
Algorithm 1 A Particle Filter Algorithm

Initialize ω_1^f to $\frac{1}{F}$ for all $f \in \{1, \dots, F\}$
for each document d with time stamp t **do**
 for $f \in \{1, \dots, F\}$ **do**
 Sample $s_{td}^f, \mathbf{z}_{td}^f$ using MCMC
 $\omega^f \leftarrow \omega^f P(\mathbf{x}_{td} | \mathbf{z}_{td}^f, \mathbf{s}_{td}^f, \mathbf{x}_{1:t,d-1})$
 end for
 Normalize particle weights
 if $\|\omega_t\|_2^{-2} < \text{threshold}$ **then**
 resample particles
 for $f \in \{1, \dots, F\}$ **do**
 MCMC pass over 10 random past documents
 end for
 end if
end for
