

A Soft Attentional Interface for Interpretability of Sentimental Analysis

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Abstract

Which phrases and words are influential to classify a positive or negative movie review. This paper uses a soft attentional recurrent neural network(RNN) to show interpretability with visualization.

1. Introduction

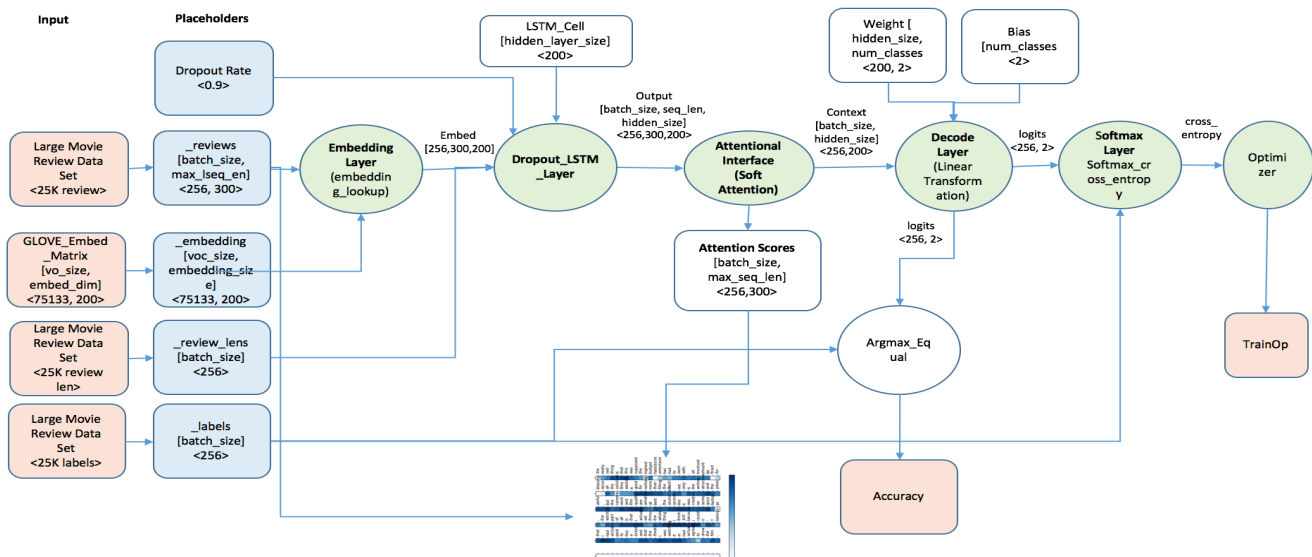
Using the soft attentional interface, an architecture is able to show what phrases and what words are emphasized to classify a positive or negative opinion over a movie review. I used the large movie data set from <http://ai.stanford.edu>, which have 25K of training and 25K of validation data set. This paper is basically to reproduce "Interpretability via attentional and memory-based interfaces, using TensorFlow" [1] and modifies some codes for my purpose.

2. Network Architecture

This network consists of an input, an embedding, encoder, attentional interface, decoder and softmax layer. The input consists of a batch of 256 reviews, review lengths and labels shown in <Fig.1 Attentional RNN architecture>. A total batch is to divide 25,000 instances by a batch size of 256. The embedding layer uses the pre-trained Glove embedding containing 75,133 words and 200 embedding dimensions. The encoder comprises one LSTM (Long Short Term Memory) level having a hidden size of 200 with a dropout having 0.9 rate. The attentional interface receives as an input 300 outputs per an instance, which is produced by 300 sequence steps from the encoder and produces 300 attention scores, alpha vector, for an interpretability visualization and 200 context vector for classification. With the 200 context vector, the decode layer does a linear transformation resulting in logits having a shape of the number of classes which is 2 of being positive or negative. Finally, through the softmax layer, a probability is produced as an output

