

# Social Stress and an Urban Planning Conflicts that Changes the Historical Appearance of Megalopolis: Social Media Data

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## Abstract

**Objectives:** the aim of this project is to elaboration of an algorithm for analyzing opinion mining and social stress on the material of social media data using the example of an urban planning conflict. **Methods:** to analyze the content of social media, a multimodal approach was used involving neural network technologies, text analysis, sentiment analysis, analysis of word associations and content analysis. **Findings:** this algorithm has shown its effectiveness. Dynamics of communication processes in the information space around the project is characterized by an escalation of the conflict between residents, builders and city authorities. Data analysis suggests about the presence of social stress and further development of the conflict as the project progresses. **Application:** the results of the study can be used in urban planning policy to timely identify conflicts between the city authorities and citizens and to prevent the growth of social tension.

**Keywords:** Social Stress, Perception, Urban Conflict, Social Media Data, Opinion Mining, Neural Network Technologies

## I. INTRODUCTION

Society reaction, and opinion mining has become one of the most active research areas in natural language processing. Social media data allowed to significantly expand the scope of application of opinion mining from business services to political campaigns [1,2,3]. The most common this subjective information is extracted from users generated content by using a combination of machine learning, natural language processing techniques, computational linguistics and information extraction [4,5]. Opinions of actors in online social media can be analyzed by textual posts, images, videos, URLs, topics, sentiments, stances, preferences, and events [6, 7, 8, 9, 10].

Meanwhile, the methods of interpreting social media data, the perception of users' speech to determine public opinion still need further improvement. In addition, the Covid 19 pandemic radically changed the life of society and caused restructuring in the research

methodology, in particular, for examination of language processing and production in a virtual environment. It is necessary to analyze how this has changed people's perception, understanding and response to the environment and interaction with each other, etc. [11].

To analyze the perception of the situation, this article uses the indices of social stress and well-being, which are calculated according to the author's method [12; 13].

Stress is understood in the interpretation of H. Selye [14]. Social well-being is examined in this article in the context of the WHO-5 Wellness Index developed by the Psychiatric Research Unit, WHO Collaborating Center for Mental Health, Frederiksborg General Hospital, DK-3400 Hillerød.

The purpose of this paper is to present an algorithm for opinion mining based on social media data using the example of an urban planning conflict that changes the historical architectural appearance of Moscow (RF).

### 1.1. Data

The material for the study was data from social networks, microblogging, blogs, instant messengers, forums, reviews, video hosting services, thematic portals, online media, print media and TV related to the construction of the Suvorovsky transport hub in Moscow (Russia). At the end of September 2019, residents of the central district of Moscow became aware of the Suvorovsky hub construction project; and this information fueled the developing conflict associated with the reconstruction of the Olimpiyskiy sports complex.

Data Collection: 1 January 2019 - 23 August 2020.

### 1.2. Method

To analyze the content of social media, a multimodal approach was used involving neural network technologies, text analysis, sentiment analysis, analysis of word associations [12] and content analysis [15; 16]

The study involved a model using neural-like elements with temporal summation of signals or corticomorphic associative memory, which made it possible to single out explicit knowledge, topics that aroused the greatest interest of actors, to study the topic structure of content and to summarization data. In addition, the neural network representation of the text made it possible to form and interpret the semantic network in the form of a set of interrelated concepts. With the help of the semantic network, implicatures and semantic accents, which are most important for the actors, were analyzed and then rated. The analysis of associative networks of relevant stimuli made it possible to draw conclusions about the perception.

### 1.2. Procedures

The study design is shown in Fig. 1.

