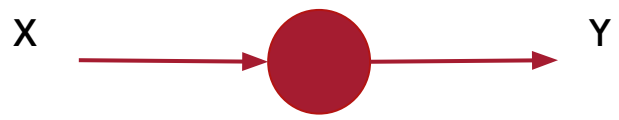


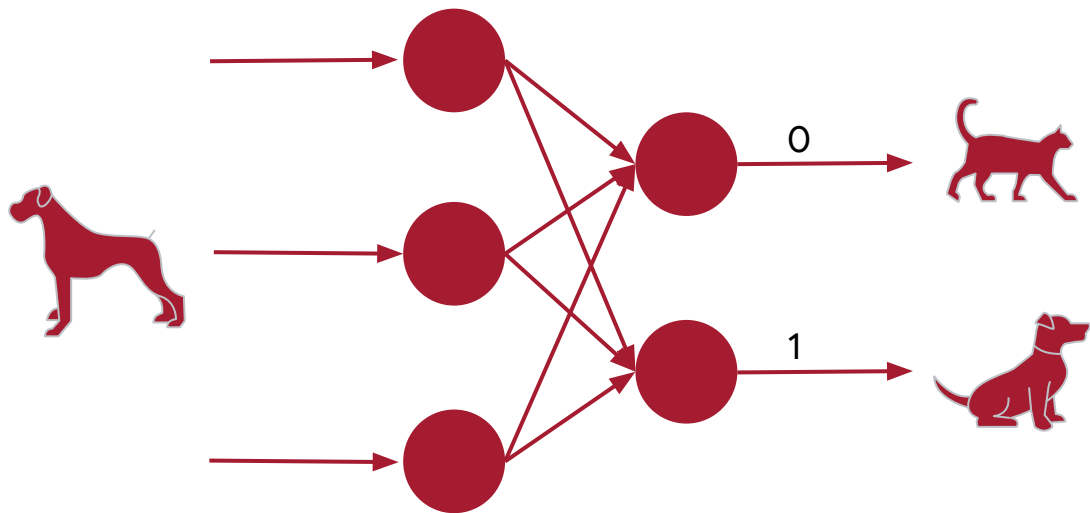
Introducing Convolutions

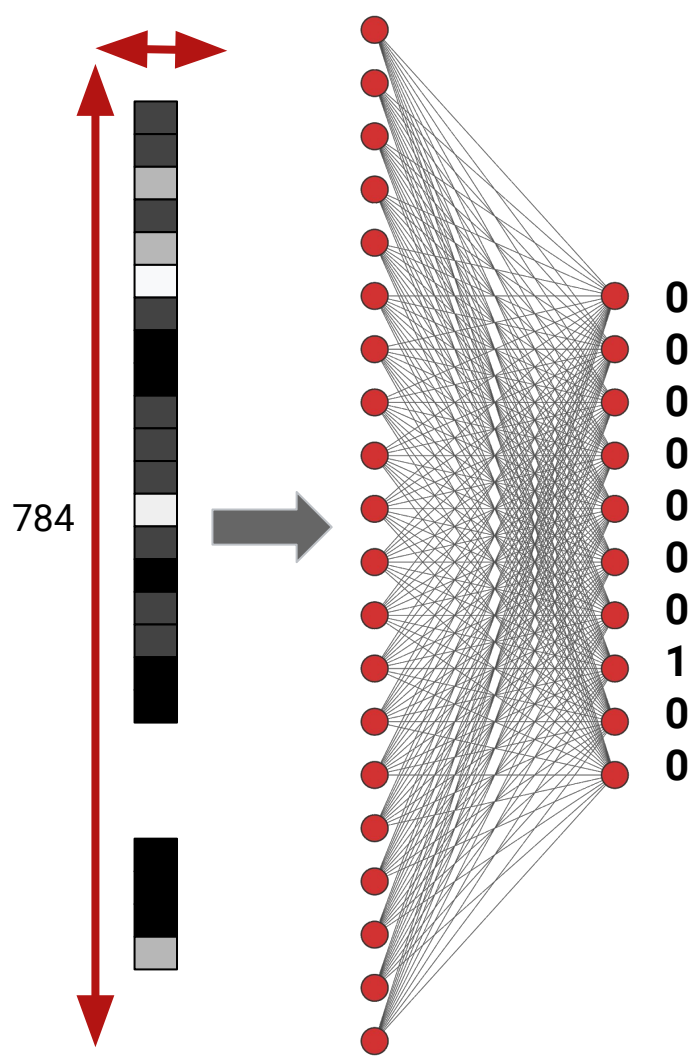
Beyond weights and biases...



