**Intermediate Project Report: Aspect Based Sentiment Analysis**

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**Project goals:**

The task we have chosen for our project is Aspect-Based Sentiment Analysis (ABSA). ABSA is essentially fine-grained sentiment analysis where the goal is to identify the polarity of an aspect, where an aspect is any entity that is the target of an opinion. We will attempt a three-way classification of aspect sentiment using the labels positive, neutral, and negative.

ABSA is typically at least a two-stage process; the first step is identifying and extracting the aspects and the second step is classifying the sentiment of those aspects. The data we will be using is from SemEval 2014, Task 4, which is broken into four subtasks. The first subtask is aspect extraction and the second task is classifying aspect term polarity, as outlined above. The third subtask is aspect category detection, where previous extracted aspects are sorted into coarser categories, and the fourth subtask is classifying the sentiment of those coarse aspect categories.

For this project, we intend to focus primarily on the classification of aspect sentiment (subtask 2). Time permitting, we are also interested in aspect extraction (subtask 1).

**Major challenges:**

There are several substantial challenges involved in ABSA, which we will illustrate with three examples.

1. The bread was as stale as the ambience.
2. The bread was stale, but the ambience was not.
3. The ambience was as stale as week-old bread.

The first obstacle is that the instances are quite limited in size. All of these examples contain about 8 words, though for example 2, the span in which the opinion about the bread is being expressed is really only 4 words. The numerous ways of expression sentiment, and subsequent data sparsity, makes it more challenging for both rule-based and data driven techniques.

Furthermore, multiple aspects can be described by a single sentiment clue; in the first example, the sentiment clue *stale* describes both aspects (bread and ambience). As with other sentiment tasks, valence shifters (e.g. intensifiers and diminishers) and negation are extremely influential in determining sentiment and need to be properly handled. In example 2, *stale* has to be connected to both *not* and *ambience.*

Other obstacles include the difficulty in distinguishing between entities, aspects and general opinions, the fact that aspects can be single or multi-word units, and their range in terms of specificity (*features* can be an aspect, as in “I like the features on this laptop.”).

**Current approaches:**

We find Wilson et al.’s (2005) paper on phrase-level sentiment analysis a good jumping-off point for feature generation. They use a range of shallow features, informed by various sentiment lexicons, as well as deeper features that focus heavily on modification.

We also draw inspiration for deeper feature extraction from *Aspect Oriented Opinion Summarization*, by Gerani et al., presented at this year’s NW-NLP conference. At the poster session, one of the researchers explained that once the aspects had been extracted from their review corpus, the sentiment analysis was done using Stanford’s CoreNLP toolset, by looking at the sentiment ratings of the nodes that subsumed the aspect terms. We would like to explore emulating this approach in our project.

**Our work:**

Our basic plan is to employ a data-driven approach and generate features by starting shallow and moving toward deeper features. Initially, we will implement a simple baseline using unigrams in a certain range of the aspect terms. Next, we will scale up to higher-order n-grams and include some element of back-off to sentiment terms to deal with the increased dimensionality. From there we will build features incorporating some syntactic element, though we are not exactly sure what this will look like at this point. The final step would be to include semantic features, likely MRS-based features extracted via the ERG. We also hope to use a variety of learning methods.

If we are able, we also hope to explore the aspect extraction subtask. Our approach here would be to create some sort of baseline (likely NP-driven), and then see if we can improve using distributional similarity. The intuition here is that if a given word is distributionally similar to a known aspect, it too is likely an aspect.

**Project resources:**

As mentioned above, our dataset comes from SemEval 2014 Task 4. This is a specially created dataset that includes training and test data for two domains: laptop and restaurant reviews. The data is annotated for all four subtasks: aspect, aspect sentiment, aspect category and aspect category sentiment, though we will be focusing on the first two subtasks. This data set also comes with an evaluation script.

We plan on using CoreNLP for the syntactic feature generation, the ERG and ACE for MRS-based feature generation, and MALLET for classification. If we are able to include aspect extraction, we will use DISCO to determine distributional similarity. The polarity lexicon we will use is SentiStrength.

**Project plans:**

At this point, we have code to extract the sentences and aspects from the XML-formatted training data into objects. Soon, we will have our unigram baseline working, and can begin to explore various approaches to feature extraction.

**References**

Samuel Brody and Noemi Elhadad. An Unsupervised Aspect-Sentiment Model for Online Reviews. *Human Language Technologies: The 2010 Annual Conference of the North American Chapter of the ACL*, pp 804–812, Los Angeles, California, June 2010.

Bo Pang and Lillian Lee. 2002. Opinion Mining and Sentiment Analysis*. Foundations and Trends in Information Retrieval.* 2(1-2) pp. 1–135.

Theresa Wilson, Janyce Wiebe, and Paul Hoffmann (2005).[Recognizing Contextual Polarity in Phrase-Level Sentiment Analysis](http://www.aclweb.org/anthology-new/H/H05/H05-1044.pdf), *Proceedings of Human Language Technology Conference and Conference on Empirical Methods in Natural Language Processing* (HLT/EMNLP), pages 347–354, Vancouver, October 2005.