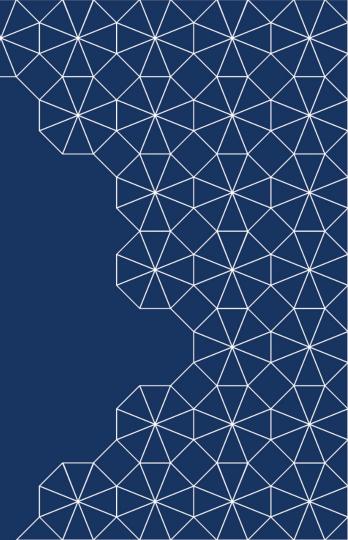
Sentiment Analysis & Text Style
Transfer on Semi-Parallel Movie
Critic Review Corpora Using NLP
Translation Techniques
Datasci 266 - Natural Language Processing

Charlie Glass





Goal

Dataset: Rotten Tomatoes Critic Reviews: https://www.kaggle.com/datasets/stefanoleone992/rotten-tomatoes-movies-and-critic-reviews-dataset?resource=download

1.1M rows, with a review of a movie, by a particular critic, designated 'Fresh' or 'Rotten', with a 1-2 sentence headline review

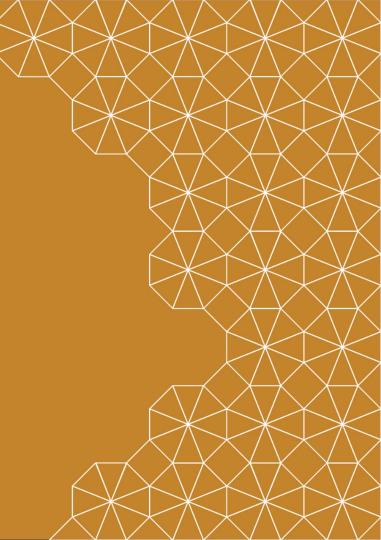
- Build a sentiment analysis classification model that classifies a reviews as 'Fresh' or 'Rotten'
- 2) Use an Encoder-Decoder Architecture to translate 'Fresh' reviews into 'Rotten' reviews
 - a) Use the sentiment analysis model to evaluate the sentiment of the decoded sequences
- 3) Use an Encoder-Decoder Architecture to translate the movie critic Roger Ebert's reviews into a generic review

Challenges

- Only review headline, not full review
- Translation pairs are non/semi-parallel corpora
 - Parallel corpora: "I liked the movie" → "I hated the movie"
 - Non/semi-parallel corpora: "After 'Thor,' this makes Marvel Comics two-for-two so far this summer movie season" → "Imagine how disappointed I am to find this movie to be a scattered affair that loses power the more it tries to take on big issues"
- Movie critics have extensive vocabularies
- Reviews can contain difficult cultural phrases/cues

Results





Sentiment Analysis Model

Model Description	Test Accuracy
Baseline	64%
Bag-of-words Logistic Regression, 500 word vocab	70%
Bag-of-words Neural Network, size-15 hidden layer, 500 word vocab	70%
Bag-of-words Neural Network, size-15 hidden layer, 1000 word vocab	73%
DAN model BERT embeddings	74%
CNN model BERT embeddings	81%
BERT pre-trained model with CNN	88%

Sentiment Transfer Model

Model	About a movie (mean, std)	Contains relevant info (mean, std)	Fluidity Score 1-10 (mean, std)	
Baseline	(1.00, 0.00)	(0.04, 0.20)	(7.06, 0.43)	
Negative Sentiment Transfer (20 Epochs)	(1.00, 0.00)	(0.05, 0.23)	(3.50, 2.02)	
Negative Sentiment Transfer (40 Epochs)	(1.00, 0.00)	(0.14, 0.36)	(4.18, 2.16)	
Negative Sentiment Transfer (<85 characters, repeat pairs, 10 epochs)	(1.00 , 0.00)	(0.02, 0.15)	(9.38, 1.94)	
Negative Sentiment Transfer (matched on close lengths, 40 epochs)	(1.00 , 0.00)	(0.06, 0.25)	(2.97, 2.11)	
Negative Sentiment Transfer (matched on close lengths, 25 epochs)	(1.00 , 0.00)	(0.00, 0.00)	(2.97, 1.72)	
Negative Sentiment Transfer (100,000 Vocab Size, 25 epochs)	(1.00, 0.00)	(0.00, 0.00)	(3.04, 1.00)	

*human judges scoring

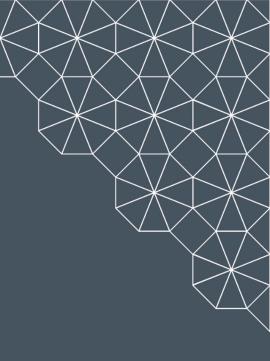
*classification model found sentiment of outputs to be negative 83%-95% of the time, across models

Sentiment Transfer Model

Example Sentences:

"The film's second half, however, disappoints in many respects."

"The film's biggest problem is that the film is, in the end, and the film's lack of a story that is so much more than a a film that is a bit too much, and the film is so predictable."



Ebert Transfer Model

Model	Sentiment matches (mean, std)	About a movie (mean, std)	Contains relevant info (mean, std)	Fluidity Score 1- 10 (mean, std)
Baseline	(0.96, 0.07)	(1.0, 0.0)	(0.05, 0.09)	(7.43, 0.78)
Ebert Seq2Seq Transfer Model	(0.76, 0.43)	(1.0, 0.0)	(0.14, 0.35)	(3.33, 2.02)

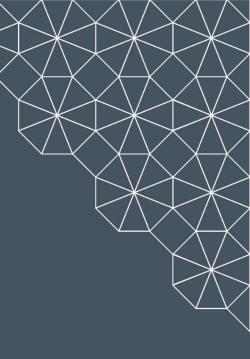
^{*}human judges scoring

Ebert Transfer Model

Example Sentences:

"The wrestler is a film about the human spirit, and the best of the year."

"A film that is not only a great film, but also a little too long and too often a little too long, and too much of the film is a little too much."



Conclusion/Next Steps

- For a model to effectively transfer text style with non/semiparallel corpora, there needs to be more data (more samples, longer reviews), more translation examples, and a more complex architecture than Keras Transformer Encoder/Decoder with own subword model and vocabulary
- Try BERT embeddings/pre-trained model for better word meaning/variance and Cross-Aligned Auto-Encoder Architecture (Shen et al.,

https://arxiv.org/pdf/1705.09655.pdf) for text style transfer

Attempted these during modeling, but RAM and GPU crashed

Thank You!

Questions/ Comments

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