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Spam Review Detection with Sentiment Analysis

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Abstract - *Product analysis is valuable for the upcoming buyers in order to help them to take decisions. To the end, different opinion approaches have been proposed, where deciding a review whether positive or negative is one of their key challenges. Recently, deep learning has emerged as an effective means of foe solving sentiment classification problems. A neural network inherently learns a useful portrayal that reacts without the intention of human efforts. However, the success of deep learning highly relies on the availability of wide-ranging training data. We propose a novel deep learning framework for evaluating the product through sentiment classification which employs prevalently available ratings as weak supervision signals. The framework consists of two steps: (1) learning a foremost depiction (an embedding space) which provides out the overall sentiment distribution of sentences through rating information; (2) adding a classification layer on top of the embedding layer and use labeled sentences for supervised fine-tuning. We explore two kinds of low-level network structure for modeling review sentences, namely, complex feature extractors and long short-term memory. To assess the advance framework, we set up a dataset containing a million weakly labeled review sentences and 11,754 labeled review sentences from various websites. Experimental results show the efficacy of the proposed framework and its superiority over baselines*.

Key Words: Sentiment Analysis, genuine online reviews.

1. INTRODUCTION

With the booming of e-commerce, people are getting used to consuming online and writing comments about their purchase experiences on merchant/review Websites. These opinionated contents are valuable resources both to future customers for decision-making and to merchants for improving their products and/or service. However, as the volume of reviews grows rapidly, people have to face a severe information overload problem. To alleviate this problem, many opinion mining techniques have been proposed, e.g. opinion summarization, opinion polling, and comparative analysis the key challenge is how to accurately predict the sentiment orientation of review sentences. Popular sentiment classification methods generally fall into two categories: (1) lexicon based methods and (2) machine learning methods. Factual information is usually more helpful than subjective feelings. Lexicon-based methods can only deal with implicit opinions in an ad-hoc way. Despite the promising performance of deep learning on sentiment classification, no previous work is prevalently available ratings for training the deep models. In this, we propose a novel deep learning which gives a review sentence sentiment classification. In this treats review ratings as the weak labels to train deep neural networks. This work generally consists of two steps. In the first step, instead of speculating sentiment labels directly, we try to learn an embedding space that gives out the general sentiment distribution of sentences, from a large number of weakly labeled sentences. That is, the sentences with the same weak labels that are near each other, while sentences with different weak labels are kept away from each other. To reduce the impact of sentences with rating-inconsistent orientation, we propose to penalize the relative distances among sentences in the embedding space through a ranking loss. In the second step, a categorized layer is added on top of the embedding layer, and we use labeled sentences to fine-tune the deep network. The framework is dubbed Weakly-supervised Deep Embedding (WDE). Considering the network structure, two popular schemes are adopted to learn to extract fixed-length feature vectors from reviewing the sentences, namely, convolutional feature extractors and Long Short-Term Memory (LSTM). With a slight misuse of concept, we will refer to the former model as Convolutional Neural Network based WDE (WDE-CNN); the latter one is called LSTM based WDE (WDELSTM). We then compute high level features (embedding) by synthesizing the extracted features, as well as the contextual aspect information (e.g. screen of cell phones) of the product. The aspect input represents prior knowledge regarding the sentence's orientation.

2. PROPOSED SYSTEM

In this work, we advance a novel deep learning framework for review sentence sentiment classification. The structure treats review ratings as weak labels to train deep neural networks. For example, with a 5-stars scale we can consider ratings above/below 3-stars as positive/ negative weak labels respectively. The structure generally consists of two steps.

In the first step, rather than predicting sentiment labels directly, we try to learn an implant space (a top-level layer in the neural network) which reflects the general sentiment where the position of sentences, from a large number of weakly labeled sentences. That is, we club the sentences with the same weak labels to be near each other, while sentences with different weak labels are kept away from one another. To reduce the impact of sentences with rating-inconsistent orientation (hereafter called wrong-labeled sentences), we

propose to penalize the relative distances among sentences in the embedding space through a ranking loss. In the second step, a categorization layer is added on top of the embedding layer, and we use labeled sentences to fine-tune the deep network. The framework is dubbed Weakly-supervised Deep Embedding (WDE). Regarding network structure, two popular schemes are adopted to learn to extract fixed-length feature vectors from review sentences, namely, convolutional feature extractors and Long Short-Term Memory.

