

# Usage of Artificial Intelligence in Internet Discourse Analysis: from Manual Mechanisms of Data Processing to Electronic Ones

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**Abstract.** The authors' method of discourse analysis of Internet discussions on relevant socio-political themes is fully described in the article. Initially, the methodology supposed only manual mechanisms of data processing, including coding and analyzing parameters of deliberative standard, created on basis of Habermas' concept. However, authors' experiment detected opportunities of artificial neural networks' usage for deeper comprehension of public discussions' results. On the grounds of outcomes, gained during approbation of automatized program for Internet deliberations' analysis, a few perspectives for further investigations with use of machine training as research instrumentation were noticed: the first one is to use AI technologies as research tools for encoding and analyzing parameters of the deliberative standard, the second one is related to the creation of methods for recognizing parameters such as argumentation and civility, the third one is to provide researchers with statistical analysis based on ML results with visualization elements.

**Keywords:** Internet Discussions, Discourse Analysis, Neural Networks, Deep Learning, Artificial Intelligence, Natural Language Processing, Machine Learning

## Introduction

Nowadays, the definition of discourse is trendy because of frequent usage in scientific texts, political speeches, debates. Reference to opportunities that let artificial intelligence in all spheres, including discourse analysis, develop is extremely significant. However, understanding the discourse is a complicated thing due to the fact that, on the one hand, the definition is blurry, on the other hand, has a narrow, more accurate meaning depending on context. There is no common opinion on discourse and the way to analyze it because of a good quantity of various approaches where we can see a competition while determining discourse and discourse analysis [1]. The discourse is a difficult and multidimensional phenomenon that should be considered from different theoretical points of view.

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The approach to discourse as communicative act and communicative event is demonstrated by linguist T. Van Dijk. The scientist claims that discourse is complicated unity of language form, meaning and acting that corresponds to the definition of communicative event [2]. In his point of view, discourse as a complex communicative phenomenon comprises social context. The notions of scientist have a huge sense for understanding a correlation of discourse with political sphere.

Due to unlimited and pervasive character of informational pluralism, expression of citizens' opinion on different online platforms, argumentation of positions can be considered as social practices of public civil dialogue and interaction, realized in online environment.

Based on diverse approaches to studying political discourse [3], it can be researched not only as information and communication and psychological and political phenomenon, but political sphere, containing opportunities for multilateral and multi-functional public dialogue and interaction. The political discourse as applied category can be a resource and instrument of public speech integration because it provides with contacts and socio-political actions, including participation of citizens and their involvement in authority.

Political online discourse is simultaneously an electronic political environment and electronic political life of person who can act as anonymously as openly [4]. We consider political Internet discourse (online discourse, electronic discourse) as one of the PR instruments in political and governmental spheres. Political online discourse can form and reflect moods, citizens' opinions with aim of influence on making political decisions, management of governmental affairs, regulation of society, manipulation, pressure on government and etc.

Therefore, for government it is important to manage to analyze Internet discourse competently. To do this, special methods, generated with usage of the most modern technologies, are required. One of authors' method of discourse analysis, based on manual data processing and with incorporation of machine training will be represented in the article.

## **1 Problem statement**

Internet discussions on various socio-political themes are currently becoming more relevant for researchers due to the fact that online deliberations more focus on critical discussion and reasoning of communicators' views on acute public issues. Therefore, the value of deliberations is that their participants can articulate their interests, openly express their positions and support them with significant arguments.

Subsequent paragraphs, however, are indented. In fact, online deliberations contribute to the development of democratic communication as they allow participants to demonstrate their political creativity, openly argue about serious political themes, lobby their interests without mediators. Thanks to exchange of views, positions on different social and political matters a public dialogue between government and society which is aimed at addressing certain problems, where citizens actively take part.

Studying Internet discourse is a methodologically and empirically difficult task because of restrictions, existing in scientific sphere, and lack of grounded theoretical

and analytical works, dedicated to discourse analysis and representation of results. Hence, it leads to wide and various interpretations of empirical evidence among investigators, experts and participants of deliberative online process. The concept of deliberation, explicitly developed in the theory of communication ethics of J. Habermas is habitually considered as an everyday practice of political online discussions that emerges due to any actions and processes in the political sphere either on local, national or global levels. However, some difficulties, connecting with research methodology of online discourse, exist due to a few reasons.

First of all, the majority of virtual public sphere researches have not been materialized yet in analytical tools that would let empirically study discursive citizens' practices. In other words, the problem is that how to convert normative values of public sphere and discursive ethical theories into studying discursive processes.

