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# GerVADER

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# Outline

1. VADER - Benefits and Concept
2. VADER - building block: encyclopedia
3. From VADER to GerVADER
4. GerVADER in six steps
5. Suitable corpora and test data
6. GerVADER Results

# VADER – Benefits and concept

- From: C.J. Hutto and Eric Gilbert
- Rated English sentences **positiv**, **negativ** or **neutral** (sentiment)
  - On a scale from -1 to 0 to +1
- MIT license, available on GitHub
- Easy to use: 1 Python script
- **Without Machine Learning** → **Lexicon and rule-based analysis tool**
- Evaluates individual records using
  - Single word sentiments (encyclopedia)
    - Rating of individual words (**pos**, **neg**, **neu**)
  - 5 Heuristics
    - Reinforcement, reduction, inversion of a sentiment

# VADER – Benefits and concept

- Very good scores in social media domains
  - o Designed specifically for this purpose

VADER is smart, handsome, and funny!

positive

```
{'pos': 0.752, 'compound': 0.8439, 'neu': 0.248, 'neg': 0.0}
```

Today SUX!

negative

```
{'pos': 0.0, 'compound': -0.5461, 'neu': 0.221, 'neg': 0.779}
```

# Comparison of VADER to SOTA

	3-Class Classification Accuracy (F1 scores)			
	Test Sets			
	Tweets	Movie	Amazon	NYT
VADER	<b>0.96</b>	0.61	<b>0.63</b>	<b>0.55</b>
NB (tweets)	0.84	0.53	0.53	0.42
ME (tweets)	0.83	0.56	0.58	0.45
SVM-C (tweets)	0.83	0.56	0.55	0.46
SVM-R (tweets)	0.65	0.49	0.51	0.46
NB (movie)	0.56	<b>0.75</b>	0.49	0.44
ME (movie)	0.56	<b>0.75</b>	0.51	0.45
NB (amazon)	0.69	0.55	0.61	0.48
ME (amazon)	0.67	0.55	0.60	0.43
SVM-C (amazon)	0.64	0.55	0.58	0.42
SVM-R (amazon)	0.54	0.49	0.48	0.44
NB (nyt)	0.59	0.56	0.51	0.49
ME (nyt)	0.58	0.55	0.51	0.50

see [VADER] in Sources

# VADER – Building block: Encyclopedia

- For each word a sentiment rating from -4 to 0 to +4
- Compiled from crowd ratings of participants
- Each rating with -4 to +4 (negative to positive word)
- Average value formed
- Word is recognized in sentence and sentiment assigned to it

# From VADER to GerVADER

- **Idea:** German adaptation of the English method
- Same algorithm
- Exchange of the English encyclopedia with the German encyclopedia
- Partial adjustment of heuristics and some code lines in the algorithm

# GerVADER - in six steps

1. Lexicon compilation
2. Crowd rating the lexicon words by polarity (-4, -3, ..., 0, +1, ..., +4) (Wisdom Of The Crowd)
3. Filter words -> Gold standard lexicon
4. Installation of 5-language heuristics as boost factors
5. e.g. !, !!, !!!, or **negation**...
6. Small adjustments
7. Testing VADER in *different domains* against *common algorithms* (benchmark)

## 1. Compile encyclopedia

- Initial situation: SentiWS Lexicon
  - Lexicon including grammatical word forms
- Supplemented by 80 German slang expressions
  - Slang common in social media channels