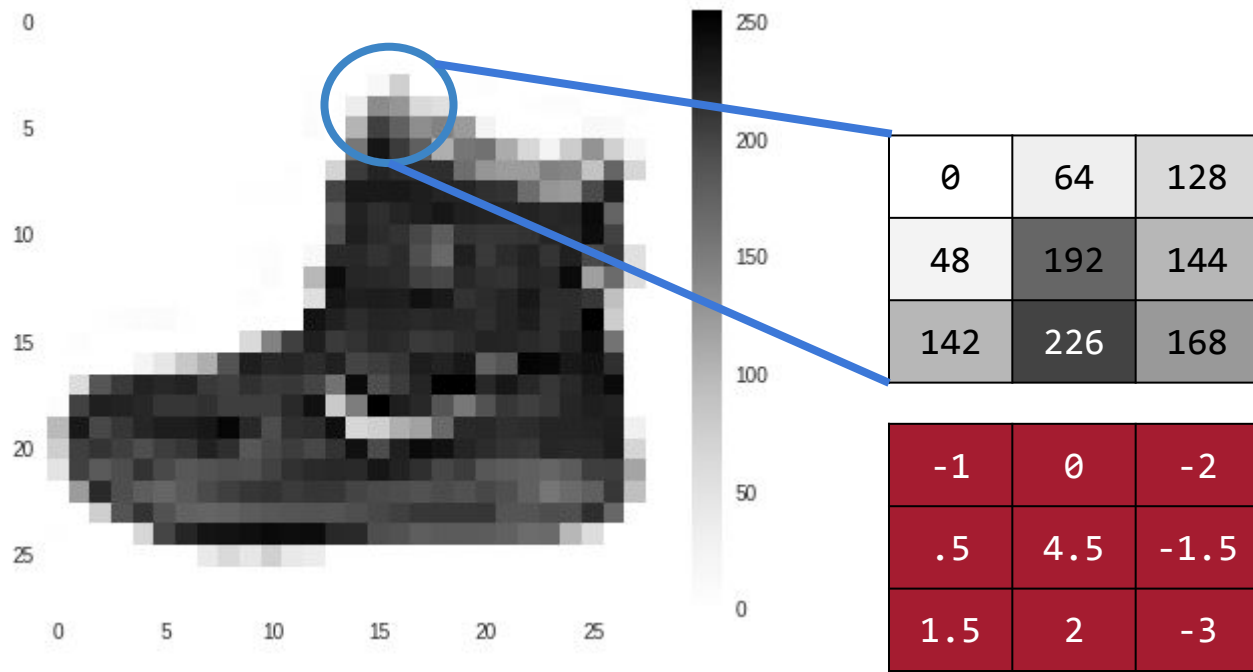
Laurence Moroney, Google











Current Pixel Value is 192

Consider neighbor Values

Filter Definition

CURRENT_PIXEL_VALUE = 192

NEW_PIXEL_VALUE = $(-1 * 0) + (0 * 64) + (-2 * 128) +$
 $(.5 * 48) + (4.5 * 192) + (-1.5 * 144) +$
 $(1.5 * 42) + (2 * 226) + (-3 * 168)$



