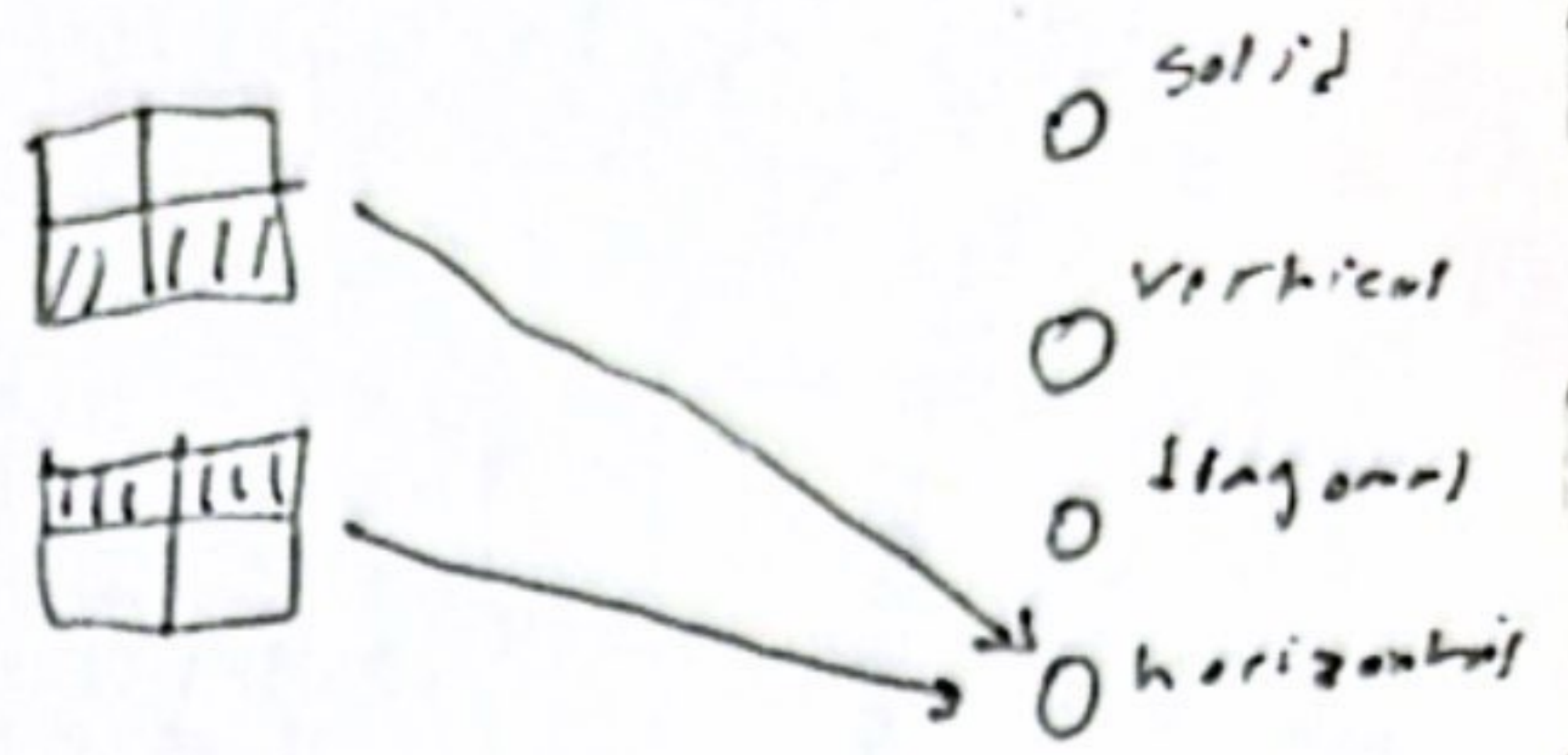# Neural Network cont.... and Deep Learning

9 — in our example we can say several pixels are illuminated next to each other they represent a horizontal line which can be a new feature for the digit in question but we never defined this feature ourselves

Ex
9.1

solid
vertical
diagonal
horizontal

• this is very simplified in real NN the behaviour is complicated we don't know the hidden layers features we just know they work

10 — in this way 1 hidden layer can only predict so much but what if we had the hidden layer predict another hidden layer and so on (like in image ex) this is called <u>Deep learning</u> and results in very complex features and can be used for facial recognition but we don't know what the hidden features mean we just know they work

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NN Flow Chart	Forward Pass make prediction	$\Rightarrow$	Compute loss, how wrong are predictions	$\Rightarrow$	Back propagation use GD to calc the gradients	$\Rightarrow$	Optimizer use gradients to update weights

12 — Single neuron

weights are used to boost or dampen signals from one neuron to another

feed sum in to activation function

$$\sum_{i=1}^{m} w_i x_i$$

a_1

RELu

$\hat{y}$

hidden layer

input layer

activation function

output layer

inputs from last layer many neurons might be connected to another one in next layer

sum up the inputs using weights for weighted sum

decides how active or important a neuron is here if $a_1 > 0 : a_1$ else : 0

this is then fed as x_n to all connected neurons in next layer

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