

## Convex Training Algorithms for Hard Machine Learning Problems

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In this talk, I will first discuss a new unsupervised training algorithm for hidden Markov models that is discriminative, convex, and avoids the use of EM. The idea is to formulate an unsupervised version of maximum margin Markov networks (M3Ns) that can be trained via semidefinite programming. This extends our recent work on unsupervised support vector machines. The result is a discriminative training criterion for hidden Markov models that remains unsupervised and does not create local minima.

Experimental results show that the convex discriminative procedure can produce better conditional models than conventional Baum-Welch (EM) training. I will then discuss how the convex relaxation approach, in general, can be used to derive effective new training algorithms for many hard machine learning problems, including outlier detection and Bayesian network structure learning.

Dale Schuurmans is a Professor of Computing Science and Canada Research Chair in Machine Learning at the University of Alberta. He received his PhD in Computer Science from the University of Toronto and MSc and BSc degrees in Computing Science and Mathematics from the University of Alberta. He has previously been an Associate Professor at the University of Waterloo, a Postdoctoral Fellow at the University of Pennsylvania, a Researcher at the NEC Research Institute, and a Research Associate at the National Research Council Canada. Prof. Schuurmans is currently an Action Editor for the Journal of Machine Learning Research and the Machine Learning journal, and served as Program Co-Chair for the International Conference on Machine Learning (in 2004). His research interests include machine learning, optimization and search. He is author of over eighty publications in these areas, and has received outstanding paper awards at the International Joint Conference on Artificial Intelligence (IJCAI) and the National Conference on Artificial Intelligence (AAAI).