-1	0	1
-2	0	2
-1	0	1



0	64	128	128
48	192	144	144
142	226	168	0
255	0	0	64

0	64
48	192

128	128
144	144

142	226
255	0

168	0
0	64

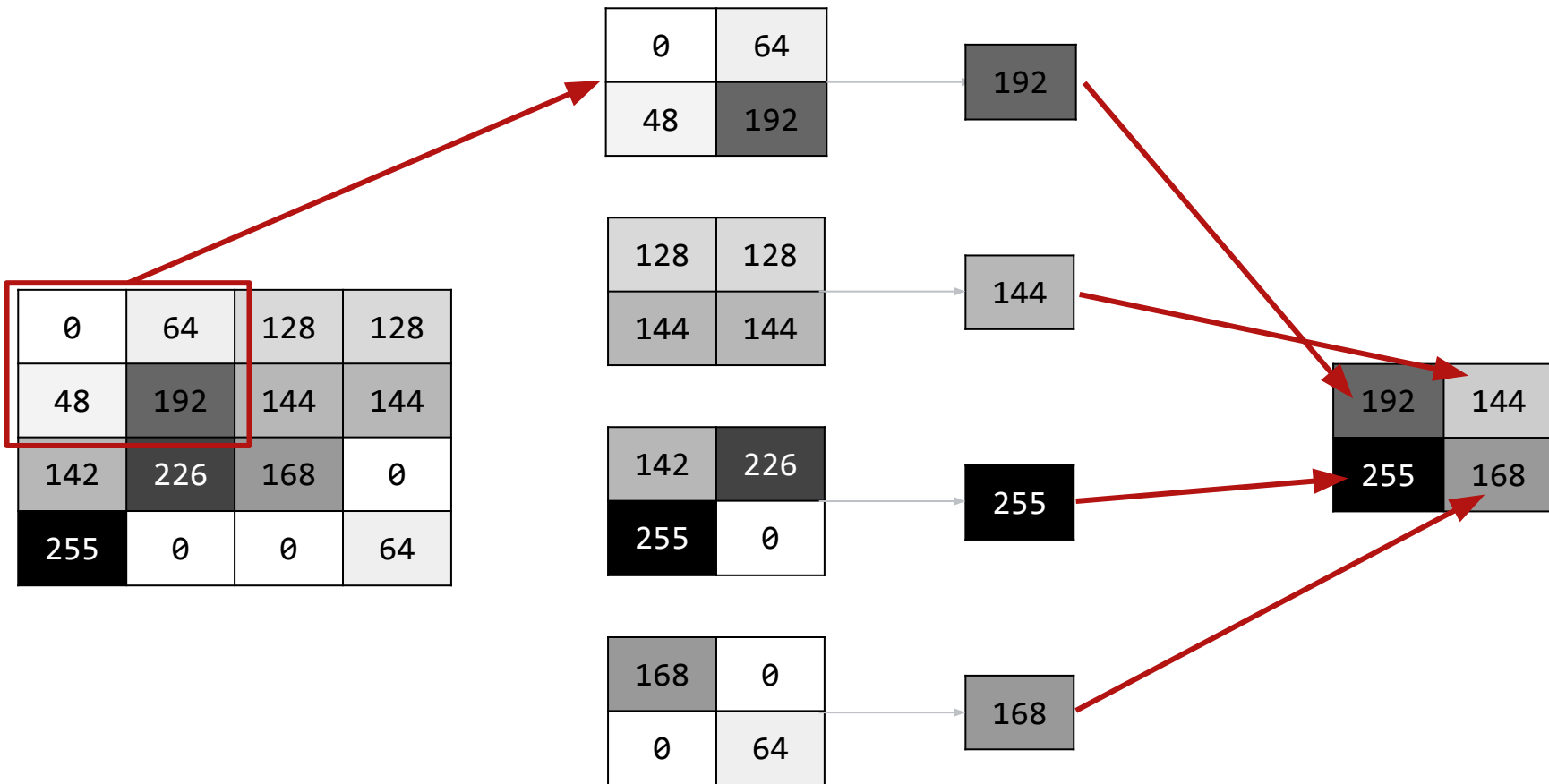
192

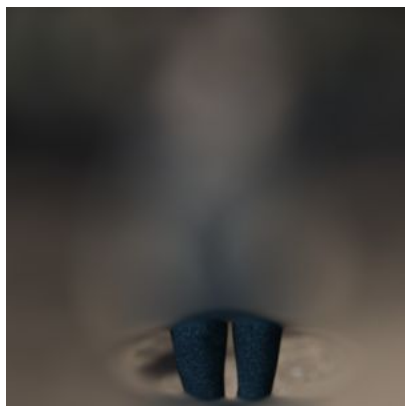
144

255

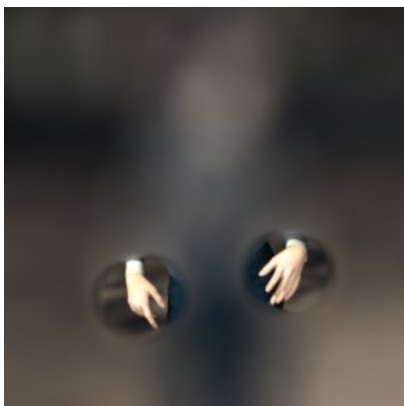
168

192	144
255	168

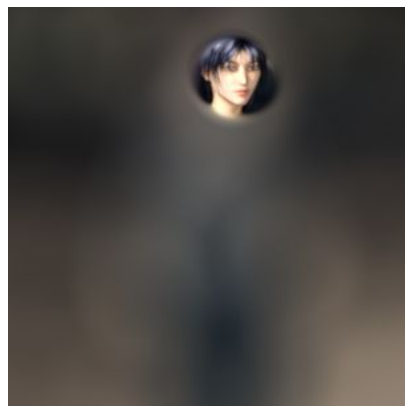




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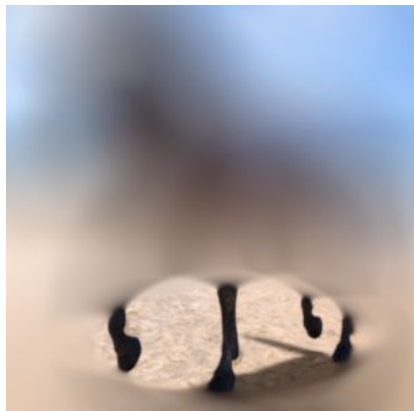


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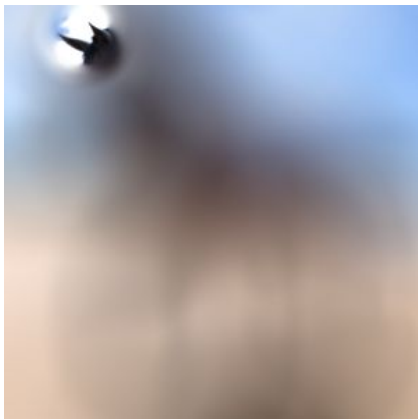


