

Hierarchical Recurrent Neural Network for Story Segmentation

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Introduction

What is “Story Segmentation?”

- To divide a sequential stream of text or audio into stories or topics

The United Nations has concluded that commercial fishing is the most dangerous job in the world. More than 70 people die every day while fishing at sea. 24,000 fishermen a year. Mostly in storms. And not every country keeps accurate records. In Afghanistan, the Taliban government is now cracking down on barbers. Some barbers have been giving Leonardo DiCaprio haircuts to men who have seen “Titanic.” The government has put 22 barbers in jail for offending Islam. Finally this evening, we take to you the south pole. ...

news stream

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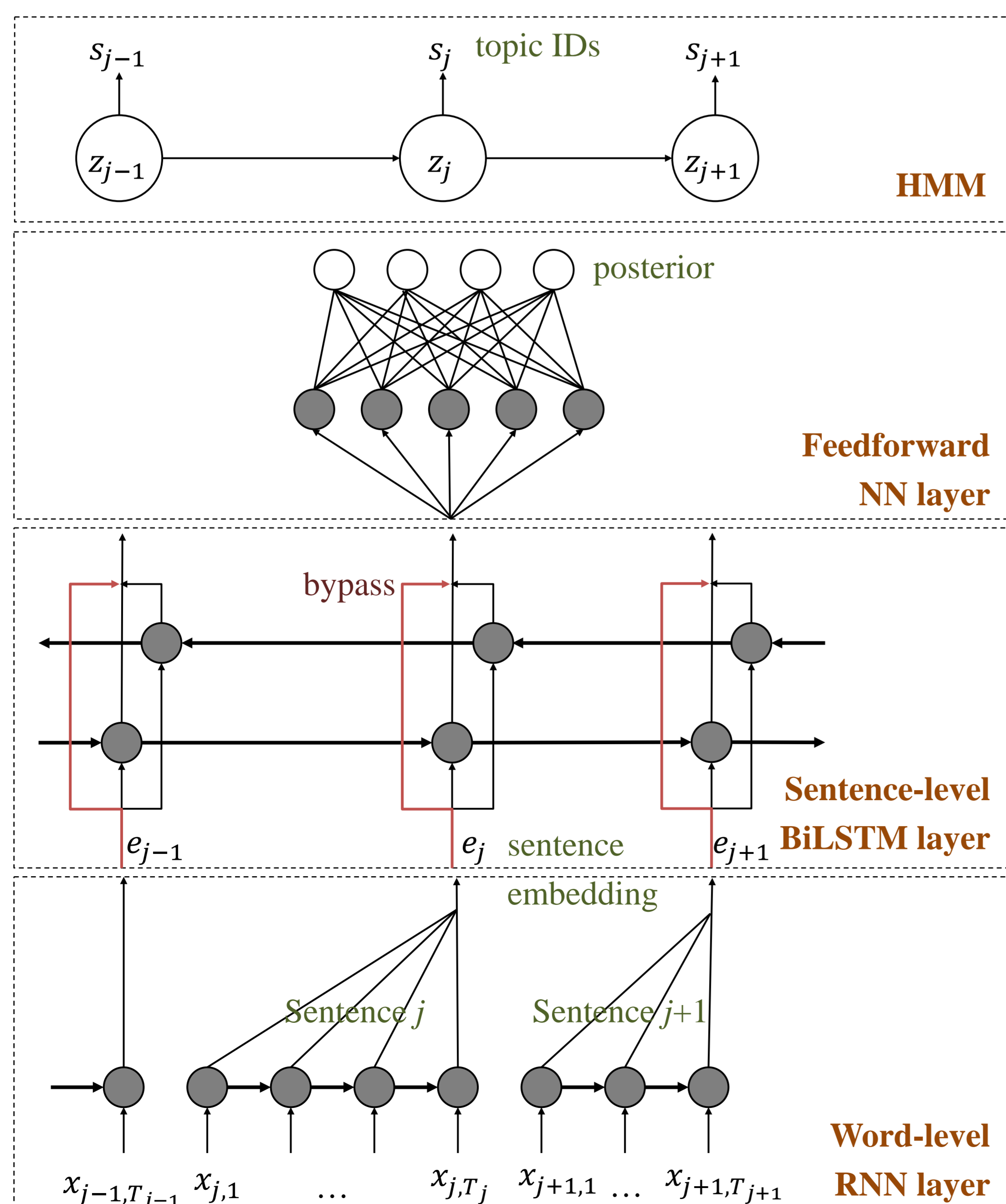
divided stories