Secondly, efficiency of concrete research methodology for collection of empirical data depends on its ability to take account of role of technological and constructive characteristics that allow online discourses to function. The absence of delimitation between technological and social characteristics of web spaces can lead to less reliable evidence and contradictory interpretations of discourses.

Moreover, the comprehension of discussion as a talk only about problems, not actions, means that efficiency of political participation is equal to zero because participation must be a politically motivated civil action. Such a narrow interpretation of public sphere is one of the point which does not let investigations show convincing evidence of pragmatic usefulness of online public sphere.

The majority of mass communications' investigations still focuses on audiences, addressers and recipients that cannot be adequately used for new digital communities and their discourses. In the era of e-communications mass media has lost the monopoly on public informing. The absence of innovations in researches of public Internet discussions is one of the basic reason of existing ambiguity and radically opposite views on communicative practices on Internet.

## **2 Research methodology**

Selecting the methodology of Internet discourse analysis, we decided to point out the methodology of discourse analysis, created and described by Yu. Misnikov in his PhD-thesis. The scientist has generated «deliberative standard to assess discourse quality» [5], where seven thematically different discursive parameters of the deliberative standard, corresponding to specific research issues and using for guiding the process of encoding messages of Internet discussions, are described. It is important to note that Yu. Misnikov was the first investigator to do this, since there were no direct analogues in the scientific literature at the time of his dissertations' publication. Each parameter of standard contains a set of specific empirical characteristics, intended to reflect certain discursive qualities.

The first parameter correlates with participatory equality and posting activism and contains seven characteristics: participant ID, participant username and membership status, post ID, participant post ID, post total ID and posting date. While investigating level of civil activity we have frequently come across to problem, connecting with

unequal distribution of participation in discussions. In addition, predominance of highly interactive, strongly personalized and frequently impolite features in Internet deliberations result in their weak, low and inadequate quality.

The second parameter reveals civility which is used for characterization of qualitative character of public online discussions and connected with demonstration of tolerant attitude [6]. The civility data are not easy to interpret because of lack of universal approach, letting do it. There can be some situations when messages contain polite and impolite speech aspects at the same time. As a result, it causes difficulties in post coding. Besides the usage of rude expressions that explicitly illustrate intentional incivility, some messages can only imply unpleasant under-lying theme. In some cases a response of online discussions' subjects to such posts can be a reliable indicator, reflecting all the complexity of subjective relations that are formed between participants in the process of discussion. If we speak about polite messages, they can have a special objective. For example, such comments can be addressed to certain users in more personalized manner or with emphasis on a few aspects of topic that contributes to more involving of people in deliberation

- 1) civil (this kind of messages can be expressly polite or friendly welcoming, not necessarily supportive or critical);
- 2) normal (these messages are ambivalent or neutral, can be both critical and supportive);
- 3) uncivil (these messages contain expressly rude, derogatory or unfriendly, offensive or hostile moments, not necessarily critical, can be supportive);
- 4) other (hard to qualify because there can be different types of civility).

The following parameter is validity claim-making and consensual practices that includes propositional truth (objective world), normative rightness (common intersubjective worlds), subjective truthfulness (personal worlds), agreement (acceptance, approval, praise, positive, assent), disagreement (rejection, opposition, criticism, negative, dissent). We consider one more parameter: intent of speech acts that can be directive (direct, without any dispute and choice), commissive (there can be some corrections), expressive (predominantly emotional character).

The relevant constituents of discussions are such parameters as discursive interactivity and dialogism, covering personally addressed, including use of addressed names, to authors of seed post, 2 preceding posts or 10 preceding posts; impersonally addressed posts; direct references to other participants (including quotes); explicit responses (feedback) to other messages; quotation of seed post, 2 preceding posts or 10 preceding posts.

Dialogism conceptually emphasizes on environment and its external conditions. If a communicator has a comprehension of them and knows how to find a necessary approach to other people, he will understand himself and his communicative actions much better. However, there is a complication when self-realization and self-expression are through others. Our speech acts cannot be determined as original or terminal because they all have a preliminary history and simultaneously contain a presentiment, connecting with reactions of others on what was said or written. The dialogue is a recognition of needs and interests of others through reciprocity that includes not only agreements, but oppositions and contradictions as well.

The definition of interactivity is so close to «dialogism». Interactivity is commonly thought as a key to studying of public online discourses. In fact, it is not required for participants who are involved in public dialogue to face each other personally, they can interact remotely. Therefore, it is one of advantages of interactivity. In addition, discursive interactivity can give communicators a possibility to be dialogic and cooperative with people who have equal statuses. As a consequence, this encourages other citizens to participate in online discourse. Disagreements, polemics are considered as a part of interactivity as well. There is a dispute about participants and their possibilities to be interactive. Some re-searchers claim that interactive participants are those who answer a previous message whereas others reckon that interactive participants try to give a response almost to all messages. From our personal angle, these two categories characterize participants as interactive ones, but the extent of their interactivity will differ noticeably.

