Adaptive teaching: Improving the efficiency of learning through hypothesis-dependent selection of training data

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Abstract: Active machine learning research shows that training of classifiers can be improved when the learning algorithm itself selects training data (e.g., choosing examples for which it is uncertain). Recent work with humans documents similar improvements whereby ”active” learners who can select their own training examples are faster at learning simple classification rules than ”passive” learners who observe data selected by another source. One explanation for this advantage is that active learners are able to choose data that tests the hypothesis they are currently considering, whereas for passive learners, data is independent of the learner's belief. We explore whether the efficiency of passive learning can be improved with ”adaptive teachers” that estimate a learner's current hypothesis and generate training data that is expected to be most helpful. Our successes and failures with this approach highlight the need to consider principles of human learning in the design of effective adaptive teachers.