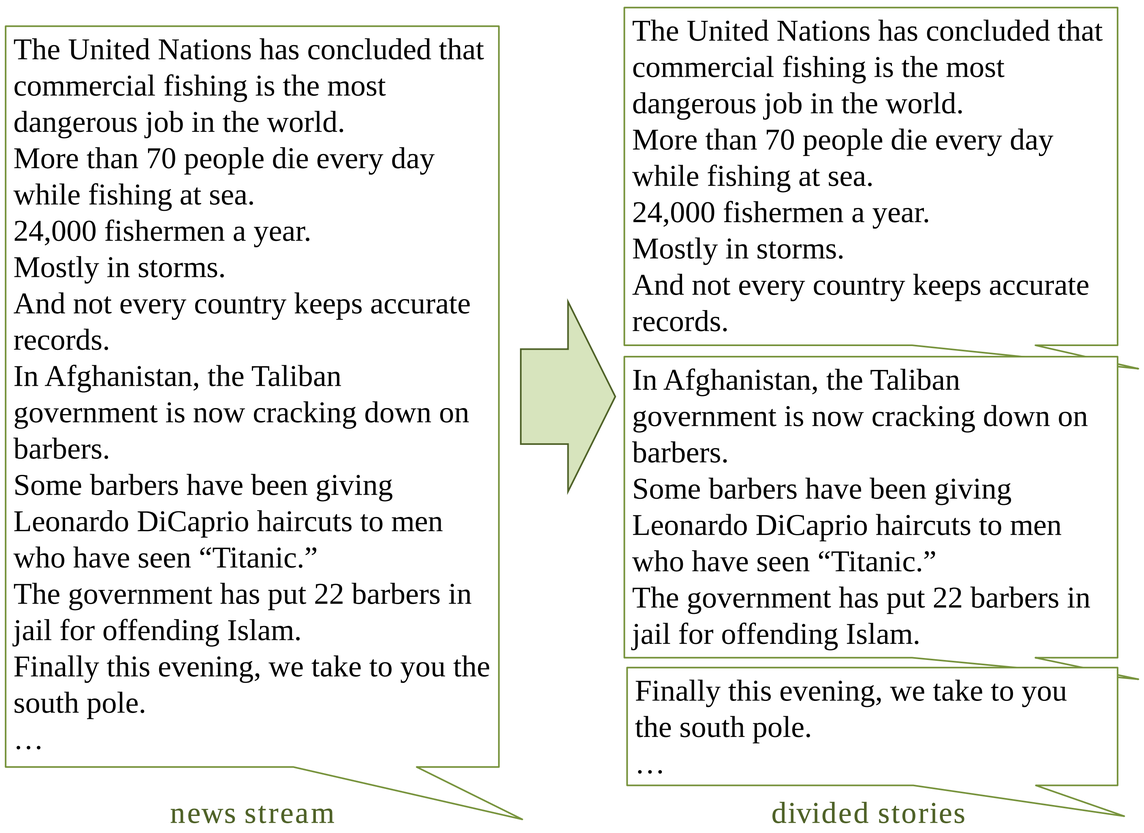
Hierarchical Recurrent Neural Network for Story Segmentation

Emiru Tsunoo[1,2], Peter Bell[1], Steve Renals[1] ([1]The University of Edinburgh, United Kingdom, [2]Sony Corporation, Japan)

Introduction

What is "Story Segmentation?"