<Fig.1, Attentional RNN architecture>

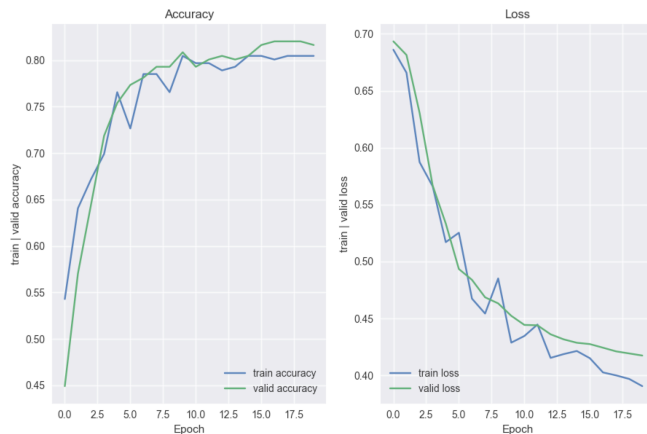
A soft attention interface for sentimental analysis



3. Experiment & Result

The <Figure2> shows accuracy and loss of the training and validation over 20 epochs using 25K instances for training and 25K ones for validation. A validation accuracy reached to 83% as a training accuracy stays around 80%.

<Fig.2, Accuracy and loss>

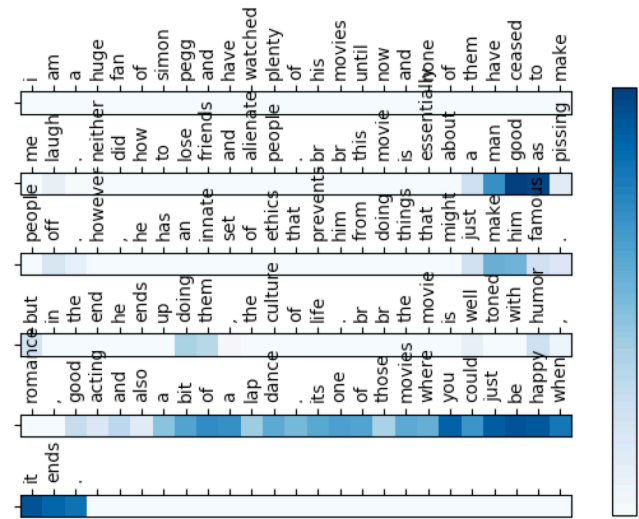


4. Interpretability

The following 10 samples are shown with a list of a prediction label, true label, a pair of probability which if the first term is higher than the second term, a prediction label is 0 as being negative, otherwise, 1 as being positive. Also, each sample shows a full review which has the highlighted phrase and words in yellow if they have more attention scores described by a visualization as below.

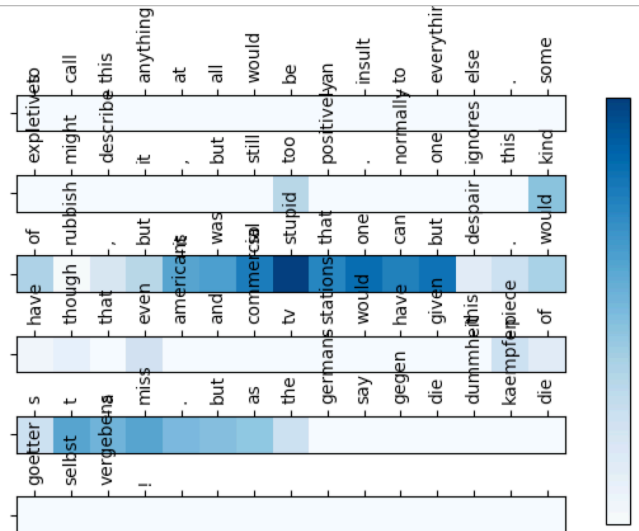
<Sample1-
pred_label:1, true_label:1, prob.: [0.21892178 0.78107822]
1 means "positive", 0 means "negative">

Input_sentence: i am a huge fan of simon pegg and have watched plenty of his movies until now and none of them have ceased to make me laugh . neither did how to lose friends and alienate people . br br this movie is essentially about a man good as pissing people off . however , he has an innate set of ethics that prevents him from doing things that might just make him famous . but in the end he ends up doing them , the culture of life . br br the movie is well toned with humor , romance , good acting and also a bit of a lap dance . its one of those movies where you could just be happy when it ends .