- Story Segmentation is useful for many subsequent tasks such as
 - summarization
 - topic detection
 - information retrieval

Our Proposal

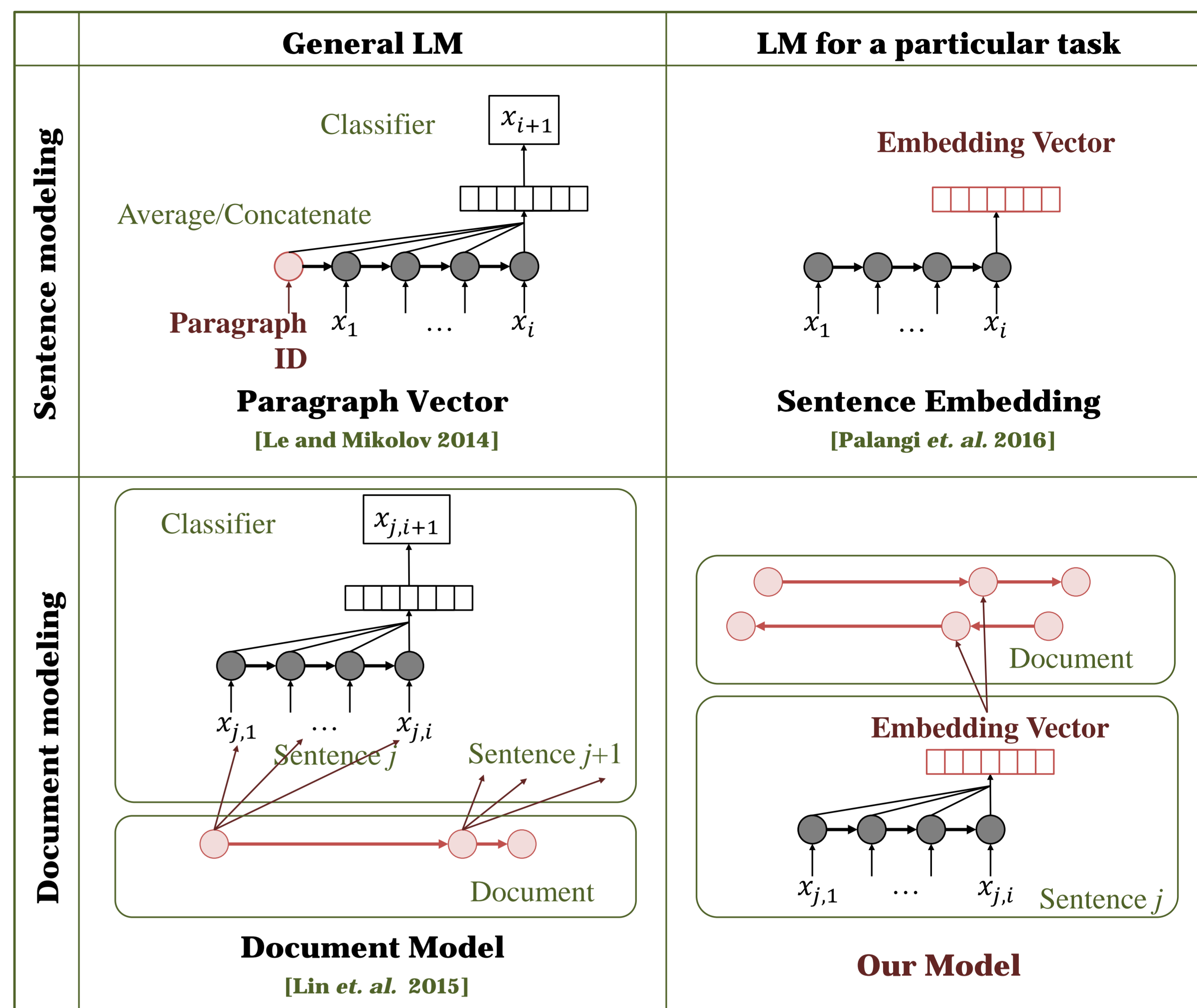
Hierarchical Recurrent Neural Network (HRNN)

