Query and Update Efficient Online Learning with Dynamic Costs

Abstract:

An online learner attempts to iteratively update its strategy and regret, but may not be able to keep up with a stream of data that requires expensive procurement or processing, or within domains that require complex execution or planning. We refer to these collective constraints on updates a cost, and decompose them into query efficiency in which a learner faces costly regret updates, and update efficiency in which it faces costly strategy updates. Because the strategy updates of a query efficient learning can be done lazily, it is essentially an imperfect information variant of update efficiency. Employing the recently discovered sequential Rademacher complexity, I reduce query efficiency to this easier case. I then bound the expected regret of an update efficient learner whose updates obey Blackwell’s condition. This work considers dynamic costs, extending the prediction framework of a static bound on the total number of labels.

Speaker: Michael Spece Ibanez

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