Filters in Convolutional Neural Network

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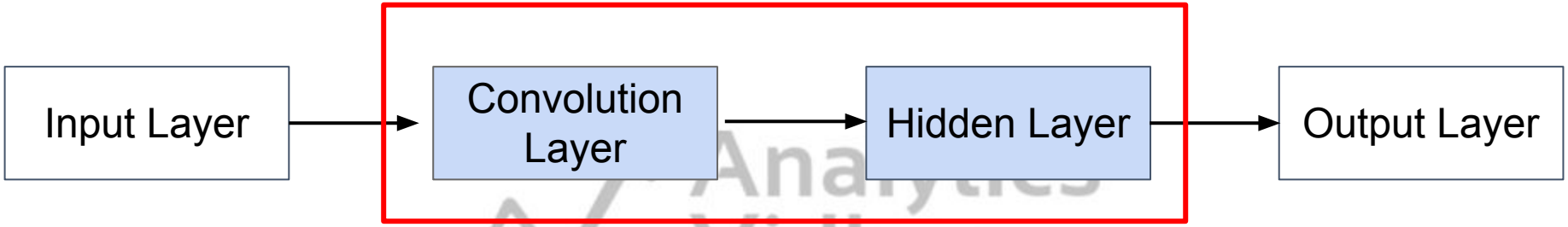
Convolutional Neural Network



Feature Extractor

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Convolutional Neural Network

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-1	0	1
-1	0	1
-1	0	1

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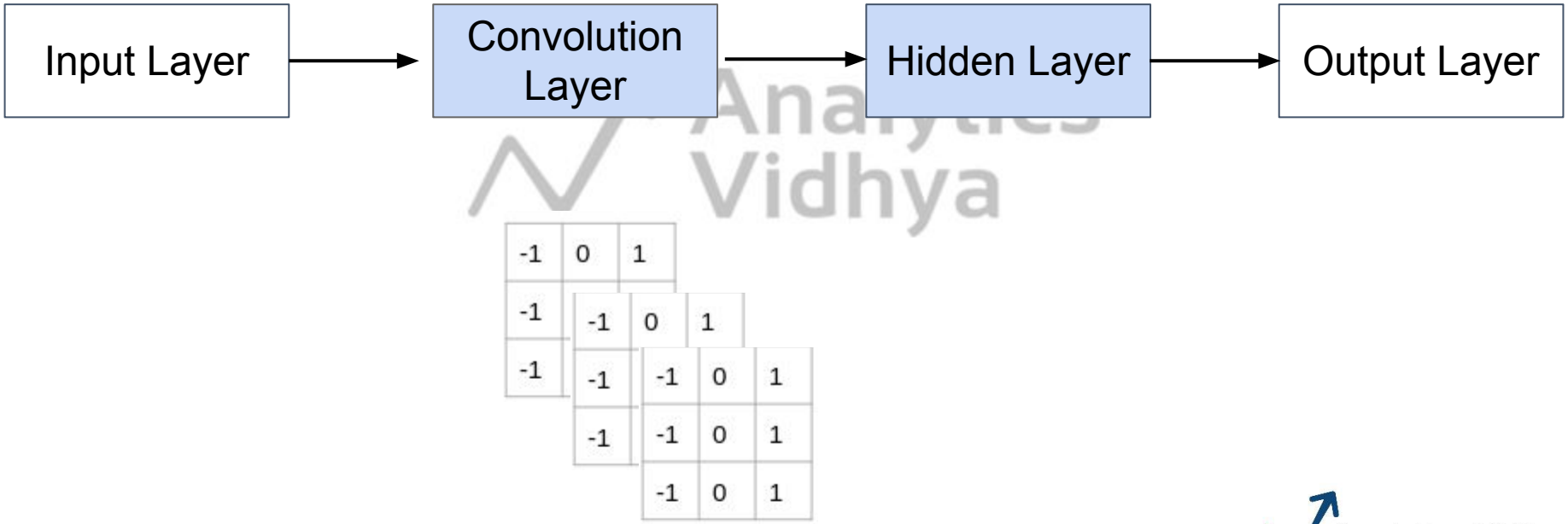
Convolutional Neural Network



