

Supplementary Material for “Dynamic and Static Topic Model for Analyzing Time-Series Document Collections”

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A Parameter Estimation

The means of ${}^1\theta_{d,s}^t$ and ${}^2\theta_{d,s,k}^t$ can be obtained by

$${}^1\hat{\theta}_{d,s}^t = \frac{n_{d,s}^t + {}^1\alpha_s^t}{n_d^t + \sum_{s=1}^S {}^1\alpha_s^t} \quad \text{and}$$
$${}^2\hat{\theta}_{d,s,k}^t = \frac{n_{d,s,k}^t + {}^2\alpha_{s,k}^t}{n_{d,s}^t + \sum_{k=1}^K {}^2\alpha_{s,k}^t}.$$

Moreover, we randomly initialized the topic assignments and ran the collapsed Gibbs sampler for 500 iterations for every model.

B Data Preprocessing

We obtained and preprocessed the **NIPS** and the **Drone** datasets by the following procedure. For the **NIPS** dataset, we downloaded its bag-of-words representations, which are available online.¹ In this dataset, the stop words and the words that appeared less than 50 times in 1987–2015 are originally removed. For the **Drone** dataset, we used a spreadsheet² that lists UAV-related papers and downloaded abstracts of papers according to the list. In this dataset, the stop words and words that appeared less than four times in 2009–2016 were removed.

C Hyperparameter Setting

We set the hyperparameters of the proposed model and the baselines as follows. For LDA, we used symmetric Dirichlet priors with $\alpha = 0.1$ and $\beta = 0.1$. For PAM, we used symmetric Dirichlet priors with ${}^1\alpha = 0.1$ and $\beta = 0.1$ and initial values of ${}^2\alpha = 1.0$. For DRTM, we used symmetric Dirichlet priors with $\alpha = 0.1$ and initial values of $\beta_{k,k'}^t = 100$ if $k = k'$, and 0.1 otherwise. For DSTM, we used symmetric Dirichlet priors with ${}^1\alpha = 0.1$ and initial values of ${}^2\alpha = 1.0$ and $\beta_{k,k'}^t = 100$ if $k = k'$, and 0.1 otherwise.

¹<https://archive.ics.uci.edu/ml/datasets/NIPS+Conference+Papers+1987-2015>.

²<https://goo.gl/cCoCwL>