Active Learning of Linear Separators with Noise

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Classic supervised machine learning assumes that humans can annotate all data available for training. However, most modern learning applications have such massive amounts of unlabeled data that it is hopeless to annotate it all. Consequently, there has been tremendous interest in understanding active learning, a learning paradigm where the algorithm itself can ask for labels of carefully chosen examples from a large pool of unannotated data with the goal of minimizing human labeling effort.

In this talk, I will present a computationally efficient, noise tolerant, and label efficient active learning algorithm for learning linear separators under log-concave and nearly log-concave distributions. Our technique exploits localization in several ways and can be thought of essentially solving an adaptively chosen sequence of convex optimization problems around smaller and smaller bands around the current guess for the target function.

Surprisingly, our algorithms not only have label complexity that is much better than one can hope for in the classic passive supervised learning scenario, but they have much better noise tolerance than previously known algorithms for this classic paradigm.

This is based on work joint with Phil Long, Pranjal Awasthi, Nika Haghtalab, and Ruth Urner [3, 2, 1].

References

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