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Title: Putting a price on expert advice: Online classification with paid stochastic experts

Abstract:

We consider online binary classification where in each round, before making a prediction, the learner can choose to ask a number of stochastic experts for their advice. In contrast to the standard experts problem, we assume that each expert needs to be paid before they provide their advice, and that the amount we pay them influences the accuracy of their advice through some unknown productivity function. In each round, the learner must decide how much to pay each expert and then make a prediction. This problem naturally captures many settings such as testing for a disease where we have access to different quality tests at different costs, and aggregating predictions from different models which can be run for longer lengths of time to achieve higher accuracy. We consider two versions of this problem, in the first, the true labels are generated probabilistically so eventually we can learn a near optimal classifier and stop relying on expert advice. In the second instance, the labels can be generated by an adversary so are not predictable. For each setting we provide algorithms for deciding how much to pay the experts and leveraging their advice, and provide theoretical guarantees on their performance.

This is joint work with Gabor Lugosi, Dirk van der Hoeven, Hao Qi and Nicolo Cesa-Bianchi.