Part A:

```
Model Architecture:
AlexNet(
  (features): Sequential(
    (0): Conv2d(3, 96, kernel_size=(11, 11), stride=(4, 4))
    (1): ReLU(inplace=True)
    (2): MaxPool2d(kernel_size=3, stride=2, padding=0, dilation=1, ceil_mode=False)
    (3): Conv2d(96, 256, kernel_size=(5, 5), stride=(1, 1), padding=(2, 2))
    (4): ReLU(inplace=True)
    (5): MaxPool2d(kernel_size=3, stride=2, padding=0, dilation=1, ceil_mode=False)
    (6): Conv2d(256, 384, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (7): ReLU(inplace=True)
    (8): Conv2d(384, 384, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (9): ReLU(inplace=True)
    (10): Conv2d(384, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (11): ReLU(inplace=True)
    (12): MaxPool2d(kernel_size=3, stride=2, padding=0, dilation=1, ceil_mode=False)
  )
  (classifier): Sequential(
    (0): Dropout(p=0.5, inplace=False)
    (1): Linear(in_features=9216, out_features=4096, bias=True)
    (2): ReLU(inplace=True)
    (3): Dropout(p=0.5, inplace=False)
    (4): Linear(in_features=4096, out_features=4096, bias=True)
    (5): ReLU(inplace=True)
    (6): Linear(in_features=4096, out_features=4, bias=True)
  )
)
```

Result for AlexNet:

```
[Epoch 100] train accuracy: 0.9904, loss: 0.0331
[Epoch 100] eval accuracy: 0.9015, loss: 0.5498
```

Part B:

```
Model Architecture:
AlexNetLargeKernel(
  (features): Sequential(
    (0): Conv2d(3, 96, kernel_size=(21, 21), stride=(8, 8), padding=(1, 1))
    (1): ReLU(inplace=True)
    (2): Conv2d(96, 256, kernel_size=(7, 7), stride=(2, 2), padding=(2, 2))
    (3): ReLU(inplace=True)
    (4): Conv2d(256, 384, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (5): ReLU(inplace=True)
    (6): Conv2d(384, 384, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (7): ReLU(inplace=True)
    (8): Conv2d(384, 256, kernel_size=(3, 3), stride=(2, 2))
    (9): ReLU(inplace=True)
  )
  (classifier): Sequential(
    (0): Dropout(p=0.5, inplace=False)
    (1): Linear(in_features=9216, out_features=4096, bias=True)
    (2): ReLU(inplace=True)
    (3): Dropout(p=0.5, inplace=False)
    (4): Linear(in_features=4096, out_features=4096, bias=True)
    (5): ReLU(inplace=True)
    (6): Linear(in_features=4096, out_features=4, bias=True)
  )
)
```

Result for AlexNetLargeKernel:

```
[Epoch 100] train accuracy: 0.9937, loss: 0.0175
[Epoch 100] eval accuracy: 0.8724, loss: 1.1351
```

```
Model Architecture:
AlexNetAvgPooling(
  (features): Sequential(
    (0): Conv2d(3, 96, kernel_size=(11, 11), stride=(4, 4))
    (1): ReLU(inplace=True)
    (2): AvgPool2d(kernel_size=3, stride=2, padding=0)
    (3): Conv2d(96, 256, kernel_size=(5, 5), stride=(1, 1), padding=(2, 2))
    (4): ReLU(inplace=True)
    (5): AvgPool2d(kernel_size=3, stride=2, padding=0)
    (6): Conv2d(256, 384, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (7): ReLU(inplace=True)
    (8): Conv2d(384, 384, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (9): ReLU(inplace=True)
    (10): Conv2d(384, 256, kernel_size=(3, 3), stride=(1, 1), padding=(1, 1))
    (11): ReLU(inplace=True)
    (12): AvgPool2d(kernel_size=3, stride=2, padding=0)
  )
  (classifier): Sequential(
    (0): Dropout(p=0.5, inplace=False)
    (1): Linear(in_features=9216, out_features=4096, bias=True)
    (2): ReLU(inplace=True)
    (3): Dropout(p=0.5, inplace=False)
    (4): Linear(in_features=4096, out_features=4096, bias=True)
    (5): ReLU(inplace=True)
    (6): Linear(in_features=4096, out_features=4, bias=True)
  )
)
```

