Industrial & Systems Engineering

Seminar Announcement

Task-Specific and Interpretable Feature Learning

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Abstract: Deep learning models have had tremendous impacts over the recent years, in a variety of machine learning and artificial intelligence applications. Meanwhile, a questions has been raised by many: *is deep learning just a triumph of empiricism*? There has been emerging interests in reducing the gap, between the theoretical soundness and interpretability, and the empirical success of deep models. In this talk, I will introduce my research on bridging traditional learning models that emphasize problem-specific reasoning, and deep models that allow for larger learning capacity. The overall goal is to devise the next-generation deep architectures that are: 1) Task-specific, namely, being optimized for the specific task by fully exploiting available prior knowledge and problem structures, rather than applying generic data-driven models as "black-boxs"; and 2) Interpretable, namely, being able to learn a representation which consists of disentangled and semantically sensible latent variables, and to display more predictable behaviors. I will present a few concrete model examples, to reveal how the analytic tools in the classical optimization problems can be translated to guide the architecture design and performance analysis of deep models. As a result, those models demonstrate improved generalization ability, intuitive interpretation, as well as efficient parameter initialization. I will then show how my developed feature learning models are widely applied, to classical topics such as image enhancement, classification, clustering and object recognition, and in novel domains such as style recognition, aesthetics assessment, and healthcare. Finally, I will conclude this talk by discussing several interesting future directions, ranging from theoretical and algorithmic research prospects, to newly-emerging interdisciplinary applications.

Bio: *Zhangyang (Atlas) Wang* is a Ph.D. student in the Electrical and Computer Engineering (ECE) Department, at the University of Illinois at Urbana-Champaign (UIUC), working with Professor Thomas S. Huang. Prior to that, he obtained the B.E. degree at the University of Science and Technology of China (USTC), in 2012. His principal research interest has been addressing machine learning and visual data analytics problems using advanced feature learning techniques, with a recent focus on deep neural network models and theories. He has published over 25 papers in top-tier journals (IEEE TIP/TCSVT/TGRS) and conferences (CVPR/AAAI/IJCAI/ACM MM/SDM/NIPS/BMVC…), and recently coauthored the book “Sparse Coding and Its Applications in Computer Vision”. He received the prestigious CSC fellowship (2016), Baidu Research Scholarship (2015), UIUC Cognitive Science/Artificial Intelligence Award (2015), among many others. The Adobe DeepFont system, to which he was the leading contributor, has led to high-impact technical products and attracted lots of media coverage. He also completed three successful summer internships in Microsoft Research (2015), Adobe Research (2014), and US Army Research (2013).

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