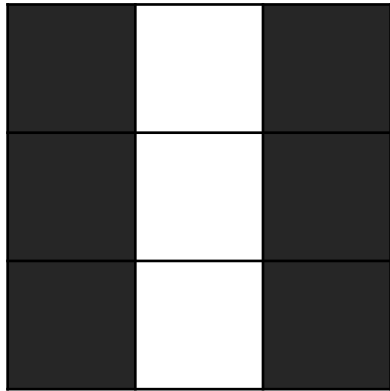# Activity 7: Understanding Convolution
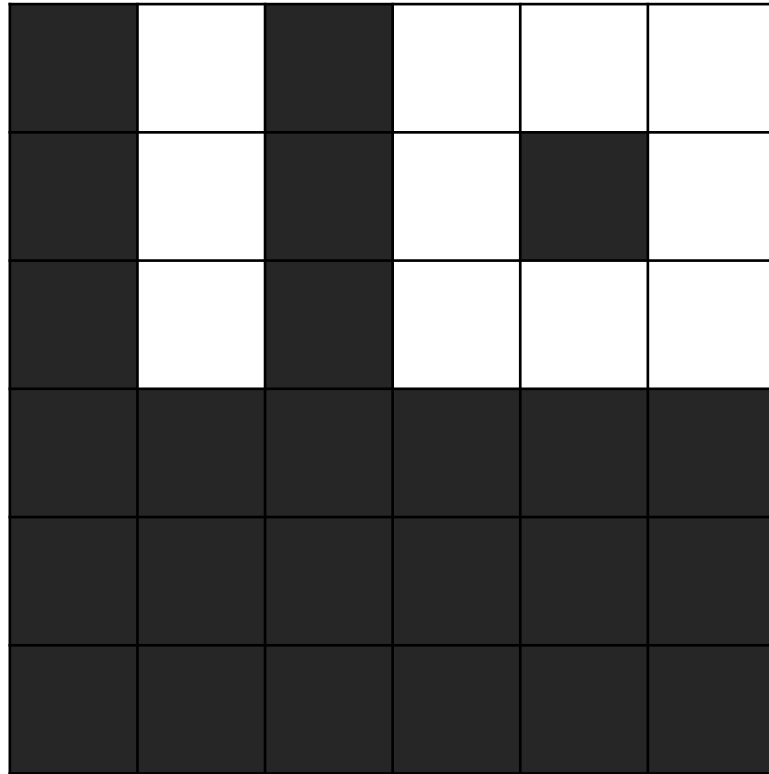
ML for Health, Week 7

ANSWER KEY

Part 1: What's the size of the feature map we'll get when we convolve the filter with the image? Why?
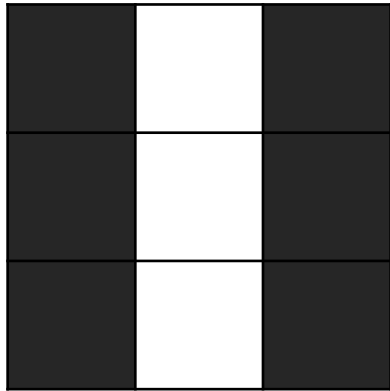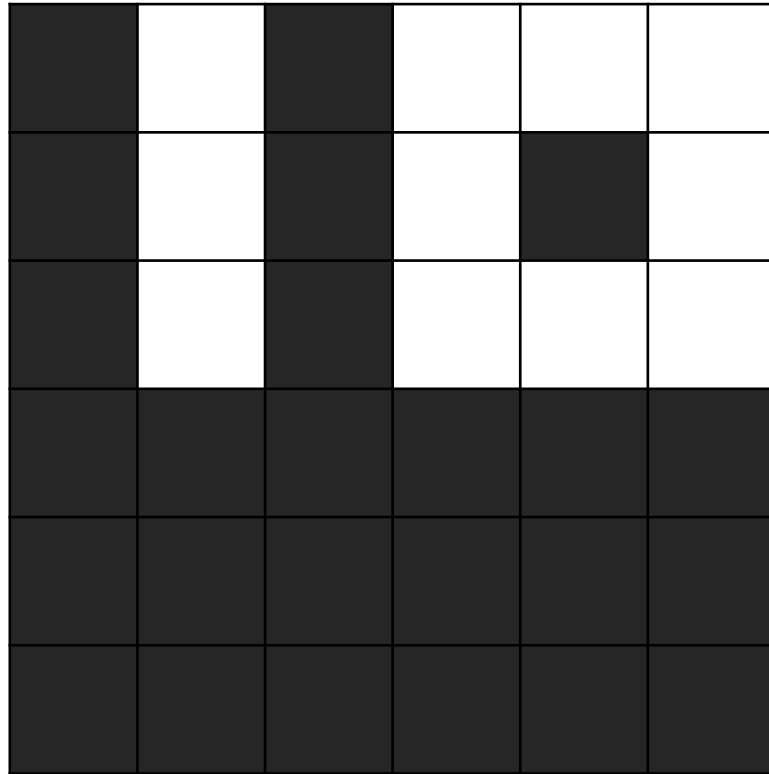

filter

image

Let's compute the resulting feature map. First, we'll convert the shades to numbers.

filter

image

Part 2a: Compute the values in the resulting feature map.

filter	

-1	1	-1
-1	1	-1
-1	1	-1

filter

-1	1	-1	1	1	1
-1	1	-1	1	-1	1
-1	1	-1	1	1	1
-1	-1	-1	-1	-1	-1
-1	-1	-1	-1	-1	-1
-1	-1	-1	-1	-1	-1

image

9	-9	5	2
7	-5	5	-3
5	-1	3	1
3	3	3	3

feature map

Part 2b: Compute the values in the resulting feature map.

1	1	1
1	-1	1
1	1	1

filter

-1	1	-1	1	1	1
-1	1	-1	1	-1	1
-1	1	-1	1	1	1
-1	-1	-1	-1	-1	-1
-1	-1	-1	-1	-1	-1
-1	-1	-1	-1	-1	-1

image

-5	5	-1	9
-7	1	-5	-1
-5	-3	-3	-1
-7	-7	-7	-7

feature map

Part 3: Max Pool by selecting the max value in each 2x2 subgrid

filters

-1	1	-1
-1	1	-1
-1	1	-1

1	1	1
1	-1	1
1	1	1

image

-1	1	-1	1	1	1
-1	1	-1	1	-1	1
-1	1	-1	1	1	1
-1	-1	-1	-1	-1	-1
-1	-1	-1	-1	-1	-1
-1	-1	-1	-1	-1	-1

feature maps

9	-9	5	2
7	-5	5	-3
5	-1	3	1
3	3	3	3

-5	5	-1	9
-7	1	-5	-1
-5	-3	-3	-1
-7	-7	-7	-7

downsampled feature maps

9	5
5	3

5	9
-3	-1

Part 4 (challenge): How could you design a level 2 filter to detect a "10"?

Answer: (2x2x2) filter that matches the feature maps at right.

| filters | image | downsampled feature maps | thresholded feature maps (1 if >7 else -1) |