Methods for Verification of Sentiment Frames

Irina Matueva and Natalia Loukachevitch

Lomonosov Moscow State University, Moscow, Russia
iramatueva@gmail.com, louk_nat@mail.ru

Abstract. The paper describes the approaches to verification of sentiment frames in the RuSentiFrames lexicon describing sentiment connotations related to specific Russian predicates. Two approaches for verification were used: 1) analysis of specific sentences from Russian National Corpus, 2) via crowdsourcing platform Yandex.Toloka. The idea was to find similarities and differences between the annotations made by the experts in RuSentiFrames and by non-experts from Yandex.Toloka, thus verifying the RuSentiFrames descriptions. The first approach showed that implicit information influences greatly on the author’s attitude and that the context plays crucial role. The second approach showed mostly the agreement between the expert’s and non-expert’s annotations in case of relations between the participants in sentiment frames, but the author’s attitudes were estimated differently in some cases.

Keywords: Sentiment analysis · Frame · Crowdsourcing

1 Introduction

In various sentiment analysis tasks, the approaches based on specialized sentiment lexicons are still quite significant. For many languages, general sentiment lexicons have been created [12,20,21]. At the same time, every sentiment analysis domain requires a specialized sentiment lexicon, which can be created with tuning a general lexicon or extracting sentiment words from domain-specific text collections [6,8].

Most sentiment vocabularies are presented as lists of words and expressions with scores of their sentiment [21]. Some vocabularies provide also additional characteristics of the word sentiment called as ‘strength’. Also sentiment scores can be assigned to specific senses of ambiguous words [1]. However, for more accurate extraction of sentiment attitudes cited or expressed in texts, it is not enough to have a simple sentiment list with sentiment scores assigned to words and expressions [5,16].

For example, Maks and Vossen [14] analyse the following sentence: “Damilola’s killers were boasting about his murder”. It is evident that this sentence conveys that the killers are positive towards the murder, and the author is negative towards the killers. In fact, both type of information can be inferred
from the use of verb *to boast*. The authors of [3] infer that Russia is negative
towards Saakashvili from the sentence “Russia criticized Belarus for permitting
Georgian President Mikheil Saakashvili to appear on Belorussian television”,
which is mainly based on interaction of two words: *to criticize* and *to permit*.

These observations make it necessary to create structured sentiment lexicons,
which provide more detailed description of sentiments, attitudes and effects,
associated with specific words [4,10,13]. However, such detailed representations
can be subjective; additional efforts are needed for their verification.

For more detailed description of sentiment and effects associated with specific
words and expressions of the Russian language, sentiment lexicon RuSentiFrames
has been created [13]. It was already used for automatic creation of a training
collection for deep learning approaches to improve the extraction of attitudes
between entities mentioned in texts [19] and for unsupervised extraction of sen-
timent relations between political entities [13]. Some procedures on evaluation of
the created resource have been already implemented, but verification procedures
of structured sentiment resources should be further investigated.

In this paper we consider approaches to verify descriptions made in the senti-
ment lexicon RuSentiFrames created for the Russian language. The verification
methods are applied to specially selected words to check experts’ decisions. The
methods include the check of the expert descriptions on sentences from Rus-
sian National Corpus, and also crowdsourcing verification via Yandex.Toloka
based on specially designed sentences. Using crowdsourcing does not mean that
we prefer opinions of native speakers more than experts, but we try to reveal
inconsistencies or accidental mistakes of experts.

2 Related Work

Our work concerns two directions in natural language processing: creating struc-
tured sentiment lexicons with more complicated structure than word lists with
scores, and crowdsourcing related to sentiment analysis tasks, especially when the
quality of expert and native speaker responses is compared.

2.1 Structured Sentiment Resources

Maks and Vossen [14] present a lexicon model for subjectivity description of
Dutch verbs. They describe the subjectivity relations that exist between the
participants of the verbs and from a speaker (a writer), expressing multiple
attitudes for each verb sense. The authors estimated inter-annotator agreement
in established relations and found that scores of attitudes between participants
have quite high agreement.

