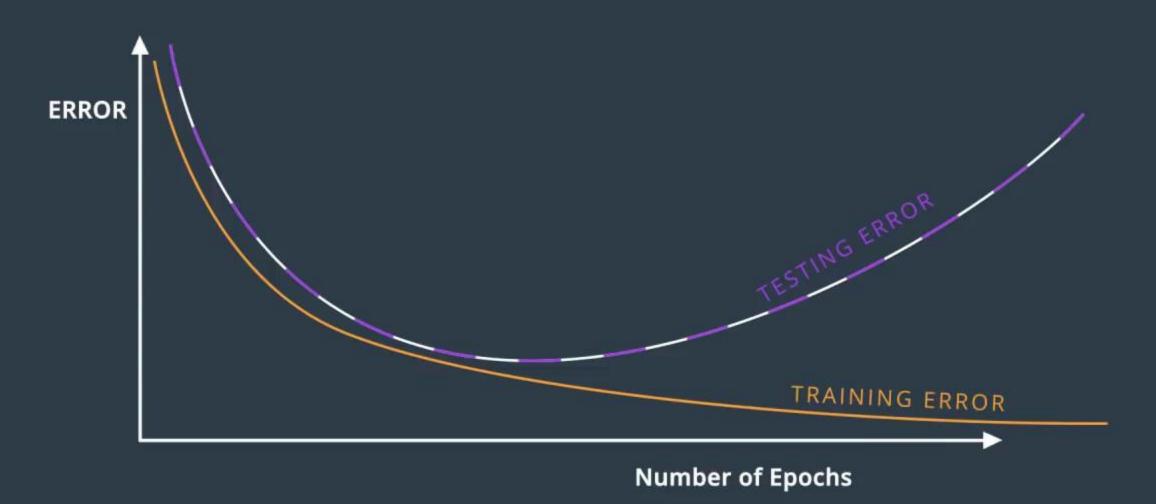
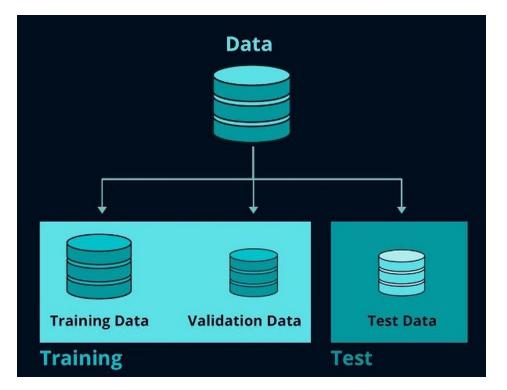
MODEL COMPLEXITY GRAPH