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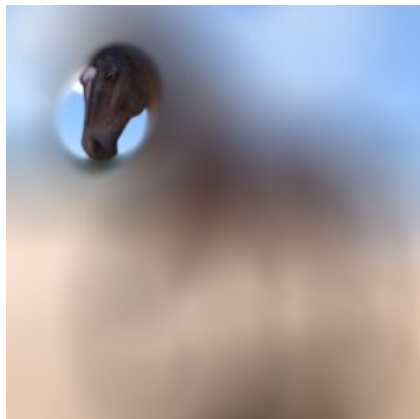
HUMAN



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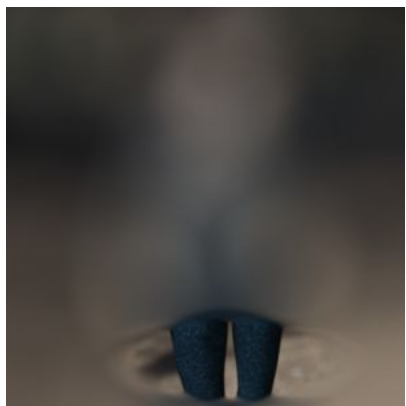


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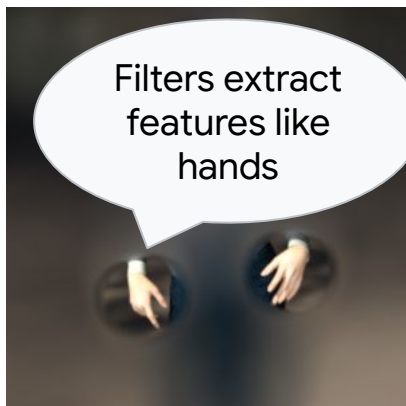


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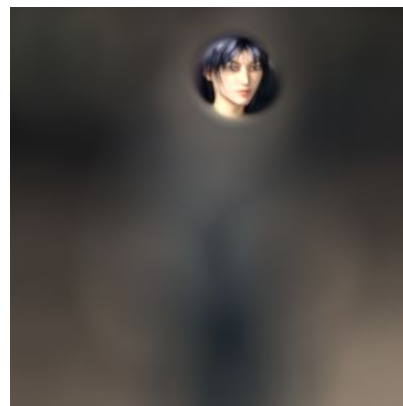
HORSE



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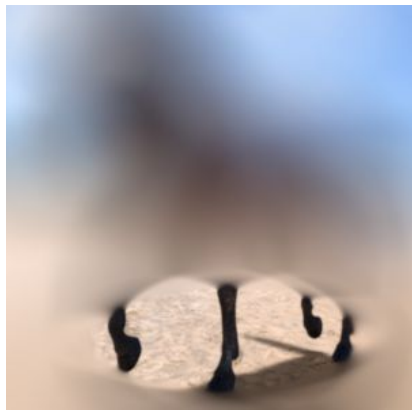


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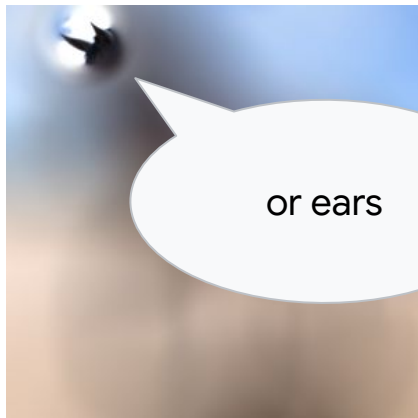


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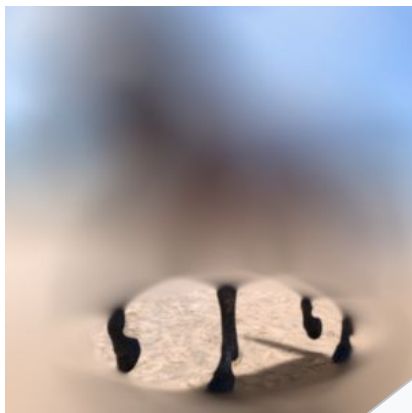


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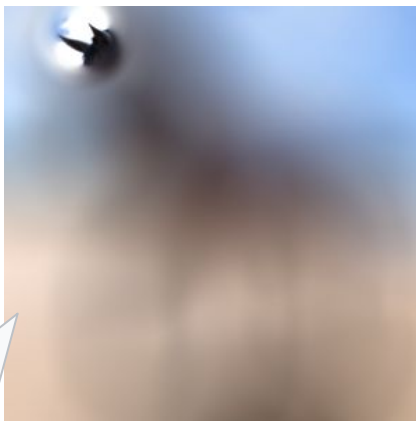


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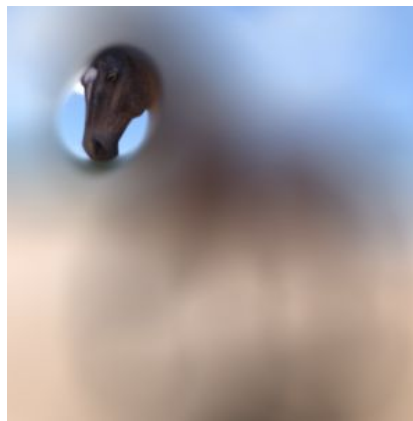
HORSE



