Food Review Summary using Aspect Extraction and Sentimental Analysis

Interim Report

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Problem Statement

Sentiment analysis is a classic NLP problem because of both the research challenges it poses and its viability in real-life industrial applications. However as the users need of getting more accurate and precise information increases, such higher level sentiment analysis becomes redundant. Consider the following review: "The staff in the restaurant was nice but food was horrible". Here, a reviewer provides information about certain important aspects of the restaurant like staff and food. If we are able to extract such aspects & the sentiment associated with them, we can extract much more precise and relevant information from a review which might prove to be beneficial for future consumers.

The aim of our project is to extract these aspect terms form a particular review. After extracting them, we predict their polarities i.e to determine whether a positive sentiment is associated with it or a negative sentiment. Both the tasks will be done using supervised learning methods. The dataset which we choose for our project is the 'Amazon Fine Food Review' dataset. We will build our model on the SemEval 2014 dataset and test it on the Amazon dataset after manually creating a labelled corpora.

Our Approach

Our approach is mainly based on "Aspect Extraction for opinion mining with a deep Convolutional Neural Network" by Soujanya et al. 2016 [4]. The network is made up of two convolution layers, two max-pool layers and one fc layer.

- Initially we trained word-embeddings on our own dataset but due to poor results we moved over to using pre-trained word embeddings.
- We then used two pre-trained word embeddings: GloVe [1] and Google News Word Embeddings to represent our data and obtained the features of each word as a 300 dimensional vector.
- In addition to it we used POS Tag features of the word as additional features to be fed into the network. Thus the final dimension of the data which was fed into the network was 306.
- Also, we formed the local features of surrounding words since words tend to depend upon each other in English. Although this part has not been implemented successfully due to difficulties faced in representing features of window of words.

The model was evaluated on standard Precision, Recall and F-1 Score metrics. The results of which are shown in below section.

Methods implemented along with the results

We have classified aspect into mainly two categories. Multi-word aspects and Single word aspects. Our model performs very well on identifying single word aspects and reasonably well on identifying single word aspect, multi word aspect and no aspect as well i.e when only single term aspects are trained and when all the aspects are trained (single, multi and none).

Model	Precision	Recall	F1-Score
CNN + GloVe WE	47.95%	43.01%	45.34%
CNN + GloVe WE + POS	51.64%	46.32%	48.84%
CNN + Google WE + POS	46.75%	66.18%	54.79%

Table 1: When all types of aspects are fed to the model.

Model	Precision	Recall	F1-Score
CNN + GloVe WE + POS	92.71%	56.44%	70.18%
CNN + Google WE + POS	72.21%	76.12%	74.11%

Table 2: When only single word aspects are fed to the model.

We have also tried to incorporate a window of size 5 i.e 2 words before and after the token but were not successful in reaching an appropriate input format. Also, since CRF's have also been proved pretty useful in Aspect Term Extraction, we are working on the CRF model mentioned in "DLIREC: Aspect Term Extraction and Term Polarity Classification System", Wang et al. 2016 [6].

Difficulties encountered

Currently, we have been facing difficulties to incorporate the features of surrounding words in a window. The main issue which we are facing is to form a feature vector of appropriate dimensions to feed into the network and how to combine the feature vectors of 5 words such that it enriches the input. Also, another issue which we expect to face is to create a quality tagged corpora for testing. Besides that minor hurdles were faced in building the complete model which were resolved shortly.

Changes from the initial project proposal

So far we have not changed anything nor do we feel the necessity to diverge from the initial project proposal. One minor setback that we encountered was unavailability of aspect tagged corpora on the Amazon Fine Food Review Dataset. We plan to address this issue by manually annotating sufficient amount of data so as to validate our model trained on SemEval 2014 dataset.

Future Goals

We have worked on Aspect Term Extraction and are currently at a stage to move to Aspect Term Polarity classification. Concurrently, we will try to improve our model for Aspect Term Extraction so as to add to the efficiency of the complete system. We are currently using Vanilla CNN's for Aspect Term Extraction. Instead of that if time permits we plan to implement CNN for Sequence Learning as described by Collbert et al. 2016 [2]. If we are able to implement the afore-mentioned model we will try to either attempt a completely Unsupervised approach [3] or a Recurrent Neural Conditional Random Field Model [5] for aspect term extraction and Term Polarity Detection to carry out an empirical study of supervised and unsupervised approaches.

References

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