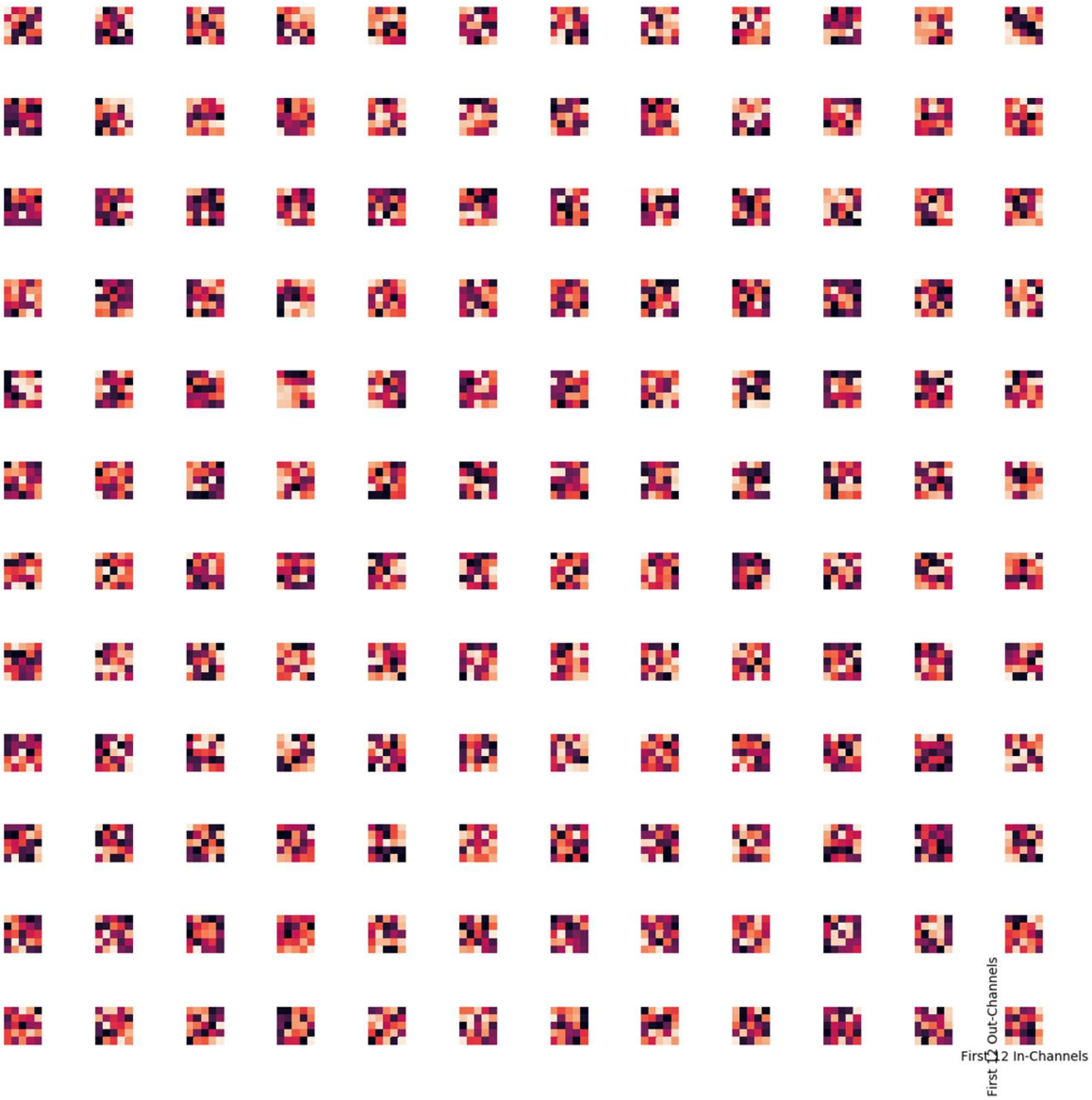
Result for AlexNetAvgPooling:

```
[Epoch 100] train accuracy: 0.9958, loss: 0.0141
[Epoch 100] eval accuracy: 0.8838, loss: 0.7957
```

