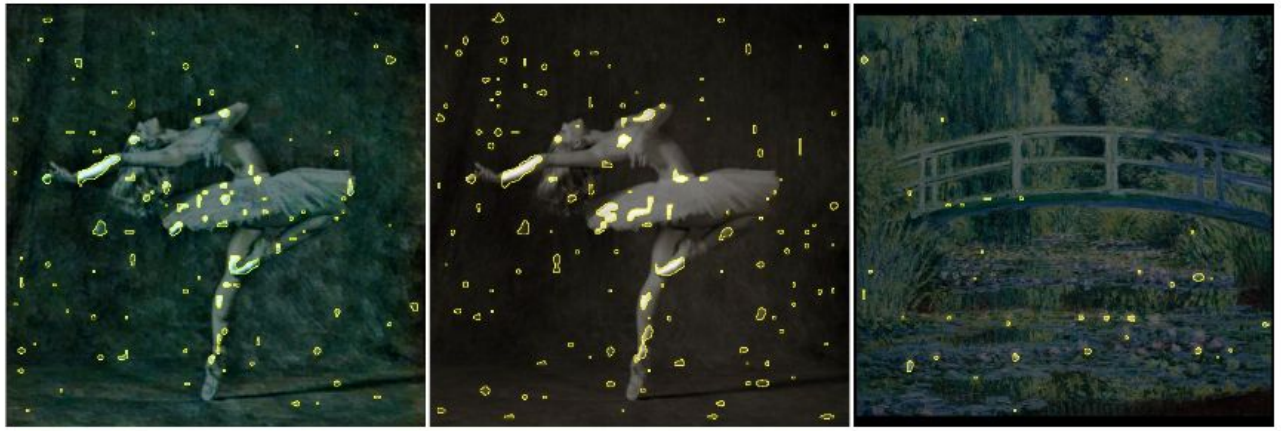
Fine-tuning vs Flattening

Which novel idea works better?

Unflattened Pretrained	Flattened Pretrained	Unflattened Fine-tuned	Flattened Fine-tuned
			
Style Loss : 0.104357 Content Loss: 1.096774	Style Loss : 0.124943 Content Loss: 0.531728	Style Loss : 0.117117 Content Loss: 0.844769	Style Loss : 0.055899 Content Loss: 0.34308

Very Similar

Network Dissection – What do the layers do?

Flattened Fine-tuned, Layer 4, Unit 1	
Flattened Pre-trained, Layer 4, Unit 1	

Network Dissection – What do the layers do?

Unflattened Fine-tuned, Layer 4, Unit 1			
Unflattened Pre-trained, Layer 4, Unit 1			

Hyperparameter Tuning - Loss placement

Where should we place the style loss and content loss?

Style Loss: Initial Layers
Content Loss: Final Layers

Style Loss : 0.000015
Content Loss: 0.000044

Style Loss: Initial Layers
Content Loss: Throughout

Style Loss : 0.036559
Content Loss: 0.518320

Style Loss: Throughout
Content Loss: Initial Layers

Style Loss : 0.015872
Content Loss: 0.389904

Style Loss: Throughout
Content Loss: Throughout

Style Loss : 0.020937
Content Loss: 0.483837

Network Dissection

Flattened Fine-tuned, Layer 2, Unit 2	
Flattened Fine-tuned, Layer 4, Unit 3	

Network Dissection

Flattened Fine-tuned, Layer 8, Unit 0	
Flattened Fine-tuned, Layer 14, Unit 14	

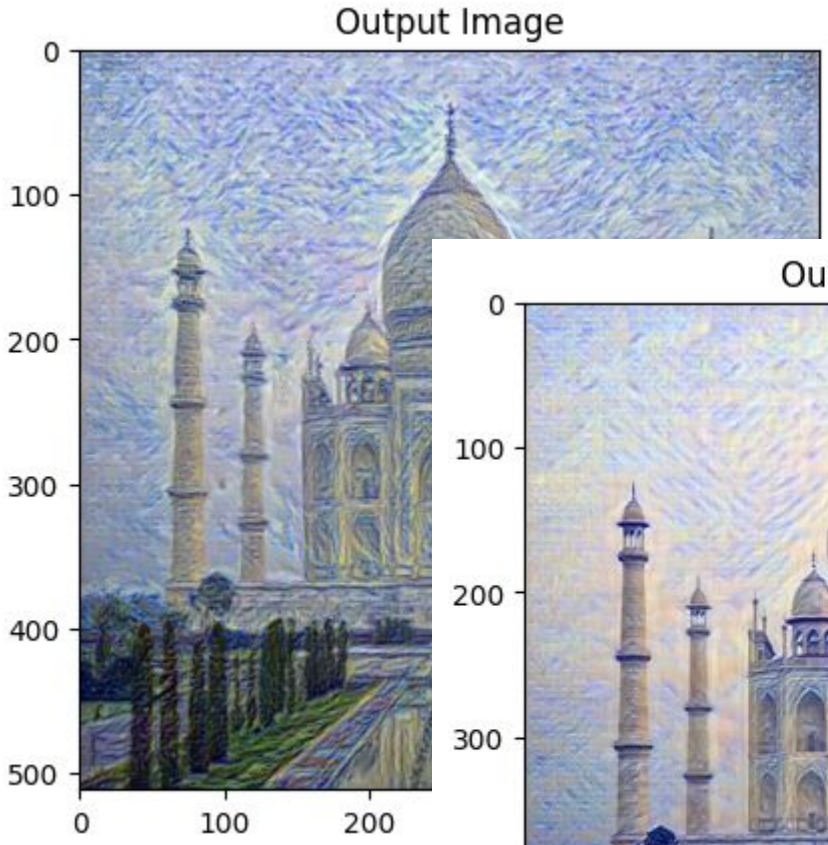


Questions?



