Modeling Interactions in Product Reviews

Utilizing Formal Argumentation to Assess Strengths and Weaknesses of Products Across Different Aspects

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Introduction

This study focuses on the creation of a valuable resource powered by formal argumentation for new users by effectively analyzing product reviews and highlighting the strengths and weaknesses associated with different aspects of a product.
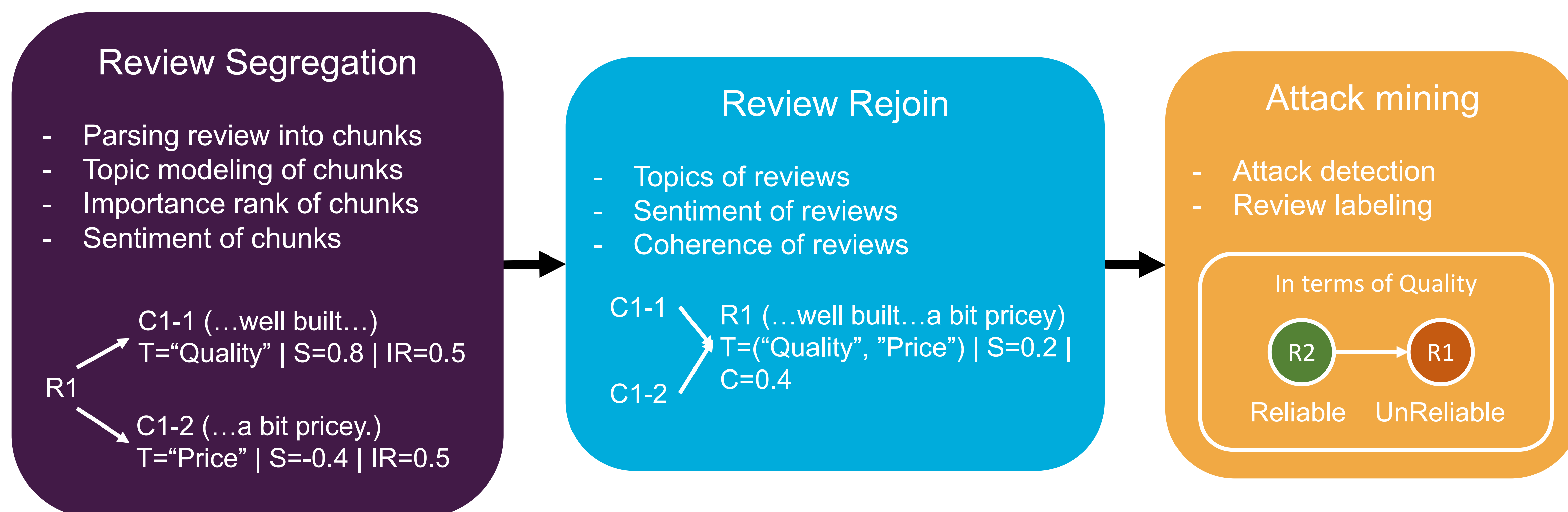
Imagine that there are three reviews given for shoes:

★★★★☆ R1: "*They are always well built and last me quite a few years. The only downside is they tend to be a bit pricey.*"

★☆☆☆☆ R2: "*My shoes are damaged in its warranty but the team has no response. Don't buy, very expensive.*"

★★★★☆ R3: "*Largely my fault for not reading carefully, but it is very uncomfortable.*"

They describe the shoes on different aspects, e.g., quality, price, service, and comfort. Here is the question we aim to answer: In case reviews conflict regarding one aspect (*well built* vs. *damaged in its warranty* regarding the quality of the shoes), which ones should we trust?

Methods

We use **Abstract Argumentation Frameworks** to address the question in three steps:

Review Segregation

- Parsing review into chunks
- Topic modeling of chunks
- Importance rank of chunks
- Sentiment of chunks

R1
→ C1-1 (…well built…) T="Quality" | S=0.8 | IR=0.5
→ C1-2 (…a bit pricey.) T="Price" | S=-0.4 | IR=0.5

Review Rejoin

- Topics of reviews
- Sentiment of reviews
- Coherence of reviews

C1-1
C1-2
→ R1 (…well built…a bit pricey) T=("Quality", "Price") | S=0.2 | C=0.4

Attack mining

- Attack detection
- Review labeling

In terms of Quality

R2 (Reliable) → R1 (UnReliable)

Implementation

A Python package is developed to implement the pipeline, as well as GUIs for user-friendly interaction.

```python
from orangearg.argument.miner import reader, chunker, processor, miner
import matplotlib.pyplot as plt

arguments = df_arguments["reviewText"]
arg_scores = df_arguments["overall"]

# Split reviews into chunks
chunk_arg_ids, chunks = chunker.get_chunk(docs=arguments)

# Compute polarity score of chunks
chunk_p_scores = chunker.get_chunk_polarity_score(chunks=chunks)

# Compute topics of chunks
chunk_topics, chunk_embeds, df_topics = chunker.get_chunk_topic(chunks=chunks)
nx.draw_networkx_edges(DG, pos, width=df_edges["weight"])

# draw labels
labels = {i: i for i in arg_selection.index}
nx.draw_networkx_labels(DG, pos, labels, font_size=9, font_color="whitesmoke")

plt.show()
```

	reviewText	overall
0	I always get a half size up in my tennis shoes…	3
1	Put them on and walked 3 hours with no problem…	5
2	excelente	5
3	The shoes fit well in the arch area. They are …	4
4	Tried them on in a store before buying online …	5
…	…	…
365	Favorite Nike shoe ever! The flex sole is exce…	5
366	I wear these everyday to work, the gym, etc.	5
367	Love these shoes! Great fit, very light weight.	5
368	Super comfortable and fit my small feet perfec…	5
369	Love these shoes!	5

370 rows × 2 columns