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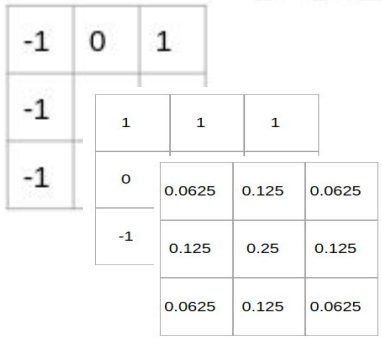
Convolutional Neural Network

Analytics Vidhya



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Shapes with Single Filter

-1	0	1
-1	0	1
-1	0	1

3 X 3

36	31	28	24	23	27	33	39
38	34	29	26	25	30	37	41
39	35	32	28	27	33	40	43
42	38	34	30	30	36	43	46
43	40	36	32	34	40	48	50
44	41	37	35	37	43	51	52
45	42	39	37	41	46	53	54
45	42	40	39	42	48	54	55
43	42	39	40	43	49	55	57
41	41	38	39	44	49	55	58
38	39	37	40	44	49	55	58
34	37	36	39	43	48	54	56
31	35	35	39	44	49	53	55

13 X 8

-24	-22	-14	12	35	33
-23	-23	-13	14	39	32
-22	-23	-11	18	41	31
-22	-23	-6	22	41	29
-20	-19	0	25	40	26
-18	-15	4	27	37	23
-15	-10	9	28	36	23
-13	-7	13	29	34	23
-8	-3	18	29	33	25
-2	2	20	28	32	25
5	8	23	28	30	23

11 X 6

Calculating shape of Feature Map

$$OutputHeight = \frac{InputHeight - FilterHeight}{RowStride} + 1$$

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$$OutputWidth = \frac{InputWidth - FilterWidth}{ColumnStride} + 1$$

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Shapes with 1 Filter and 2D image

720 X 960

-1	0	1
-1	0	1
-1	0	1

3 X 3

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Shapes with 1 Filter and 2D image

720 X 960

-1	0	1
-1	0	1
-1	0	1

3 X 3

718 X 958

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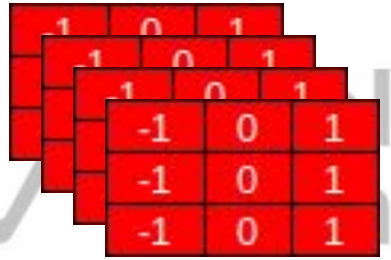
Shapes with 4 Filter and 2D image



720 X 960

4

3 X 3

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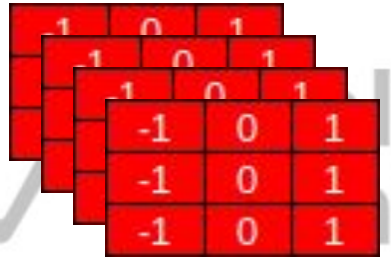
Shapes with 4 Filter and 2D image

720 X 960



4 3 X 3

718 X 958 X 4

Analytics Vidhya
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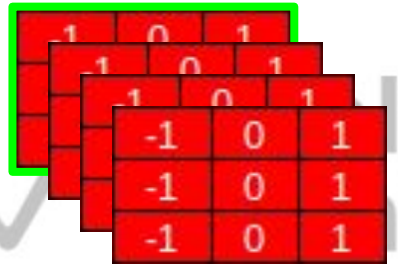
Shapes with 4 Filter and 2D image

