**SPRITE: Structured-Prior Topic Models**

SPRITE is based on LDA, but the Dirichlet priors are log-linear functions of underlying components. The components provide an additional level of latent structure that can model relations between topics.

1. Generate hyperparameters: \( \alpha, \beta, \delta, \omega \)
2. For each document \( m \), generate parameters:
   - \( \theta_m = \exp[\sum_{c=1}^{C} \alpha_m \phi_c] \), \( 1 \leq t \leq T \)
   - \( \theta_m \sim \text{Dirichlet}(\theta_m) \)
3. For each topic \( t \), generate parameters:
   - \( \phi_t = \exp[\sum_{c=1}^{C} \beta_t \omega_c] \), \( 1 \leq v \leq V \)
   - \( \phi_t \sim \text{Dirichlet}(\phi_t) \)
4. For each token \((n, m)\), generate data:
   - (Topic (unobserved)): \( z_{mn} \sim \theta_m \)
   - (Word (observed)): \( w_{mn} \sim \phi_{z_{mn}} \)

**Related Models**

- Dirichlet-multinomial regression ( Mimno and McCallum, 2007)
  - \( \alpha \) are feature weights (supervision)
  - \( \delta \) are regression coefficients
- Pachinko allocation ( Li and McCallum, 2006)
  - \( \alpha \) behave like supertopic weights
  - \( \delta \) behave like supertopic priors

**Sparse Additive Generative Models** (Eisenstein et al., 2011)
- \( \omega \) are sparse
- \( \beta \) are predefined
- \( \phi = \delta \)

**Example: Modeling Perspective and Topic Hierarchies**

Each topic’s prior comes from two components:
- **Perspective** (positive or negative)
- **Hierarchy** (each topic chooses one parent component)

**Code available**: 

http://cs.jhu.edu/~mpaul