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

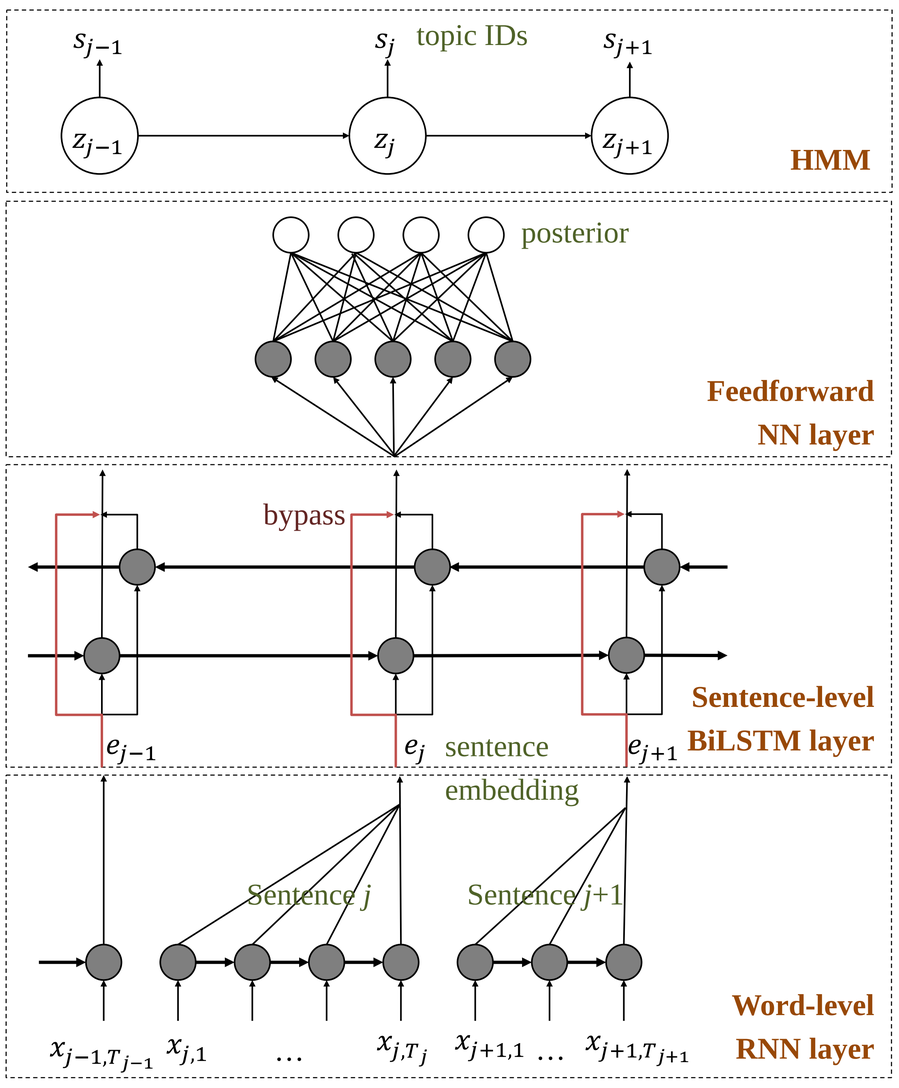


- Story Segmentation is useful for many subsequent tasks such as
  - summarization
  - topic detection
  - information retrieval