720 X 960



4

3 X 3

718 X 958 X 4

Analytics Vidhya
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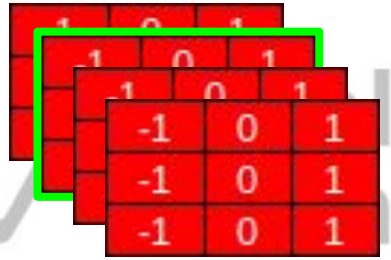
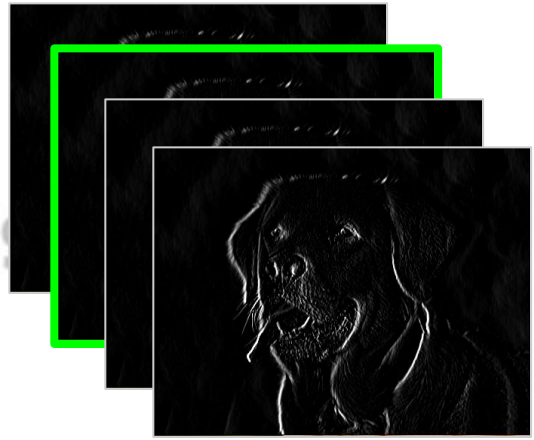
Shapes with 4 Filter and 2D image

720 X 960



4

3 X 3



718 X 958 X 4

Analytics Vidhya
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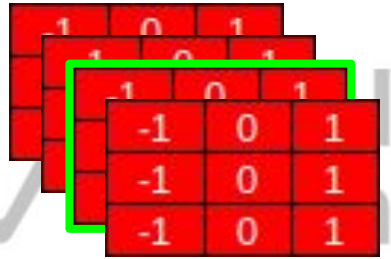
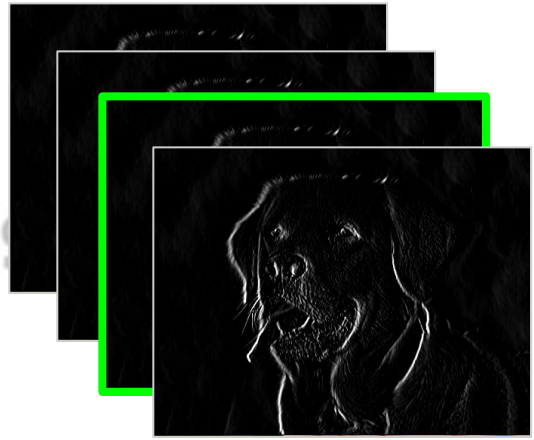
Shapes with 4 Filter and 2D image

720 X 960



4 3 X 3



718 X 958 X 4

Analytics Vidhya
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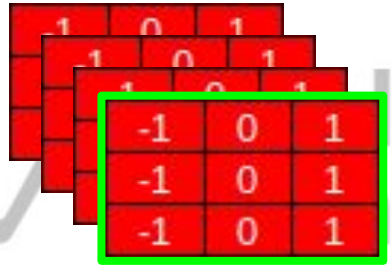
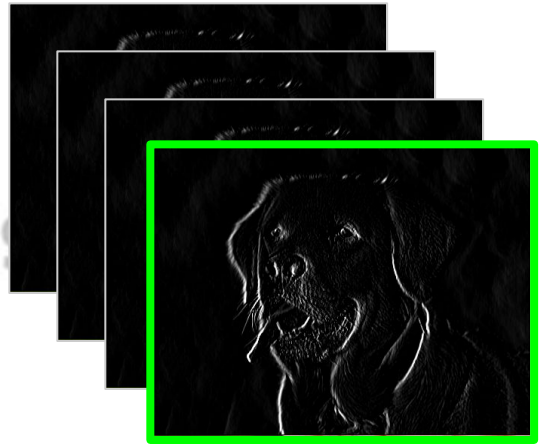
Shapes with 4 Filter and 2D image