In [18] the authors stressed that it is important to extract implied sentiments
and proposed the approach to description of so-called connotation frames for
transitive verbs. The description includes three participants’ roles: agent, theme,
and writer. The frame includes the attitude polarity of participants to each other
(positive, negative, or neutral), the effect of the situation to agent or theme,
mental states and values of the participants. For experiments, 1000 most frequent English verbs were extracted from a corpus. These verbs were provided with five example sentences constructed from most frequently seen Subject-Verb-Object triples in Google syntactic ngrams and were annotated by crowdsourcers. The obtained values were averaged.

In [10] the authors introduce Sentiframes, a German verb resource for verb-centered sentiment inference. Their model specifies verb polarity frames that capture the polarity effects on the fillers of the verb’s arguments in a sentence with that verb frame. By 2017, 1500 verb-polarity frames for 1100 verbs were described [11]. Some nominalizations (for example, destruction) have been also considered as frame entries. Authors also introduced an algorithm to apply the verb resource to treebank sentences.

In [4] the authors consider the problem of analyzing implicit sentiments. Some such sentiment attitudes are conveyed mentioning of events, which positively or negatively affect the object: malefactive (BadFor) and benefactive (GoodFor) events (effects). To study the inference of implicit sentiments, the authors extract GoodFor and BadFor words from FrameNet and WordNet. Examples of GoodFor verbs are to encourage, to promote. BadFor verbs examples are to assault, to assail, to lower. They also created rules for inference, for example, if the writer expresses a positive sentiment toward a BadFor event, then it is possible to infer that the writer is positive toward the agent of the event and negative toward the theme.

2.2 Crowdsourcing in Sentiment Analysis

Crowdsourcing in sentiment analysis is executed through online crowdsourcing platforms, which can be paid or free. In [2] the authors analyzed both approaches. To implement crowdsourcing on a fee basis, they used the CrowdFlower platform to classify students’ comments about the learning process. For crowdsourcing on a free basis, the authors used the Pybossa platform. The study showed that crowdsourcing analysis of sentiment on both paid and free platforms is much more accurate than automatic sentiment analysis algorithms, but not as accurate as manual expert annotation.

In [7] contributors had to label term groups in three different main classes, emotion, intensifier and none, without instructions through the CrowdFlower platform. The authors compared several interfaces and also annotations performed by experts and non-expert annotators. The cost of hiring two experts was equal to the cost of hiring 19 participants at CrowdFlower. The authors concluded the crowd is capable of producing and evaluating a quality pure emotion lexicon without gold standards. However, it was also found that spam is very common and quality assessment should be implemented.

In [17] the authors examined the problem of multi-class annotation of pictures in the crowdsourcing platform MTurk with the help of experts and non-expert annotators. In the end, having measured several statistics, they concluded that with a good guide for annotators they can get a significantly better dataset.
Thus, because non-expert annotators are ordinary people and can be found in large numbers, crowdsourcing is an effective way to collect accurate data.

In the work [15] the author identifies several types of sentences that are difficult to annotate with sentiment. These are, for example, sentences describing the success or failure of one of the parties over another, sentences with sarcasm, requests, or rhetorical questions. To improve the consistency of annotation, the author proposed two new types of questionnaires (general and target-oriented). Both questionnaires were applied for annotation of tweets via a crowdsourcing platform.

3 RuSentiFrames Lexicon

Russian Sentiment Lexicon RuSentiFrames describes sentiments and connotations conveyed with a predicate word in form of sentiment frames [13,19]. Sentiment frame is a set of positive or negative associations (connotations) related to a predicate word or expression. A predicate usually describes a situation with some participants. The types of connotations that are conveyed in sentiment frames are as follows:

- attitude of the author of the text towards mentioned participants,
- positive or negative sentiment between participants,
- positive or negative effects on participants,
- positive or negative mental states of participants related to the described situation.

To designate roles of a predicate, the approach of PropBank [9] is accepted when semantic arguments are numbered, starting from zero. For a particular predicate , Arg0 is generally the argument exhibiting features of a Prototypical Agent of the situation, while Arg1 is a Prototypical Object.