<Sample2-
pred_label:0, true_label:0, prob.: [0.90761954 0.09238045]>

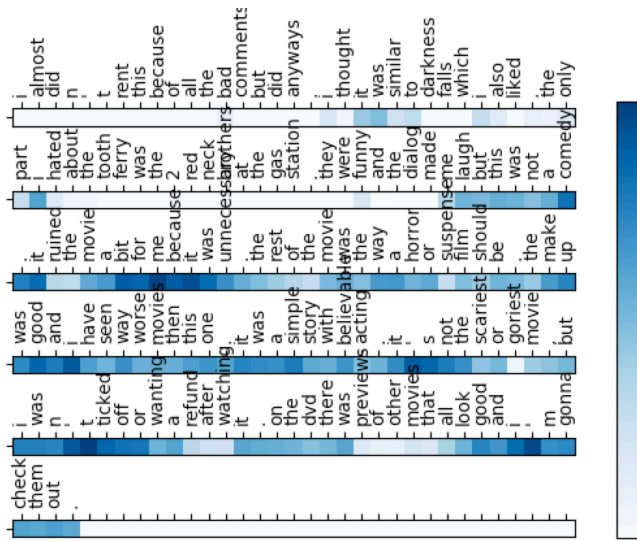
Input_sentence: to call this anything at all would be an insult to everything else . some expletives might describe it , but still too positively . normally one ignores this kind of rubbish , but it was so stupid that one can but despair . would have though that even americans and commercial tv stations would have given this piece of s t a miss . but as the germans say gegen die dummheit kaempfen die goetter selbst vergebens !



<Sample3-
pred_label:0, true_label:1, prob.: [0.96537983 0.03462016]>

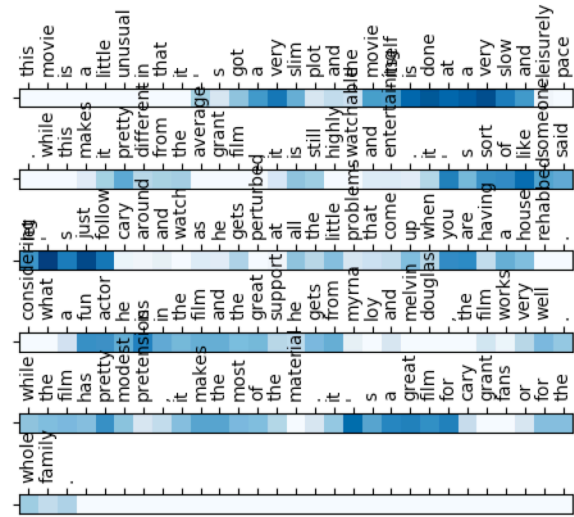
Input_sentence: i almost did n ' t rent this because of all the bad comments but did anyways . i thought it was similar to darkness falls which i also liked . the only part i hated about

the tooth ferry was the 2 red neck brothers at the gas station . they were funny and the dialog made me laugh but this was not a comedy . it ruined the movie a bit for me because it was unnecessary . the rest of the movie was the way a horror or suspense film should be . the make up was good and i have seen way worse movies then this one . it was a simple story with believable acting . it ' s not the scariest or goriest movie , but i was n ' t ticked off or wanting a refund after watching it . on the dvd there was previews of other movies that all look good and i ' m gonna check them out .