720 X 960



4 3 X 3



718 X 958 X 4

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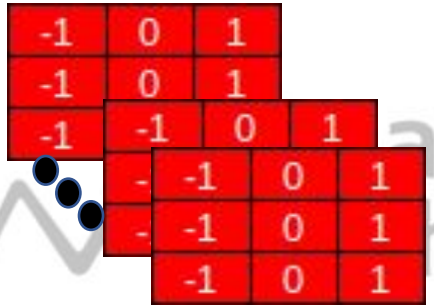
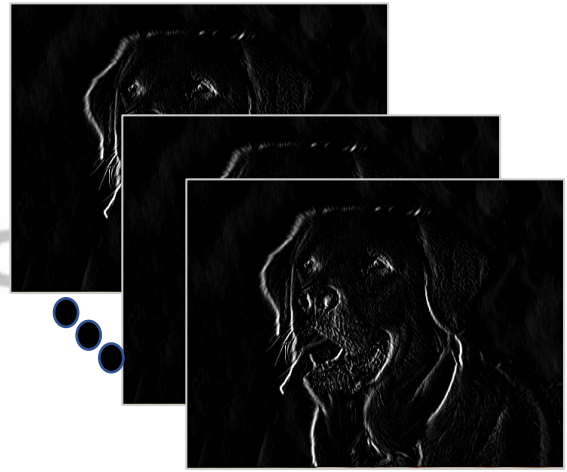
Shapes with 4 Filter and 2D image

720 X 960



N

3 X 3



718 X 958 X N

Analytics Vidhya
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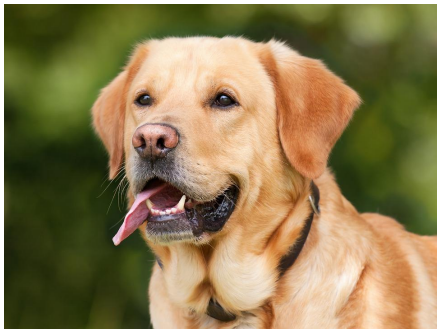
Shapes with 1 Filter and 3-D Image

720 X 960 X 3

R G B

Analytics Vidhya
Learn everything about analytics

Shapes with 1 Filter and 3-D Image



-1	0	1
-1	0	1
-1	0	1

Analytics Vidhya

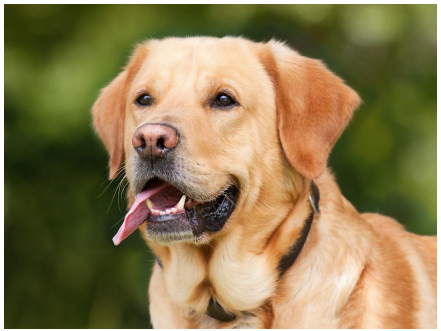
720 X 960 X 3

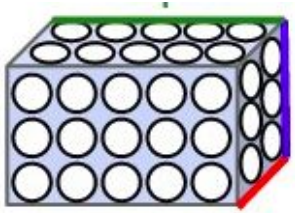
R G B

3 X 3

Analytics Vidhya
Learn everything about analytics

Shapes with 1 Filter and 3-D Image





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720 X 960 X 3

3 X 3 X 3

Same

Analytics Vidhya
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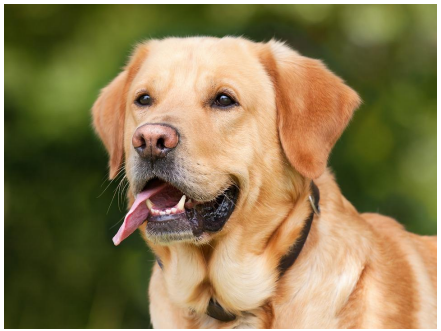
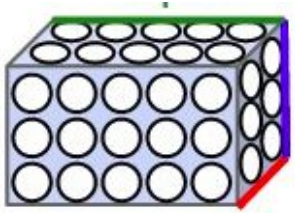
Shapes with 1 Filter and 3-D Image