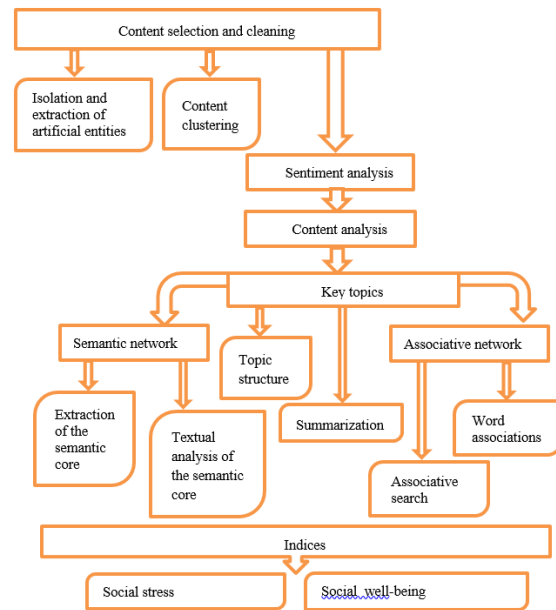


Fig. 1.

Indices of social stress and social well-being were calculated according to the algorithm Fig. 2).

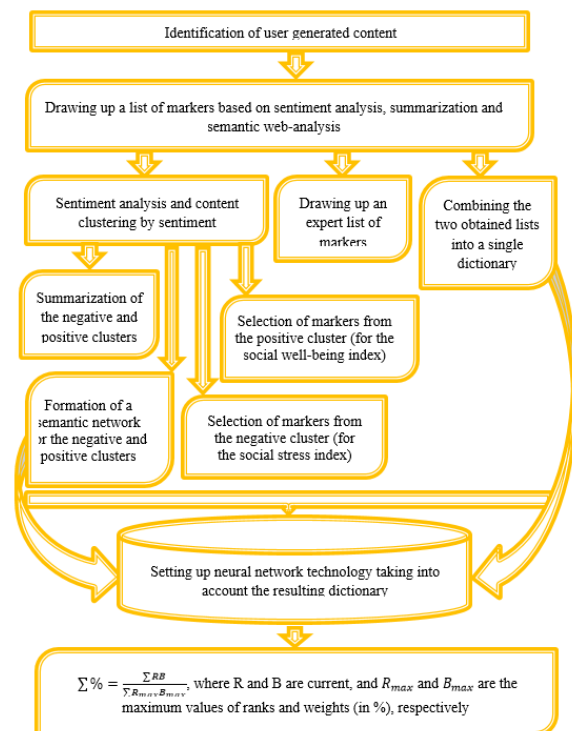


Fig. 2. Algorithm of calculating of Indices of social stress and social well-being

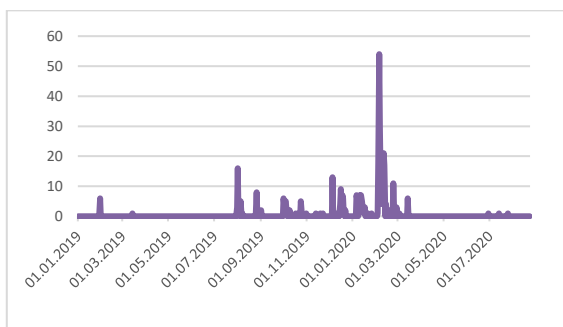
## II. RESULT

### 2.1. General description of the content

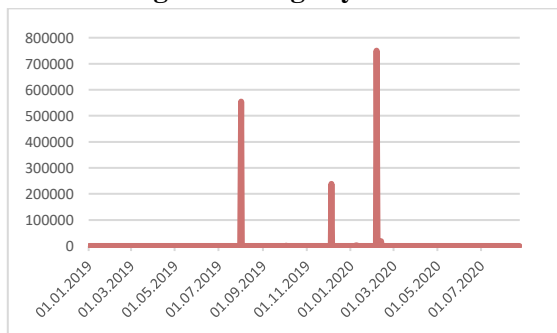
According to the data of the analyzed period, the first burst of information activity associated with the project of the Suvorovsky hub refers to January 30, 2019; it was caused by S. Sobyenin's

tweet about the resumption of the station construction. The message was actively disseminated by traditional and social media. The project of the Suvorovsky hub was considered as part of the LCL (Large Circle Line) construction.