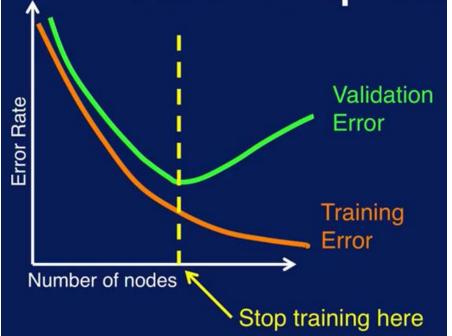


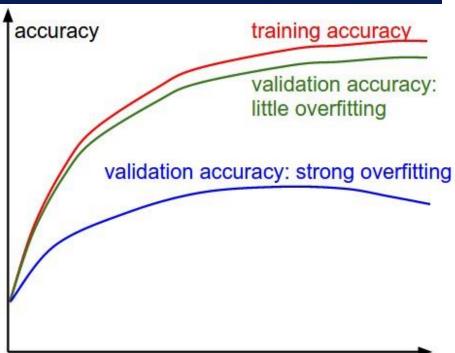


Available Data





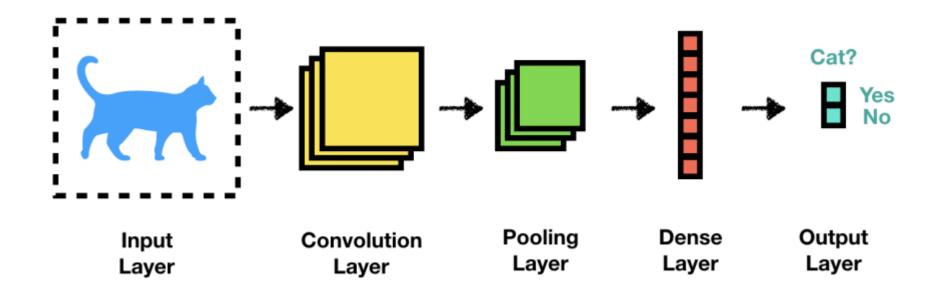




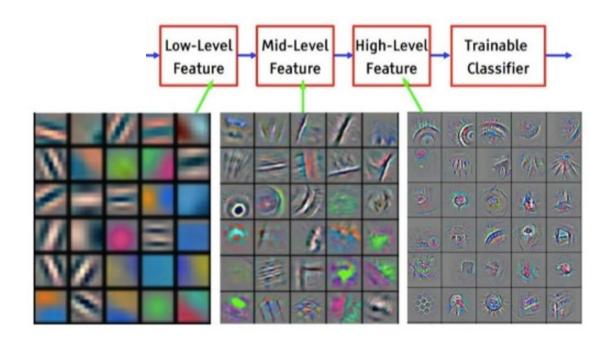
epoch

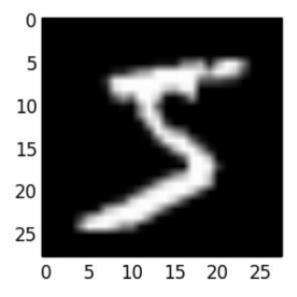
Early Stopping is a regularization technique used to prevent overfitting. Training is interrupted as soon as there is no further reduction of the validation loss for a certain number of epochs. So the goal is to stop training at the minimum of the validation loss.

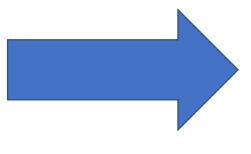




COSA VEDE LA RETE NEURALE?

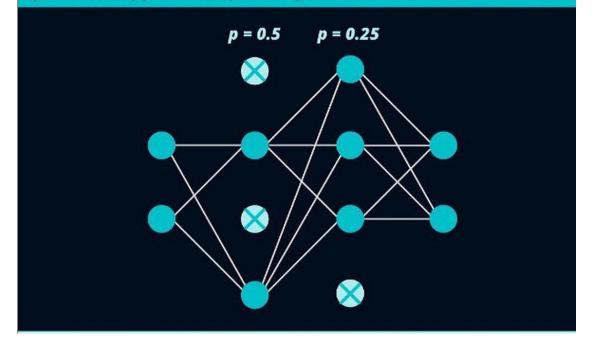






0 -	0.0	0.0	0.0	0.0			0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5 -	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	18.0	18.0	18.0	126.0	136.0	175.0	26.0	166.0	255.0	247.0	127.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	36.0	94.0	154.0	170.0	253.0	253.0	253.0	253.0	253.0	225.0	172.0	253.0	242.0	195.0	64.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.0	238.0	253.0	253.0	253.0	253.0	253.0	253.0	253.0	253.0	251.0	93.0	82.0	82.0	56.0	39.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	219.0	253.0	253.0	253.0	253.0	253.0	198.0	182.0	247.0	241.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.0	156.0	107.0	253.0	253.0	205.0	11.0	0.0	43.0	154.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10 -	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	1.0	154.0	253.0	90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	139.0	253.0	190.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	190.0	253.0	70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	241.0	225.0	160.0	108.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.0	240.0	253.0	253.0	119.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15 -	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	186.0	253.0	253.0	150.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	93.0	252.0	253.0	187.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	249.0	253.0	249.0	64.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46.0	130.0	183.0	253.0	253.0	207.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.0	148.0	229.0	253.0	253.0	253.0	250.0	182.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20 -	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0	114.0	221.0	253.0	253.0	253.0	253.0	201.0	78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0	66.0	213.0	253.0	253.0	253.0	253.0	198.0	81.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	18.0	171.0	219.0	253.0	253.0	253.0	253.0	195.0	80.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	55.0	172.0	226.0	253.0	253.0	253.0	253.0	244.0	133.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	136.0	253.0	253.0	253.0	212.0	135.0	132.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25 -	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	ó					5					10					15					20					25		

