

CS 6476 Project 1

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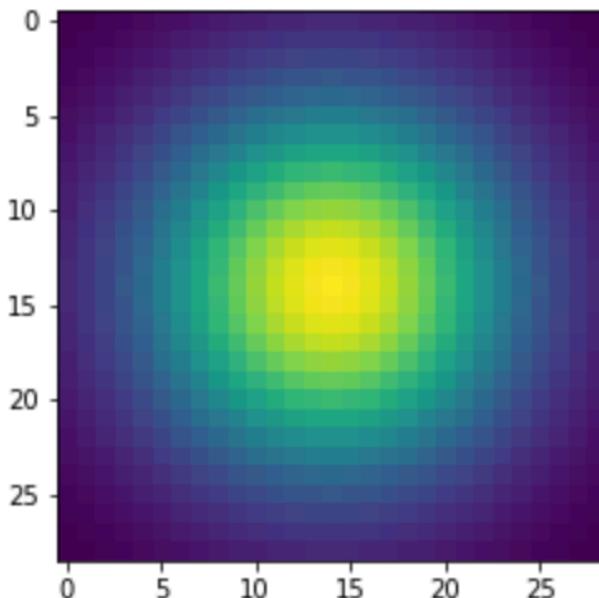
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Part 1: Image filtering

insert visualization of Gaussian kernel from proj1.ipynb here



my_conv2d_numpy():

[Describe your implementation of my_conv2d_numpy() in words. Make sure to discuss padding, and the operations used between the filter and image.]

Part 1: Image filtering

Identity filter



Small blur with a box filter

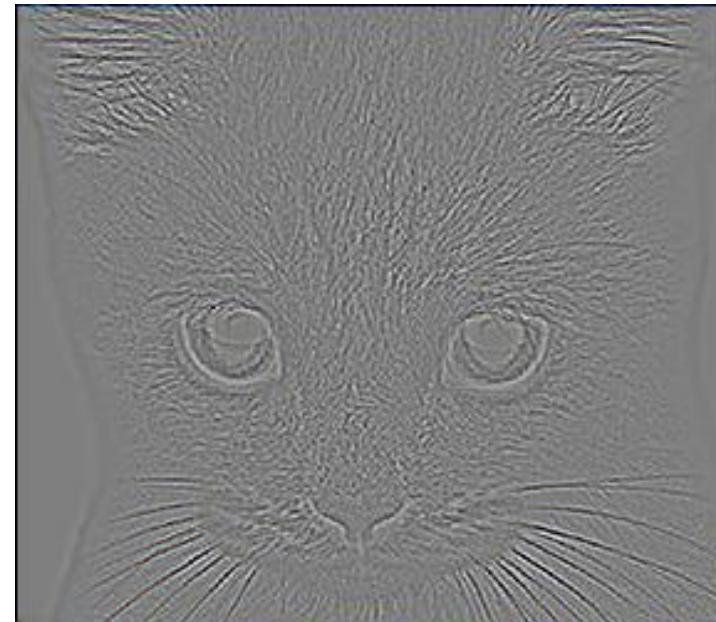


Part 1: Image filtering

Sobel filter



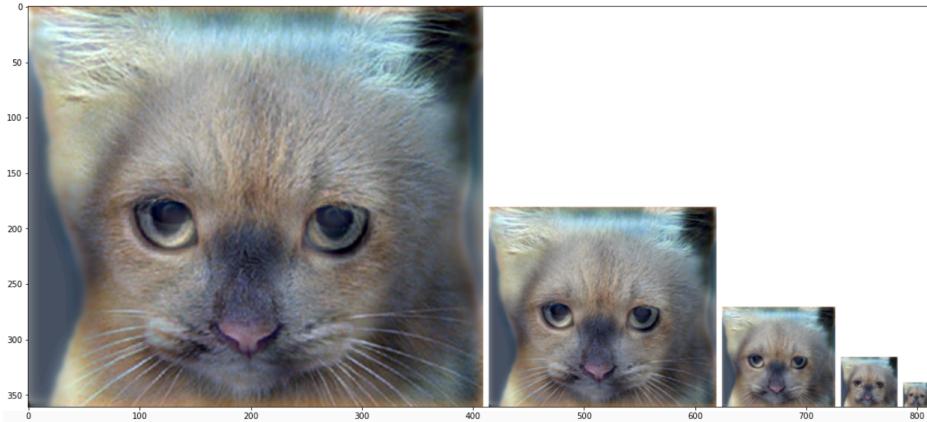
Discrete Laplacian filter



Part 1: Hybrid images

[Describe the three main steps of `create_hybrid_image()` here. Explain how to ensure the output values are within the appropriate range for matplotlib visualizations.]