3. METHODOLOGY

On applying Bayes Therom with the best independent assumptions between the features. Naive Bayes classifiers are highly stretchable, requiring a number of parameters directly for the number of variables (features/predictors) in a learning problem. Maximum-likelihood training can be done by assessing a closed-form expression, which is done constantly, rather than by expensive monotonous approximations that are used for many other types of categorizations. On considering some types of probability models, naive Bayes classifiers are trained very efficiently in a supervised learning. From the practical applications, parameters estimations for naive Bayes models uses the method of likely with the same; in other words, one can work with the naive Bayes model without accepting any Bayesian methods. Despite their naive design and apparently the simplest assumptions, naive Bayes classifiers have worked quite well in many complex real-world situations.

4. RESULTS

The below pictures are the build results obtained when the project is build in executed.

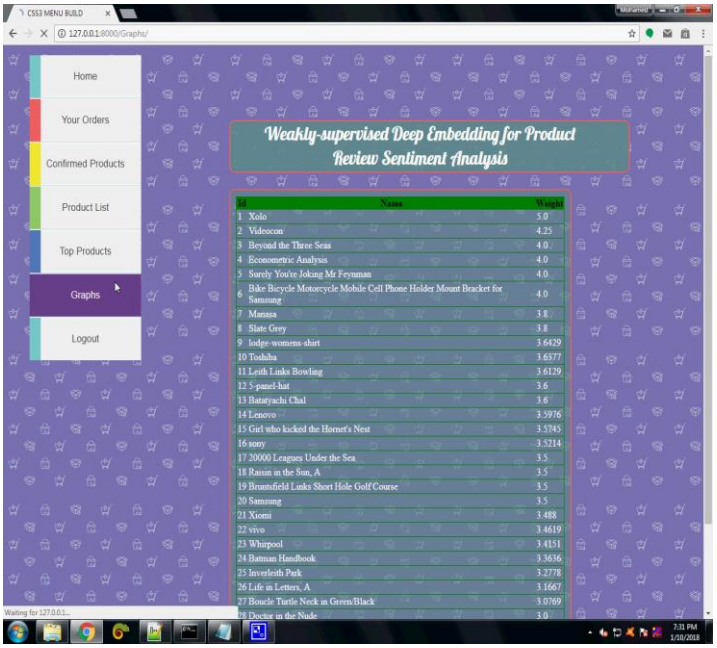
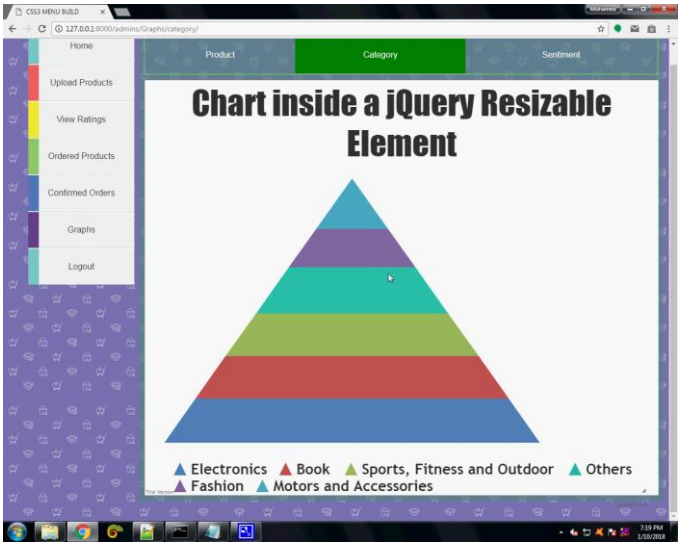


Fig 5.1



5. CONCLUSION

In this work we proposed a novel deep learning framework named Weakly-supervised Deep Embedding for review sentence sentiment classification. DE trains deep neural networks by exploiting rating information of reviews which is prevalently available on many merchant/review Websites. The training is a 2-step procedure: first we learn and embedding space which tries to capture the sentiment distribution of sentences by penalizing relative distances among sentences according to weak labels inferred from ratings; then a softmax classifier is added on top of the embedding layer and we fine-tune the network by labeled data. Experiments on reviews collected from various

websites to show that WDE is effective and outperforms baseline methods. Two specific instantiations of the framework, WDE-CNN and WDE-LSTM, are proposed. Compared to WDE-LSTM, WDECNN has fewer model parameters, and its computation is more easily parallelized on GPUs. Nevertheless, WDE-CNN cannot well handle long-term dependencies in sentences. WDE-LSTM is more capable of modeling the long-term dependencies in sentences, but it is less efficient than WDE-CNN and needs more training data. For future work, we plan to investigate how to combine different methods to generate better prediction performance. We will also try to apply WDE on other problems involving weak labels.

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