Dropout is a regularization technique used to prevent overfitting. During each iteration of the training process, some neurons are randomly selected with a given probability (dropout rate p) for each layer. The selected neurons are ignored (dropped-out) by setting their activations to zero.



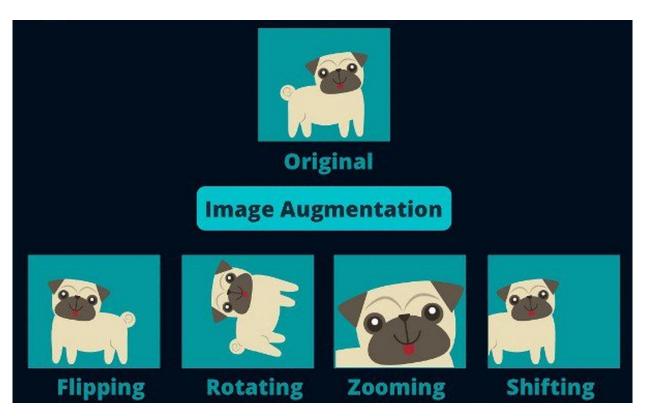
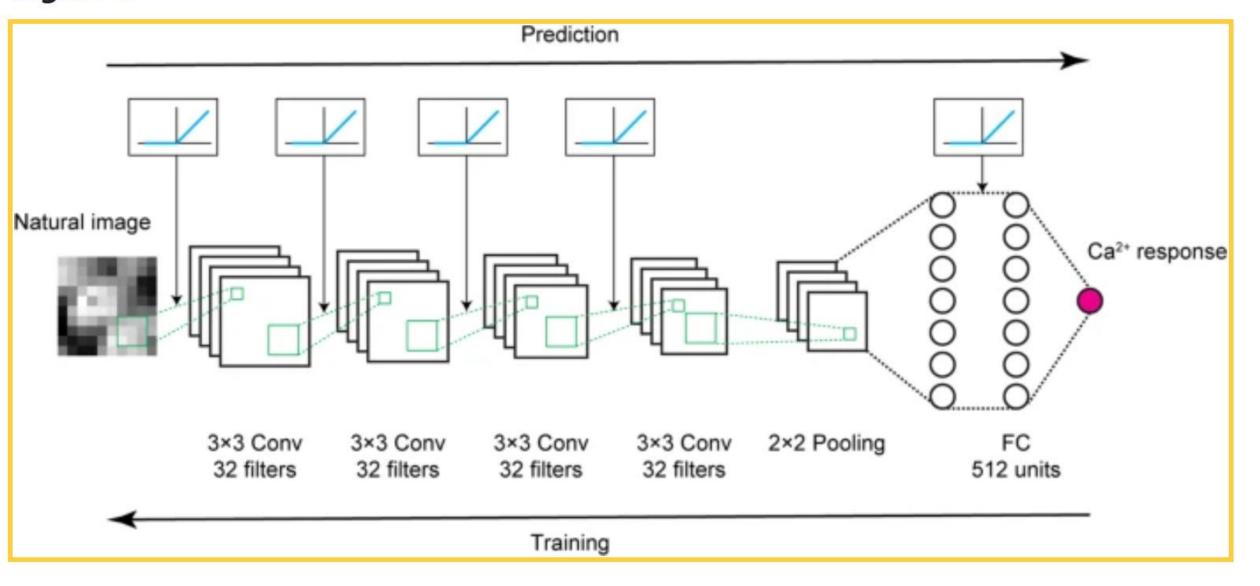
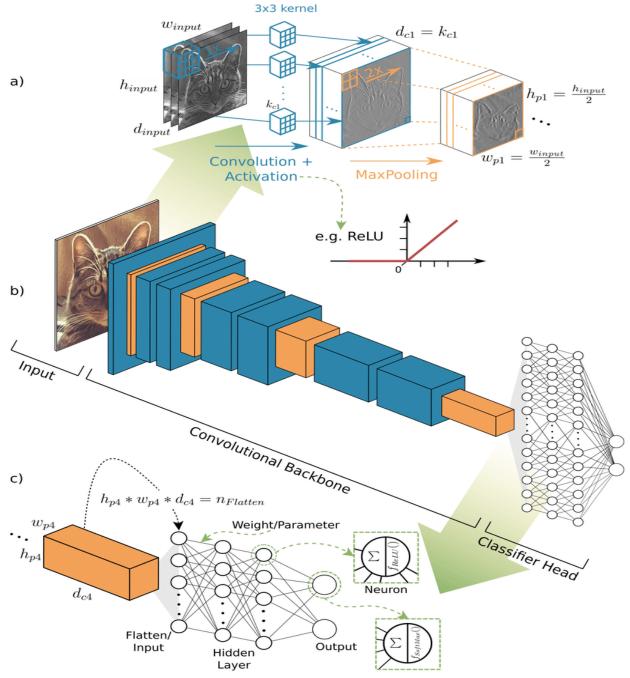


