We approximate SHLDA’s posterior using stochastic EM, alternating between Gibbs sampling and optimization.

Gibbs sampling:
• Sampling c-table assignments for sentences:

where the probability of assigning the table to a path is

• Sampling z-level assignments for tokens:

where

Optimizing \( \eta \) and \( \tau \): We optimize the regression parameters using L-BFGS via the likelihood

Gibbs sampling for prediction

During training: Learn models from training data
• The Gibbs sampler is run for a number of iterations.
• After discarding samples during the burn-in period, multiple samples are selected.

During test: predict response variable for unseen data
• For each sample selected during training, run a Gibbs sampler on test data to obtain a Markov chain.
• Final prediction is the average of multiple predicted values across different test Markov chains.

Table: Sample response variables for Amazon reviews.

Datasets:
• U.S. Congressional floor debates: 5,201 debate turns in the House and 3,060 debate turns in the Senate of the 109th U.S. Congress.
• Amazon product reviews: 37,916 reviews on manufactured products such as computers, MP3 players, GPS devices etc.
• Movie reviews: 5,066 movie reviews.

Baselines:
• Support vector regression (SVR)
• Multiple linear regression (MLR)
• Supervised latent Dirichlet allocation (LSDA)

Evaluation metrics:
• Pearson’s correlation coefficient (PCC, higher is better)
• Mean squared error (MSE, lower is better)

Table: Sample response variables for Amazon reviews.