

# Computation of the EM Algorithm

- Initialize all unknown parameters randomly
- Repeat until likelihood converges

– E-step  $p(z_{d,w} = j) \propto \pi_{d,j}^{(n)} p^{(n)}(w | \theta_j)$   $\sum_{j=1}^k p(z_{d,w} = j) = 1$

– M-step  $p(z_{d,w} = B) \propto \lambda_B p(w | \theta_B) \leftarrow$

What's the normalizer for this one?

$$\pi_{d,j}^{(n+1)} \propto \sum_{w \in V} c(w, d) (1 - p(z_{d,w} = B)) p(z_{d,w} = j)$$

$$\forall d \in C, \sum_{j=1}^k \pi_{d,j} = 1$$

$$p^{(n+1)}(w | \theta_j) \propto \sum_{d \in C} c(w, d) (1 - p(z_{d,w} = B)) p(z_{d,w} = j)$$

$$\forall j \in [1, k], \sum_{w \in V} p(w | \theta_j) = 1$$

**In general, accumulate counts, and then normalize**