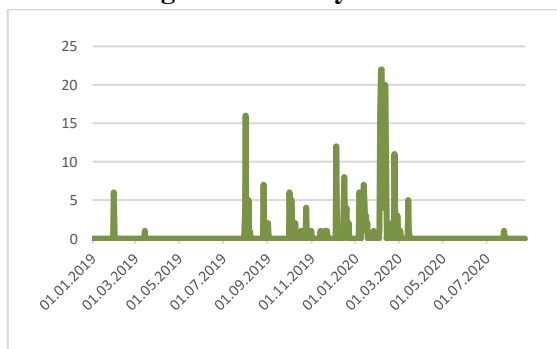
The users' interest in the project, the growth in the dynamics of message views, which determines the interest of a wide range of the public in the topic, is observed only on August 7, 2019 and can be considered as a reaction to a new burst in information activity caused by the growth of messages and the active involvement of authors from July 31, 2019. The highest peak in the activity of authors and the growth of messages was observed on February 4, 2020; the peak in the growth of views was observed since February 5, 2020 (Fig. 2, 3, 4).



**Fig. 2. Message dynamics**



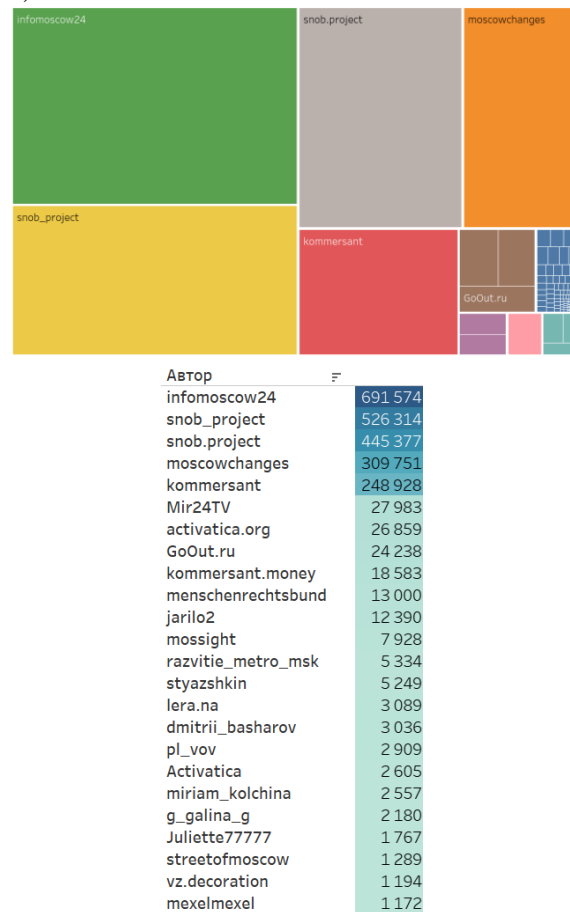
**Fig. 3. Review dynamics**



**Fig. 4. Authors' activity dynamics**

Geolocation of users shows a fairly wide range of countries: Russia, Great Britain, Armenia, Hungary, Latvia, Ukraine, Belarus, United Arab Emirates, USA, China, South Korea, Japan, Mongolia, Germany, Slovakia, France and Switzerland. It is no surprise at all that most of the actors were in Moscow. Residents of St. Petersburg, Solnechnogorsk, Yaroslavl, Kaluga, Nizhny Novgorod, Krasnogorsk, Samara, Elektrostal, Yekaterinburg, Serpukhov Neftekamsk, Salavat, Ufa, Omsk, Irkutsk and Sevastopol also showed interest in the implementation of the project.

The most active actors generating content about the Suvorovsky hub were media resources (Fig. 5).



**Fig. 5. Authors' rating**

Residents created a petition “Residents of the Meshchansky and Tverskoy districts against the construction of high-rise blocks and the Suvorovsky hub” on the portal “change.org”, addressing to the city authorities, which was signed by 2,940 users (as of June 2, 2021). The

petition is being actively disseminated through various digital platforms.