- To capture a hierarchical character of broadcast news
 - each story consists of multiple sentences
 - each sentence consists of words which are relevant to the story
- Hierarchical structure
 - word-level RNN concentrates each sentence into a sentence embedding
 - sentence-level bidirectional LSTM considers both preceding and following sentences
 - feed forward NN layer estimates topic posterior
 - HMM detects the topic changes



Hierarchical RNN (HRNN) model structure

Relation between Other Work



Experiments

Experimental Setup

- Data:** Topic Detection and Tracking (TDT2) task
- Parameters:** all hidden units and embedding dim. were 256
- Label:** given by unsupervised clustering

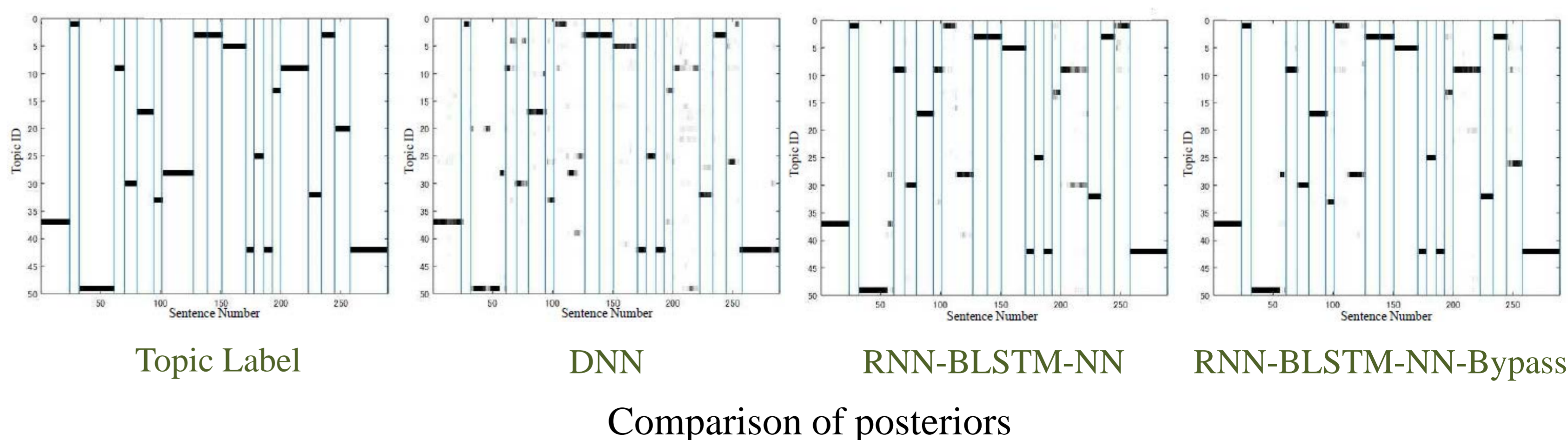
Results

F1-Measure and comparison with the other models

| # of Clusters | 50 | 100 | 150 | 170 | 200 |
|---------------------------|--------------|--------------|--------------|--------------|-------|
| TextTiling [Hearst 1997] | | | 0.484 | | |
| DNN-HMM [Yu et. al. 2016] | 0.718 | 0.729 | 0.741 | 0.741 | 0.732 |
| HRNN (Proposed) | 0.743 | 0.739 | 0.747 | 0.744 | 0.728 |

Comparison of model variation

| Model | F1-Measure (150 clusters) |
|-----------------------------|---------------------------|
| RNN-BiRNN | 0.706 |
| RNN-BiLSTM | 0.729 |
| RNN-BiLSTM-NN | 0.740 |
| RNN-BiLSTM-NN-Bypass | 0.747 |



Comparison of posteriors

Conclusion

- Propose Hierarchical RNN approach for story segmentation
- Experimentally HRNN model improved on the other methods
- Best performing model was RNN-BiLSTM-NN-Bypass