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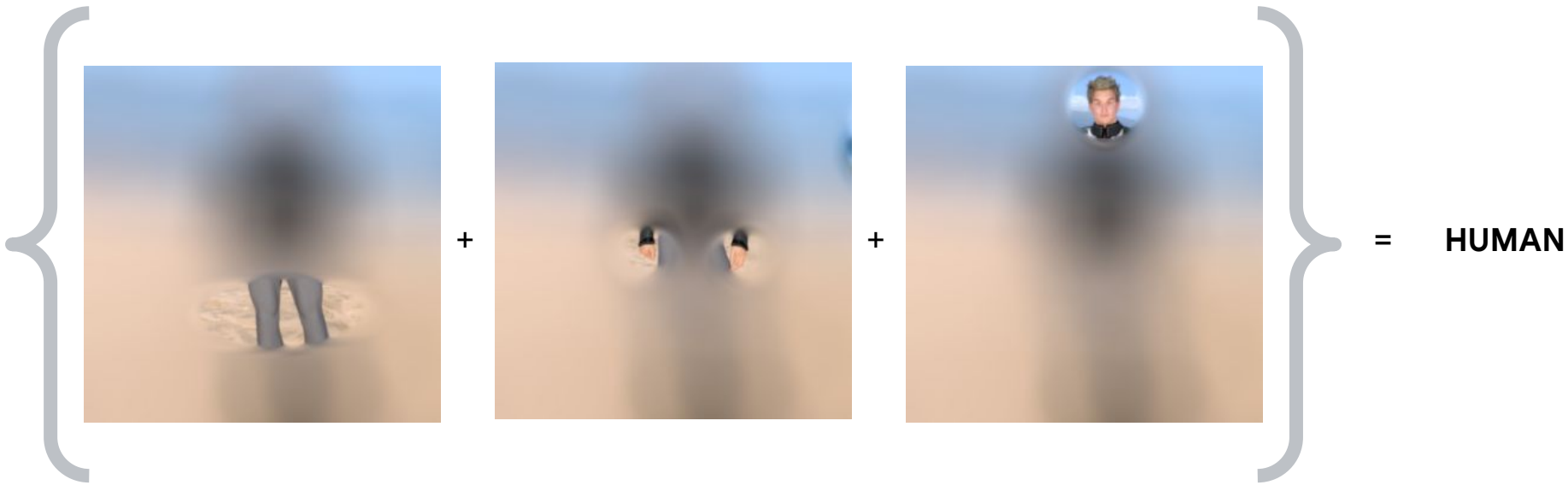
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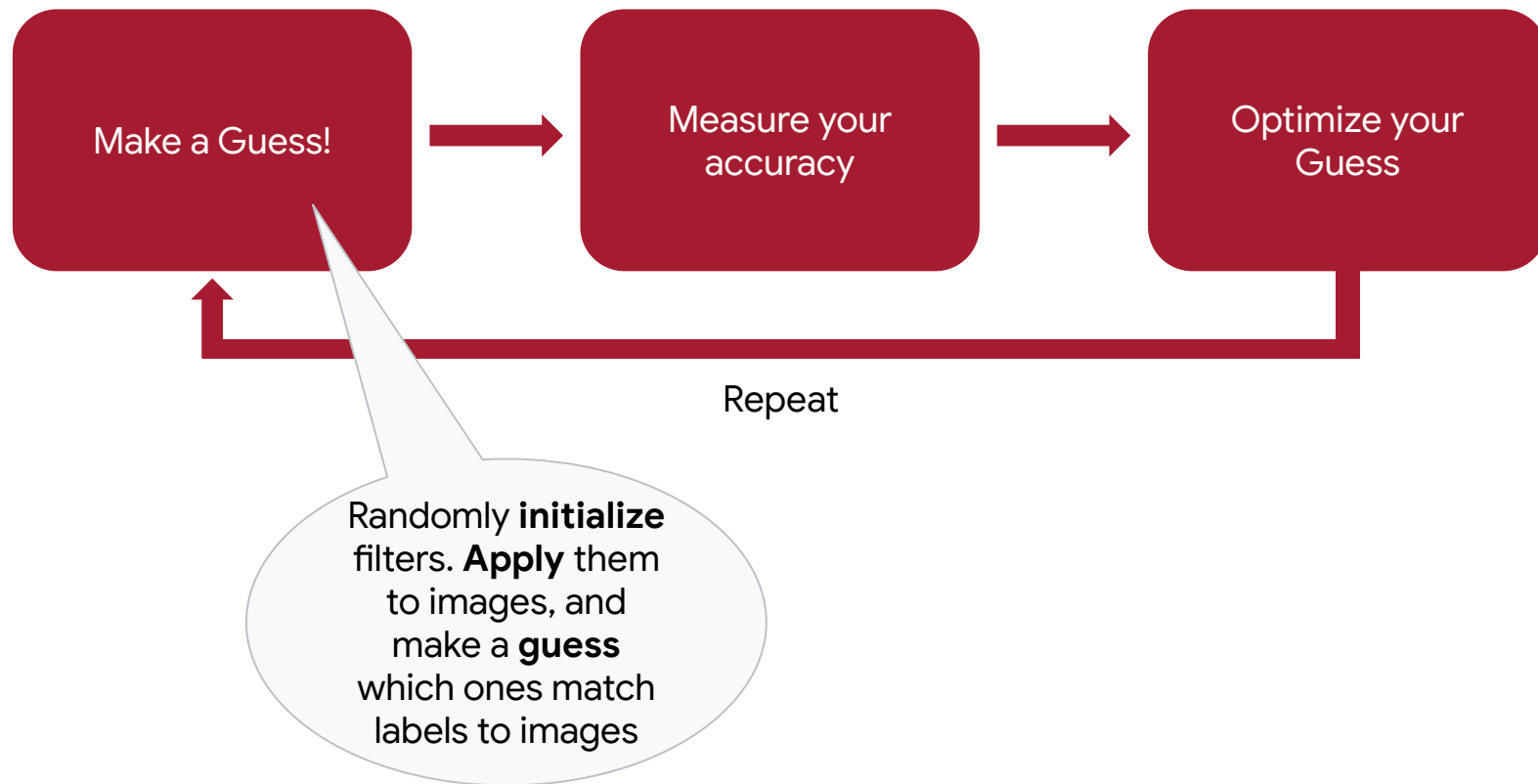
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HORSE