Part C: Domain Kernels:

Conv2d-0

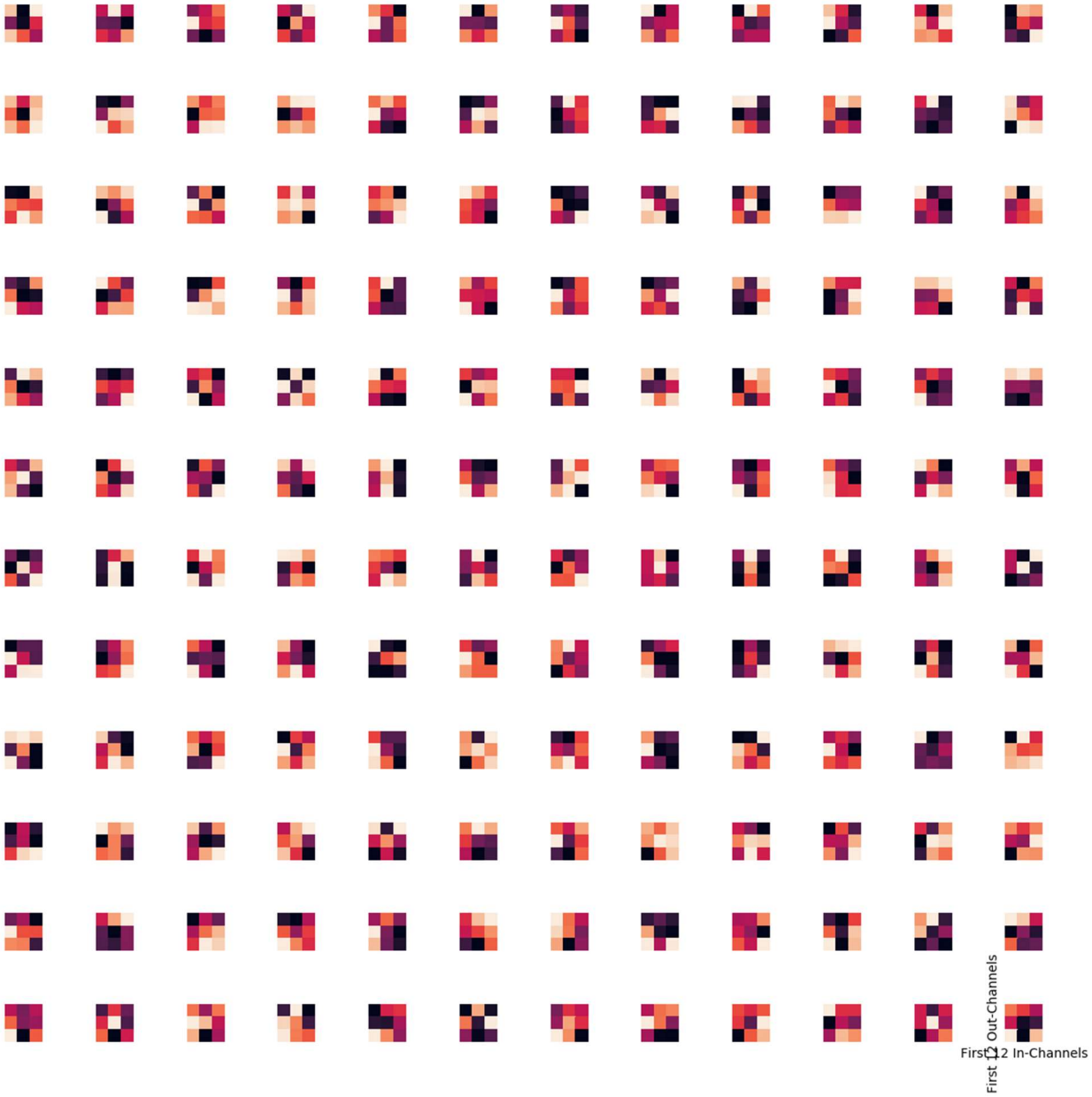
Conv2d-3