Unflattened, fine tuned. Not activating on output image!
Layer 14

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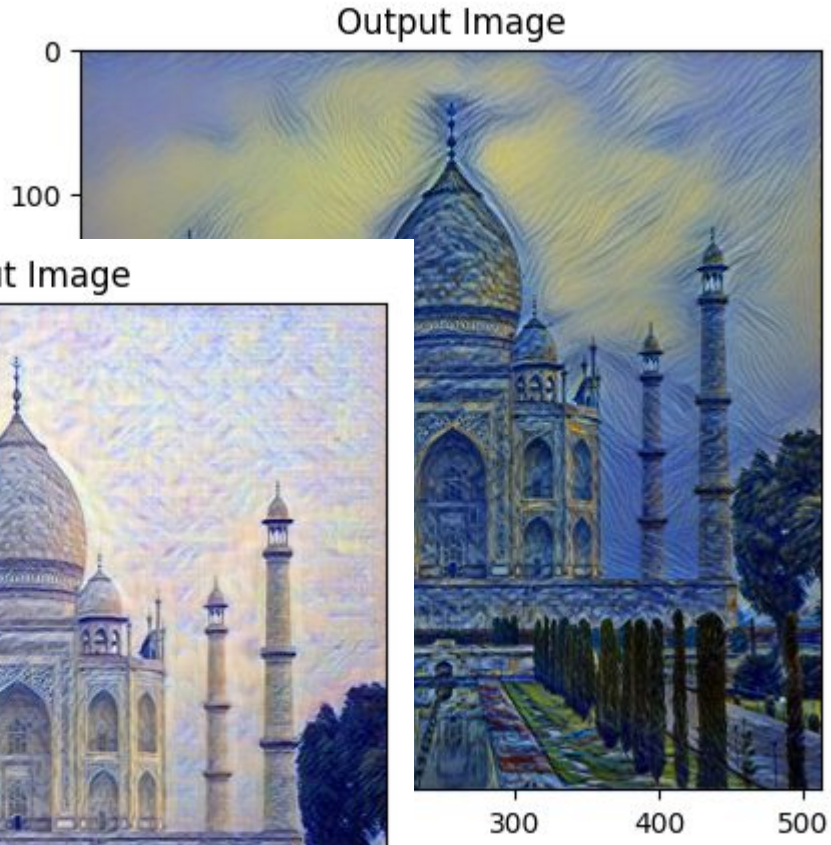
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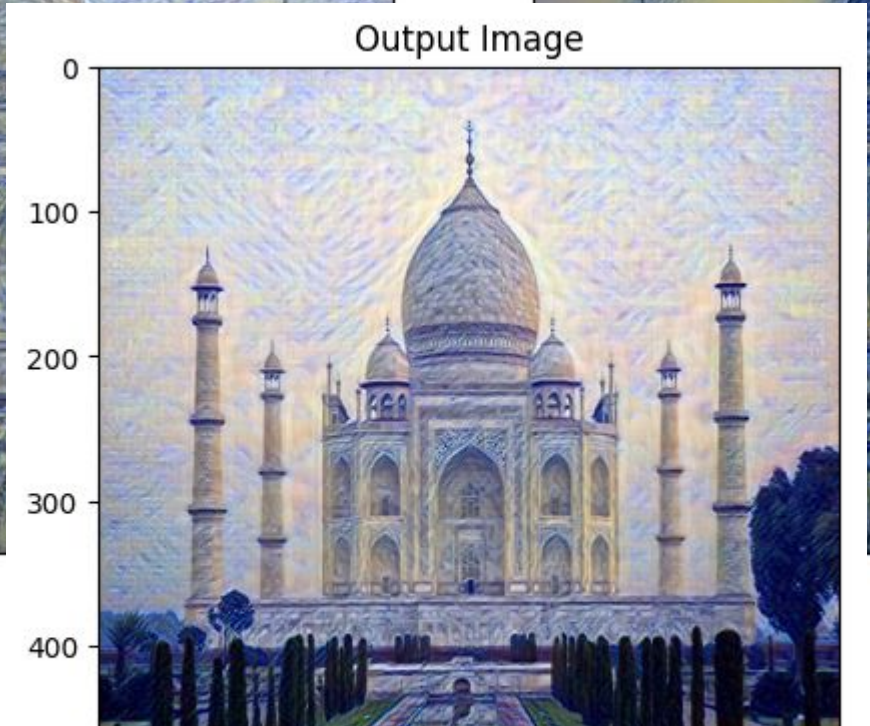
Output Image
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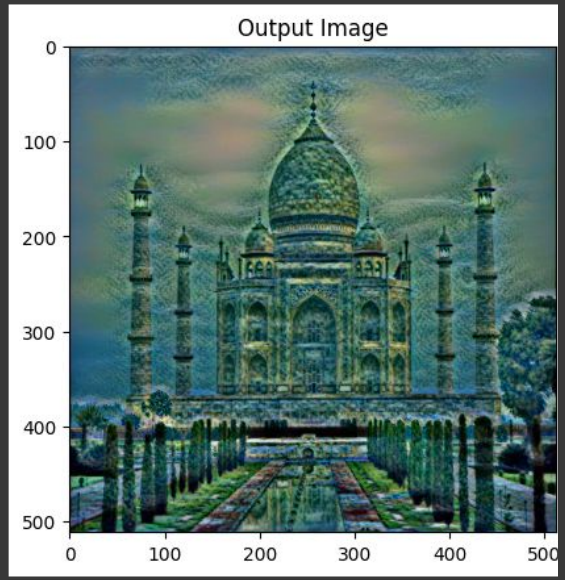
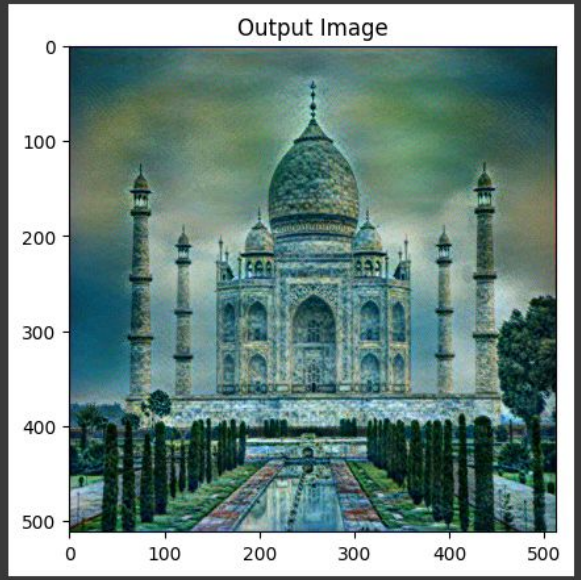
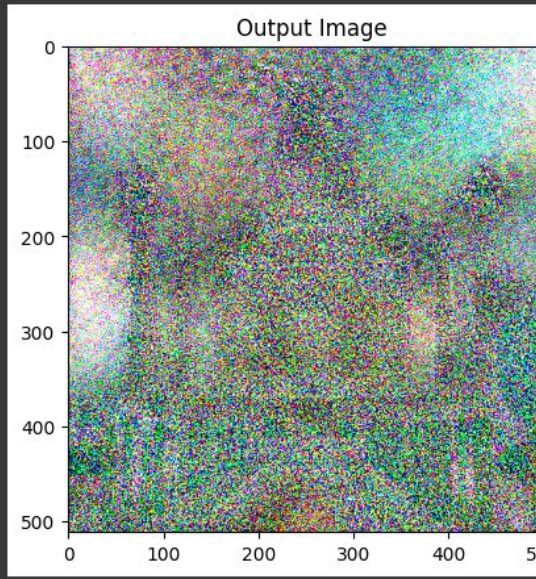
```
Building the style transfer model..
Optimizing..
run [50]:
Style Loss : 13.311300 Content Loss: 12.310196

run [100]:
Style Loss : 5.942426 Content Loss: 10.621855

run [150]:
Style Loss : 2.810558 Content Loss: 9.990990

run [200]:
Style Loss : 1.698432 Content Loss: 9.546036

run [250]:
Style Loss : 1.366307 Content Loss: 9.284018

run [300]:
Style Loss : 1.127659 Content Loss: 9.174747
```