→ Encyclopedia for the evaluation of the Crowd: **3,546** words

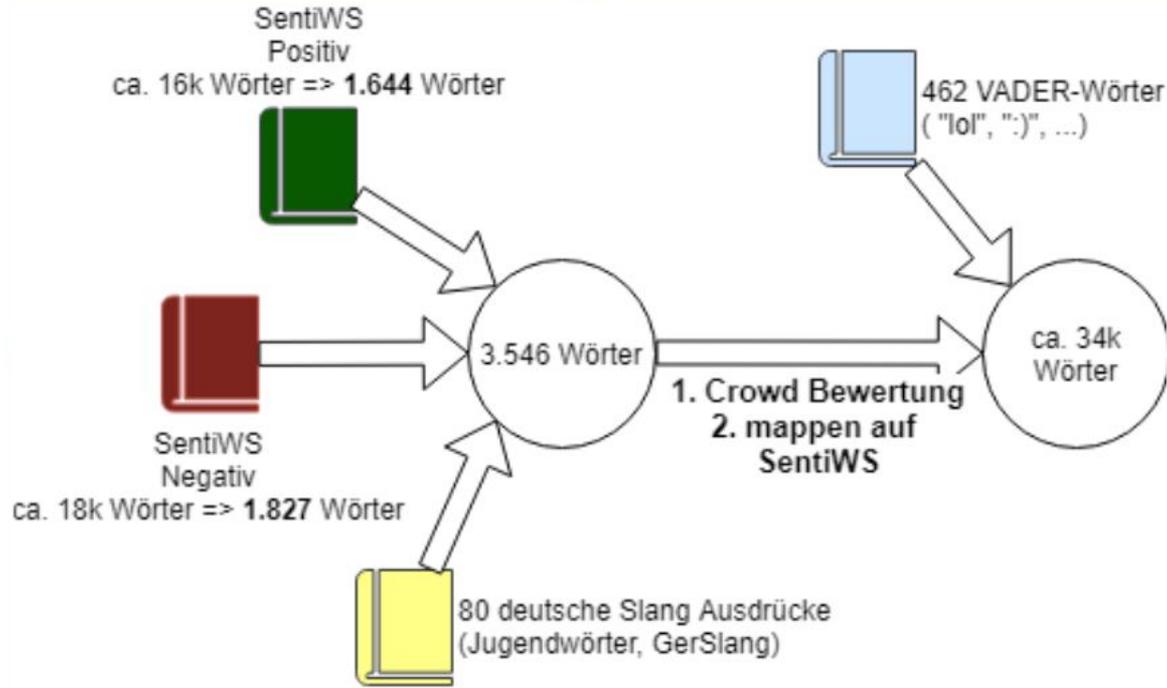
## 2. Crowd Rating

- Rating of the words (-4 to +4) by 10 headed crowd members
- Approx. 7 reviews per word received

### 3. Filter words → Gold standard lexicon

- Filter: Words with neutral sentiment and high standard deviation ( $> 2.5$ )
  - Crowd disagree in rating
    - Hayvan 2.5 [+1, +1, -1, -4, +4, -4, +0, +0]
- Expand: Words extended to grammatical forms, sentiment adopted
  - agil = [agilstes, agilster, agileren, ... ]
- Added cross-language VADER words
  - 462 VADER words ("lol", "rofl", ...)
  - 3,500+ VADER Emojis

# Compilation process: Review and mapping



## 4. Translating the 5-Heuristics from VADER

Punctuation ! can boost the sentiment of the sentence

### 1. Punctuation: ! vs !! vs !!! vs .

- Punctuation ! can boost the sentiment of the sentence
- "VADER is smart, handsome, and funny."
- "VADER is smart, handsome, and funny!"

### 2. ALL-CAPS

- Strengthens the sentiment of the word
- "VADER is very smart, handsome, and funny."
- "VADER is VERY SMART, handsome, and FUNNY!!"

## 4. Translating the 5-Heuristics from VADER

### 3. **Booster Words**

- amplify/attenuate the next word
- “It is good”
- “It is **extremely** good”

### 4. **Contrast-conjunction (contrast)**

- Follow-up part is given increased attention
- “The food is great, **but** the service sucks”

### 5. **Negating sentence**

- Sentiment tips over
- “VADER is **not** smart, handsome, nor funny.”

Just **Booster Words** and **Negating sentence** adapted for **GerVADER** → Words were manually translated

## 5. Small adaptations

- VADER transforms currently viewed word into lowercases
- but in German nouns are written in capital letters
- GerVADER encyclopedia has same words with different POS tag

Anstieg	1.1	0.8	[+1,+1,+0,+3,+1,+1,+1]
---------	-----	-----	------------------------

anstieg	0.7	0.7	[+0,+0,+0,+2,+1,+1]
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therefore:

1. search currently viewed word in encyclopedia
2. if not found, lowercase() the word and search in lexicon
3. if not found, first letter capitalize() and search in lexicon

## 6. Benchmarking - Twitter Corpus + Google Play Corpus

### **A Twitter Corpus and Benchmark Resources for German Sentiment Analysis**

- Paper that collected tweets with more than 9000 tweets and manually labeled them (SB10k Corpus)
  - o Got only '7500' on request
- Google Play Store Reviews (SCARE Corpus), 800.000+ Reviews
  - o Different categories, e.g. Sport News Apps

# GerVADER - Results

No.	Classifier	Training Corpus	Test Corpus	F1pos	F1neg	F1neutral	F1	F1-3
1	GerVADER	-	SB10k	43,54%	35,30%	40,69%	39,42%	39,84%
2	GerVADER	-	SB10k (NN)	74,50%	53,73%	-	64,12%	
3	GerVADER	-	SB10k (10%)	44,52%	37,64%	42,01%	41,08%	41,39%
4	GerVADER	-	SB10k (10%, NN)	73,15%	55,23%	-	64,19%	
5	SVM	SB10k	SB10k (10%)	66,16%	47,80%	81,32%	56,98%	65,09%
6	CNN	SB10k	SB10k (10%)	71,46%	58,72%	81,18%	65,09%	70,45%
7	SVM	MGS	SB10k (10%)	67,77%	53,23%	80,20%	60,50%	67,07%
8	CNN	MGS	SB10k (10%)	63,94%	58,21%	70,66%	61,08%	64,27%
9	GerVADER	-	SportNews	85,41%	55,05%	12,71%	70,23%	51,06%
10	GerVADER	-	SportNews (NN)	88,07%	57,78%	-	72,93%	
11	GerVADER	-	SportNews (NN, N merged into P)	90,72%	57,78%	-	74,25%	
12	GerVADER	-	News Apps	80,63%	58,14%	11,78%	69,39%	50,18%
13	GerVADER	-	News Apps (NN)	83,73%	60,75%	-	72,24%	
14	GerVADER	-	News Apps (NN, N merged into P)	85,77%	60,75%	-	73,26%	