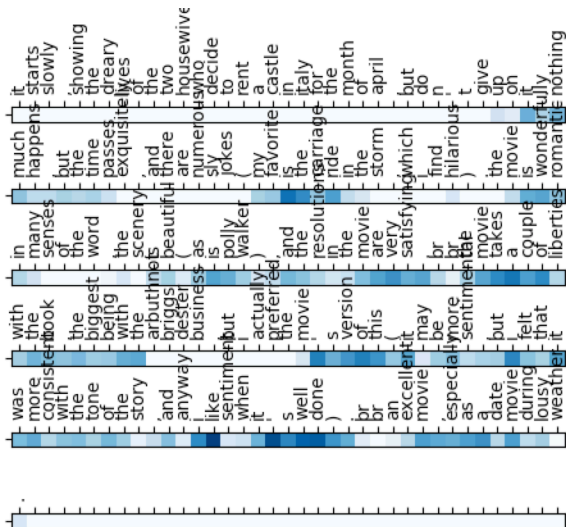
<Sample4-
pred_label:1, true_label:1, prob.: [0.02943868 0.97056133]>

Input sentence: this movie is a little unusual in that it ' s got a very slim plot and the movie itself is done at a very slow and leisurely pace . while this makes it pretty different from the average grant film , it is still highly watchable and entertaining . it ' s sort of like someone said let ' s just follow cary around and watch as he gets perturbed at all the little problems that come up when you are having a house rehabbed , considering what a fun actor he is in the film and the great support he gets from myrna loy and melvin douglas , the film works very well . while the film has pretty modest pretensions , it makes the most of the material . it ' s a great film for cary grant fans or for the whole family .



<Sample5-
pred_label:1, true_label:1, prob.: [0.04705166 0.95294833]>

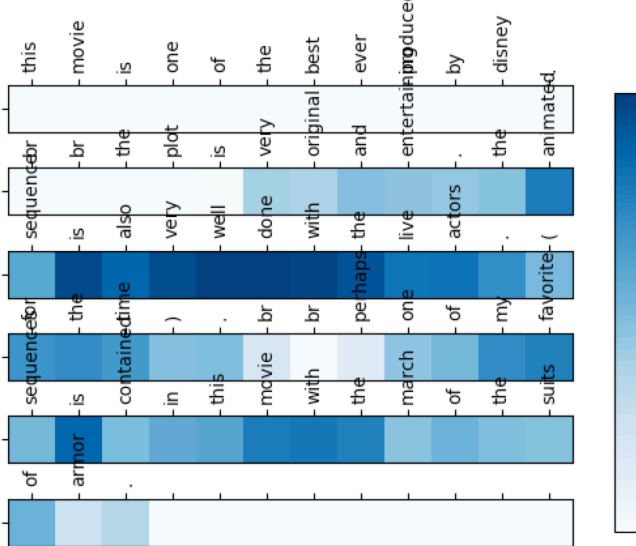
Input sentence: it starts slowly , showing the dreary lives of the two housewives who decide to rent a castle in italy for the month of april , but do n ' t give up on it . nothing much happens , but the time passes exquisitely , and there are numerous sly jokes (my favorite is the carriage ride in the storm , which i find hilarious) . the movie is wonderfully romantic in many senses of the word , the scenery is beautiful (as is polly walker) , and the resolutions in the movie are very satisfying . br br the movie takes a couple of liberties with the book , the biggest being with the arbutnot briggs dexter business , but i actually preferred the movie ' s version of this (it may be more sentimental , but i felt that it was more consistent with the tone of the story , and anyway i like sentiment when it ' s well done) . br br an excellent movie , especially as a date movie during lousy weather .