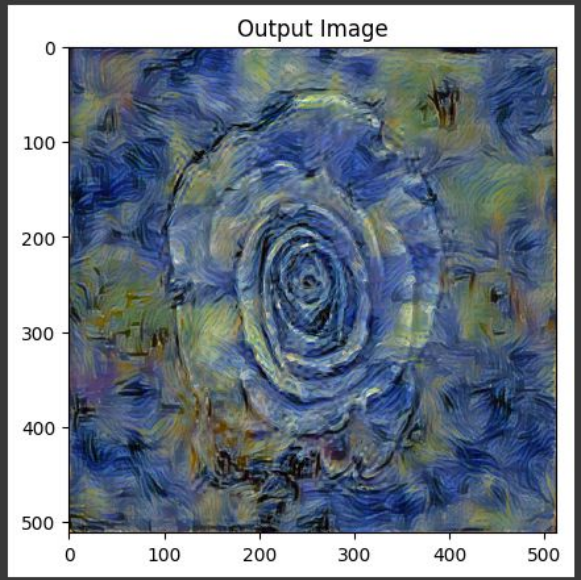

```
Building the style transfer model..
Optimizing..
run [50]:
Style Loss : 1.069202 Content Loss: 6.497723

run [100]:
Style Loss : 1.156101 Content Loss: 6.214647

run [150]:
Style Loss : 1.229813 Content Loss: 6.382384

run [200]:
Style Loss : 1.341874 Content Loss: 6.439767

run [250]:
Style Loss : 1.295149 Content Loss: 7.038956

run [300]:
Style Loss : 7.482626 Content Loss: 10.903210
```