Figure 1





Weight/Parameter

Classifier Head

Output

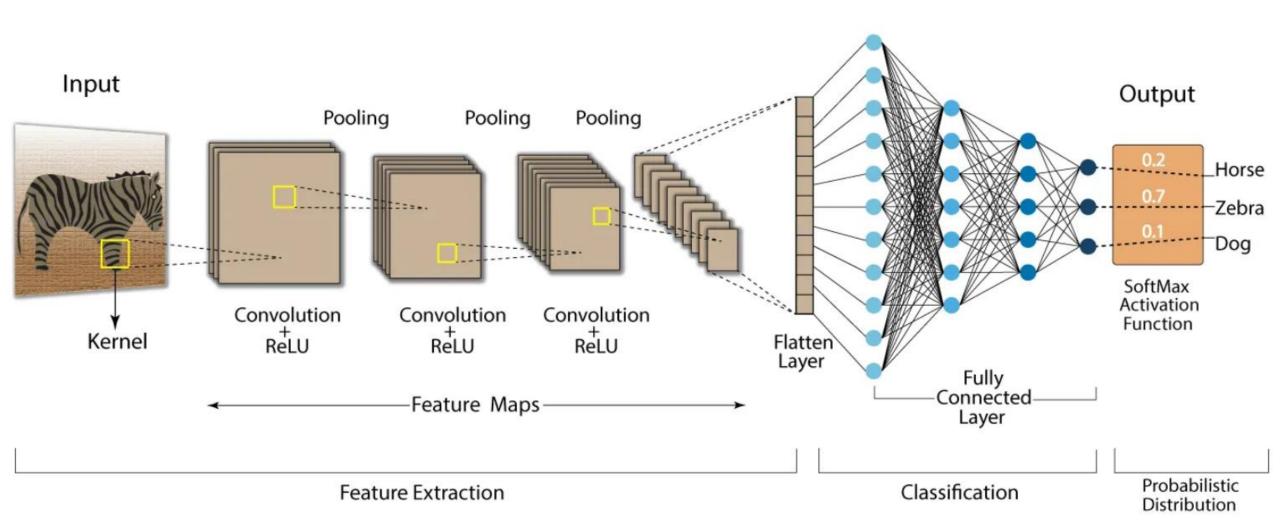
Discontinuous Company of the Company o

75 -100 -125 -150 -175 -200 -0 50 100 150 200

50 -

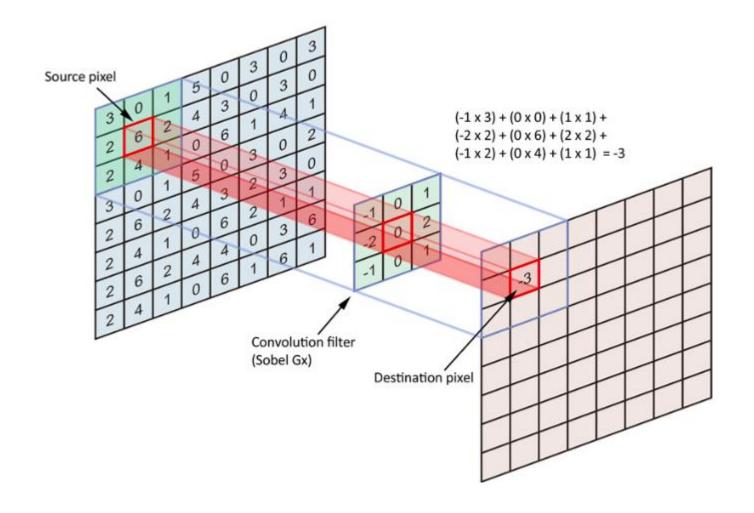
Fully Connected ANN

Convolution Neural Network (CNN)



1x1	1 x 0	1x1	0	0
0x0	1x1	1x0	1	0
0 x 1	0x0	1x1	1	1
0	0	1	1	0
0	1	1	0	0

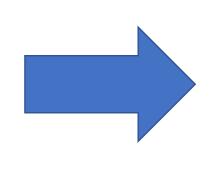