Argumentation as an overriding parameter is variable and never static, it is primarily aimed at ensuring understanding between the participants in the discussions and maintaining a dialogue between them during interactions. The arguments are always important as they assist to see positions of consent and disagreement, which, in turn, can be democratic forms of public reasoning through interpersonal interaction.

The argumentation is an act of relative comprehension between communicators and mutual acknowledgement of other individuals and their points of views. Correspondingly, when commentators give arguments on the basis of reciprocity, their communication becomes more discursive. The quality of argumentation depends on relations between people who speak and listen because there is no sense when there is no constructive dialogue. The communication is considered as a relevant instrument when community reacts and gives a response to socially or politically important questions. Otherwise, a communicative act is useless and insensitive. Isolated discourses almost have no sense for being analyzed, particularly in polarized socio-political relations since their participants are not enough represented as rhetorically persuasive and dialogically adaptive [6].

Argumentation includes three directions: facts, numerical data, statistics, conclusions, comparisons, logical inferences, generalizations, examples, other evidence presented to prove or disprove opinions; references to online resources (within and outside thread, forum); references to print and broadcast media.

The final parameter is thematic diversity. The themes of discussions can be correlated with state and government, society and politics, economy, social problems, Russian regions, foreign relations (ex-USSR), foreign relations (overseas), culture and lifestyle, media and Internet.

The methodology of discursive analysis, based on the concept of Habermas and developing it (Habermas never counted results), was chosen due to some reasons [7]. First of all, we study online discourse from positions of political public relations, and a communicative aspect of discussions that we can investigate thanks to selected approach is important to us. The certain aspects of studying deliberations (argumentation, interactivity, dialogism, activity of participants, rationality, civility and etc.) aiding to describe a discussion, its members, and identify civil positions and their content were marked by scientists.

Secondly, the procedure is clear and simple, there is no problem to make use of it by Excel program. When we research users' comments from Internet debates we give a three-unit code to each comment. As a result, it assists to determine a row of posts in chronological order and their authors, and also allows to see a quantity of posts that were made by the same author. Hence, these characteristics can be used during counting a number of posts and their producers. When it is about detecting the aspects of online discussions mentioned above, there is a special method to note a position. If there is something that we aim to investigate (for example, theme, content, comment, argumentation extent and etc.), we fix a position by writing «1» in space of program Excel. If there is nothing necessary, a space in Excel is empty. Making up overall conclusions, a general quantity of registered positions is counted and significant inferences are indicated.

Thirdly, hand-operated data estimation and their coding can be brought to machine training that, undoubtedly, will accelerate and facilitate a work of researchers. However, this is not so easy. It is necessary to train a computer program to process information correctly by giving a certain number of comments. In accordance with our data, it should be at least 10000 posts for machine training. For hand-operated analysis one hundred posts in each discussion is enough.

### **3 The opportunities of artificial intelligence in studying Internet discourse**

AI (Artificial Intelligence) includes a whole range of rapidly developing technologies and processes. A special place in terms of relevance for public administration is occupied by Machine Learning. Machine Learning (ML) is usually defined as a class of AI methods that study and develop algorithms for automated pattern recognition and knowledge extraction from a huge amount of data, as well as training-based hardware systems based on the data obtained, generating predictive values and recommendations.

Machine Learning combines such disciplines as mathematical statistics, methods optimization, information retrieval, data mining etc. Research in the field of ML necessarily involves model experiments on test or real data in order to verify the relevance and quality of methods, confirm hypotheses, calculate statistical and empirical metrics, and create a criteria list that have statistical significance. According to our case it is necessary to "train" models by providing a certain number of posts, comments, and online discussions, previously marked up into categories (topics) by a group of experts or coders.

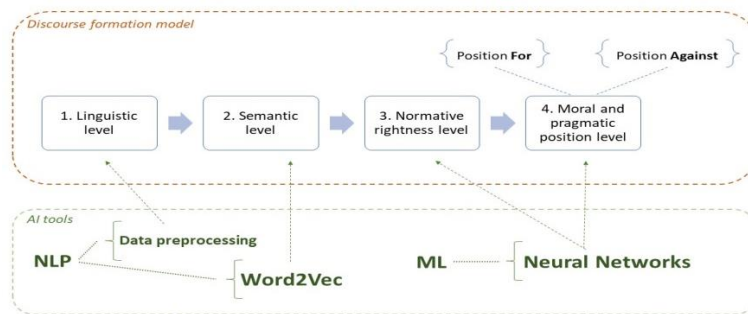
The main methods of ML are linear and logistic regression, support vector machines (SVM), decision trees, random forest, gradient boosting, neural networks, deep learning, self-organizing maps etc. [8–10].

