Final Project Proposal

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1 Problem/Task

Argumentation mining aims to automatically identify structured argument data from unstructured text. One important part of argumentation mining is claim and stance identification. Most of the current approaches are engineered to address specific domains, for example a specific model might be built just to analyze claims in court documents using attributes specific to court documents and legal vocabulary. However, argumentative sentences are often characterized by common rhetorical structures, independently of the domain. We propose to explore a method that exploits structured parsing information to detect claims without resorting to topic specific information.

An example of this would be taking a topic like "the sale of violent video games harms minors" and a wikipedia article about the Video game content rating system and identifying if a specific sentence or entire text of the article has a Pro or Con stance towards the topic. The article includes the sentence "Exposure to violent video games causes at least a temporary increase in aggression and this exposure correlates with aggression in the real world" which should be labeled as a PRO stance.

There are two main tasks in this problem:

- Identifying claims in text, this will be done through an entity resolution and scoring task using SVM
- Identifying the stance of a claim against a topic, this will be done similar to a sentiment classification task

By combining these tasks we will be able to tell what sentences in a long text support and oppose a claim.

2 Dataset and Evaluation

We are planning to use the Claim Stance Dataset from IBM Debater project (link).

This dataset contains 2,394 labeled claims for 55 topics that are pulled from 1,065 wikipedia articles. For each article, the algorithm identifies claims and stance (Pro/Con) towards the topic. Additional fine-grained annotations such as topic target, topic sentiment towards its target, claim target, claim sentiment towards its target, and the relation between the targets are also included based on the semantic model of Bar-Haim et al. [2017a].

3 Methods

Task 1 Claim Identification: To extract claims from a given text file we will use the following data transformation pipeline similar to what was used in the paper "Context-Independent Claim Detection for Argument Mining.

1. Split the text into sentences using a tokenizer
2. Parse each sentence to obtain a constituency tree
3. Discard sentences not containing a verb tag
4. Stem words at leaves to improve generalization
5. Use a SVM to classify each sentence as possibly containing a claim or not

Another approach we will experiment with is TextRank algorithm. Since evidence and rebuttals could be relevant to one argument in each paragraph, TextRank algorithm, which determines the most important sentences in a paragraph could be useful to identify claims as well.

Task 2 Stance Identification: Here we will try to identify a pro/con stance for a given sentence with a confidence rating. We will score the sentence for the pro and con and the absolute value of the difference will indicate confidence. Having an effective confidence measure is important for on-demand argument construction or if you want to rank sentences by their stance. Here we will experiment with new ways to include context that could improve stance identification and confidence. For this part we plan to use a sentiment model and experiment with different kinds of regularization similar to the tasks in Homework 2.

Further Analysis (Time & Results permitting)
Can we come up with the overall strength of the claims in an entire text? To do this, as proposed in this paper, we will combine our system and analyze **neighborhood claims**. This approach clusters the claims so that each pair in the same paragraph shared a cluster unless a term indicating potential polarity flip was found before the two claims or between them. For each claim, we summed the sentiment scores over all other claims in its cluster. Note that this feature requires additional information about other claims for the topic.

4 Key Experiments

We have two main tasks in our setup and we will experiment with different loss metrics to achieve the highest accuracy.

Task	Architecture	loss	accuracy
Claim Identification	SVM, LSTM	log	Accuracy, False Positives, False Negative
Stance Identification	Classification	Hinge regular	Accuracy, False Positives, False Negative

5 Related Work

[Bar-Haim et al., 2017a]
Roy Bar-Haim, Indrajit Bhattacharya, Francesco Dinuzzo, Amrita Saha, and Noam Slonim. 2017. Stance Classification of Context-Dependent Claims.
In Proceedings of the 15th Conference of the European Chapter of the Association for Computational Linguistics: Volume 1, Long Papers. Association for Computational Linguistics, Valencia, Spain, pages 251–261.

[Bar-Haim et al., 2017b]
Roy Bar-Haim, Lilach Edelstein, Charles Jochim and Noam Slonim.
Improving Claim Stance Classification with Lexical Knowledge Expansion and Context Utilization. 2017. In Proceedings of the 4th Workshop on Argument Mining.
Association for Computational Linguistics, Copenhagen, Denmark, pages 32-38.

J Lawrence, C Reed. Mining Argumentative Structure from Natural Language text using Automatically Generated Premise-Conclusion Topic Models. In Proceedings of the 4th Workshop on Argument Mining, 2017

Lippi, Marco, and Paolo Torroni. "Context-Independent Claim Detection for Argument Mining." IJCAI. Vol. 15. 2015.

6 Timeline/Work Plan

Step 1. By May.13th: obtain datasets and perform exploratory data analysis
Step 2. By May 20th: finish feature engineering and model implementation
Step 3. By May 25th: Experiments and compiling final report.

We plan to share each part of the work evenly and collaborate through GitHub. We are both graduating this quarter so will submit the project by May 30th.