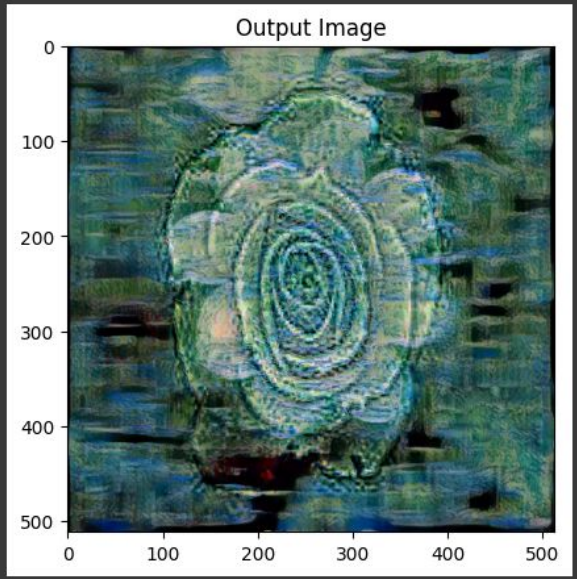

```
Building the style transfer model..
Optimizing..
run [50]:
Style Loss : 1.293402 Content Loss: 3.239389

run [100]:
Style Loss : 1.312568 Content Loss: 3.039969

run [150]:
Style Loss : 1.321576 Content Loss: 2.944651

run [200]:
Style Loss : 1.335276 Content Loss: 2.888039

run [250]:
Style Loss : 1.352896 Content Loss: 2.935876

run [300]:
Style Loss : 1.374570 Content Loss: 2.883390
```



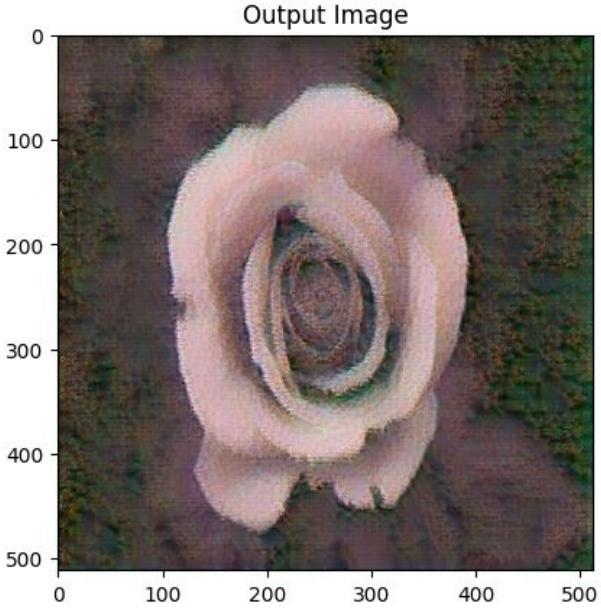
```
Building the style transfer model..
Optimizing..
run [50]:
Style Loss : 119.220932 Content Loss: 27.920401

run [100]:
Style Loss : 44.891624 Content Loss: 27.195110

run [150]:
Style Loss : 18.741980 Content Loss: 26.265457

run [200]:
Style Loss : 7.572743 Content Loss: 25.233135

run [250]:
Style Loss : 4.239271 Content Loss: 23.850388

run [300]:
Style Loss : 3.191205 Content Loss: 22.772913
```




```
Building the style transfer model..
Optimizing..
run [50]:
Style Loss : 1.647564 Content Loss: 24.443336

run [100]:
Style Loss : 1.432694 Content Loss: 22.252676

run [150]:
Style Loss : 1.319910 Content Loss: 20.776543

run [200]:
Style Loss : 1.136196 Content Loss: 19.782787

run [250]:
Style Loss : 1.142115 Content Loss: 19.038792

run [300]:
Style Loss : 0.970283 Content Loss: 18.513287
```



