Fake News Detection with Multilayer LSTM and CNN

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1 Introduction

In recent years, deep learning have been applied to a wide range of research problems after achieving remarkable results in computer vision [3] and speech recognition [1]. For this project, we apply deep learning methods to solve a text classification problem. For natural language processing tasks, recurrent neural networks or RNNs [5] are commonly used to model language sequence. The idea of parameter sharing makes it possible for these models to generalize across sequences with different lengths. RNNs use the same parameters to process tokens at each step. With the same idea, convolutional neural networks (CNNs) use convolution kernels to share parameters.

Text classification is a classic problem in natural language processing. For this specific task, we need to assign each news sample with a predefined category. Traditional methods require designing features and choosing the best machine learning classifiers. With the power of deep learning, features are automatically learned by the neural networks and training is often end-to-end. With the meta data provided for each statement, we use a multi-layer LSTM to extract sentence features and a CNN is implemented to extract features from the meta data. Detailed description of the model is included in the next section.

2 Model

2.1 CNN for Meta data

For each sample, we have six attributes for meta data. We encode the meta data with pre-trained word embeddings [4]. These embeddings were trained on Google News Corpus with 300 dimensions. The input of CNN model will be a 6-by-300 matrix. We adopt the same CNN structure as in [2]. Figure 1 shows the model structure used in the project. Instead of using the words as input, we use the embeddings of the meta data.

2.2 LSTM for Statement

A multi-layer LSTM is used to model the statement sentence. The one-hot word representations are first transformed to word embeddings using pretrained Word2Vec [4] embeddings trained on Google News corpus. The last hidden layer of the LSTM is used as the representations of the statement. Figure 2 shows the LSTM used in the model.

3 Implementation Details

The features extracted by LSTM and CNN are then concatenated as the input of an fully-connected layer. The model is implemented using TensorFlow. The hyperparameters used in the problem is listed in Table 1. Easy stopping is adopted using the dev set to prevent overfitting.

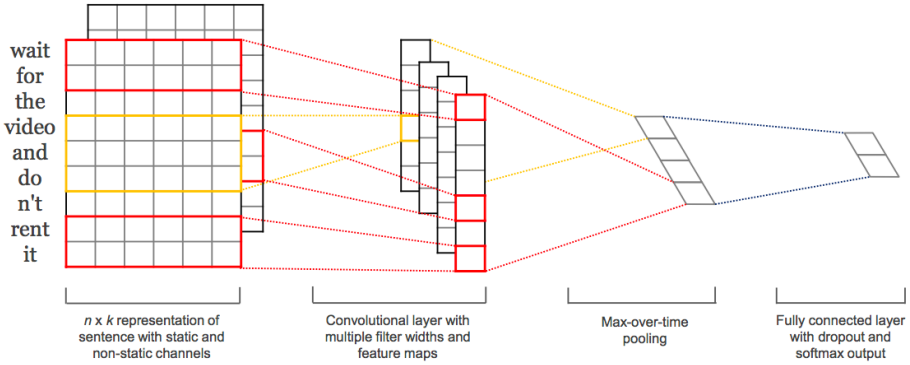

Figure 1: Structure of the CNN model for meta data

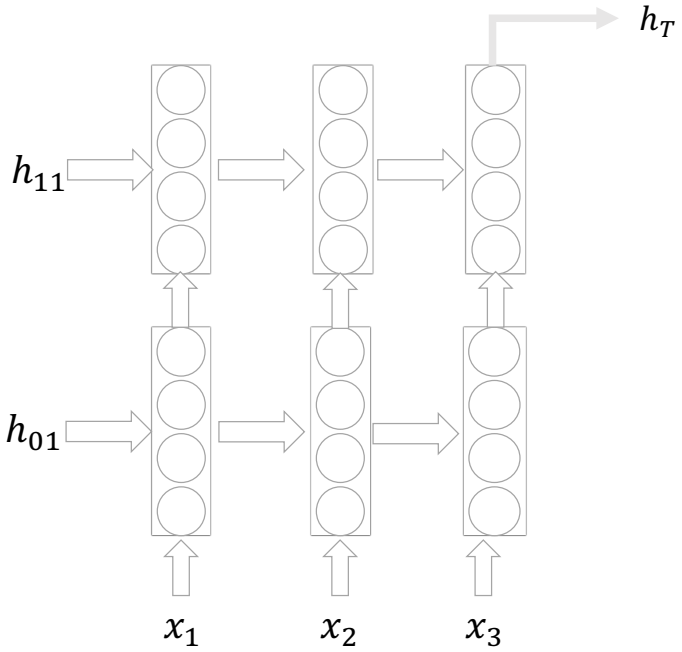

Figure 2: 2-layer LSTM used in out model

Hyperparameters	
Embedding dim	300
Filter size	2,3,4
State size	300
Dropout rate	0.5
# of LSTM layers	2
# of filters	128
L_2 regularization	0.1

Table 1: Hyperparameters

References

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