720 X 960 X 5

3 X 3 X 5

Same

Analytics Vidhya
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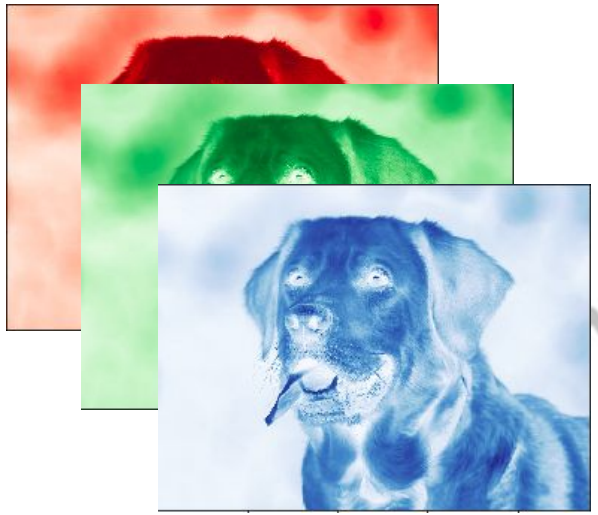
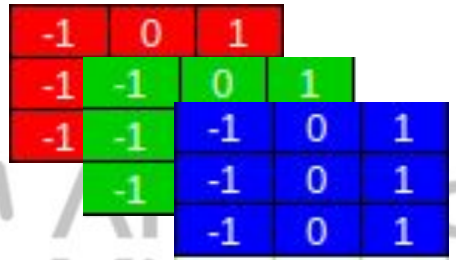
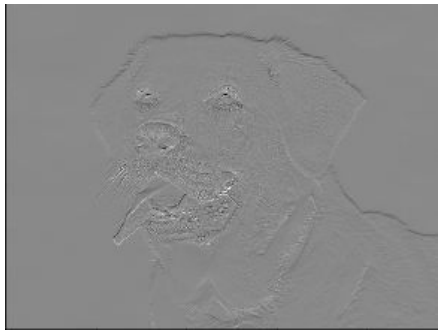
Shapes with 1 Filter and 3-D Image







720 X 960 X 3

3 X 3 X 3

Same

Analytics Vidhya
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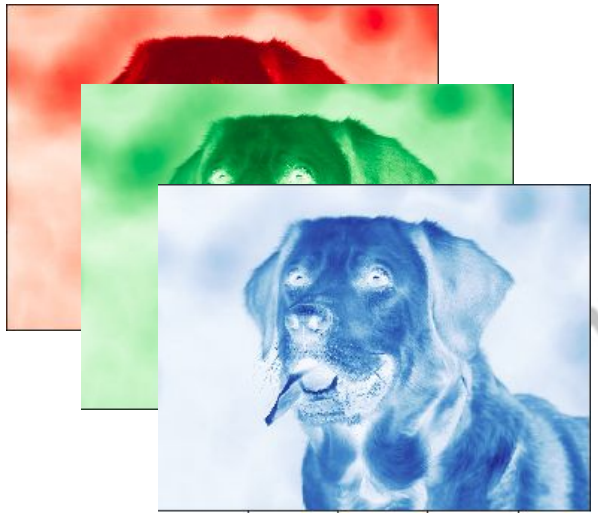
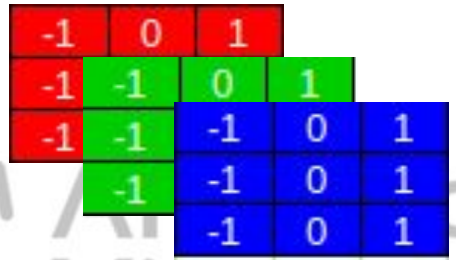
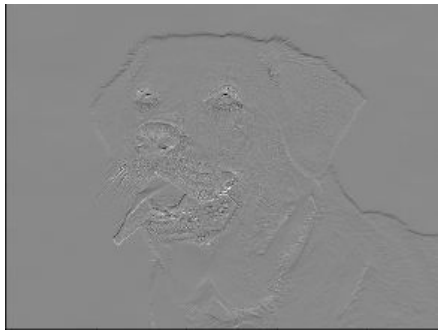
Shapes with 1 Filter and 3-D Image