Conv2d-6

Conv2d-8

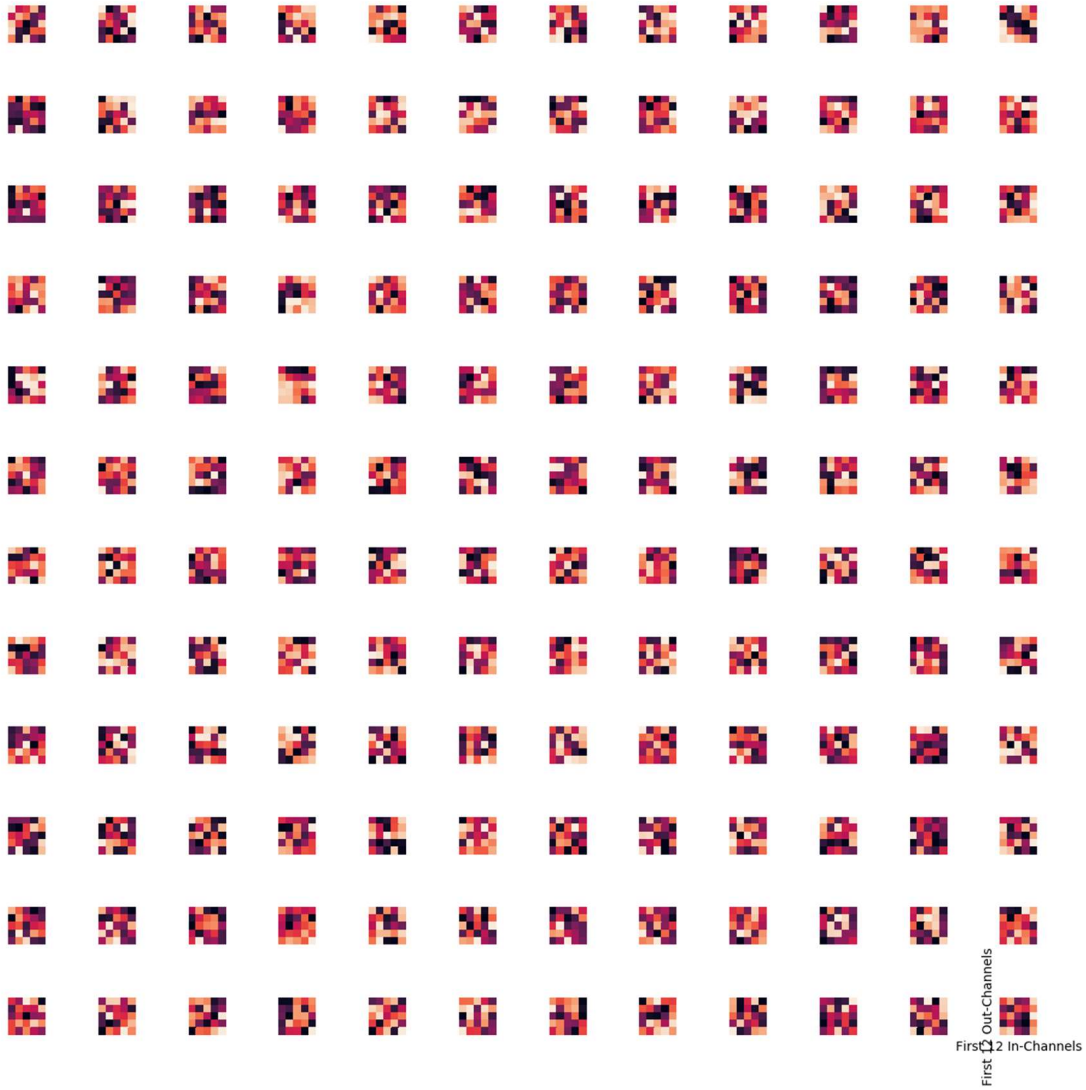
Conv2d-10



Class Kernels:

