

Introduction to Neural Network Models of Cognition

NNMOC Book

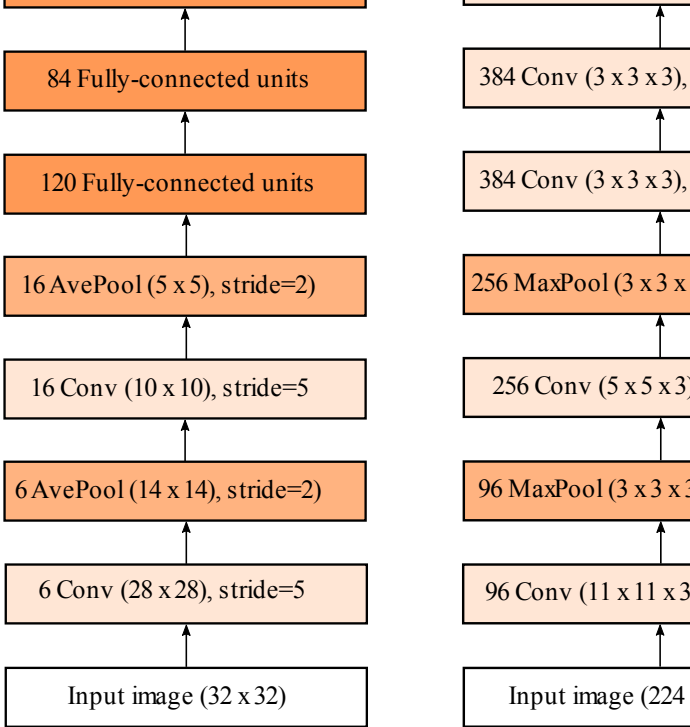
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Notation:
<number of planes> **type of layer** <width x height x RGB>, **stride/pooling**

Each layer in AlexNet is three dimensional because it was designed to process color images (LeNet-5 classified 10 grey-scale digits). The dimensions represent (number of planes, width, and height) color values. This type of 3-D arrays of numbers is often referred to as **tensors**. The pooling operation is done by taking the maximum value or the average of all units, which is known as **max pooling**. The pattern of connections in the convolutional and pooling layers is different from the one in LeNet-5. AlexNet utilizes the same building blocks and operations as LeNet-5.

Neural network models of vision and computer vision

In my experience, If you ask a random researcher in computer vision about the relationship between the human visual/perceptual system and convolutional neural networks, you might hear something like: "Well, CNN's are roughly inspired in the brain by biological vision. I care about solving the problem artificial vision by any means, not necessarily by biological correspondence to human vision, more or less in the same way as birds fly without having to imitate birds flapping". Or some version of that. Computer vision is seen as an independent area of research with its own goals, regardless of whether it is inspired by neural networks these days. Beyond the parallels with human vision, AlexNet are designed to maximize object-recognition performance. For instance, ReLU units were introduced in AlexNet because they facilitate learning. ReLU are more biologically realistic than sigmoids. For instance, the LeNet-5 was designed in the context of the debate between traditional pattern recognition and the more automated learning-based approach of neural nets. Nothing was said about the issue of **whether convolutional nets are useful models for human vision and perception**. However, from our perspective, the issue of **whether convolutional nets are useful models for human vision and perception** is critical. This is an open debate.