Thwarting in Sentiment Analysis

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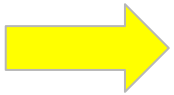
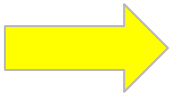
Problem Overview

"I love the **sleek design**. The **lens** is **impressive**. The **pictures** look **good** but, somehow this **camera disappoints** me. I do not recommend it."



Aspect Level	
Design	Sleek
Lens	Impressive
Pictures	Good
Camera	Disappointing



Document Level
NOT RECOMMENDED

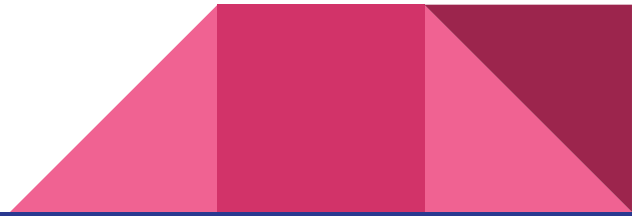
Related Work

- Although there is a lot of work in sentiment analysis, there is comparatively little direct research on thwarting
  - Thwarting is very rare (~1-2% of most datasets)
    - Persistent but minimal impact on sentiment analysis overall
  - Thwarting is difficult to detect
    - Generally requires domain knowledge
  - Generally requires hand annotation to identify
    - Expensive
    - Tedious

Methodology

Dataset Overview

- 50,000 Movie Reviews from IMDB
  - 50% Positive, 50% Negative
- Hand-annotated subset
  - 48% positive, 52% negative
  - 10 thwarted, 40 non-thwarted



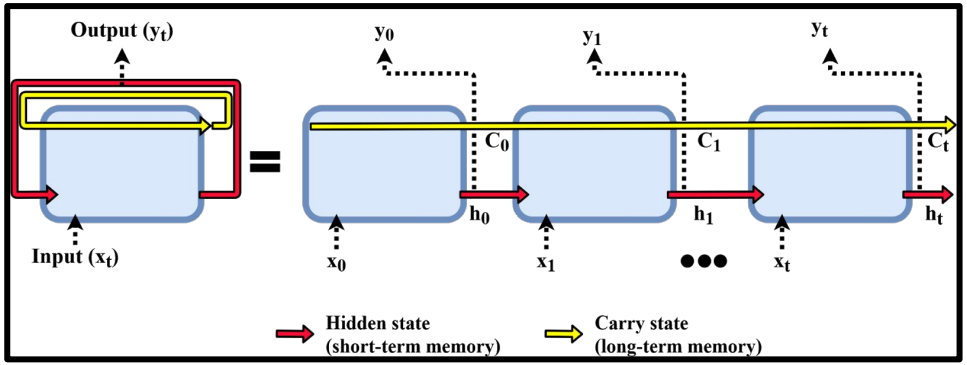
Valence-Arousal-Dominance (VAD)

- Valence - “Pleasantness”
  - Tracks best to overall sentiment
- Arousal - Intensity
- Dominance - Degree of control
- 0-1 scale

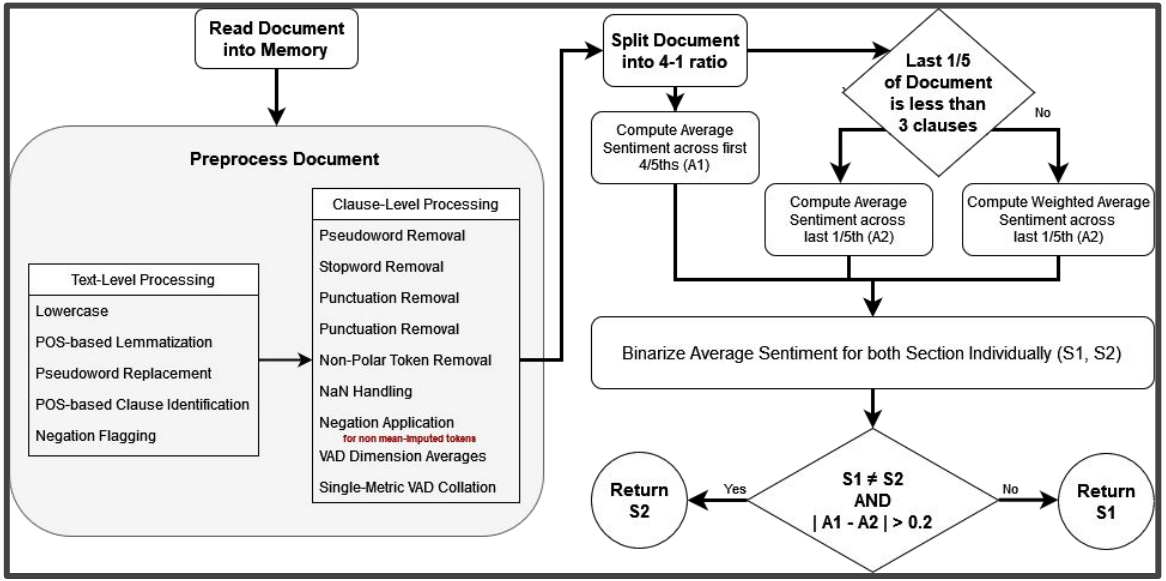
- Words mapped as vectors
  - “Stupendous” [.7, .6, .3]
  - “Criminal” [.2, .6, .4]
  - “Forbidden” [.3, .8, .7]