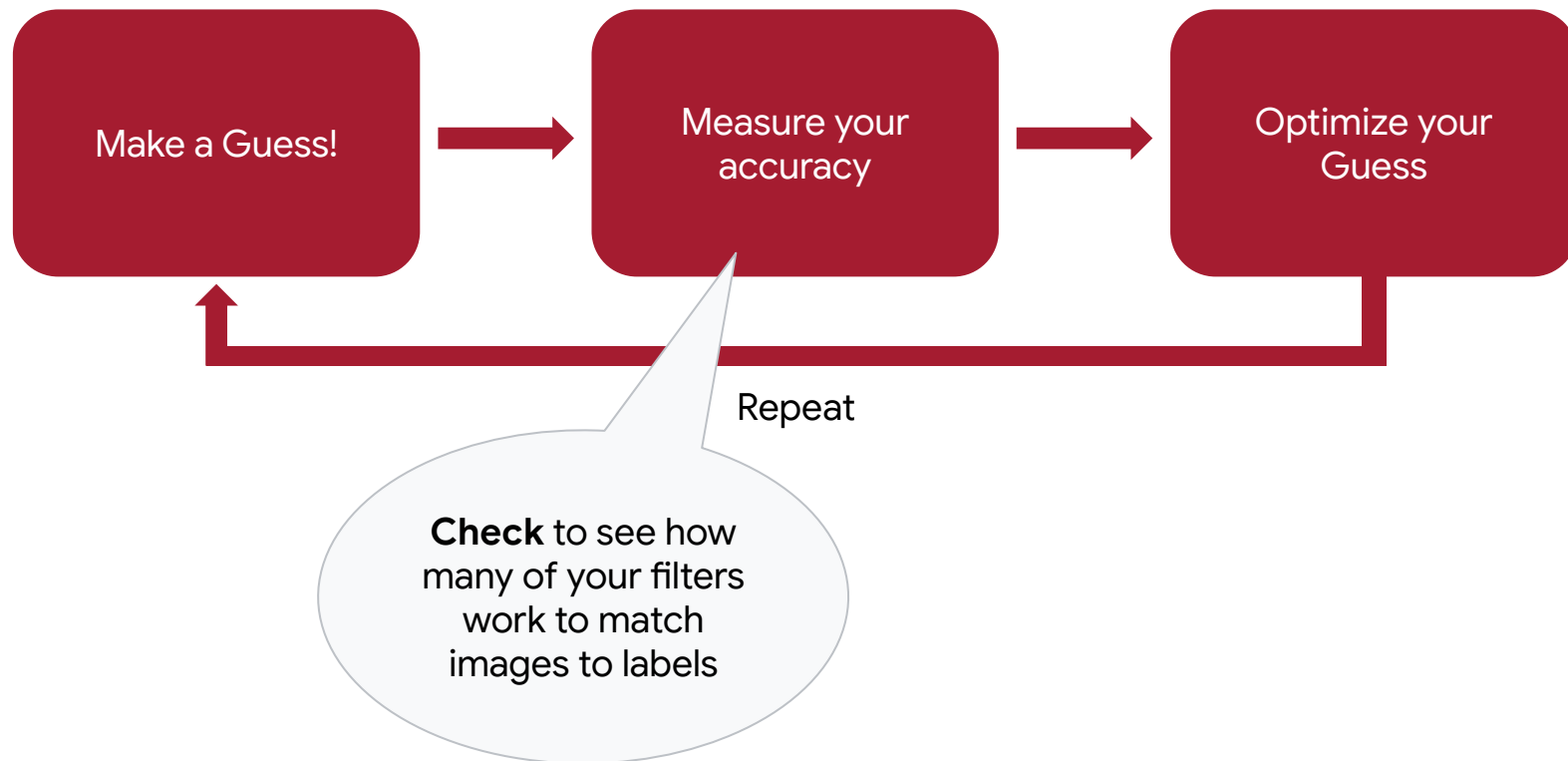
Filters can then be combined with **labels** to make a **prediction** of the image contents...