# GerVADER - Results

## SB10k Corpus

		PREDICTED							
		pos	neg	neu					
		4034	1499	1943	Precision	Recall	f1 Score		
ACTUAL	pos	1717	1252	133	332	pos	0,3103619236	0,7291788002	43,54%
	neg	1130	392	464	274	neg	0,3095396931	0,410619469	35,30%
	neu	4629	2390	902	1337	neu	0,6881111683	0,2888312811	40,69%
7476							F1		39,42%
							F1(3)		39,84%

## SB10k Corpus - Neutral tweets previously filtered out

		PREDICTED							
		pos	neg	neu					
		1644	597	606	Precision	Recall	f1 Score		
ACTUAL	pos	1717	1252	133	332	pos	0,7615571776	0,7291788002	74,50%
	neg	1130	392	464	274	neg	0,7772194305	0,410619469	53,73%
	neu	0	0	0	0	neu			
2847							F1		64,12%
							F1(3)		

# GerVADER - Results

- SB10k can only be compared moderately, since it is not known on which 10% the authors have tested.
- SCARE positive, negative, neutral star classification (1-2 neg; 3 neu; 4-5 pos)
- **positive statements** are quite well recognized
- **negative statements** are almost equally distributed on all three labels
- **neutral statements** are often recognized as positive

		PREDICTED			
			pos	neg	neu
			29041	4977	4003
ACTUAL	pos	26912	23896	676	2340
	neg	8360	3455	3671	1234
	neu	2749	1690	630	429

## Negative statements are almost equally distributed on all 3 labels

GerVADER recognizes negation words in long sentences, but has no effect:

- 'Ich finde **nicht**, dass diese Menschen wirklich freundlich sind.'  
→ positive, but should be negative

Negative words only affect the nearest neighbours

- between **nicht** and freundlich too great a distance
- with long sentences or funny sentences this leads to wrong classifications

## Negative statements are almost equally distributed on all 3 labels

What happens here?

6	negative	Ach verdammt. Nich groß genug! -.-	rated <b>positive</b>
7	negative	Ach verdammt. Groß genug! -.-	rated <b>positive</b>
8	negative	Ach verdammt. Nicht Groß genug! -.-	rated <b>negative</b>
9	negative	Verdammt! .-	rated <b>neutral</b>

verdammt & .- = is not recognized

Nich = is not a deposited negation word

-.- = nicht Teil des Lexikons

- some words are **not recognized**, if they are also stored as **booster words**
- incorrect spelling and words written together are **not recognized** either

## Conclusion

- Copura often lacks context information and missing irony recognition
- Boosters and negation words must be translated/selected more adequately
- German negation ("nicht" at end of sentence) and long sentences with negation are not recognized
- Contrast conjunction "aber" is not even recognized yet
- Subset of emoticons are not recognized or missing in the lexicon
- Potential for improvement, especially with regard to the algorithm

### But:

- SCARE Corpus Benchmark already promises good results
- Fixing the above problems could bring **GerVADER** much closer to **VADER** results

## Sources

[more details in paper sources](#)

### SentiWS:

R. Remus, U. Quasthoff & G. Heyer: SentiWS - a Publicly Available German-language Resource for Sentiment Analysis.

In: *Proceedings of the 7th International Language Resources and Evaluation (LREC'10)*, pp. 1168-1171, 2010

<http://wortschatz.uni-leipzig.de/de/download>

### SCARE:

Mario Sängler, Ulf Leser, Steffen Kemmerer, Peter Adolphs, and Roman Klinger. SCARE -- The Sentiment Corpus of App Reviews with Fine-grained Annotations in German. In *Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC'16)*, Portorož, Slovenia, May 2016. European Language Resources Association (ELRA).

<http://www.romanklinger.de/scare/>

## Sources

[more details in paper sources](#)

SB10k:

*Cieliebak, Mark & Deriu, Jan & Egger, Dominic & Uzdilli, Fatih. (2017). A Twitter Corpus and Benchmark Resources for German Sentiment Analysis. Social NLP @ EACL. 10.18653/v1/W17-1106.*

[https://www.researchgate.net/publication/315362150\\_A\\_Twitter\\_Corpus\\_and\\_Benchmark\\_Resources\\_for\\_German\\_Sentiment\\_Analysis](https://www.researchgate.net/publication/315362150_A_Twitter_Corpus_and_Benchmark_Resources_for_German_Sentiment_Analysis)

VADER:

**Hutto, C.J. & Gilbert, E.E. (2014). VADER: A Parsimonious Rule-based Model for Sentiment Analysis of Social Media Text. Eighth International Conference on Weblogs and Social Media (ICWSM-14). Ann Arbor, MI, June 2014.**

<https://github.com/cjhutto/vaderSentiment>