Models

LSTM



Rules-based



Sample Input

The actors are terrible and the directing is lackluster. Although I dislike comedy, the movie was surprisingly enjoyable

Sample Input (Cont.)

C_{i1}1: terrible -> 0.061

C_{i2}: lackluster -> 0.25

C_{i3}1: dislike comedy -> 0.537

C_{i4}: movie surprisingly enjoyable -> 0.8796666

D_i = [0.061, 0.25, 0.537, 0.8796666]

Sample Output

Rules-based Model:

- Sentiment Prediction: False
- Thwarting Prediction: True

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===== RULE-BASED MODEL RESULTS =====
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Confusion matrix for predicting overall sentiment on ALL evaluation documents
[[0. 0.]
 [0. 1.]]
Confusion matrix for predicting overall sentiment on ONLY thwarted evaluation documents
[[0. 0.]
 [0. 1.]]
Confusion matrix for predicting the existance of thwarting on ALL evaluation documents
[[0. 0.]
 [0. 1.]]
```

LSTM Model:

- Sentiment Prediction: 1

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==================================
======== LSTM MODEL RESULTS ========
==================================
Confusion matrix for predicting overall sentiment on ALL evaluation documents
[[0. 0.]
 [0. 1.]]
Confusion matrix for predicting overall sentiment on ONLY thwarted evaluation documents
[[0. 0.]
 [0. 1.]]
```
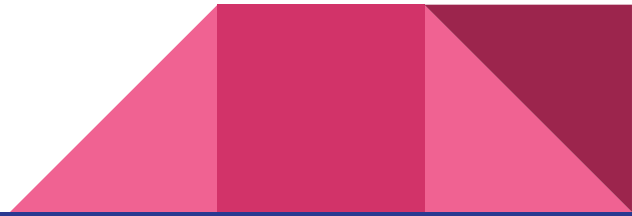

Thank you!

Future Work

- Train LSTM on a larger dataset of thwarted reviews
- Divide longer documents into sub-sections before averaging
  - Reduce input vector size
- Try using rule-based method as an initial filtering for hand annotation



Thank you!

Resources

[1] Ramteke Ankit, Malu Akshat, Bhattacharyya Pushpak; Nath, Saketha. 2013. *Detecting Turnarounds in Sentiment Analysis: Thwarting* https://aclanthology.org/P13-2149.pdf

[2] Mohammad Saif. 2011.NCR Valence, Arousal, and Dominance (NCR-VAD) Lexicon. https://saifmohammad.com/WebPages/nrc-vad.html

[3] LAKSHMIPATHI N. 2020. *Sentiment Analysis of IMDB Movie Reviews*. https://www.kaggle.com/code/lakshmi25npathi/sentiment-analysis-of-imdb-movie-reviews

[4] Spacy en_core_web_sm pipeline, https://spacy.io/models/en

[5] Pennington Jeffrey, Socher Richard,Manning Christopher. 2014. *GloVe: Global Vectors for Word Representation*. https:/nlp.stanford.edu/projects/glove/

[6] Pang Bo,Lee Lillan,Vaithyanathan Shivakumar. 2002. *Thumbs Up? Sentiment Classification using Machine Learning Techniques.* https://ncf.instructure.com/courses/6788/assignments/53643?module_item_id=154725

[7] Wankhade Mayur,Rao Annavarapu Chandra Sekhara,Kulkarni Chaitanya. 2022. *A survey on sentiment analysis methods, applications, and challenges* https://link.springer.com/article/10.1007/s10462-022-10144-1

[8] Panda Saismita, Gupta Saumya, Kumari Swati, Yadav Parul. 2020. *Sentiment Analysis Techniques and Approaches* https://www.ijert.org/research/sentiment-analysis-techniques-and-approaches-IJERTV9IS060350.pdf