

# **Stochastic Discriminative EM (sdEM)**

## **Discriminative Learning in the Natural Exponential Family**

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# What can sdEM do for you?

- Imagine your learning problem is based on a **probabilistic generative model**:
  - E.g. Bayesian networks, Latent Dirichlet Allocation model, etc.
  - Deal with Missing Data and/or Hidden Variables in a principled way.
  - **EM is the off-the-self learning algorithm for these settings.**
- But if, in addition to this, your learning problem is a **prediction problem**:
  - **Discriminative loss** (e.g. Conditional Log-Likelihood, Hinge, etc).
  - Naive Bayes classifier discriminatively trained to deal with missing data.
  - Online Supervised Latent Dirichlet Allocation trained with the Hinge Loss.

**sdEM to the rescue!!**

An off-the-self algorithm for discriminative learning

Imagine that your learning problem is based on a probabilistic generative model such as a Bayesian network or a Latent Dirichlet Allocation model. And you want to use these models because you need to deal with missing data and/or hidden variables in a principled way. In this case, EM is the off-the-shelf algorithm for this learning problem. But if, in addition to this, your learning problem is a prediction problem, you probably want to train your models using a discriminative loss function instead and not using the maximum log-likelihood as happens with the EM. For example, you want to train discriminatively a naive bayes classifier to deal with missing data or to train an online supervised LDA using the hinge loss. In this work we present a simple and a well-founded extension of the EM algorithm to make all of that possible.