The maximum number of messages revealing various aspects of the implementation of the Suvorovsky hub project is presented in microblogs. A certain number can be found in social networks, a small number in the Internet media, on issue-related portals, messengers, blogs and forums (Fig. 6). Twitter, VKontakte and Instagram became the leaders among the digital sources preferred by the actors (Fig. 7).



Fig. 6. Types of sources used by actors



Fig. 7. Sources used by actors

However, the immediate reaction of users (likes, comments, views) is presented in social networks, which can serve as the main source in the analysis of user perception (Fig. 8).

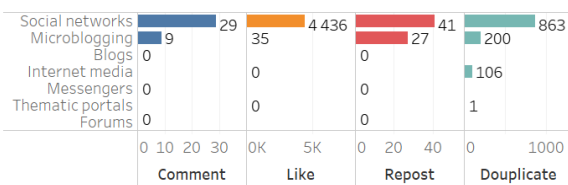


Fig. 8. Types of sources with actors' digital footprints

The most popular among authors covering the implementation of the project are Twitter and

Facebook. Discussion of the construction results also takes place in VKontakte and Instagram. The authors' rating based on the various platforms used is shown in Fig 9.



Fig. 9. Authors' rating based on various platforms used

The largest audience coverage (724 673) was observed for the official informational text headed “The design of the “Suvorovskaya” station of the Belt-line has begun” (Moscow 24 (infomoscow24)). The maximum number of “likes” (629) was also given to similar official information.

Meanwhile, the rating of the texts that received the maximum number of comments started with the text of some user with a sharply negative assessment of the project:

*My friends, things are getting complicated! We are being evicted from our area! (...)*

The post with sharp criticism of the construction also received the maximum number of reposts: *This is also possible in Moscow! The so-called reconstruction of the Olimpiyskiy sports complex in Moscow, new construction, in fact, goes on without permits (...)*

## 2.2. Topic structure and semantic network of the content

Analysis of the topic structure of the consolidated dataset and the results showed that the greatest weight of the link belongs to the following concepts: *high-rise block* (84), *Suvorovskaya Belt-line* (86), *metro stations* (80), *design* (81), *construction* (82), *district* (62), *Olimpiyskiy* (59), *city* (57), *mayor* (55), *avenue* (45). The contexts showed that when discussing the implementation of the Suvorovsky hub project, the users considered the construction of

high-rise blocks, the state of the transport system, the reconstruction of the Olimpiyskiy complex, the development of the district and the urban environment, as well as the activities of the mayor as the most vital problems.

The semantic network of the consolidated dataset demonstrates the semantic actants of issues important for residents, where dissatisfaction with the project comes to the fore, expressed as a protest that was manifested in the petition on the change.org portal, “Residents of the Meshchansky and Tverskoy districts against high-rise blocks and the construction of the Suvorovsky hub”. The link weight of the “petition” nomination in the semantic network is 99.

In the semantic core, the link weight of 99 was given to nominations designating the problems that most strongly concern residents: *construction of high-rise blocks, violations of urban planning policy, traffic restrictions, functioning of the subway, reconstruction of the Olimpiyskiy complex*.

During the discussion of the problems related to the construction of the Suvorovsky hub, residents also actively criticize the activities of the mayor S. Sobyenin (99) and the deputy mayor A. Bochkarev (99).

### 2.3. Key topics of the users’ content

#### 2.4. Negative cluster

The negative cluster consists of residents’ claims addressed to the city authorities and builders in connection with the implementation of the project:

- In the opinion of the residents, the construction of the Suvorovsky hub is necessary for the city authorities and builders only in order to build high-rise blocks. The problem of the construction of the Suvorovsky hub turns out to be closely connected in the residents’ minds with the problems of the launch site for the renovation program of the city of Moscow (Durova Street, build. 3). This is what causes the greatest fear of residents. The residents accuse the Moscow authorities of

unwillingness to eliminate problems and settle the conflict.