Analvsis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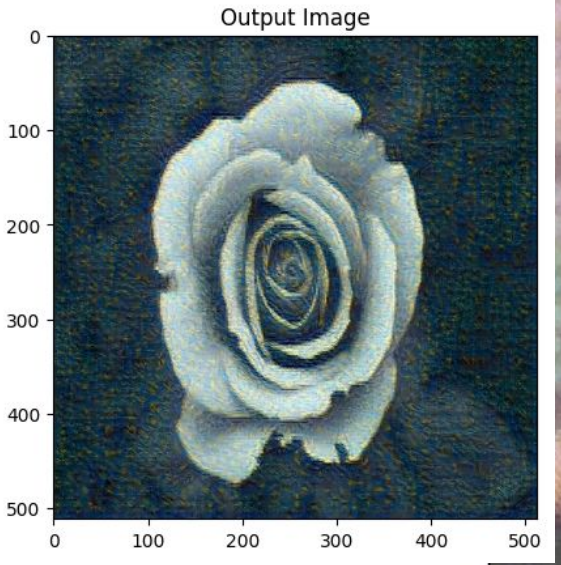
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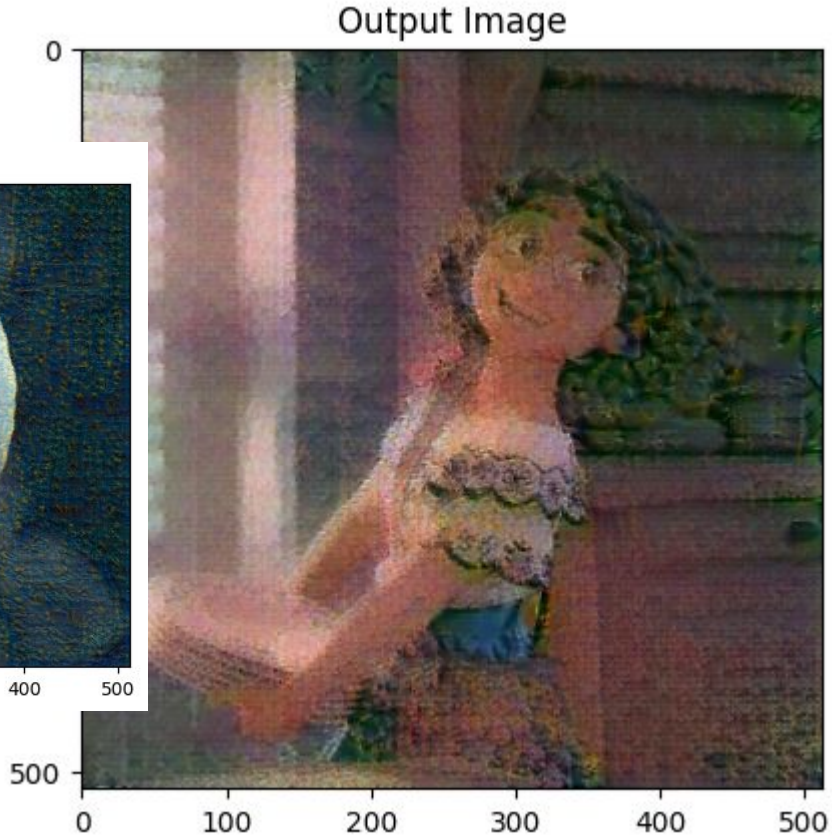
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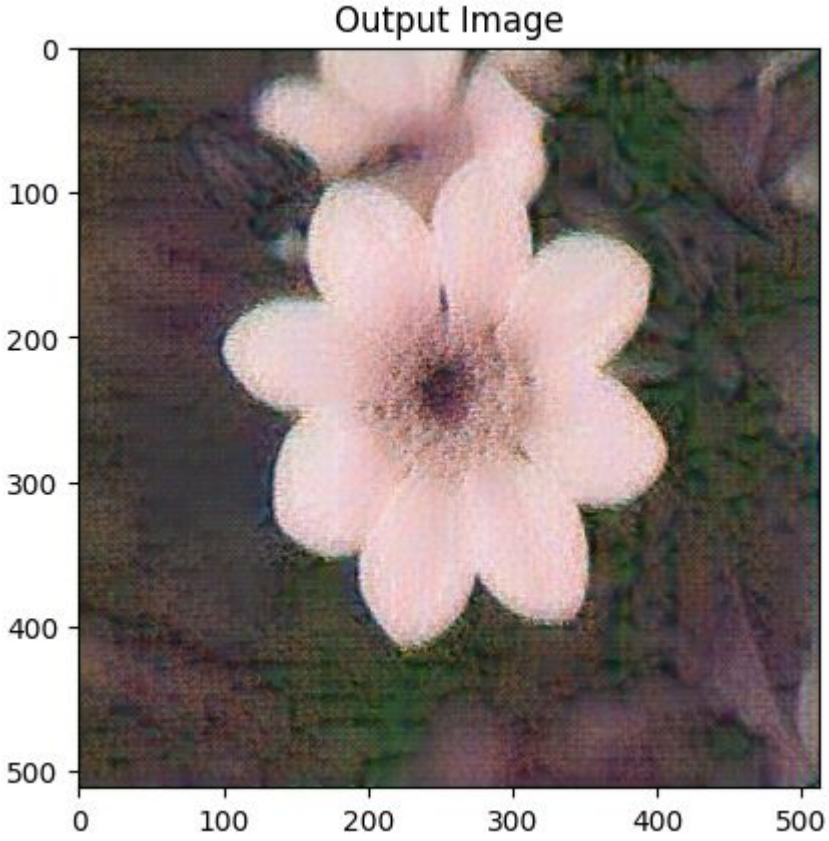
