Sentiment Analysis

Sentiment Analysis: What Is It?

Sentiment analysis (also known as opinion mining or emotion AI) refers to the use of natural language processing, text analysis, computational linguistics, and biometrics to systematically identify, extract, quantify, and study affective states and subjective information. A basic task in sentiment analysis is classifying the polarity of a given text at the document, sentence, or feature/aspect level—whether the expressed opinion in a document, a sentence or an entity feature/aspect is positive, negative, or neutral. Advanced, "beyond polarity" sentiment classification looks, for instance, at emotional states such as "angry", "sad", and "happy". (Wikipedia)

The Sentiment Analysis GUI

The NLP Suite Sentiment Analysis GUI provides four different approaches to sentiment analysis: Stanford CoreNLP, ANEW, hedonometer, SentiWordNet, and VADER.

A Neural-Network Approach to Sentiment Analysis: Stanford CoreNLP

Stanford CoreNLP sentiment analysis annotator uses a neural network approach to sentiment analysis where each **sentence** in an input text document is assigned an integer number from 0 to 4 to indicate the sentiment of the sentence. Each sentiment number corresponds to one of the following labels:

0: very negative
1: negative
2: neutral
3: positive
4: very positive

From the Stanford Semantic Analysis website (http://nlp.stanford.edu/sentiment/) we read:

> Most sentiment prediction systems work just by looking at words in isolation, giving positive points for positive words and negative points for negative words and then summing up these points. That way, the order of words is ignored and important information is lost. In constrast, our new deep learning model actually builds up a representation of whole sentences based on the sentence structure. It computes the sentiment based on how words compose the meaning of longer phrases. his way, the model is not as easily fooled as

> previous models. ... [the model] is based on a new type of Recursive Neural Network that builds on top of grammatical structures.

On sentiment analysis in CoreNLP, see Socheret al. (2013).

Four Dictionary-Based Approaches to Sentiment Analysis

The NLP Suite implements four different dictionary-based approaches to Sentiment Analysis: ANEW, hedonometer, SentiWordnet, and VADER.

Dictionary-based sentiment analysis algorithms (such as ANEW, hedonometer, SentiWordnet, and VADER) perform more poorly, in general, than neural network aproaches like StanfordCoreNLP sentiment analysis.

For a comparative evaluation of different algorithms, see Ribeiro et al. (2016) and Reagan et al. (2016).

For a comparative evaluation of different sentiment lexicons, see Jagdale et al. (2018).

Sentiment Analysis with ANEW (Affective Norms for English Words)

The NLP Suite Python script – sentiment_analysis_ANEW_util.py – is based on dictionary approach ANEW (Affective Norms for English Words) ratings for SENTIMENT (VALENCE), AROUSAL, and DOMINANCE (CONTROL) by Bradley, M.M. & Lang, P.J. (2017). Affective Norms for English Words (ANEW): Instruction manual and affective ratings. Technical Report C-3. Gainesville, FL:UF Center for the Study of Emotion and Attention.

THE SCRIPT EXPECTS TO FIND THE FILE EnglishShortenedANEW.csv IN A "lib" SUBFOLDER OF THE FOLDER WHERE THE sentiment_analysis_ANEW.py SCRIPT IS STORED.

Contrary to the Stanford CoreNLP algorithm which computes only sentiment values, ANEW computes sentiment, arousal, and dominance values.

SENTIMENT or VALENCE measures how *pleasant/unpleasant* a word makes us feel;
AROUSAL measures how *calm/excited* a word makes us feel;
DOMINANCE or CONTROL measures how *dominanted/in control* a word makes us feel.

Each word rating can have a total of maximum 9 points.

Sentiment Analysis with hedonometer

The NLP Suite Python script – sentiment_analysis_hedonometer_util.py – uses the hedonometer.org sentiment analysis function (https://hedonometer.org/index.html).
The script has been shown to work best with social media texts (e.g., Twitter), New York Times editorials, movie reviews, and product reviews.

THE SCRIPT EXPECTS TO FIND THE FILE hedonometer.json IN A "lib" SUBFOLDER OF THE FOLDER WHERE THE sentiment_analysis_hedonometer.py SCRIPT IS STORED.

Sentiment Analysis with SentiWordNet

The NLP Suite script sentiment_analysis_ SentiWordNet_util.py – uses the NLTK's SentiWordNet sentiment analysis function. The routine relies on the WordNet dictionary.

The SentiWordNet algorithm outputs sentiment scores to 4 classes of sentiments:
Negative
Neutral
Positive
Compound (i.e. aggregated score)
The "compound" score, ranging from -1 (most neg) to 1 (most pos) provides a single measure of polarity.

Sentiment Analysis with VADER (Valence Aware Dictionary and sEntiment Reasoner)

The NLP Suite Python script – sentiment_analysis_VADER_util.py – uses the NLTK VADER sentiment analysis function (VADER, Valence Aware Dictionary and sEntiment Reasoner). VADER has been found to be quite successful when dealing with tweets.

THE SCRIPT EXPECTS TO FIND THE VADER RATED DICTIONARY FILE vader_lexicon.txt IN A "lib" SUBFOLDER OF THE FOLDER WHERE THE sentiment_analysis_VADER.py SCRIPT IS STORED.

Excel charts visualization

The results of any of the sentiment analysis algorithms are displayed in Excel pie charts and line charts by sentence index with hover over effects (displaying the sentence at each point of the graph).

References

Bradley, Margaret M. and Peter J. Lang. 1999. *Affective Norms for English Words (ANEW): Instruction Manual and Affective Ratings*. NIMH Center for the Study of Emotion and Attention. Technical Report C-1, The Center for Research in Psychophysiology, University of Florida.

Jagdale, R. S., V. S. Shirsat, and S. N. Deshmukh. 2018. Review on sentiment lexicons. In 2018 3rd International Conference on Communication and Electronics Systems (ICCES).

Reagan, Andrew J., Christopher M. Danforth, Brian Tivnan, Jake Ryland Williams, Peter Sheridan Dodds. 2016. "Benchmarking sentiment analysis methods for large-scale texts: A case for using continuum-scored words and word shift graphs." Download from https://arxiv.org/abs/1512.00531.

Ribeiro, Filipe N., Matheus Araújo, Pollyanna Gonçalves, Marcos André Gonçalves, and Fabrício Benevenuto. 2016. "Sentibench-A Benchmark Comparison of State-of-the-Practice Sentiment Analysis Methods." *EPJ Data Science*, Vol. 5, No. 1, pp. 1-29.

Socher, Richard, Alex Perelygin, Jean Y. Wu, Jason Chuang, Christopher D. Manning, Andrew Y. Ng, and Christopher Potts. 2013. "Recursive Deep Models for Semantic Compositionality Over a Sentiment Treebank." *Conference on Empirical Methods in Natural Language Processing (EMNLP 2013)*.