Initial descriptions in RuSentiFrames are created by experts. To justify their descriptions, expert have to analyze specific sentences mentioning a word under analysis [13]. All the assertions in RuSentiFrames are provided with the score of confidence, which currently has two values: 1, if an expert believes that this assertion is true almost always, or 0.7, if the assertion is considered as default. It is difficult to obtain more fine-grained scores from experts. Assertions about neutral sentiments, effects and states of participants are not described.

For example, verb 

хвастаться

(to boast) is associated with the following frame (Example 1). The frame indicates, that the first participant of the situation

```
Example 1: Frame "Хвастаться" (Boast)

"roles": {"a0": "who boasts",
    "a1": "about what"}
"polarity": {["a0", "a1", "pos", 1.0],
    ["author", "a0", "neg", 1.0]},
"state": {["a0", "+", 1.0],
```
(a0) is positive towards the theme of boasting (participant a1). The participant a0 is in positive mood, but the author is negative towards a0. Thus, the frame explains the interpretation of the example from [14] mentioned in the introduction section. Also we can see a mix of positive and negative sentiments associated with the same word.

Another example is the frame for words such as позволить (to permit) (Example 2). It does not seem that this word has significant sentiment strength, but it has several positive associations, including positive relations between participants, positive effects, positive private state. But the author’s attitude is not conveyed.

Example 1: Frame "Позволить" (Permit)

```
"roles": {"a0": "who permits",
              "a1": "what permitted"},
"a2": "whom is permitted"},
"polarity": {"[a0, a1, "pos", 0.7],
              [a2, a0, "pos", 0.7],
              [a0, a2, "pos", 0.7],
              [a2, a1, "pos", 1.0]},
"effect": {"a1", "+", 1.0],
            [a2", "+", 1.0]},
"state": {[a2", "+", 1.0]},
```

The created frames are associated with a set of related words and expressions, which have the same attitudes and connotations. The set of lexical units of a frame can include: single words (mainly verbs and nouns); idioms (вешать лапшу на уши – to hang noodles on the ears—to lie); light verb constructions (нанести вред – inflict harm)[13].

Currently, RuSentiFrames contains 311 frames with more than 7K associated frame entries. Table 1 presents the distribution of frame entries according to sentiments between main participants of the situation and from the author to the participants in the current version of RuSentiFrames.

| Attitude      | Sentiment | Number |
|---------------|-----------|--------|
| a0 to a1      | Pos       | 2,252  |
| a0 to a1      | Neg       | 2,802  |
| Author to a0  | Pos       | 1,178  |
| Author to a0  | Neg       | 1,571  |
| Author to a1  | Pos       | 1,429  |
| Author to a1  | Neg       | 815    |
4 Verification Procedures

The created sentiment frames need evaluation and possibly correction. The procedures of verification can be implemented using manual analysis of sentiments conveyed in specific sentences, via crowdsourcing, or with the use of distributional methods. Currently, only sentence analysis and crowdsourcing were implemented for RuSentiFrames verification.

4.1 Previous Experiments for Checking Sentiment Frames

Previously, the following experiments on evaluation of RuSentiFrames were implemented.

In the first experiment, two experts described frames for selected words in parallel using their intuition and text examples. In the second experiment, one expert created frames and gave only roles (without connotations) to an annotator. The annotator gathered 10 random non-duplicate sentences for each word from different topics of the current news flow. The task of the annotator was to assign positive or negative scores to each role of the word mentioned in a sentence under analysis. The obtained scores were averaged. The average scores and connotations were compared with the original frame of the word.

The agreement in both experiments is estimated as 0.76–0.78 of the harmonic mean of relative intersections between both annotations, which can be considered as a quite high value [13]. It was found that the most agreement is met in polarity of relations between participants, and also in estimation of effects. But the author’s position towards the participants is most dependent on context and subjectivity of an expert.

4.2 New Verification Procedures

In new experiments, the sentiment connotations of words were evaluated using two approaches: 1) analysis of specific sentences; 2) crowdsourcing via the Yandex.Toloka service¹.