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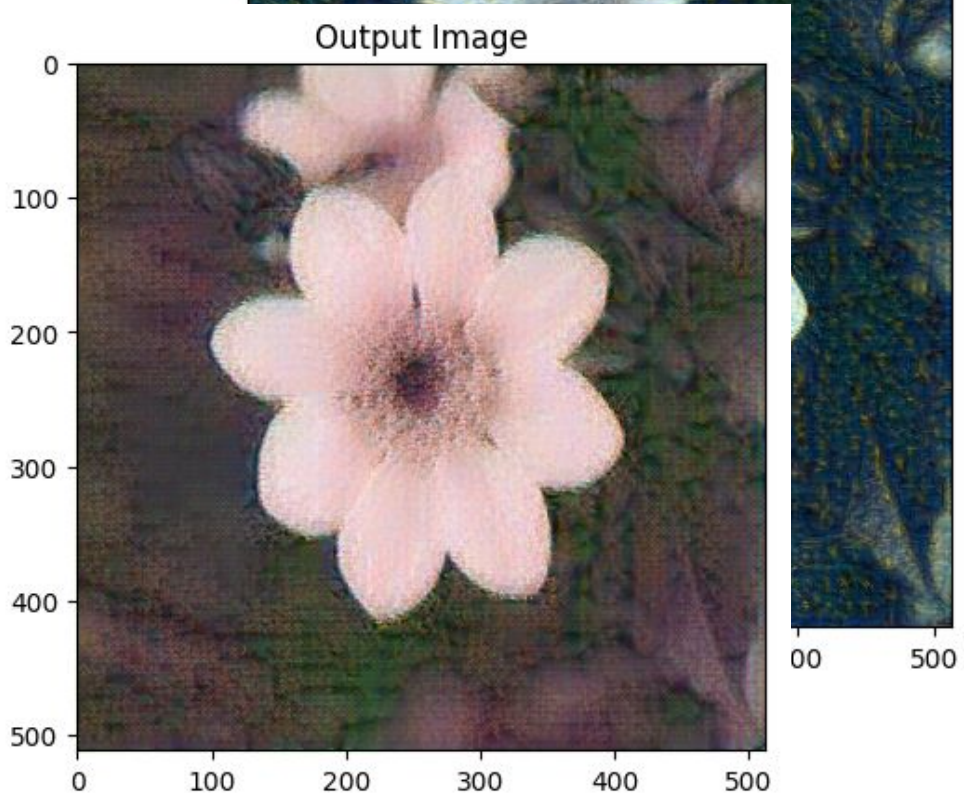
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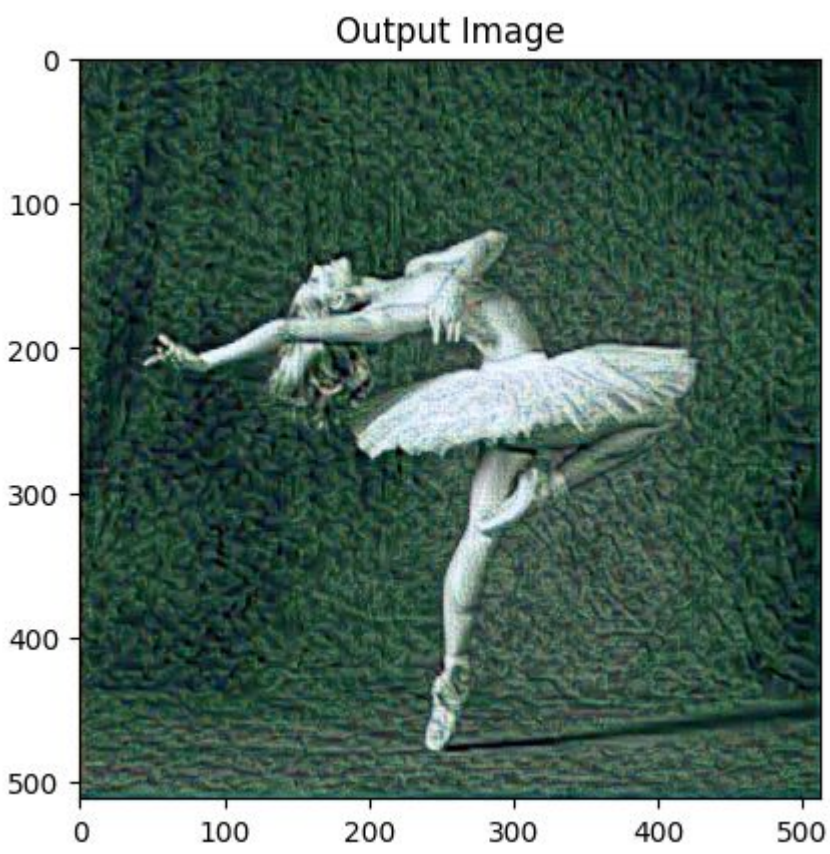
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