Sentence Embeddings for Text Classification

Project Group #25

10-701 Spring 2019 Project (IMDB Review)

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Introduction

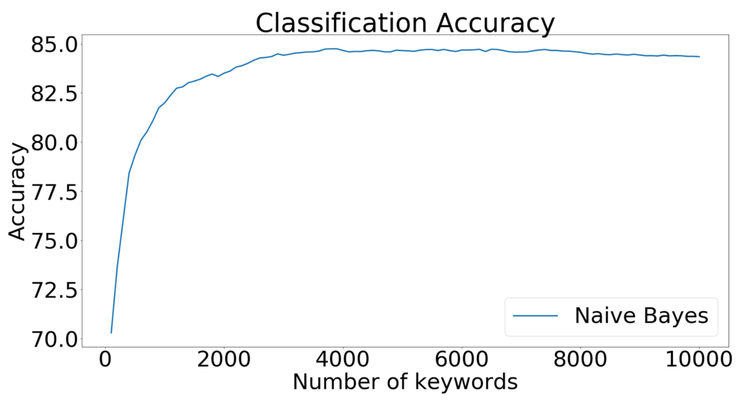
- IMDB Movie Review Dataset [4], contains 25k positive, 25k negative reviews
- Long reviews, composed of many sentences, challenging to classify
- Our aim: predicting a movie review as positive or negative by a binary classifier

Related Work

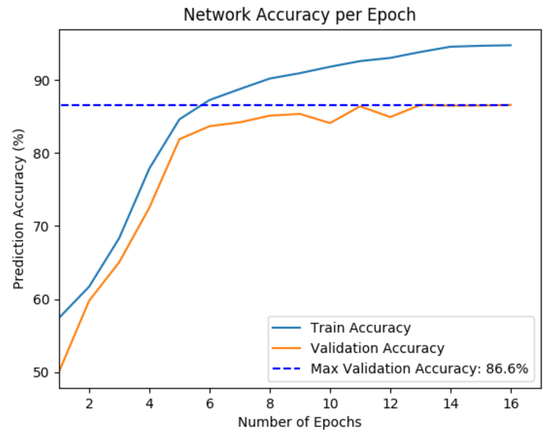
- Naive-Bayes-SVMs
- Decision Forests
- Word embedding based techniques [4]
- Transfer Learning Embeddings:
  - Language Model [2]
  - Multi-task Training [1,3]

Baselines

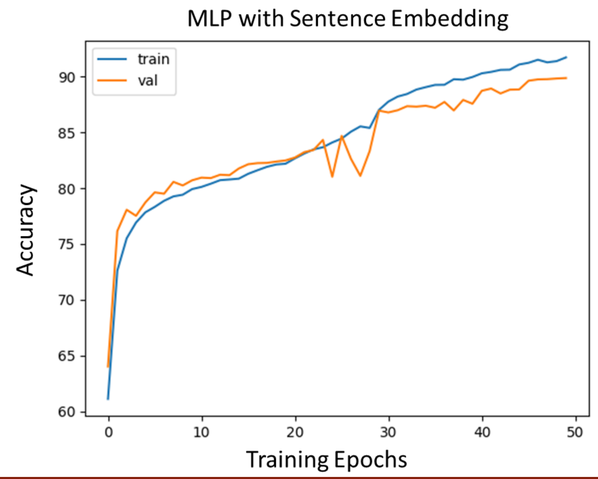
Naive Bayes



Bi-LSTM



Paragraph Embeddings



Results

Model	Test Accuracy
Naive Bayes	84.75 %
BLSTM	87.10 %
Embeddings	89.50 %

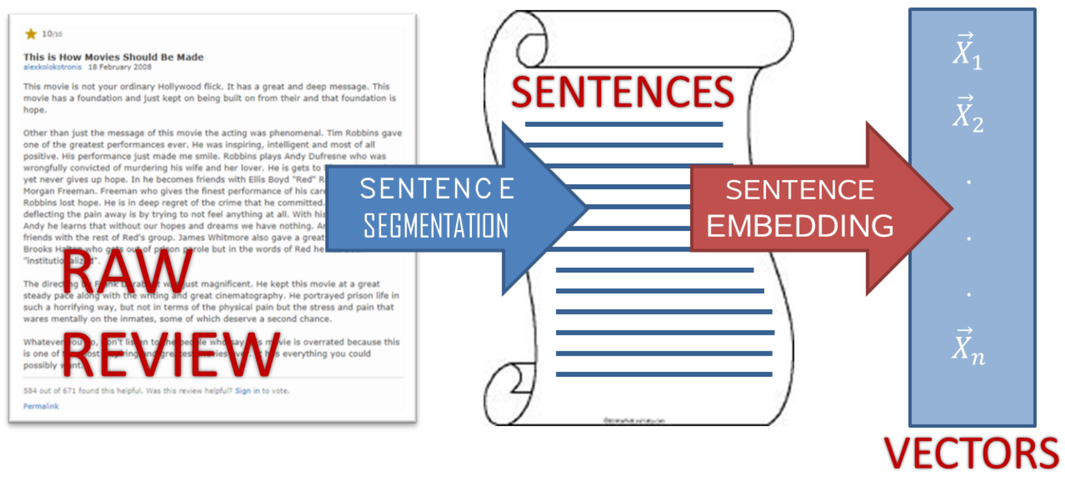
Length Challenges

- Accuracy for reviews with 300 words or less: **91.6%**
- Accuracy for reviews with more than 300 words:**79.2%**
- Current representation does not capture long-term dependencies

Goals

- Design text representation that captures dependencies across sentences
- Leverage multi-task training
- Evaluate performance on IMDB Reviews Dataset

Segmented Representation



- Long-term dependencies across 100's of words are captured between a few embeddings
- Can be augmented with sentence similarity
- Potentially useful as a text representation for many NLP tasks

Classification

Classification using segmented representation:

- Gaussian Mixture Model Classification
- Hidden Markov Model Classification
- RNN Classification
- CNN/TDNN Classification
- Sentence-level classification and voting
- Weakly-Labeled Voting

References

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4. Andrew L. Maas, Raymond E. Daly, Peter T. Pham, Dan Huang, Andrew Y. Ng, and Christopher Potts. Learning word vectors for sentiment analysis. InProceedings of the 49th Annual Meeting of the Association for Computational Linguistics: Human Language Technologies, pages 142–150, Portland, Oregon, USA, June 2011. Association for Computational Linguistics