In previous evaluation experiments, predicate words for verification were selected randomly. In new procedures of RuSentiFrames evaluation, words for verification were specially chosen. For sentence analysis, words which have positive or negative author’s attitudes described in RuSentiFrames were selected. For crowdsourcing, word pairs close in meanings but different in some aspects (usage, single word or phrase, connotations) were chosen for comparison.

4.3 Sentence Analysis

It was previously found [13] that the author’s attitude mostly depends on the context. To verify the sentiment frames based on the analysis of specific sentences, we compiled a list of sentiment predicates having positive or negative author’s attitude to the participants of this situation according to RuSentiFrames.

¹ https://toloka.yandex.ru/.
The set of words with described negative author’s attitudes includes the following words: докзумь (to die), грозить (to threaten), убить (to kill), ухудшить (to worsen), похитить (to abduct), нарушить (to violate), осудить (to condemn), ухмыляться (to grin), ябедничать (to sneak).

Examples of selected words with positive author’s attitudes are as follows: предотвратить (to prevent), почист (to rest), карать (to punish), ладить (to get along), воодушевить (to inspire, вразумить (to reason), постигать (to comprehend), развивать (to develop).

For each sentiment predicate we selected example sentences from Russian National Corpus using the following principles:

- number of sentences: 10 example sentences for each sentiment predicate,
- uncomplicated construction: the sentiment predicate should be in the main clause of the sentence, in active voice, without negation, without introductory constructions,
- sentiment of other words: sentences should not contain evident negative or positive words; according to [5] if a participant in the situation is represented by a negative lexical unit, then regardless of the sentiment orientations of other components of the sentiment frame, the attitude towards this participant is negative,
- cases of irony, humor and sarcasm were not included due to interpretation problems,
- if the syntactic valences of the sentiment predicate are filled with anaphoric expressions, we replace them with antecedents.

Thus, sentences like ‘The situation was only worsened by the press and television programs’ were included in the evaluation. Sentences like ‘Nothing could be improved or worsened by haste’ were not included.

Author’s attitude scores were calculated manually on a numerical scale from ‘very negative’ (−2) to ‘very positive’ (+2). The obtained numbers were averaged, and this averaged result was compared with the original sentiment of frame components in RuSentiFrames.

As a result, there is not large numerical difference between relations in sentiment predicates in RuSentiFrames and the ones, obtained from the sentence analysis in Russian National Corpus in case of:

- verbs with the meaning of deprivation of life: убить (‘to kill’), докзумь (‘to die’), почист (‘to rest’)
- verbs with meaning of damage: ухудшить (‘to worsen’), нарушить (‘to break’)
- verbs with the meaning of impact on a negative object: предотвратить (to prevent), обезвредить (to neutralize)
- verbs with the lexical meaning ‘express disapproval’: ябедничать (to sneak), осудить (to condemn)
Table 2. Annotation of some predicates in RuSentiFrames and in the sentence analysis

| Verb             | Attitude       | RuSentiFrames score | Sentence score |
|------------------|----------------|---------------------|----------------|
| ябедничать       | (author, a0)   | −1.0                | −0.5           |
| (to sneak)       |                |                     |                |
| ухудшить         | (author, a0)   | −0.7                | −0.4           |
| (to worsen)      |                |                     |                |
| нарушить         | (author, a0)   | −1.0                | −0.5           |
| (to violate)     |                |                     |                |
| ухмыляться        | (author, a0)   | −0.7                | −0.4           |
| (to grin)        |                |                     |                |
| предотвратить     | (author, a0)   | +0.7                | 0.5            |
| (to prevent)     | (author, a1)   | −0.7                | −0.35          |
| обезвредить      | (author, a0)   | +1                  | 0.35           |
| (to neutralize)  | (author, a1)   | −1.0                | −0.5           |

Some sentiment predicates that were provided with the positively assessed author’s attitudes showed significant difference from those obtained from the sentence analysis, for example:

- карать (‘to punish’): positive author’s attitude towards the actor (a0) assigned with experts was not confirmed,
- ладить (‘to get along’): the author of the statement usually remains neutral towards the participant with whom one gets along (a2), but in frames the positive attitude to that participant was described. Only the main actor (a0) was positively characterized by the author as the most active participant.

