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7. Top 3 Preferred Projects

Project 4: Methods for multimodal learning and sensor fusion

One step closer to the human brain

The concept of multimodal learning is interesting to me for several reasons. Firstly, joint learning from multiple information sources has been practically proven effective, especially in noisy environments. Secondly, multimodal learning involving irregular data (e.g. knowledge graph) is challenging as most of the work so far is designed only for highly structured data (audio, video, text, etc.). Thirdly, there are many inspirational works in the field of machine learning in general such as Bimodal Deep Auto-encoder, Multimodal Residual Learning, or the DeepMind's differentiable neural computers. For me, it is exciting to explore in the field of multitask learning because the behavior of the learned models is closer to human (e.g. describing videos). Lastly, I believe that my research in multimodal learning might be able to have an impact on the performance of automated systems such as self-driving cars or automated drones. On the other hand, the results from multimodal learning can also be beneficial to project 1 and project 9.

Project 2: Methods for robust feature learning

Representation is (probably) the core of ML-related tasks

Robust features (or representations) extracted from data is desirable for any Machine Learning task. From the practical standpoint, it is important to have a robust machine behavior when an automated system is deployed in the real world. Such robust features can possibly be learned through various methods such as cross-validating training data or transfer learning. On the other hand, it is more interesting to think about robust features learning from the theoretical standpoint. The predictive power of a machine learning model can be defined and bounded under some assumptions about training data samples or the learning model architecture itself. I choose this topic as my second preferred project because of my interest in theoretical machine learning.

Project 5: Combining Generative Probabilistic Models with DL

We observes other people's behavior

To the extent of my knowledge, study about graphical models in combination with deep architecture has been an active field of research. The flexibility and robustness of generative power are proven to be supportive to the discriminative classifiers. Recent advancements in generative models (e.g. deep belief networks, GAN) promises many new hybrid generative-discriminative models. It is said that the human brain is excel at guessing what other brains are doing, therefore I am quite interested in studying about a generative model that can "observe" some other discriminative classifiers and improve their performances.