4	



STRATO CONVOLUZIONALE (FILTRI + RELU)

STRATO CONVOLUZIONALE (FILTRI + RELU)

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

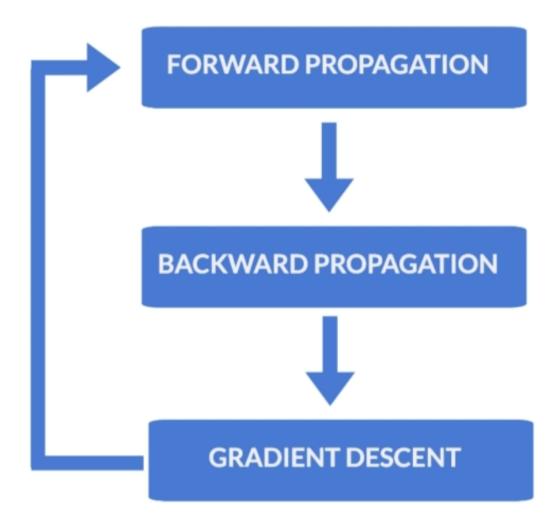


w1,1	w1,2	w1,3
w2,1	w2,2	w2,3
w3,1	w3,2	w3,3

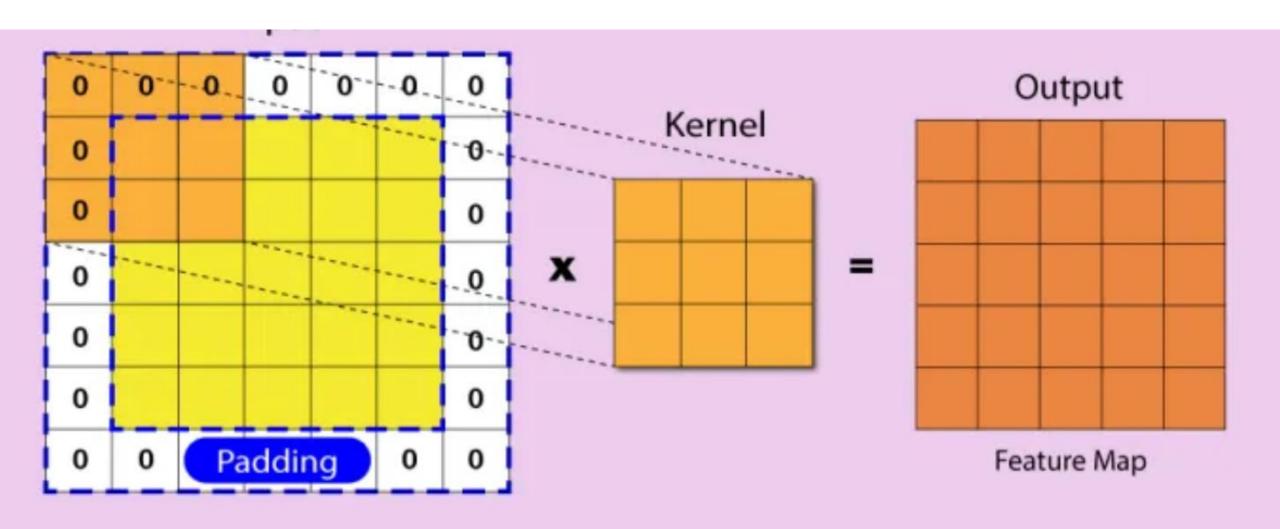
Esistono tantissimi filtri e possiamo anche creare i nostri, come facciamo a selezionare quelli da utilizzare ?

