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Exploring images with deep learning for classification, retrieval and synthesis

Liu, Y.

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Propositions

pertaining to the thesis

“Exploring Images with Deep Learning for Classification, Retrieval and Synthesis”

by Yu Liu

1. Normally, plain convolutional neural networks (CNNs) produce an image feature from the top-most layer, however, deep fusion networks built on plain CNNs are able to integrate diverse features from different layers and to produce a superior feature [Chapter 2 & 5].
2. Despite that CNNs are commonly developed to address image-level prediction, they can be further adopted to improve pixel-level prediction, such as edge detection, semantic segmentation, image translation and style transfer [Chapter 2, 3 & 8].
3. In spite of the fact that deep neural networks are complicated because of training a large amount of parameters, we can incorporate deep feature representations into the inverted index scheme to maintain the efficiency of image retrieval [Chapter 4].
4. Although multi-modal matching and classification have different objectives, we can combine them in a unified model to promote each other [Chapter 7].
5. Despite the fact that integrating visual and textual features for image classification is not normally done, textual features may provide additional semantic information that is non-tractable to capture from images [this thesis, Chapter 5, 6 & 7].
6. The mission of computer vision is to endow the machines with the ability to learn and discover knowledge from visual data, however, it is still challenging for the machines to understand the real world like human beings do.
7. Deep learning helps to narrow the gap between different research fields such as computer vision, machine learning and natural language processing. As a result, it is feasible to combine different fields for tackling more challenging tasks.
8. Although deep learning has helped us to address diverse tasks, it is important yet difficult to interpret what we have learned with deep learning and to examine the cases where deep learning fails.
9. Figuratively, doing a PhD is like a process from supervised learning to semi-supervised learning to unsupervised learning.
10. Doctoral graduates are similar to the trained models in machine learning, but they still need more fine-tuning in the future.