Exploring Active Learning in a Bayesian Framework

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Abstract: Bayesian approaches provide a framework for models of active learning–learning in which stimuli are actively probed to disambiguate potential beliefs regarding outcomes. Within a Bayesian framework, uncertainty across beliefs is inherently represented and expected uncertainty reductions for candidate stimuli can be evaluated. Bayesian active learning models offer the prediction that an active learner would select the stimuli for which the expected uncertainty across all hypotheses is minimized. This research contrasts four possible hypothesis spaces for active learning consisting of two simple cue-combination models and two possible priors. An automated search of associative learning structures for which the models make maximally different predictions was performed. Participants were tested on these same structures in an allergy diagnosis context and were asked which cues they would find the most informative to learn about; i.e., their active learning preferences were assessed. Model and prior combinations that best mimic human active learning are discussed.