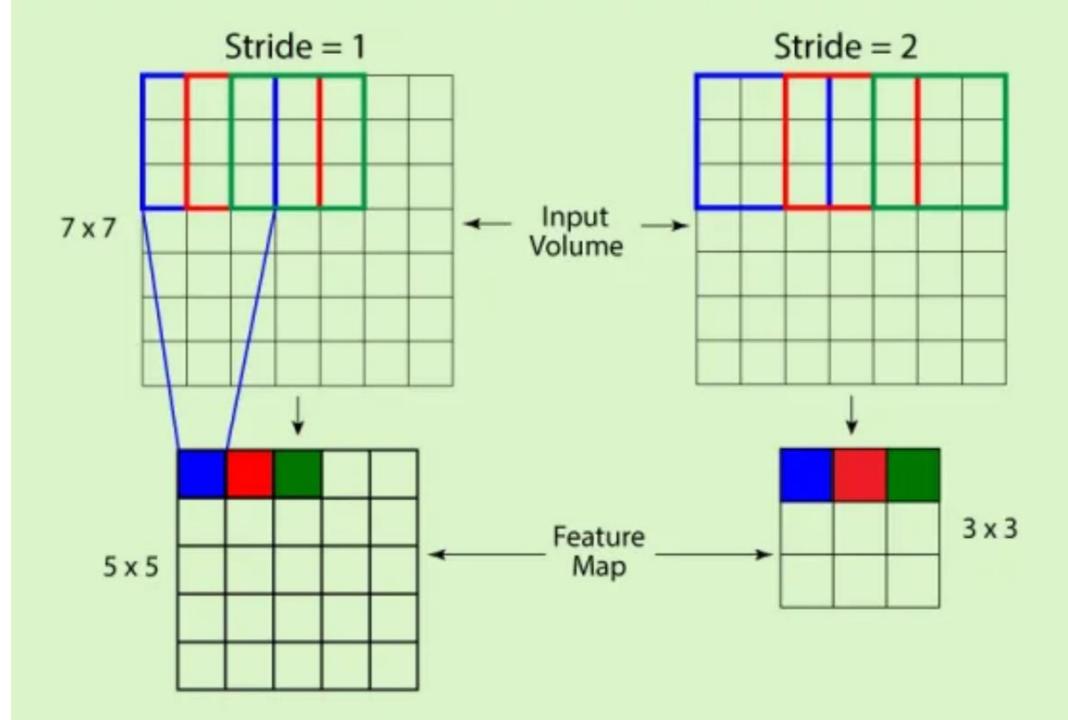
Non lo facciamo!

