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| **PA3 Individual Report** |

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1. **Understanding convolutional network basics**

Filtered input 1:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | x | x | x | x |
| x | 4 | 4 | 3 | x |
| x | -4 | -1 | 0 | x |
| x | -2 | -1 | 0 | x |
| x | x | x | x | x |

Filtered input 2:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | x | x | x | x |
| x | -2 | -2 | 0 | x |
| x | 2 | 3 | 2 | x |
| x | 2 | 2 | 3 | x |
| x | x | x | x | x |

Output Feature Map:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | x | x | x | x |
| x | 2 | 2 | 3 | x |
| x | -2 | 2 | 2 | x |
| x | 0 | 1 | 3 | x |
| x | x | x | x | x |

**2 Maximumly activating patch**

**Activating Patches from Input:**

|  |  |  |
| --- | --- | --- |
| -1 | 0 | 0 |
| x | x | x |
| 1 | 1 | 1 |

|  |  |  |
| --- | --- | --- |
| 0 | x | -1 |
| -1 | x | x |
| 1 | 1 | 1 |

**Optimal Activating Patches:**

|  |  |  |
| --- | --- | --- |
| -1 | -1 | -1 |
| x | x | x |
| 1 | 1 | 1 |

|  |  |  |
| --- | --- | --- |
| 1 | x | -1 |
| 1 | x | x |
| 1 | 1 | 1 |

**3 Spatial pooling**

Output Feature Map:

|  |  |
| --- | --- |
| 2 | 3 |
| 2 | 3 |

**4 Number of learnable parameters**

(i) The number of input channels to conv1: 1

(ii) The number of input channels to conv2: 12

(iii) The number of input channels to conv3: 10

(iv) The number of the incoming dimensions to fc1 will be in total. First, the grayscale image with resolution will be processed by a kernel with channels of output, resulting in a output of the layer. Then, it will be processed by another kernel with channels of output, resulting in a output size. Another convolutional layer with a kernel and output channels will further shrink the input size to . Finally, this will be max pooled by a kernel, leaving the next output before the fully connected layer in the size of .