UE21CS343BB2

Topics in Deep Learning

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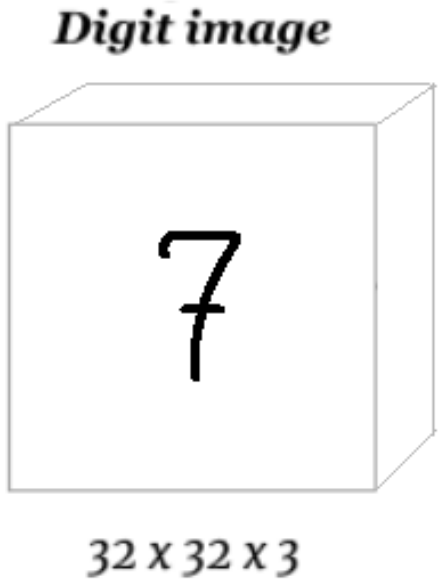
Overview of lecture

- CNN Example (LeNet-5)
- Conclusion

CNN Example

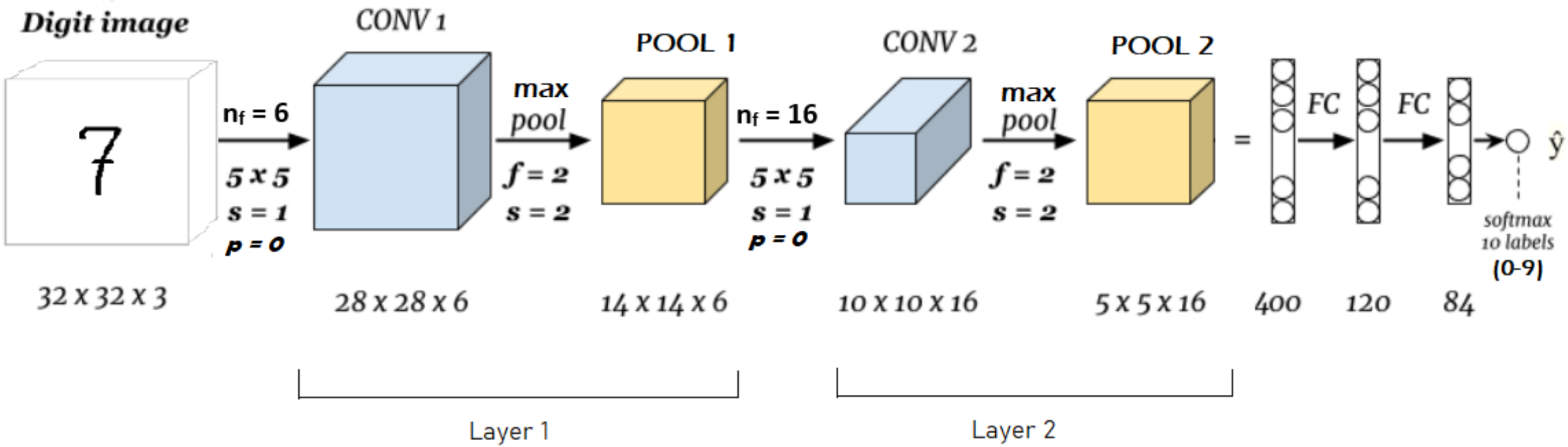
Let us take a look at an example:

We have an input as an image of 32×32×3, so it is an RGB image and we are trying to do a handwritten digit recognition. We have the number “7” and we are trying to recognize which one of the 10 digits from 0 to 9 is this number.



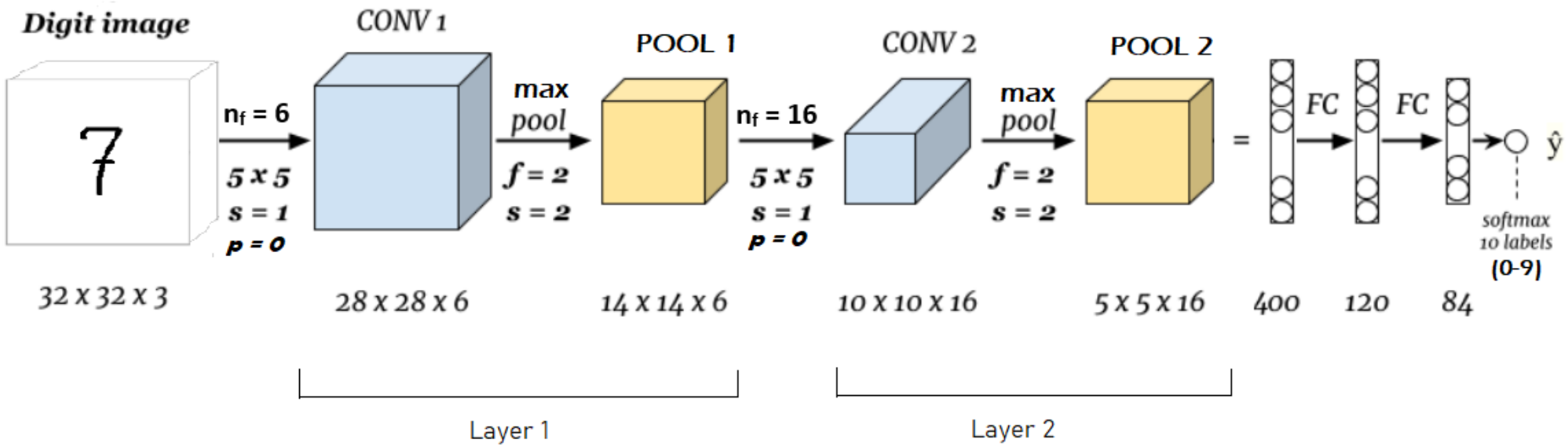
CNN Example

Let us build a neural network for this task, inspired by a classic neural network called LeNet-5:



Here, n_f = number of filters; f = filter size; s=stride; p=padding;
CONV and POOL represent the convolution and pooling outputs respectively.

CNN Example



- We may notice that as we go deeper into the neural network, the height and width decreases, while the number of channels increase.
- CNNs usually comprise a combination of one or more convolution layers followed by pooling layers, and finally a few fully connected layers.

CNN Example

Let us go through a few more details for this example:

	Activation Shape	Activation Size	# Parameters
Input:	(32, 32, 3)	3072	0
CONV1 (f=5, s=1)	(28, 28, 8)	6272	608
POOL1	(14, 14, 8)	1568	0
CONV2 (f=5, s=1)	(10, 10, 16)	1600	3216
POOL2	(5, 5, 16)	400	0
FC3	(120, 1)	120	48120
FC4	(84, 1)	84	10164
Softmax	(10, 1)	10	850

We may notice:

- Pooling layers don't have any parameters
- Convolution layers have relatively few parameters
- Fully connected layers have the most parameters
- Activation size decreases gradually as we go deeper in the neural network

Conclusion

We have now seen all the building blocks of CNN:
convolution layer, pooling layer and fully connected layer

Let’s sum up why we need convolutions:

- Parameter sharing: A feature detector (such as a vertical edge detector) that’s useful in one part of the image is probably useful in another part of the image.
- Sparsity of connections: In each layer, each output value depends only on a small number of inputs.

Acknowledgements

https://www.deeplearning.ai/courses/deep-learning-specialization/

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