<Sample6-

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pred_label:1, true_label:1, prob.: [ 0.05235745  0.94764256]>
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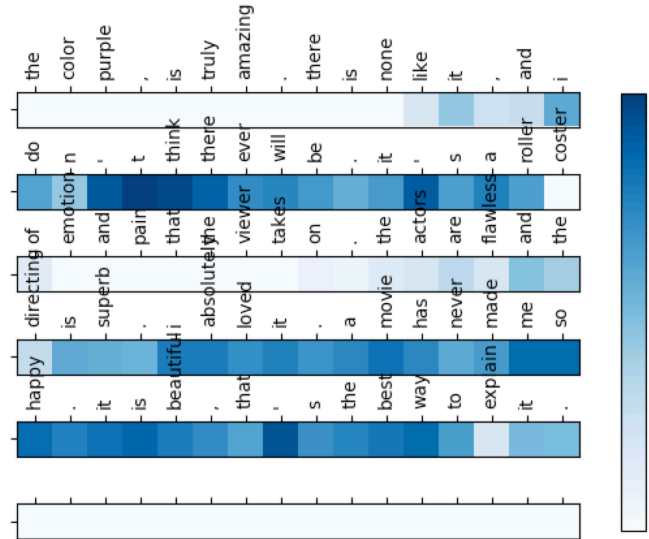
Input_sentence: this movie is one of the best ever produced by
disney . br br the plot is very original and entertaining . the
animated sequence is also very well done with the live actors .
(for the time) . br br perhaps one of my favorite sequences is
contained in this movie with the march of the suits of armor .



<Sample7-

```
pred_label:1, true_label:1, prob.: [ 0.0340738  0.96592617]>
```

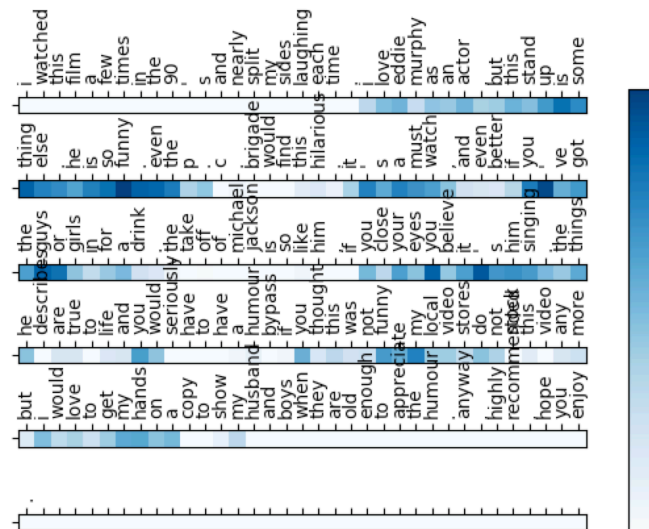
Input_sentence: the color purple , is truly amazing . there is none like it , and i do n ' t think there ever will be . it ' s a roller coster of emotion and pain that the viewer takes on . the actors are flawless and the directing is superb . i absolutely loved it . a movie has never made me so happy . it is beautiful , that ' s the best way to explain it .



<Sample8-

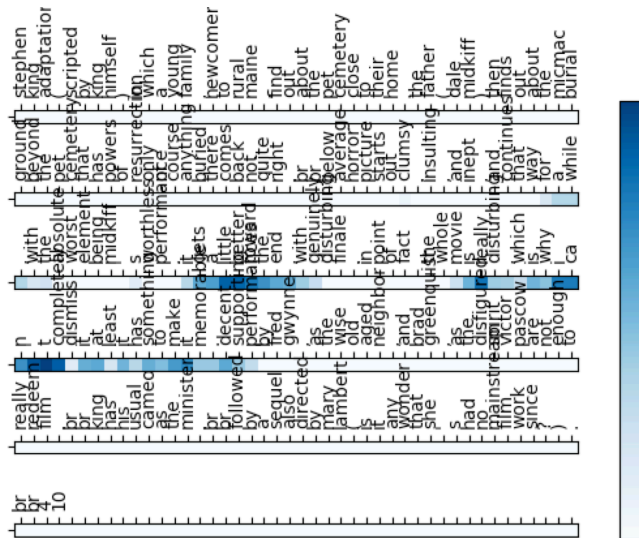
```
pred_label:1, true_label:1, prob.: [ 0.1797114  0.82028854]>
```

Input sentence: i watched this film a few times in the 90 's and nearly split my sides laughing each time . i love eddie murphy as an actor , but this stand up is some thing else . he is so funny . even the p . c . brigade would find this hilarious . it 's a must watch , and even better if you ' ve got the guys or girls in for a drink , the take off of michael jackson is so like him , if you close your eyes you believe it 's him singing . the things he describes are true to life and you would seriously have to have a humour bypass if you thought this was not funny . my local video stores do not stock this video any more but i would love to get my hands on a copy to show my husband and boys when they are old enough to appreciate the humour . anyway , highly recommended , hope you enjoy .