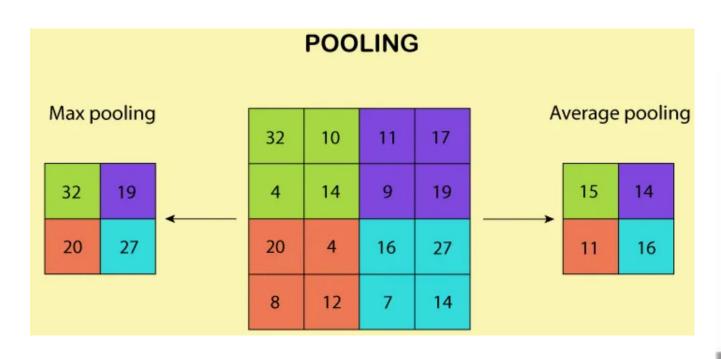
lasciamo che sia la rete a selezionare i filtri durante l'addestramento

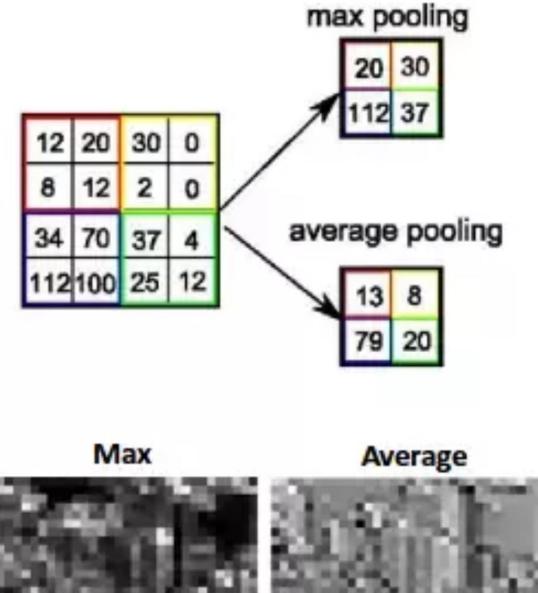


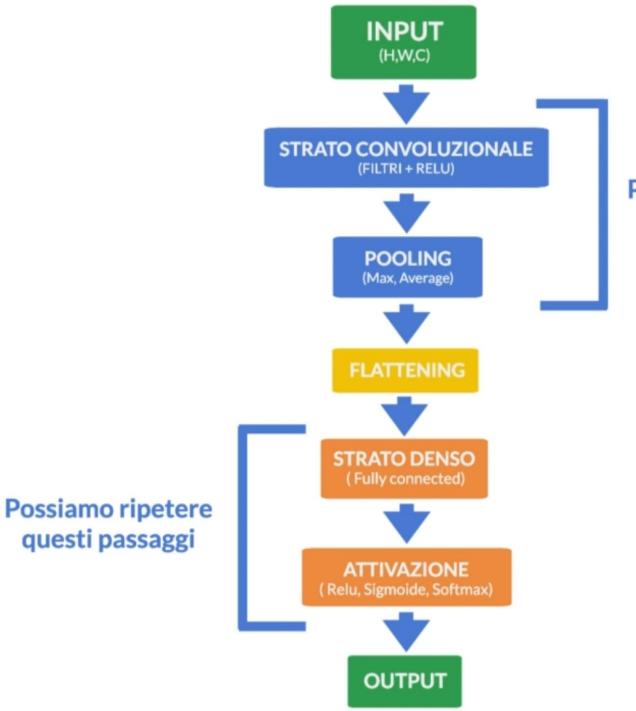
Trattando i valori dei filtri come coefficienti del modello, il processo di addestramento diventa lo stesso di una semplice rete neurale artificiale