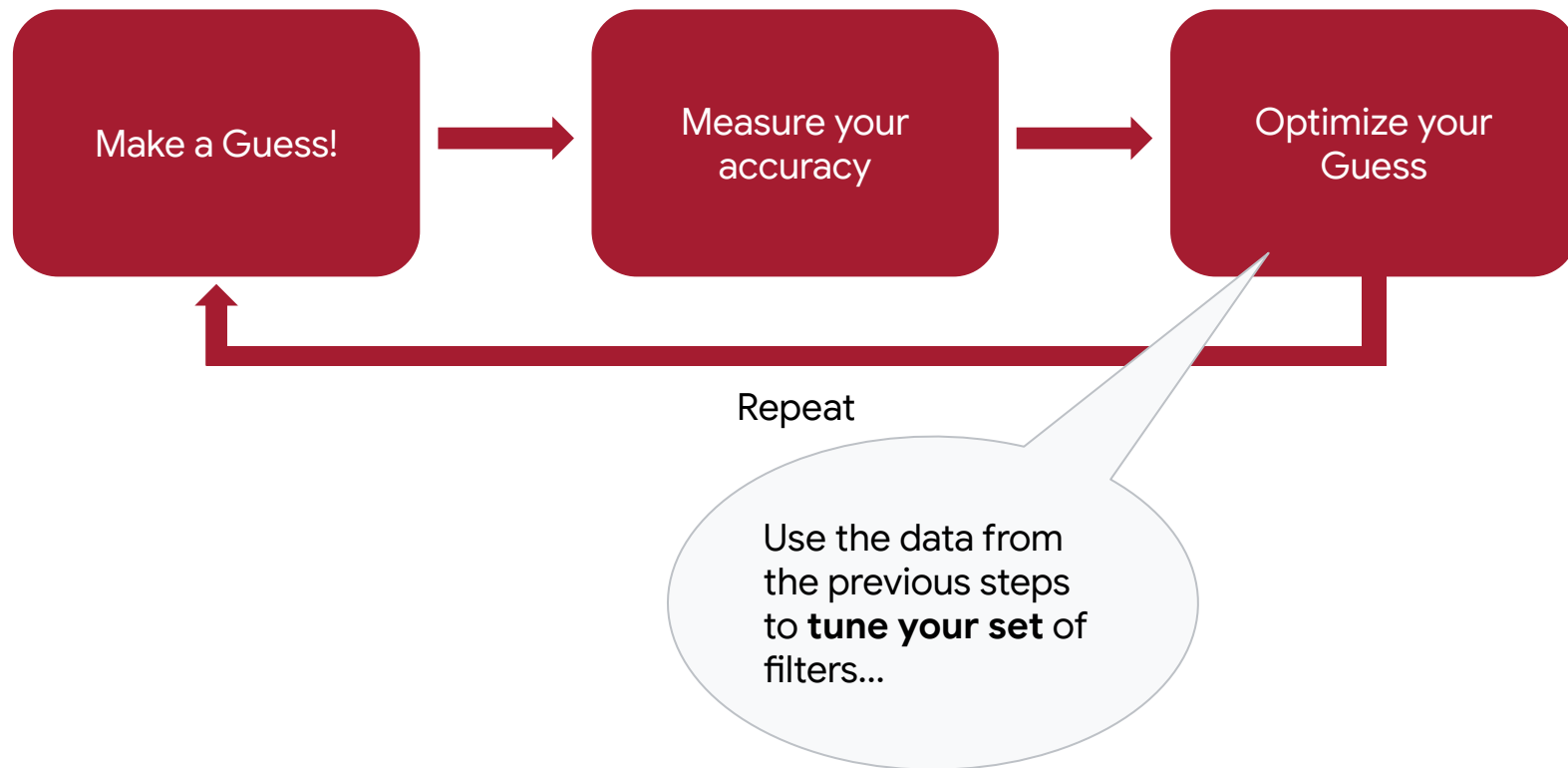
The Machine Learning Paradigm



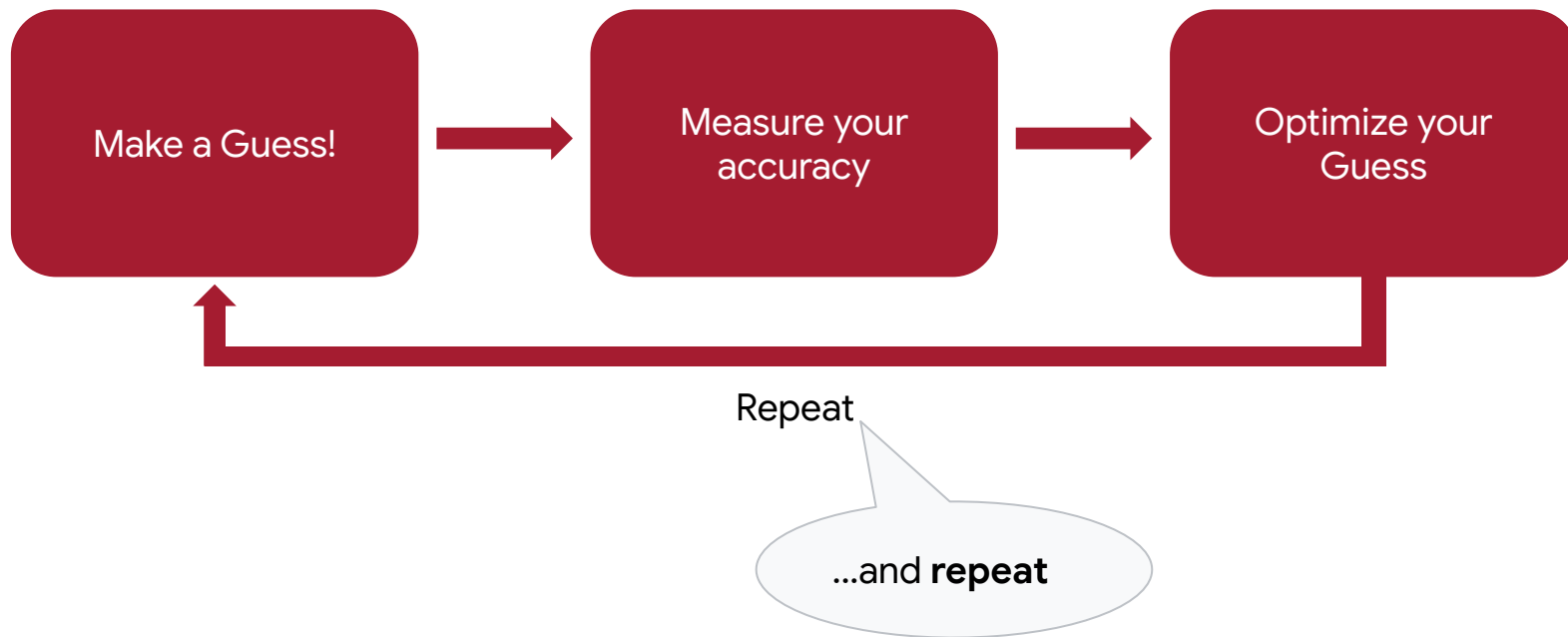
The Machine Learning Paradigm

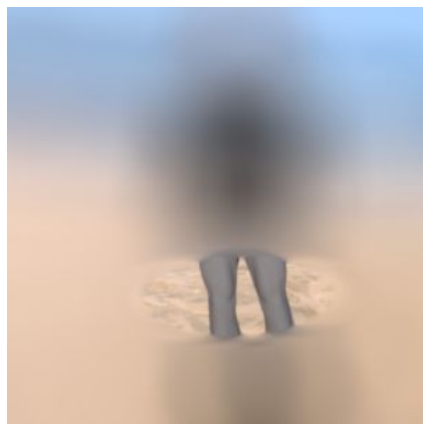