720 X 960 X 3

3 X 3 X 3

718 X 958

Same

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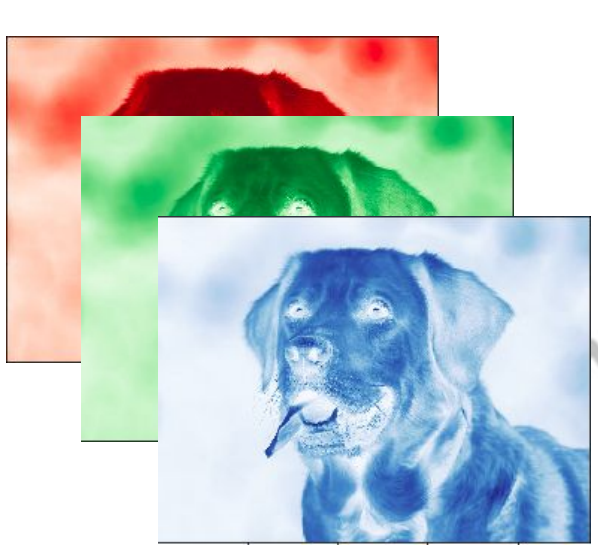
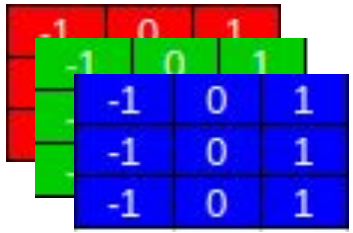
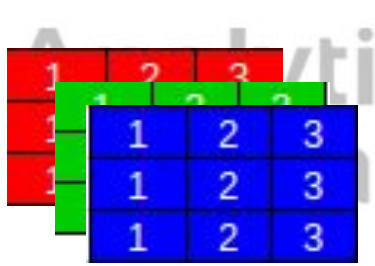
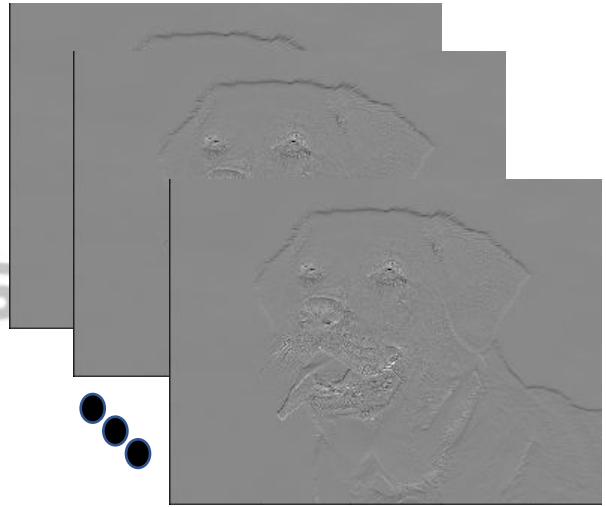
Shapes with N Filter and 3-D Image









720 X 960 X 3

N

3 X 3 X 3

718 X 958 X N

Same

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Thank You!

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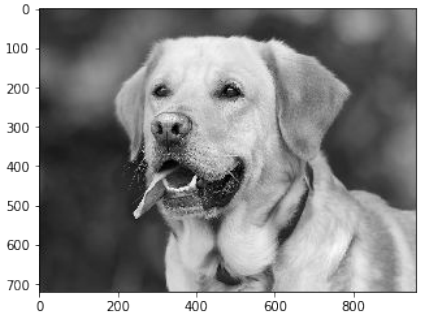
Different kinds of Features Extracted



filters

Blur

Outline

Horizontal lines

Contrast

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What are Filters?

Original Image

-1	0	1
-1	0	1
-1	0	1

Filter – Right Sobel

Extracted Feature – Vertical lines