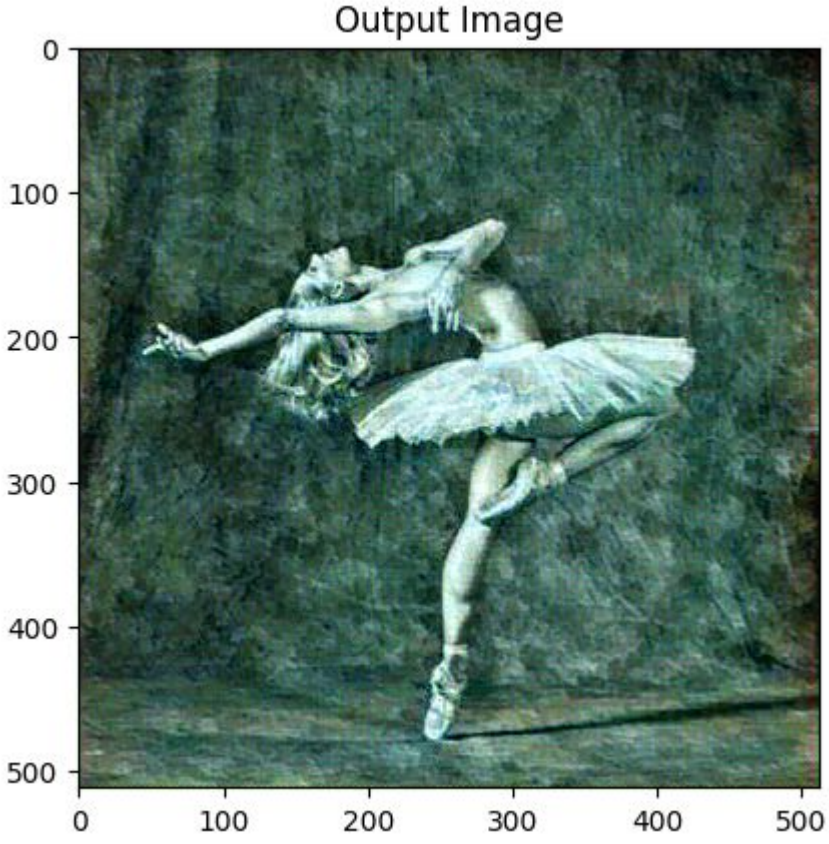
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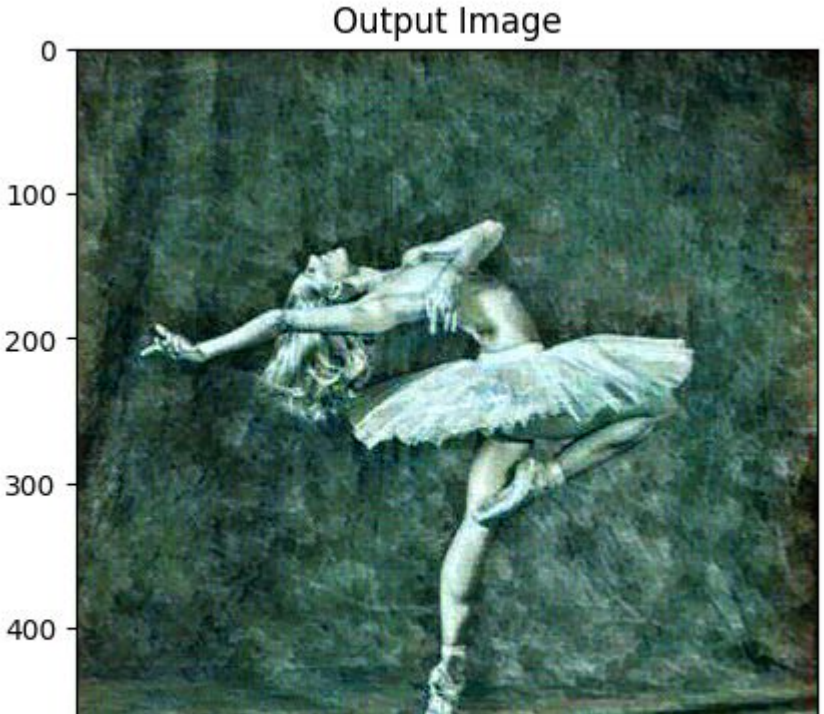
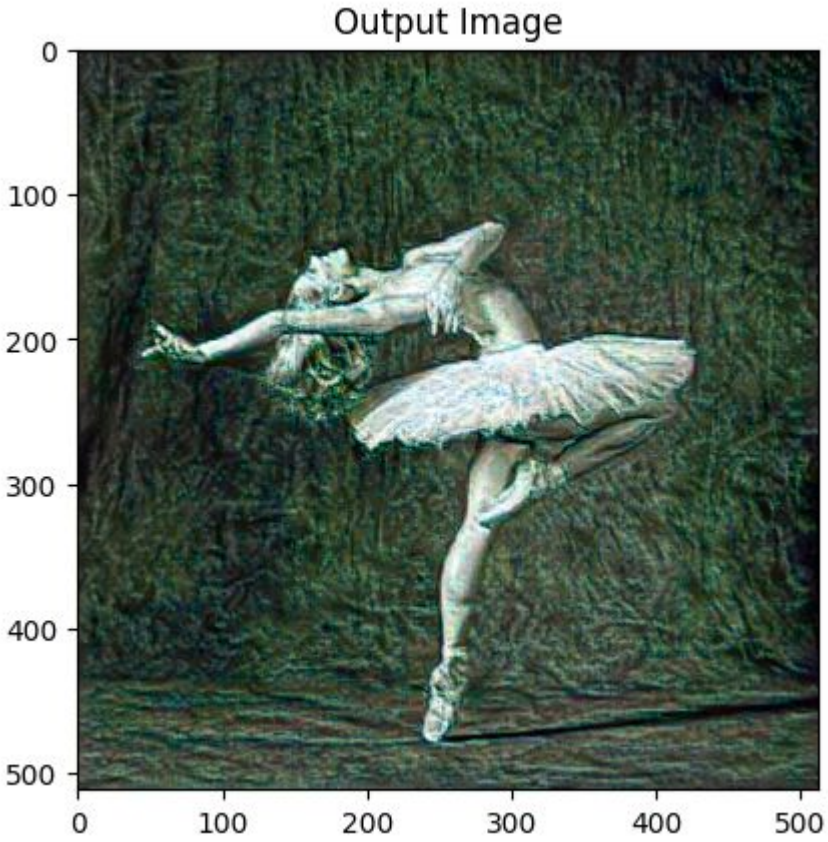
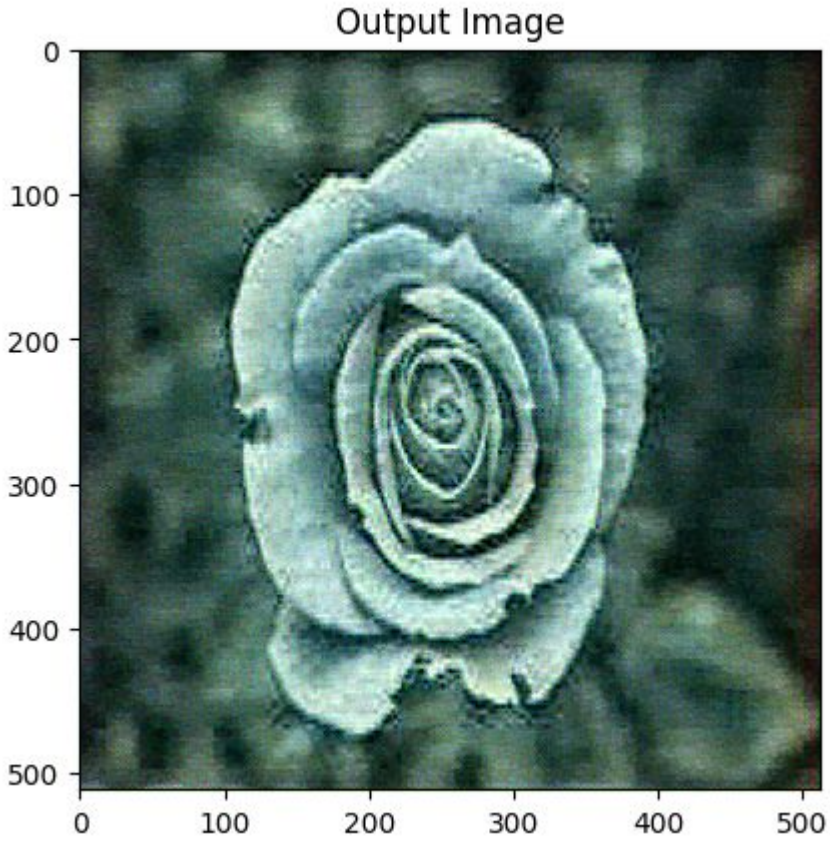
Flatten - pretrained model