Cat + Dog



Cutoff frequency: 7

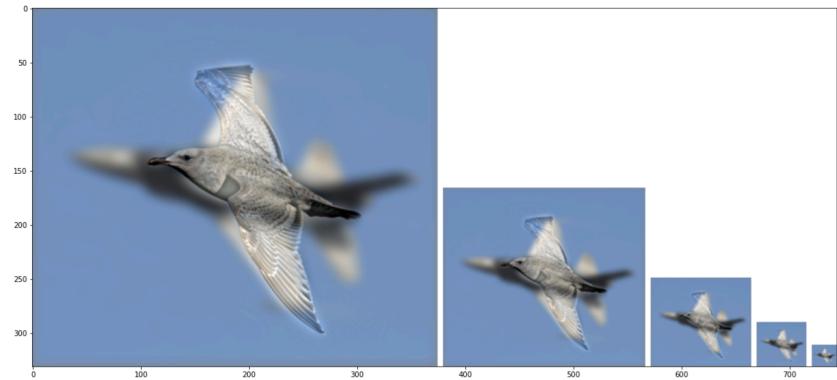
Part 1: Hybrid images

Motorcycle + Bicycle



Cutoff frequency: 5

Plane + Bird



Cutoff frequency: 5

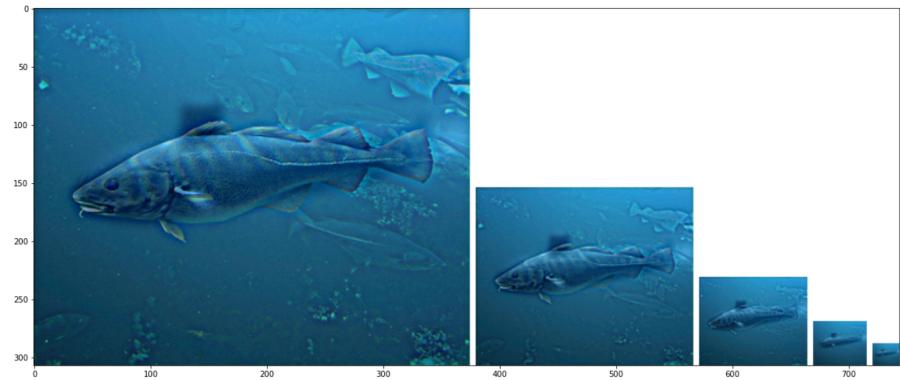
Part 1: Hybrid images

Einstein + Marilyn



Cutoff frequency: 6

Submarine + Fish



Cutoff frequency: 4

Part 2: Hybrid images with PyTorch

Cat + Dog



Motorcycle + Bicycle



Part 2: Hybrid images with PyTorch

Plane + Bird



Einstein + Marilyn



Part 2: Hybrid images with PyTorch

Submarine + Fish



Part 1 vs. Part 2

Compare the run-times of Parts 1 and 2 here, as calculated in proj1.ipynb. Which method is faster?

Numpy: 16.303 seconds

Pytorch: 0.158 seconds

According to the runtime result, pytorch outrun numpy. I think one of the factors that makes pytorch much faster is that pytorch can access array elements faster.

Part 3

Consider a 1-channel 5x5 image and a 3x3 filter.
What are the output dimensions of a convolution
with the following parameters?

Stride = 1, padding = 0?

Stride = 2, padding = 0?

Stride = 1, padding = 1?

Stride = 2, padding = 1?