The Machine Learning Paradigm

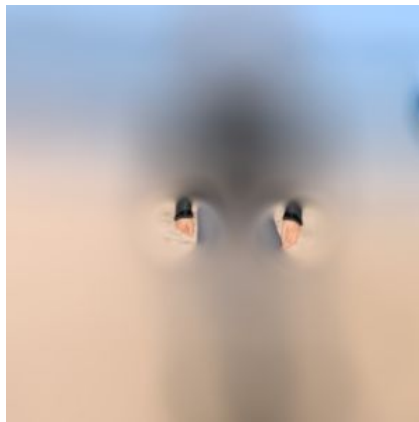


The Machine Learning Paradigm

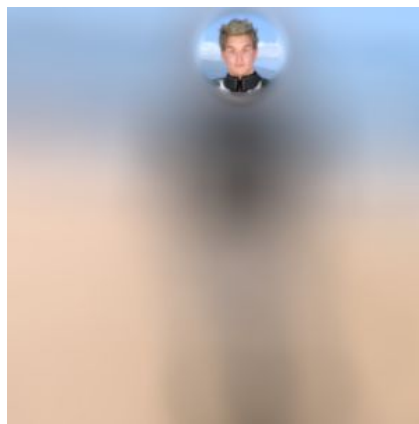




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Your Turn!