The found inconsistencies should be corrected in a new version of RuSentiFrames. Table 2 shows some examples of initial RuSentiFrames annotations and results of sentences analysis. All scores are given on the scale \([-1, 1]\).

4.4 Verification via Crowdsourcing

To verify sentiment frames with a crowdsourcing experiment, we selected word pairs that correspond to one of the following criteria:

- words are similar in meaning but have different sentiment connotations, specifically some differences in author’s attitudes towards participants, and, therefore, these words are assigned to different frames. For example, sentiment predicate укокошить (‘finish off as to kill’) differs from ‘убить’ (‘to kill’) in that in addition to negative author’s attitude towards the main participant, there is a negative author’s attitude towards the second participant who was killed;
words are similar in meaning but have difference in polarity of relations between the participants. For example, in sentiment predicate ‘смеяться’ (‘to laugh’) the one who is laughing will show negative attitude towards the one who does it. But in ‘насмехаться’ (‘to mock’) this negative attitude will be more intense;

– synonymous words, assigned to the same frame, but different in language register to understand the difference in scores, for example одобрить – похвалить (to approve – to praise). This group also includes cases when a synonymous entry is a phrase: надеяться/возлагать надежду (to hope), доверять/оказывать доверие (to trust);

– antonym words. We would like to understand, if scores of connotations obtain opposite values from respondents or in sentences: запретить/разрешать (to prohibit/to allow), улучшить/ухудшить (to improve/to worsen), нарушать/соблюдать (to violate/comply).

To conduct a crowdsourcing experiment in the Yandex.Toloka platform we selected 89 sentiment predicates according to the above-mentioned principles. Then we created sentences with these predicates, and questions about attitudes between the entities in the sentiment frame. Respondents were asked to answer these questions. The sentences were constructed artificially, using neutral names as Ivanov or Petrov, so as not to cause specific associations among annotators.

The sentences looked like this: Иванов воздал Петрову по заслугам. (‘Ivanov paid Petrov what he deserved’). Then the following questions were asked:

– Как Иванов относится к Петрову? (‘How does Ivanov feel about Petrov?’)
– Как Петров относится к Иванову? (‘How does Petrov feel about Ivanov?’)
– Как автор относится к Иванову? (‘What is the author’s attitude towards Ivanov?’)
– Как автор относится к Петрову? (‘What is the author’s attitude towards Petrov?’)

Respondents were asked to choose one answer from the options, that were ranked from very negative (−2) to very positive (+2), as well as in the analysis of specific sentences.

To identify the optimal settings, we included in each experiment several test sentences containing an obvious positive/negative relationship between entities, such as: Ivanov loves Petrov. It is obvious that Ivanov has the positive attitude towards Petrov. Those respondents who correctly answered the test sentences were accepted. Thus, it is possible to block wrong annotators by collecting high-quality data without intervening the experiment process itself.

In total, 100 respondents participated in each experiment. The respondents’ answers were averaged and compared with the initial expert assessment in RuSentiFrames.
Иванов отказал Петрову в этом
Как Иванов относится к Петрову?
☑ Очень хорошо ☐ Хорошо ☐ Нейтрально ☐ Плохо ☐ Очень плохо

как Петров относится к Иванову?
☐ Очень хорошо ☐ Хорошо ☐ Нейтрально ☐ Плохо ☐ Очень плохо

Как автор относится к Иванову?
☐ Очень хорошо ☐ Хорошо ☐ Нейтрально(Неизвестно) ☐ Плохо ☐ Очень плохо

Фиг. 1. Пример предложения и вопросов, заданных о этом предложении в Yandex.Toloka.

As a result, the annotations of the experts in RuSentiFrames and non-expert annotators showed the agreement in the relationships of the participants of the sentiment predicate towards each other. For example, in the pair наказать-карать (to punish) respondents annotated the subject’s attitude in наказать towards the object as negative as well as in карать and it coincides with the expert annotations in RuSentiFrames.