Artificial neural networks are ones of widely used Machine Learning methods. Neural networks are considered the most effective tools for solving problems of classification, pattern recognition, predicting the behavior of complex systems. The process of creating and training a neural network is iterative, which allows us to achieve

the desired precision and configure the created model quite flexibly. Training a neural network involves a process in which the parameters of a neural network are configured through modeling the environment in which the network is embedded. There are usually three ways for doing that: supervised learning, unsupervised learning, and reinforcement learning.

Natural Language Processing (NLP) is used in combination with ML methods because it allows us to identify dialogic acts and speech, detect emotions, analyze the sentiment of text etc. By NLP methods natural language is converted into a format used by Machine Learning methods to implement and augment their own algorithms. The main methods and approaches for NLP are tokenization, stop-words list elimination, stemming, lemmatization, Named Entity Recognition, Bag-of-words model, TF-IDF function, Word2Vec and Doc2Vec technics etc. [11–15].

Conceptually usage of main AI tools for discourse formation model, which is based on theories of J. Habermas and is developed by Yu. Misnikov [16], is presented on the Fig.1.



**Fig. 1.** Discourse formation model together with AI tools

We can mention our own experiment in 2019 as an example of using ML possibilities to conduct research on Internet discourse. The experiment was related to deep learning in the text classification field. As a result, our network model learned to predict the position of participants ("for", "against" or "neutral") in discussions in relation to such a hyped socio-political topic as the Russian pension reform. An automated tool was developed for the study of Internet discourses based on recurrent neural networks with an LSTM block (RNN+LSTM). For binary classification ("for" and "against") the accuracy rate was 89%. For triple classification ("for", "against", "neutral") the accuracy rate was 78%. Gained result were quite good and that fact prompted us to continue research in that area. For the more detailed description of experiment, see [16, 17].

The made experiment showed that ML is a reliable and easy-to-use tool for analyzing the content of discussions on the Internet and understanding their intended meaning in semantic terms. Research in this area needs to continue to offer solutions for the use of AI to better understand the results of any public discussions. Many new research questions have risen. For instance:

1) Is it possible to identify the process of social construction and generation of social meanings?

2) Is it possible to generalize ordinary conversations on the Internet so that the process of forming such socio-political meanings becomes clearer?

The answers to these questions can help researchers not only to better understand the social dynamics of the modern digital society, but also to improve the quality of citizen participation in politics and create new tools to facilitate such participation.

There are also several prospects for further research:

1) The first one is to use ML and other AI technologies as research tools for encoding and analyzing parameters of the deliberative standard described in the article.

2) The second one is related to the creation of methods for recognizing parameters such as argumentation and civility. For example, the identification of argumentation and some of its types (e.g. links to sources, citations) will be based on parsing and using regular expressions to search for links using ML to improve search accuracy. The selection of civility types can be done automatically, which is quite like the sentiment analysis, but there is a slightly different approach.

3) The third one is to provide researchers with statistical analysis based on ML results with visualization elements, for example, types of civility by city and their classification on a map. The results can be displayed in a table as well as presented on a graph or on a diagram. These outcomes for instance can be helpful for the city administration that can consider citizens' opinion about some urban objects or useful for business field to know customers' feedbacks.

## Conclusions

Thus, the presented method of discourse analysis can be gradually translated into a machine (computer) format and implemented using the power of AI.

For text analysis on Internet there are a wide range of tools of Natural Language Processing methods such as Word2Vec and Doc2Vec, TF-IDF, bag-of-words, lemmatization, stemming, stop-words removing and so on. It is expected that the proposed solutions for the use of AI and ML will contribute to a deeper understanding of the results of any public discussions.

The design and prototype development of an application will also allow to arise the content analysis of public discussions to a qualitatively new level and help participants to assist in Internet discussions by smoothing out contradictions by using well-trained neural networks. Targeted on-demand discussions are assumed to be in a case when participants understand and consciously accept the role of such an application as a discussion assistant. Such an app should work on different platforms, including social networks and discussion forums.

**Acknowledgements.** This work was supported by the Russian Science Foundation, project No. 18-18-00360 "E-participation as Politics and Public Policy Dynamic Factor".



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