Establishing Normative SentiWordNet Based on Moral Foundation Theory for Multidimensional Sentiment Analysis

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Abstract

Previous emotional dictionaries are incomplete and inaccurate because they did not consider personal emotion values. To overcome this, multipolarity approach is needed in view of value-cognition-affect paradigm. In this study we suggest multidimensional sentiment analysis, especially SentiWordNet-normative, newly based on Moral Foundation Theory.

Introduction

Background
- The importance of sentiment analysis and opinion mining is increasing.
- Sentiment: crucial for strategic planning
- Source of sentiment analysis: unstructured data (e.g. websites, social media sites, call center information)

Emotional dictionaries
- A variety of emotional dictionaries such as WordNet-Affect and SentiWordNet have been developed (some of them have been translated into Korean)
- Yet, these data sets are limited (incomplete and inaccurate emotion estimation)

SentiWordNet	pos	neg		SenticNet5	value		Hu & Liu	value		KNU	value
able	0.125	0		abandon	-0.84		abnormal	-1		가난	-2
unable	0	0.75		abhor	-0.29		abolish	-1		가능하다	2
direct	0.75	0		abhorrence	-0.29		abominable	-1		가다듬어	1
unquestioning	0.5	0.5		abject	-0.82		abominably	-1		가래	-1
relative	0.25	0.5		able	0.778		abominate	-1		가르침	1
plentiful	0	0.25		abolish	0.357		abomination	-1		가볍게	-1
rich	0.125	0		abort	-0.87		abort	-1		가쁘게	-1
scarce	0	0.25		abroad	0.761		aborted	-1		가엾다	-1
unfaithful	0	0.5		abrupt	-0.82		abound	1		간사스럽게	-1
basic	0.25	0		abyss	-0.84		abounds	1		간질간질하다	-1
unrecognized	0	0.5		academic	-0.79		abundance	1		감동	2
active	0.375	0.5		academy	0.782		abundant	1		강탈	-2
effective	0.5	0		accident	-0.11		accessible	1		강하게	1
neat	0.625	0		ace	0.044		accessible	1		개선하다	2
good	0.625	0		ache	-0.74		acclaim	1		개성	1

Goal
- To improve the completeness and accuracy of the polarity of SentiWordNet
- Propose a method to construct SentiWordNet-normative, which includes a set of words related to normative values

Our approach
- The value-cognition-affect paradigm: affect is influenced by cognition and cognition depends on individual value systems, which are associated with personality.
- Multidimensional value set: utilitarian value, hedonic value, and normative value
- In this study, we posit that SentiWordNet consists of three values: SentiWordNet-utilitarian, SentiWordNet-hedonic, and SentiWordNet-normative.
- We then describe our method to expand normative value-related SentiWords from these seed words
- We examine the seed words embedded within various morally-oriented questionnaires.

Theoretical Background

Moral Foundation Theory (MFT)
- A major theory from the field of moral psychology (Haidt & Graham, 2007)
- Moral psychologists study factors, mechanisms, and psychological development related to moral or immoral human behavior, assuming that human moral judgment can be empirically verified.
- Complicated intrapersonal and interpersonal mechanisms are involved in moral cognition, emotions, and behaviors.
- MFT includes five elements of moral foundation based on an understanding of evolutionary and cultural development across cultures and over time: care/harm, fairness/cheating, loyalty/betrayal, authority/subversion, and sanctity/degradation.
- To identify important aspects of each of these elements, various useful tools have been developed such as the Moral Foundations Questionnaire

Method

- Identify normative words related to sentiment (as the seed words of SentiWordNet-normative)
- Reuse the moral foundations dictionary (Graham, J. Haidt, and B.A. Nosek, "Liberals and Conservatives Rely on Different Sets of Moral Foundations", Journal of Personality and Social Psychology, 96(5), 2009, pp. 1029-1046.): A representative exemplar of the Moral Foundations Questionnaire, based on Moral Foundation Relevance.
- The Moral Foundations Questionnaire measures five universal elements of moral foundations
  : harm/care, fairness/reciprocity, ingroup/loyalty, authority/respect, and purity/sanctity
- Norms may be classified into social norms (subjective) and personal norms (moral).

