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## Assignment: MM Chapter 5 ConvNets and ImageNet

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1. He combined ideas from Fukushima's neocognitron with the back-propagation algorithm to create the semi-eponymous "LeNet" – one of the earliest ConvNets. Who was he? Who was his postdoctoral advisor? And, in addition to developing "LeNet", what was his contribution to the field of neural network research?

A1. Yann LeCun, Geoffrey Hinton, LeCun helped develop such a learning method essentially the same form of back-propagation used on ConvNets today.

2. What is WordNet? Please answer by referencing its creator (the human most responsible for its existence), saying something about its use, and presenting, in just two or three sentences, a high-level description of its structure?

A2. Princeton professor, the psychologist George Miller, to create a database of English words, arranged in a hierarchy moving from most specific to most general, with groupings among synonyms.

3. What is ImageNet? Please answer by referencing its creator (the human most responsible for its existence), saying something about its use, and presenting a high-level description of its structure, being sure to mention WordNet in doing so.

A3. Fei-Fei-Li had a new idea: create an image database that is structured according to the nouns in WordNet, where each noun is linked to a large number of images containing examples of that noun. Thus the idea for ImageNet was born.

4. Specifically, what role did ImageNet play in the advancement of computer programs dedicated to the problem of "object recognition."

A4. In 2010 the ImageNet project launched the first ImageNet Large Scale Visual Recognition Challenge, in order to spur progress toward more general object-recognition algorithms.

5. What is the Mechanical Turk (Amazon's Mechanical Turk), and what role did it play in building ImageNet?

5A. Mechanical Turk service is "a marketplace for work that requires human intelligence." Fei-Fei Li realized that if her group paid tens of thousands of workers on Mechanical Turk to sort out irrelevant images for each of the WordNet terms, the whole data set could be completed within a few years at a relatively low cost.

6. Describe the nature and operation of the ImageNet competition.

6A. The competitors were given labeled training images – 1.2 million of them – and a list of possible categories. The task for the trained programs was to output the correct category of each input image.

7. What was the most notable thing about the 2012 ImageNet competition?

7A. However, these expectations were upended in the 2012 ImageNet competition: the winning entry achieved an amazing 85 percent correct. Such a jump in accuracy was a shocking development. What's more, the winning entry did not use support vector machines or any of the other dominant computer-vision methods of the day. Instead, it was a convolutional neural network.

8. What was the most notable thing about the 2015 ImageNet competition?

8A. The pressure to produce programs that outperformed competitors was notably manifest in a 2015 cheating incident involving the giant Chinese internet company Baidu.

9. Describe some commercial applications of convolutional neural networks.

9A. Google offered a photo-storage system that would tag your photos by describing the objects they contained, and Google's Street View service could recognize and blur out street addresses and license plates in its images. Facebook labeled your uploaded photos with names of your friends.

10. Have ConvNets surpassed humans at object recognition?

10A. A 2015 paper from Baidu ( post-cheating scandal) carried the subtitle "Surpassing Human-Level Performance on ImageNet Classification." At about the same time, Microsoft announced in a research blog "a major advance in technology designed to identify the objects in a photograph or video, showcasing a system whose accuract meets and sometimes exceeds human-level performance." While both companies made it clear they were talking about accuracy specifically on ImageNet

11. What is the relationship between “object recognition” and “visual intelligence?”

11A. It seems that visual intelligence isn't easily separable from the rest of intelligence, especially general knowledge, abstraction, and language –abilities that, interestingly, involve parts of the brain that have many feedback connections to the visual cortex.