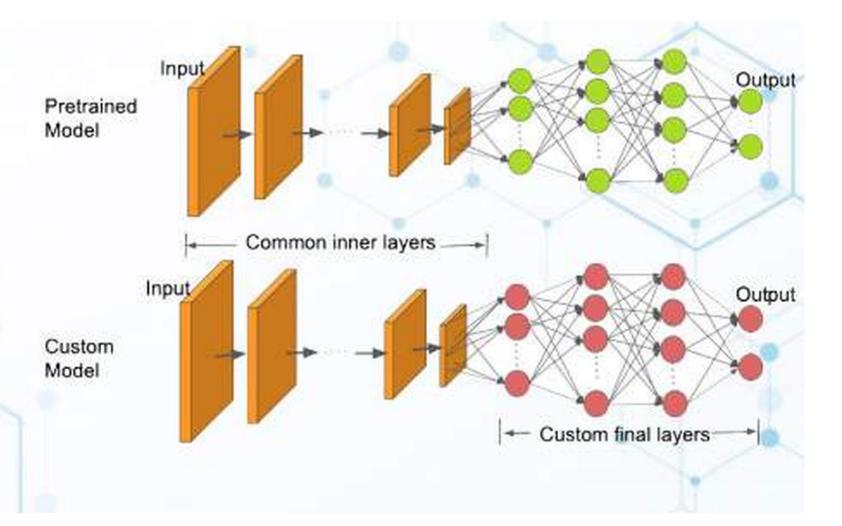


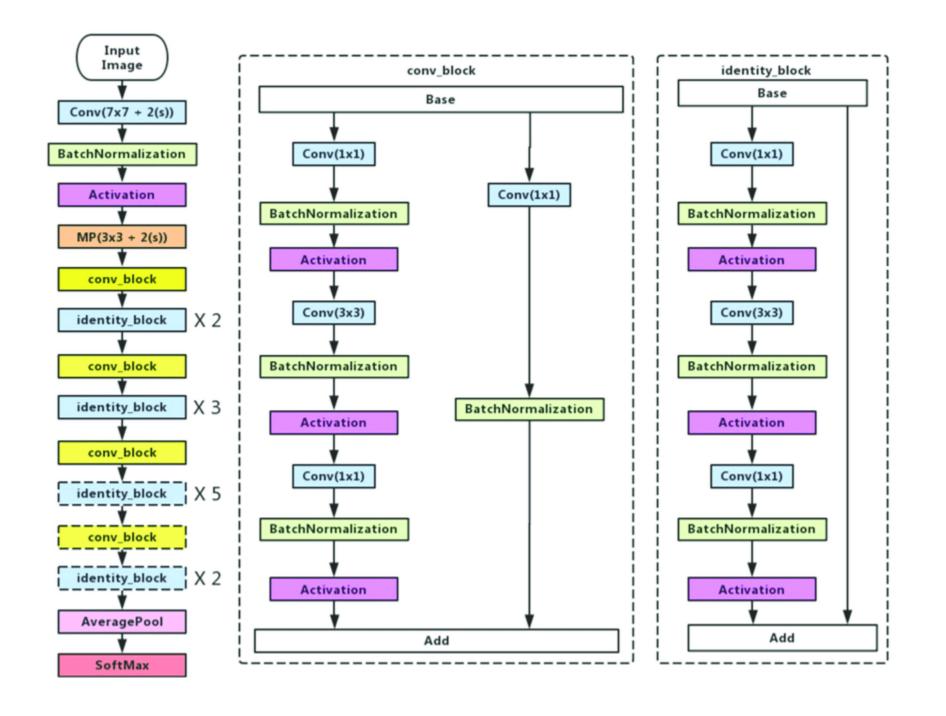




Possiamo ripetere questi passaggi

Transfer Learning



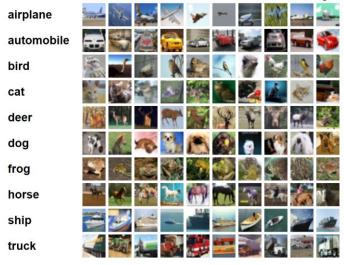


The CIFAR-10 dataset

The CIFAR-10 dataset consists of 60000 32x32 colour images in 10 classes, with 6000 images per class.

The dataset is divided into five training batches and one test batch, each with 10000 images. The test batcher, but some training batches may contain more images from one class than another. Between them, the containing batches may contain more images from one class than another.

Here are the classes in the dataset, as well as 10 random images from each:





COCO Dataset

nk7260ynpa 20190406