<Sample9-
pred_label:0, true_label:0, prob.: [0.694103 0.305897]>

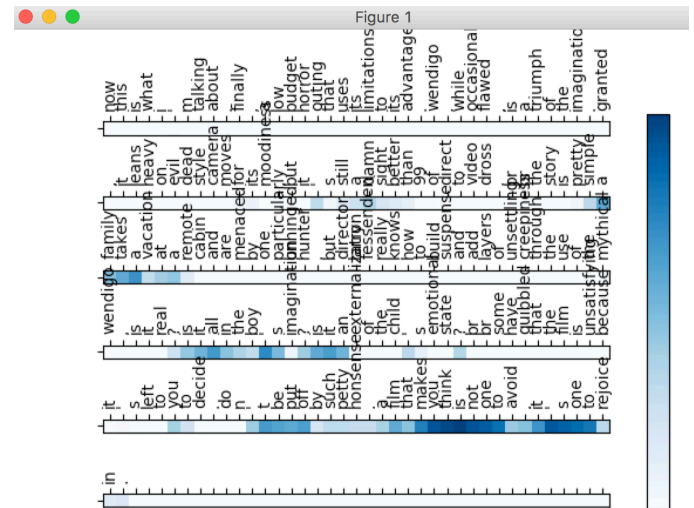
Input_sentence: stephen king adaptation (scripted by king himself) in which a young family , newcomers to rural maine , find out about the pet cemetery close to their home . the father (dale midkiff) then finds out about the micmac burial ground beyond the pet cemetery that has powers of resurrection only of course anything buried there comes back not quite right . br br below average horror picture starts out clumsy , insulting , and inept , and continues that way for a while , with the absolute worst element being midkiff ' s worthless performance . it gets a little better toward the end , with genuinely disturbing finale . in point of fact , the whole movie is really disturbing , which is why i ca n ' t completely dismiss it at least it has something to make it memorable . decent supporting performances by fred gwynne , as the wise old aged neighbor , and brad greenquist , as the disfigured spirit victor pascow are not enough to really redeem film . br br king has his usual cameo as the minister . br br followed by a sequel also directed by mary lambert (is it any wonder that she ' s had no mainstream film work since ?) . br br 4 10



<Sample10-
pred_label:1, true_label:1, prob.: [0.38126993 0.61873001]>

Input_sentence: now this is what i ' m talking about . finally , a low budget horror outing that uses its limitations to its advantage . wendigo , while occasionally flawed , is a triumph of the imagination . granted , it leans heavy on evil dead style camera moves for its moodiness , but it ' s still a damn sight better than 99 of direct to video dross . br br the story is pretty simple a family takes a vacation at a remote cabin and are

menaced by one particularly unhinged hunter . but director larry fessenden really knows how to build suspense and add layers of unsettling creepiness through the use of the mythical wendigo . is it real ? is it all in the boy ' s imagination ? is it an externalization of the child ' s emotional state ? br br some have quibbled that the film is unsatisfying because it ' s left to you to decide . do n ' t be put off by such petty nonsense . a film that makes you think is not one to avoid . it ' s one to rejoice in .



5. Conclusion

According to a range of 10 samples, the attentional RNN architecture learns what phrases and words are influential to classify a positive and negative opinion. The highlighted texts in yellow proves that human can think of them as being reasonable. Some phrases this network didn't learn from the 25K training instances like germans say "gegen die dummheit kaempfen die goetter selbst vergebens" shown in the <Sample 2> don't have higher attention scores.

6. References

- [1] Goku Mohandas (2017). Interpretability via attentional and memory-based interfaces, using TensorFlow. Sebastopol, CA: O'Reilly Media. <https://www.oreilly.com/ideas/interpretability-via-attentional-and-memory-based-interfaces-using-tensorflow>