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CSC 791: Natural Language Processing

P1: Response Type Classification in Discussions

PROJECT DESCRIPTION

In this assignment, you will learn feature engineering through a classification task. Background Interactions through question-answering play an important role in discussions. Through questioning, askers may want to elicit information (e.g., wh-questions), clarify situations (e.g., closed-ended questions), or even make a point (e.g., rhetorical questions). However, how a question is responded does not necessarily align with the intent of the asker. For example,

- Asker: How could you possibly know that?
- Responder: I am not claiming this is a statement of fact, it is an opinion.

In the example above, the asker implies a point “no one could know that” with a rhetorical question, however, though generally no response is expected for a rhetorical question, the responder attacked the point the asker makes.

In this assignment, you will need to model the relations between a question and response and classify the interaction into different types.

BASELINE MODEL 1:

- Preprocessing: Stopword Removal from Spacy list of Stop Words
- Features Extracted:
 - POS tags of the words [count encoding]
 - Sentence Encoder
- Ensemble Classifier: Voting based on 2 Linear SVMs (LinearSVC)

```
➡ [[ 0 13 0 0]
   [ 0 310 7 3]
   [ 0 37 2 0]
   [ 0 37 1 0]]
```

	precision	recall	f1-score	support
agreed	0.00	0.00	0.00	13
answered	0.78	0.97	0.86	320
attacked	0.20	0.05	0.08	39
irrelevant	0.00	0.00	0.00	38
accuracy			0.76	410
macro avg	0.25	0.26	0.24	410
weighted avg	0.63	0.76	0.68	410

Accuracy: 0.7609756097560976

BASELINE MODEL 2:

- Preprocessing: Stopword Removal from Spacy list of Stop Words
- Features Extracted:
 - POS tags of the words [count encoding]
 - Sentence Encoder
 - Sentiment Analysis
 - Token checker
- Ensemble Classifier: Voting based on 4 Linear SVMs (LinearSVC)

```
[[ 0 13 0 0]
 [ 0 319 1 0]
 [ 0 39 0 0]
 [ 0 37 1 0]]
```

	precision	recall	f1-score	support
agreed	0.00	0.00	0.00	13
answered	0.78	1.00	0.88	320
attacked	0.00	0.00	0.00	39
irrelevant	0.00	0.00	0.00	38
accuracy			0.78	410
macro avg	0.20	0.25	0.22	410
weighted avg	0.61	0.78	0.68	410

Accuracy: 0.7780487804878049

CHALLENGE:

One challenge of this task is that you need to find a way to “combine” the vectorized representation of questions and responses. Since the output of sentiment analysis is 2 float values which basically represent the sentiment of the question and response on a 0-1 scale. The POS tags use something similar to a one hot encoder. The sentence encoders given by spacy are high dimensional vectors. Since there is non-uniformity in the input vectors itself, the ideal classifier to be used is ensemble classifier. The weights can be later adjusted in the ensemble classifier voting phase based on prior knowledge of what exactly the features extracted are and their results.

PERFORMANCE ANALYSIS:

Metric	Accuracy	Weighted F1 Score
Baseline Model 1 [with 2 features: word embedding, POS tags]	0.76	0.68
Proposed Approach [with 4 features: word embedding, POS tags, sentiment analysis and tagged words]	0.78	0.68