1. Stride = 1, padding = 0 -> output: 3x3
2. Stride = 2, padding = 0 -> output: 2x2
3. Stride = 1, padding = 1 -> output: 5x5
4. Stride = 2, padding = 1 -> output: 3x3

What are the input & output dimensions of the
convolutions of the dog image and a 3x3 filter
with the following parameters:

Stride = 1, padding = 0

Stride = 2, padding = 0

Stride = 1, padding = 1

Stride = 2, padding = 1?

Input dimensions: 361x410

Output dimensions:

1. 359x408
2. 180x204
3. 361x410
4. 181x205

Part 3

How many filters did we apply to the dog image?

Ans: 12 filters

Why do the output dimensions adhere to the equations given in the instructions handout?

Part 3

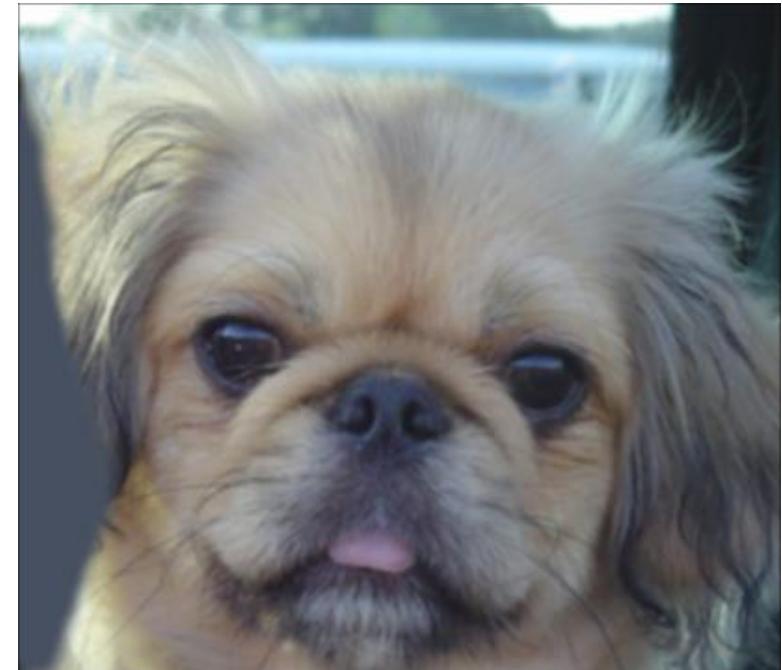
[What is the intuition behind this equation?]

Part 3

insert visualization 0 here



insert visualization 1 here

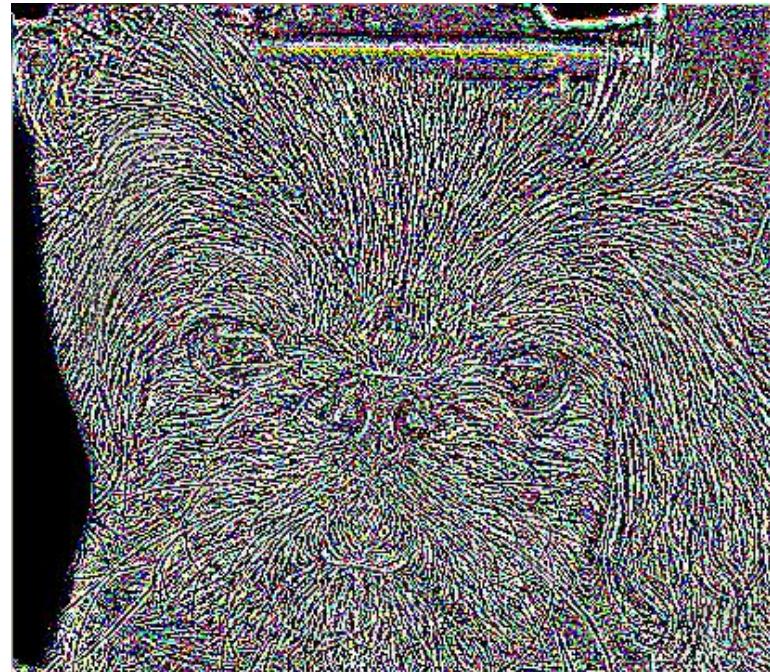


Part 3

insert visualization 2 here



insert visualization 3 here



Conclusion

[How does varying the cutoff frequency value or swapping images within a pair influences the resulting hybrid image?]