

## Stochastic variational inference

- 1: Initialize  $\lambda^{(0)}$  randomly.
- 2: Set the step-size schedule  $\rho_t$
- 3: Repeat until convergence:
  - 4:   Sample a document  $w_d$  uniformly from the corpus D.
  - 5:   Initialize  $\gamma_{dk} = 1$ , for  $k \in \{1, \dots, K\}$ .
  - 6:   Repeat until convergence
    - 7:       For  $n \in \{1, \dots, N\}$  set

$$\phi_{dn}^k \propto \exp(\Psi(\gamma_{dk} + \Psi(\lambda_{k,w_{dn}}) - \Psi(\sum_v \lambda_{kv})))$$

- 8:       Set  $\gamma_d = \alpha + \sum_n \phi_{dn}$ .
- 9:   For  $k \in \{1, \dots, K\}$  set intermediate topics

$$\hat{\lambda}_l = \eta + D \sum_{n=1}^N \phi_{nk}^k w_{dn}.$$

- 10:    $\lambda^{(t)} = (1 - \rho_t)\lambda^{(t-1)} + \rho_t \hat{\lambda}.$