Aspect based sentiment analysis

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We have implemented two papers:
1)Aspect-Based Sentiment Analysis by Mayank Gulaty
2)Aspect-Based Sentiment Analysis Using a Two-Step Neural Network Architecture
and picked better performing modules from each of them.

Aspect based sentiment Analysis:

Sentiment analysis or opinion mining is a process to identify the polarity of the opinion by applying NLP and text analysis. Aspect Based sentiment analysis is identifying the aspects of the sentences which the polarity is about. Aspects which are being described are brought out and their polarity is determined.
By extracting and analyzing the expressed opinions in customer reviews in a fine-grained way, valuable opportunities and insights for customers and businesses can be gained.

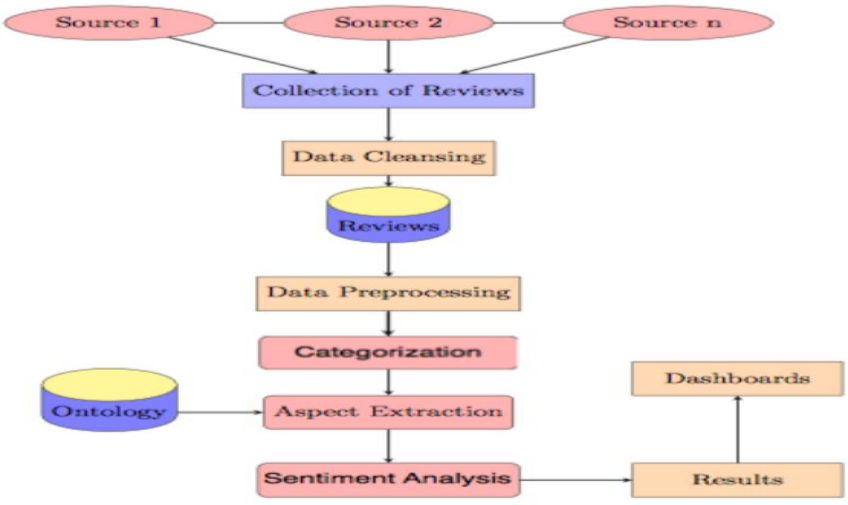

Figure 4: Flow Chart

Various Stages:

The project involves these stages:
(i)Categorization. One text may fall into multiple categories.
(ii)Aspect extraction.
(iii)Sentiment classification of the extracted aspects.

(i) Categorisation of the sentences:

As the bank dataset was not available so we used SemEval 2014 restaurant dataset. In the data , the categories to which the sentences belong are given. Dataset contained text, its categories(can be multiple) with their polarities and aspect terms in text along with their polarity.

We used mayank gulaty's method for this categorization. Data was segregated mainly into 5 categories. The data was separated into training and test data in 80:20 ratio. The language in the text was not grammatically correct and thats why unigrams and bigrams were also used as features which can tolerate these errors.
We used tf-idf vectorizer along with different classifier like OneVsRest svm classifier, logistic regression and neural networks. SVM's outperformed others with accuracy of 70%. And later predicted their polarity in the same way. We trained classifiers for each category and predicted the sentiment based on the predicted category.

(ii) Aspect Extraction:

In mayank gulaty's paper, aspect ontology was generated for each category by passing the reviews through the Stanford POS tagger and seeing the frequently mentioned nouns under that category. Once the aspects are extracted and the ontology is made, Word2Vec (glove embedding 300d) was used to get the set of words similar to the aspects. This helps in getting the aspects that are not explicitly mentioned in the

review or are not frequent. But the performance of this method was not that good as aspects like compound nouns, “orrechiete with sausage and chicken” cannot be captured in this method and also other unnecessary words can be extracted because of the similarity.
So we decided to use the approach from second paper. I.e extracting aspects terms from given text by framing the extraction as sequence labelling problem.
Each word in our text receives one of 3 tags, namely I, O or B that indicate if the word is at the Beginning, Inside or Outside of an annotation. We design neural network based sequence tagger and it predicts sequence of corresponding BIO tags that encode detected aspect terms. We use word vectors and pos tags as features as word vectors capture word similarity and pos tags can be helpful while assigning I tag. We concatenate word vector of a word with its pos tag and then pass it through a BiGRU layer and then pass the output through Dense layer and finally through output layer to predict th BIO tags. The network is trained to minimize the categorical cross-entropy between expected tag distribution p_i and predicted tag distribution q_i of each word i.
We only take explicitly mentioned aspect terms into account that have a polarity label of either positive or negative and accuracy is calculated based on the presence of word in the prediction or not. We achieved 60% accuracy using this method.

(iii) Sentiment classification of aspects:

In mayank gulaty’s paper there was no specific method provided for sentiment classification, he just mentioned that sentence boundary is predicted and sentiment analysis is done. So for proper classification, we used the method mentioned in the other paper.
In order to predict a polarity label for a specific aspect term in a sentence, we need to mark the aspect term in text so for that we use distance markers. So the final features are word vectors, pos tags and the distance from the aspect term. The input layer is fed with concatenation of all these

features and later passed to BiGRU layer and its output is fed into Dense layer and finally into output layer which predicts the sentiment of the term. We train the network to minimize the categorical cross-entropy between expected polarity label distribution p and predicted polarity label distribution q of each aspect term. We considered only the matching extracted terms predicted polarity with their actual polarity and achieved an accuracy of 63%.