- subjective norm: a set of beliefs about normative expectations of relevant referents and motivation to comply with these norms
- personal norm: feelings of personal obligation to do something
- SentiWordNet-normative includes the words which show either social or personal norms.
- E.g.: the harm/care and fairness/reciprocity elements are individualizing, whereas ingroup/loyalty, authority/respect, and purity/sanctity are seen as binding because they relate to the evolutionary need to create functioning communities.

SentiWordNet-normative

위험(Harm)		공정(Fairness)		소속감(Ingroup)		존엄(Authority)		순수(Purity)	
잔혹하다	-1.2	거부하다	-2.4	기만하다	-3.5	위치	0.5	혐오하다	-3.5
연민하다	1.7	차단하다	-3.2	애국하다	3.7	굴복하다	4.5	착취하다	-4.2
전멸하다	-1.2	애호하다	0.8	연대하다	3.7	존경	3.5	고상하다	2.7
쿵쿵하다	-0.6	선호하다	0.4	공통	3.2	승인하다	4.2	온전하다	3.2
유기하다	-0.5	관대하다	2.8	탈영병	-3.7	명령하다	1.7	얌전하다	1.2
잔인하다	-1.3	제외하다	-2.5	조국	3.7	견디다	2.2	새롭다	1.7
유린하다	-1.3	배제하다	-2.5	친하다	4.2	공경하다	3.7	진실하다	3.7
파괴하다	-1.3	권리	3.5	이사회	2.2	자격	3.2	전염성	-4.2
동정하다	2.2	가치	3.5	단체	2.7	따르다	3.2	독실하다	4.2
망치다	-1.2	무원칙	-3.7	구성원	2.2	경의	3.7	깨끗하다	4.2
진압하다	-0.8	거짓	-3.2	적	-4.2	전통	3.7	맑다	4.2
막다	1.3	일관되다	3.7	방치하다	-2.2	지휘하다	3.7	우쭐하다	-2.2
완패하다	-1.1	타당하다	4.2	격리하다	-2.7	지위	3.2	제련하다	2.2
보살피다	2.3	온당하다	3.7	협회	2	지도자	4.2	무고하다	2.2
안심하다	2.1	올바르다	4.2	외부	-1	대표하다	3.7	부패하다	-4.2
방어하다	3.5	옳다	4.2	외국	-1	숭배하다	3.2	불결하다	-4.2
평온하다	4.5	균등하다	4.2	사기꾼	-3	저항하다	-4.2	죄	-4.2
배려하다	4.5	동등하다	4.2	사기치다	-3	모반하다	-4.2	죄악	-4.2
공감하다	3	고르다	3.7	협잡꾼	-3	전복하다	-3.2	간통	-4.2
유지	2	균형	3.7	범법자	-3	허용하다	4	부랑자	-1.7

Examples

Past
- Y = alpha * number of positive words – (1-alpha) number of negative words

Proposed
- Y = beta1 * (number of harmless words) – (1-beta1)*(number of harm words) + beta2*(number of fair words) – (1-beta2)*(number of unfair words) + beta3*(number of ingroup harm words) – (1-beta3)*(number of non-ingroup words) + beta4*(number of authoritarian words) – (1-beta4)*(number of unauthorized words) + beta5*(number of pure words) – (1-beta5)*(number of impure words) + alpha

Conclusions

Contributions
- We extracted emotional words of normative value based on MFT
- Will increase the accuracy of the polarity of the words
- Will increase the robustness of the technology acceptance models (TAM, TBP, TRA, etc.) which incorporate factors related to normative values, utility values, and hedonic values.
- A multidimensional SentiWordNet can predict the polarity of SentiWords which incorporate multiple values and concepts(e.g., good, helpful, hopeful, fine, etc.).
- For example, the word 'good' in a sentence may be written in the context of a utilitarian perspective, while the same word in another sentence can be related to other values.
- The correct polarity can be identified according to the context using this new multidimensional version of SentiWordNet.
- Adding the normative viewpoint to opinion mining makes it possible to avoid sentiment analyses that are not ethical and morally undesirable decision-making while still including words of high utility and/or hedonic value.

Acknowledgement