Intra-Speaker Topic Modeling for Improved Multi-Party Meeting Summarization with Integrated Random Walk
Yun-Nung Chen and Florian Metze

Summary

- Idea:
  - Important utterances are topically/lexically similar to each other
  - Utterances from the same speaker usually focus on similar topics

- Approach for extractive summary
  - Construct a graph to represent the utterances in the document (node: utterance, edge: weighted by topical/lexical similarity)
  - Use the graph to compute importance of each utterance

Graph Construction

- Node: utterances in a doc.
- Edge weight: topical/lexical similarity between utterances
- The utterances topically/lexically similar to more important utterances should be more important

- Intra-Speaker Topic Sharing
  - Weight the edge similarity if two utterances are from the same speaker
  - The utterances from the same speaker can partially share the importance

Integrated Random Walk

- Basic Idea: high importance means
  1. Utterances with higher Latent Topic Entropy (original score)
  2. Utterances topically/lexically similar to the indicative utterances
- Compute a set of new scores based on graph structure, $S(U_i)$ satisfying
  $$S(U_i) = (1 - \alpha - \beta)I(U_i) + \sum_{U_j \in \text{TopicSim}(U_i, U_j) S(U_j)} \alpha \text{ and } \sum_{U_j \in \text{LexSim}(U_i, U_j) S(U_j)} \beta$$

- Updated importance $v = \left(1 - \alpha - \beta\right)r + \alpha \text{P}_{\text{t}}v + \beta \text{P}_{1}v$

  $$\text{P'} = \left((1 - \alpha - \beta) \text{re}^T + \alpha \text{P}_{\text{t}} + \beta \text{P}_{1}\right)v$$

  Chen, Y.-N. et al. “Spoken lecture summarization by random walk over a graph constructed with automatically extracted key terms,” in InterSpeech. 2011.


Experiments

- Dataset: 10 meetings from CMU Speech Group
- 30% Summary for ASR (WER ~ 44%)

  - ROUGE-1
  - ROUGE-L

Conclusions

- Graph-based approach can improve summarization performance using lexical or topical similarity
- Topics from the same speaker can be shared in the graph
- For manual transcriptions, random walk with intra-speaker topical similarity performs best
- For ASR transcriptions, integrated random walk performs best because lexical and topical similarity are additive
  - Lexical similarity measures word overlap
  - Topical similarity compensates the negative effects of recognition errors on similarity evaluated on word overlap to some extent

The first author was supported by the IES, U.S. Department of Education through Grant R305A080628. Any opinions, findings, and conclusions or recommendations do not necessarily reflect the views or official policies, either expressed or implied of the Institute or the U.S. Department of Education.