However, significant differences were found for some predicates. Respondents also estimated the author’s attitude to the first participant (a0) of verb карать negatively, which agrees with previously mentioned results of sentence analysis. In predicates упустить (to miss), опоздать (to be late) the main participant does not have positive attitudes towards what is missed or where the participant is late, according to respondents. The RuSentiFrames experts assigned positive scores in default (0.7) to these attitudes.

Also the author’s attitude towards the main participant in high-style words like умереть-почить (to die), понять-постичь (to understand), жаловаться-роптать (to complain) did not change to a more positive unlike RuSentiFrames data. Most often respondents chose the answer neutral when classifying the author’s attitude towards the participants in case of low frequency predicates as for the words: изобличить (to expose), постигать (to comprehend).

If the predicate was a colloquial word, then the polarity of author and participants was estimated as more intense. For example, in pairs: умереть-дохнуть (to die), убить-укокошить (to kill), ругать-охаять (to scold), отказать-отбрить (to refuse).

Table 3 shows the annotation of some predicates made by the experts in RuSentiFrames and the results of crowdsourcing experiment. All scores are given on the scale [−1, 1]. Table 4 shows the average deviation of crowdsourcing scores from expert scores.
Table 3. Annotation of some predicates in RuSentiFrames and in the crowdsourcing experiment

| Verb     | Attitude | RuSentiFrames score | Crowdsourcing score |
|----------|----------|---------------------|---------------------|
| ябедничать (to sneak) | (author, a0) | −1 | −0.1 |
|         | (author, a1) | 0 | −0.61 |
| ухудшить (to worsen) | (author, a0) | −0.7 | −0.34 |
|         | (author, a1) | 0 | −0.24 |
| нарушить (to violate) | (author, a0) | −1 | −0.24 |
|         | (author, a1) | 0 | −0.34 |
| ухмыляться (to grin) | (author, a0) | −0.7 | −0.32 |
|         | (author, a1) | −0.7 | −0.28 |
| убить (to kill) | (author, a0) | −0.7 | −0.93 |
|         | (author, a1) | 0 | −0.12 |
| укокошить to finish off | (author, a0) | −0.7 | −0.73 |
|         | (author, a1) | −0.7 | −0.28 |

Table 4. Average deviations of crowdsourcing scores from expert scores

| Parameter | (a0, a1) | (a1, a0) | (author, a0) | (author, a1) |
|-----------|----------|----------|--------------|--------------|
| Deviation | 0.41     | 0.49     | 0.31         | 0.2          |

5 Conclusion

In this paper we presented the approaches to verification of sentiment frames in the RuSentiFrames lexicon describing sentiment connotations related to specific Russian predicates. Two approaches for verification were used: 1) analysis of specific sentences from Russian National Corpus, 2) via crowdsourcing platform Yandex.Toloka.

The results of annotation of sentiment frames in specific sentences and in the crowdsourcing experiment were compared with the original annotation data made by experts in RuSentiFrames. As a result, context and implicit information from the context had a great influence on the sentiment in the analysis of specific sentences.

We see the prospects of the study in the possibility of creating crowdsourcing experiment with the help of non-professionals to annotate relations in the sentiment frame, but in the context of different sentences. Thus, it would be possible to study the problem of implicit information in sentiment analysis more deeply, which seems us to be a promising task not only for system of sentiment frames, but also for improving the quality of sentiment analysis on the whole.