flatten - finetuned

Unflattened - pretrained

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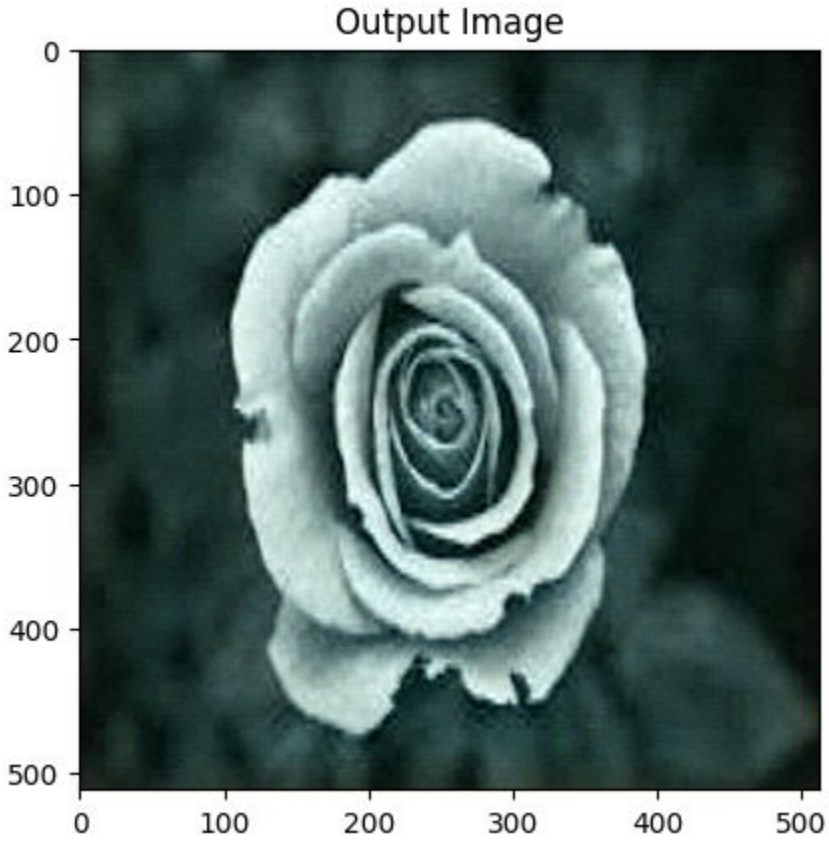
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