Conv2d-0

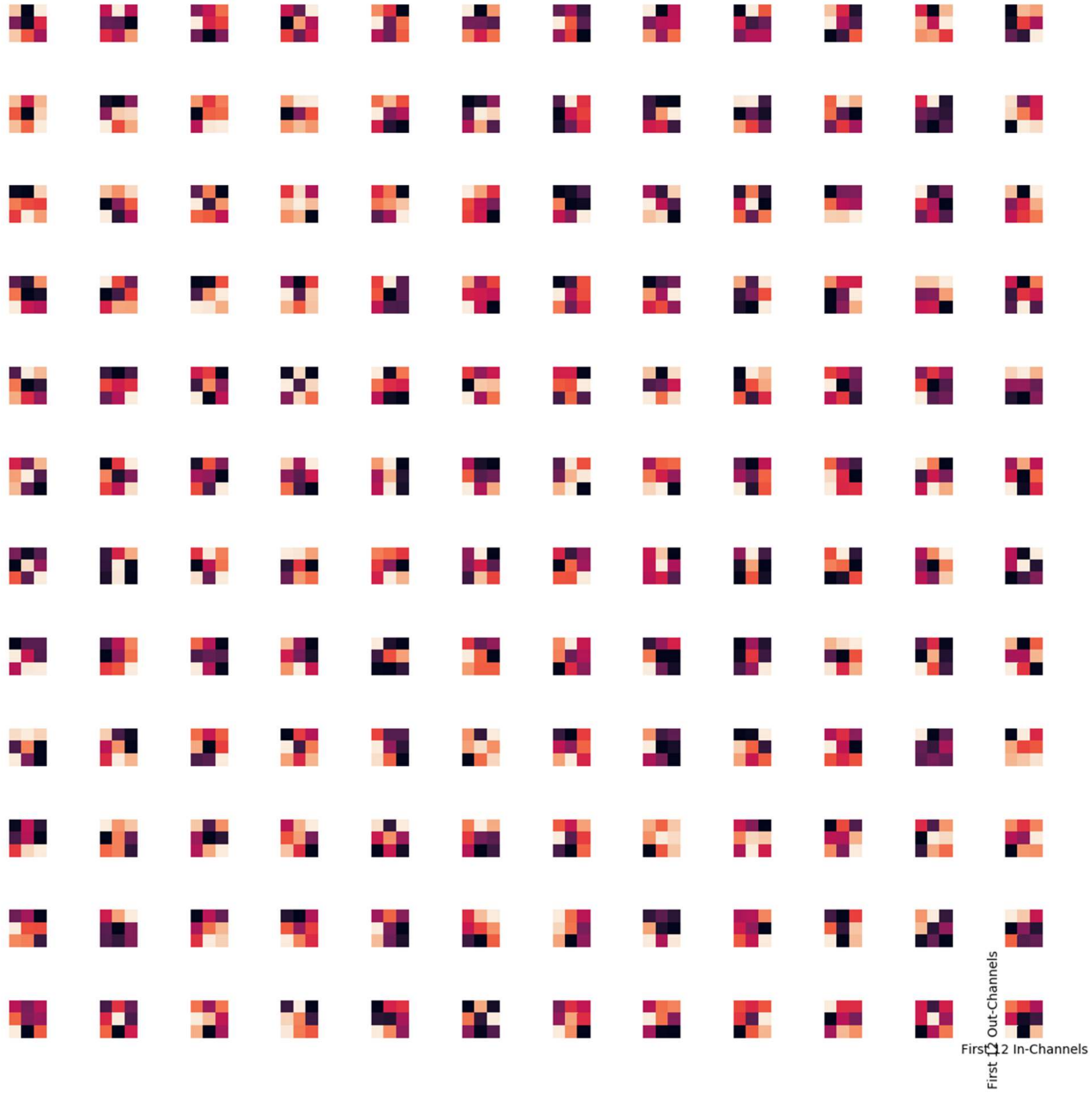
Conv2d-3



Conv2d-6

Conv2d-8

Conv2d-10



My findings:

The kernels start as simple and then progress to more advanced convolutions. There are also some consistencies in both domain and category classification even though they are looking for different properties in the images.