- The conflict between the residents and the city authorities over the Suvorovsky hub project fuels the conflict related to the reconstruction of the Olimpiyskiy sports complex (Olimpiysky Avenue, bldg. 16, blocks 1, 2, 3, 4). The construction of the Suvorovsky hub and the demolition of the Olimpiyskiy sports complex are perceived as a single problem.
- Increase in height and increase in building density, hence, a sharp deterioration in the standard of living for the residents of the area.
- The project damages natural park areas, leads to a deterioration of the ecological situation.
- Engineering capacities are not taken into account, which will lead to the need to re-lay existing service lines.
- In the opinion of the residents, the design parameters of the Suvorovsky hub have significant drawbacks, such as the traffic situation of the adjacent districts that has not been taken into account; thus, during the construction there will be serious traffic restrictions, and after its completion there will be a traffic collapse of the district.
- As a result of the project, Meshchansky district will completely lose its historical appearance.
- Insufficient study of technical aspects of the construction.
- Violations in the execution of legal and construction documentation.
- Manipulation and deception in public hearings.
- The planned parking lot for 5,000 cars will significantly worsen the transport and environmental situation in the area.

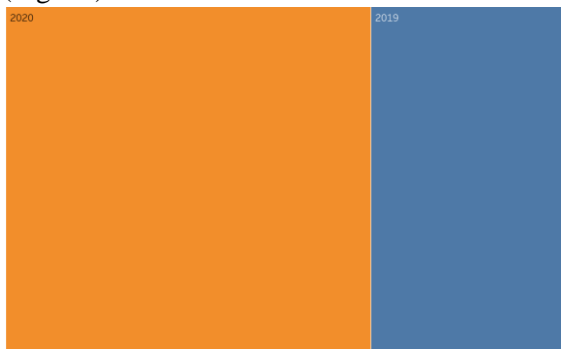
#### 2.4.1. Positive cluster

The positive attitude characterizes mainly the official materials describing the progress of the line construction, the pace of construction and the advanced methods used by the builders. As a

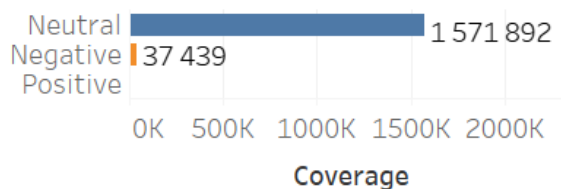
positive moment, the engaged actors provide information about the renewal of the old project for the development of the transport system of the city, about the improvement of the infrastructure in the district, as well as the fact that complex engineering problems will be solved during the construction of the Suvorovsky hub.

**2.5. Formation of a rating of social stress around the implementation of the Suvorovsky hub project**

During the analyzed period, one can note a significant increase in messages dedicated to the implementation of the Suvorovsky hub project (Fig. 10).



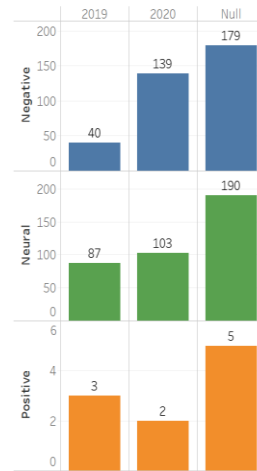
**Fig. 10. Increasing number of messages dedicated to the implementation of the Suvorovsky hub project**



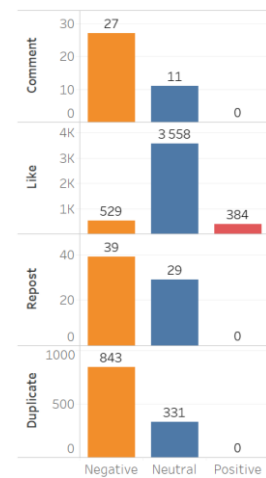
**Fig. 11. Coverage sentiment**

In the consolidated database on audience coverage, a neutral cluster predominates (Fig. 11). However, it should be borne in mind that a significant number of neutral and positive references are determined by the increase in the number of official materials. Meanwhile, the dynamics of the sentiment of messages dedicated to the construction of the Suvorovsky hub demonstrates an increase in negative messages and a decrease in positive references in 2019-2020 (Fig. 12). The rating of digital footprints by

sentiment also shows the predominance of negative comments, duplicates and reposts (Fig. 13). This situation characterizes the growth of the negative attitude of users to the problem.