Acknowledgments. The reported study was funded by RFBR according to the research project № 20-07-01059.
References

1. Baccianella, S., Esuli, A., Sebastiani, F.: SentiWordNet 3.0: an enhanced lexical resource for sentiment analysis and opinion mining. In: LREC-2010, pp. 2200–2204 (2010)
2. Borromeo, R.M., Toyama, M.: Automatic vs. crowdsourced sentiment analysis. In: Proceedings of the 19th International Database Engineering & Applications Symposium, pp. 90–95 (2015)
3. Choi, E., Rashkin, H., Zettlemoyer, L., Choi, Y.: Document-level sentiment inference with social, faction, and discourse context. In: Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers), pp. 333–343 (2016)
4. Choi, Y., Deng, L., Wiebe, J.: Lexical acquisition for opinion inference: a sense-level lexicon of benefactive and malefactive events. In: Proceedings of the 5th Workshop on Computational Approaches to Subjectivity, Sentiment and Social Media Analysis, pp. 107–112 (2014)
5. Deng, L., Wiebe, J.: Sentiment propagation via implicature constraints. In: Proceedings of the 14th Conference of the European Chapter of the Association for Computational Linguistics, pp. 377–385 (2014)
6. Hamilton, W.L., Clark, K., Leskovec, J., Jurafsky, D.: Inducing domain-specific sentiment lexicons from unlabeled corpora. In: Proceedings of the Conference on Empirical Methods in Natural Language Processing. Conference on Empirical Methods in Natural Language Processing, EMNLP-2016, p. 595 (2016)
7. Haralabopoulos, G., Simperl, E.: Crowdsourcing for beyond polarity sentiment analysis a pure emotion lexicon. arXiv preprint arXiv:1710.04203 (2017)
8. Huang, S., Niu, Z., Shi, C.: Automatic construction of domain-specific sentiment lexicon based on constrained label propagation. Knowl. Based Syst. 56, 191–200 (2014)
9. Kingsbury, P.R., Palmer, M.: From TreeBank to PropBank. In: LREC, pp. 1989–1993. Citeseer (2002)
10. Klenner, M., Amsler, M.: Sentiframes: a resource for verb-centered German sentiment inference (2016)
11. Klenner, M., Tuggener, D., Clematide, S.: Stance detection in Facebook posts of a German right-wing party. In: Proceedings of the 2nd Workshop on Linking Models of Lexical, Sentential and Discourse-level Semantics, pp. 31–40 (2017)
12. Koltsova, O.Y., Alexeeva, S., Kolcov, S.: An opinion word lexicon and a training dataset for Russian sentiment analysis of social media. Comput. Linguist. Intellect. Technol. Mater. DIALOGUE 2016, 277–287 (2016)
13. Loukachevitch, N., Rusnachenko, N.: Sentiment frames for attitude extraction in Russian. In: Proceedings of the International Conference on Computational Linguistics and Intellectual Technologies (Dialogue-2020) (2020)
14. Maks, I., Vossen, P.: A lexicon model for deep sentiment analysis and opinion mining applications. Decis. Support Syst. 53(4), 680–688 (2012)
15. Mohammad, S.: A practical guide to sentiment annotation: challenges and solutions. In: Proceedings of the 7th Workshop on Computational Approaches to Subjectivity, Sentiment and Social Media Analysis, pp. 174–179 (2016)
16. Neviarouskaya, A., Prendinger, H., Ishizuka, M.: SentiFul: a lexicon for sentiment analysis. IEEE Trans. Affect. Comput. 2(1), 22–36 (2011)
17. Nowak, S., Rüger, S.: How reliable are annotations via crowdsourcing: a study about inter-annotator agreement for multi-label image annotation. In: Proceedings of International Conference on Multimedia Information Retrieval, pp. 557–566 (2010)
18. Rashkin, H., Singh, S., Choi, Y.: Connotation frames: a data-driven investigation. In: Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics, pp. 311–321 (2016)
19. Rusnachenko, N., Loukachevitch, N., Tutubalina, E.: Distant supervision for sentiment attitude extraction. In: Proceedings of International Conference on Recent Advances in Natural Language Processing (RANLP 2019), pp. 1022–1030 (2019)
20. Waltinger, U.: GermanPolarityClues: a lexical resource for German sentiment analysis. In: LREC, pp. 1638–1642 (2010)
21. Wilson, T., Wiebe, J., Hoffmann, P.: Recognizing contextual polarity in phrase-level sentiment analysis. In: Proceedings of Human Language Technology Conference and Conference on Empirical Methods in Natural Language Processing, pp. 347–354 (2005)