Our Proposal

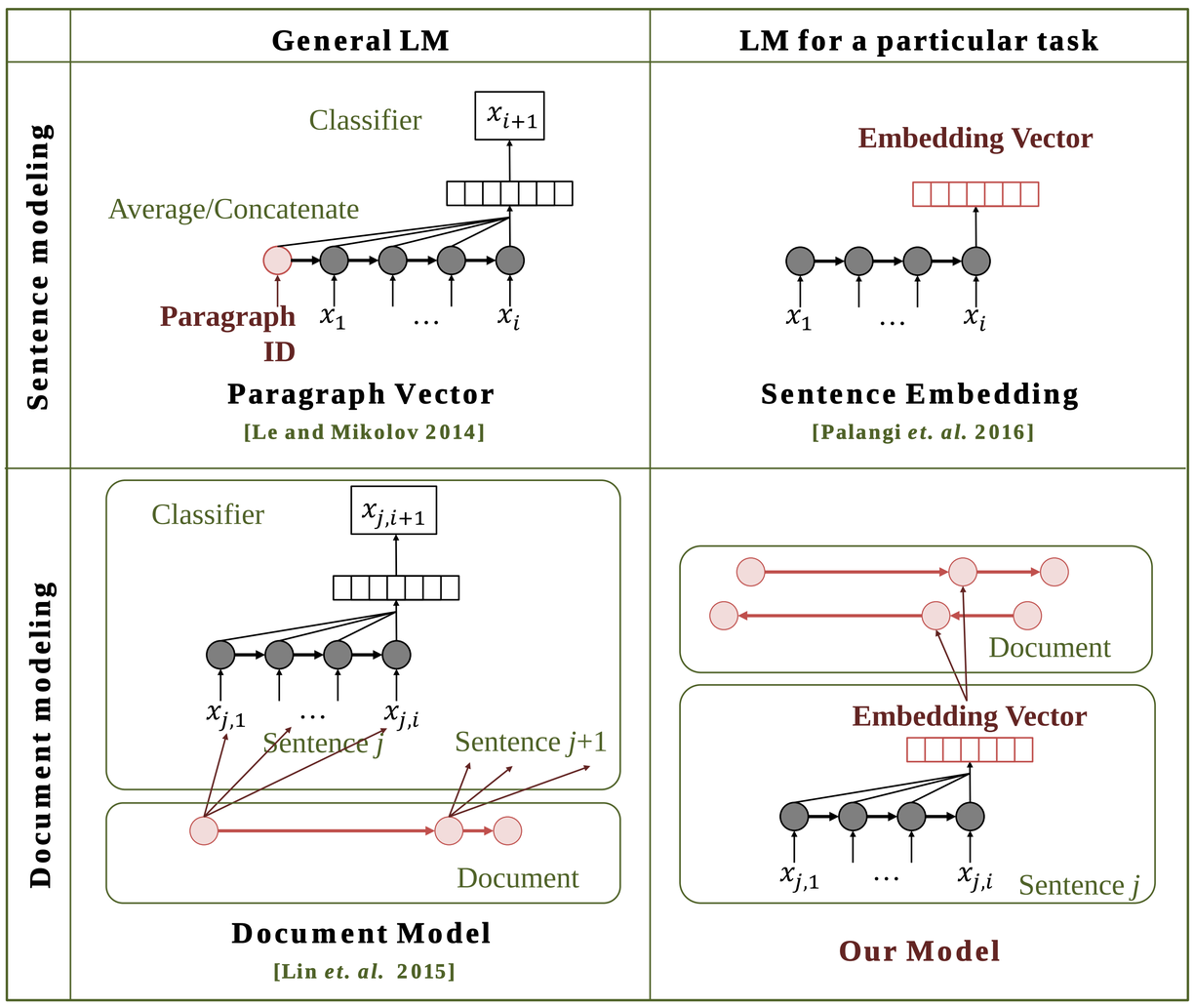
Hierarchical Recurrent Neural Network (HRNN)

- 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

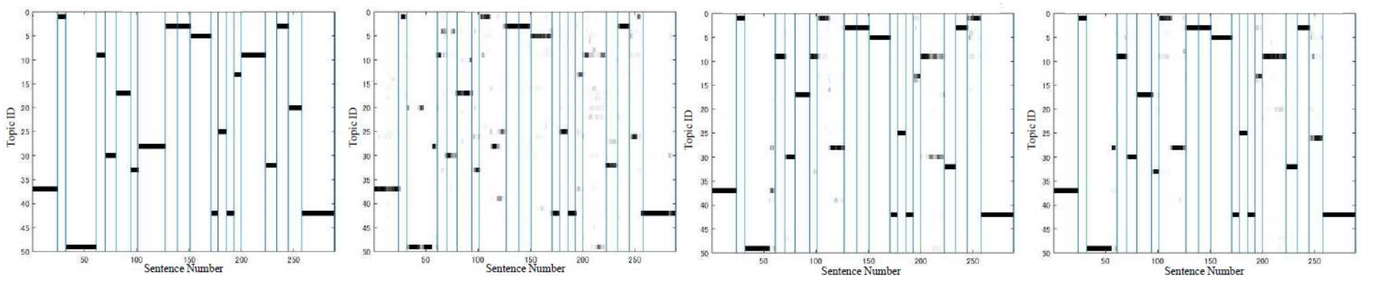
Results

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**



Topic Label | DNN | RNN-BLSTM-NN | RNN-BLSTM-NN-Bypass

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