**Fig. 12. Dynamics of references with various sentiment types**



**Fig.13. Dynamics of the actors' digital footprints with various sentiment types**

**2.6. Revealing the presence/absence of social stress in the area of the Suvorovsky hub construction**

The presence/absence of social stress in the area of the Suvorovsky hub construction using digital data was revealed using neural network technologies according to the method described in [12; 13].

The specificity of this object lies in the fact that it is a local conflict that affects the interests of the residents of the central district. Since the conflict is geographically limited, activists have a chance to meet frequently and discuss problems personally.

This situation does not cause sympathy in a large number of users, since the problems of prosperous residents of the Meshchansky and Tverskoy districts do not affect residents of remote dormitory districts or New Moscow.

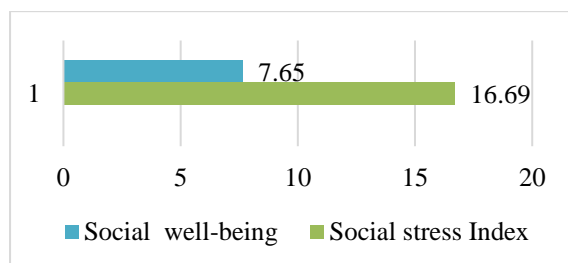
The core of the minimal tree-like subgraph of the original associative network built on the vertex corresponding to the stimulus "Suvorovsky hub", has a weight of 10/551 according to the negative cluster. The petition on the portal "change.org", which clearly formulates the

claims of the residents to the city authorities and builders, comes into focus (Fig. 14).



**Fig. 14. Associative network of the stimulus “Suvorovsky hub” (10/551)**

The presence of social stress in the area of the Suvorovsky hub construction is also complicated by the general low level of public confidence in the authorities and the media. The social well-being index is determined by a large volume of biased content that expresses the official point of view of builders and city authorities, while, on the contrary, it causes a negative attitude of the other party of the conflict (Fig. 15).



**Fig. 15. Social stress and social well-being indices**

### III. CONCLUSION

Of this paper is to present an algorithm for opinion mining based on social media data using the example of an urban planning conflict that changes the historical architectural appearance of Moscow.

Analysis of the data showed that most of the content related to the Suvorovsky hub construction is from official authorities. Posts in social media are mostly reposts and rewrites of official messages and information from biased resources and do not cause a positive reaction from the residents of the district.

The maximum number of messages revealing various aspects of the implementation of the Suvorovsky hub project is presented in microblogs, a certain number can be found in social networks, a small number in the Internet media, on issue-related portals, messengers, blogs and forums. Meanwhile, the immediate reactions of users (likes, comments, views) are presented on social networks.

The result of the data analysis showed the presence of an average level of social stress with a coefficient of 16.69 and a low level of the social well-being index with a coefficient of 7.65.

The dynamics of communication processes in the information space around the implementation of the Suvorovsky hub project is characterized by an escalation of the conflict between the residents, builders and city authorities. Data analysis suggests further development of the conflict as the project progresses. During the analyzed period, a significant increase in the number of messages dedicated to the implementation of the Suvorovsky hub project can be observed. Moreover, the analysis of the content sentiment shows an increase in negative messages and a decrease in positive references. The increase in neutral references is determined by the increase in the number of official materials generated by biased media resources, the content of which causes an ambiguous, often disapproving attitude of the residents. This situation characterizes the negative perception of the events by users and the escalation of the conflict.

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