a) Matching using the maximum of the matching function.
b) Comparison using the reconstructed maximum at the center of mass of the window.
The number of errors decreased from 26% to 4%.
Uncompensated geometric distortions include all spatial transformations that are not taken into account in the matching process. They may arise from uncertainties in the observation process or from inaccuracy in the observation model. The first group includes unaccounted nonlinearities of the optical system, deviation of the line of sight from the normal to the observation plane, etc. The second group includes the loss of some parameters from the search process due to the assumption of their immutability, errors in parameter sampling, and others. Most of these errors normally distributed around the design parameters.

Conclusion

The problem of self-organization of robust, neuro-fuzzy and adaptive control algorithms in intelligent systems to achieve the goal. The differential-model concept in the taxonomy of the macrophysics knowledge base for intelligent systems and the structural-algorithmic model of intelligent systems and its application in control problems are also considered. Parallel algorithms for information processing and control, including multitransputer information technologies, are studied. The application of intelligent systems in problems of computer vision, speech signal recognition, etc. considered as applied problems.

References

[1] Pupkov K.A. Intelligent systems: problems of theory and practice// Izv. universities Ser. Instrumentation. 1994. No. 9-10.P. 3-5.

[2] Japanese promising R&D in the field of computer technology and artificial intelligence // Collection. materials. Compiled by A.S. Narignani, I.E. Shvetsov. Moscow /Novosibirsk, 1993.

[3] Pupkov K.A. Dynamic expert systems in management // Izv. universities Ser. Instrumentation. - No. 8-9. 1996. P. 39-50.

[4] Ziemke T. Adaptive behavior in autonomous agents. Dec. 1998. – Vol. 7. – № 6. – P. 564- 587. MIT Press, Journal Paper.

[5] Freeman R.A., Kristic M., Kokotocvic P.V. Robustness of adaptive nonlinear control to bounded uncertainties, Automatica. – V. 34. – P. 1227-1230, 1998.

ARTIFICIAL INTELLIGENCE AND ALGORITHMIC SOLUTIONS IN THE SOCIAL SPHERE

Sevda Salmanova

Abstract

In the last decade, the diffusion of digital innovations in the social group of young people has occurred at an accelerated pace. The article denotes an analysis of the attitude of young people to the idea of applying social ratings as one of the areas of application of artificial intelligence (AI) and algorithmic management practices in the social sphere. The empirical object of analysis was representatives of student youth in three countries. More than half of respondents in all regions indicated that the impact of AI technologies on people's lives will have both positive and negative consequences. An analysis of the model situation—the possibility of widespread use of social ratings—records that about a third of respondents in all regions supported this idea. In the capital, most respondents did not approve of the idea of introducing social rating algorithms, while in other regions most respondents found it difficult to

assess this issue. There is a significant rise in the level of support and perceptions of assessments of social rating algorithms as far as one moves away from the capital. The general digital advancement of some regions is accompanied by advancement in the explanations about the ambiguous social consequences of the use of AI and algorithmic solutions. It leads to greater caution among respondents in assessing the prospects of these technologies. The results of multivariate statistical analysis show that the differentiation of support/non-support for the idea of widespread application of social ratings is associated with general attitudes towards new technologies, features of digital media consumption, value orientations, and certain characteristics of social demographics.
Keywords: youth, digitalization, artificial intelligence, algorithmic control, innovation, social rating system, digital profile

Introduction

A distinctive feature of the digital technological order is the widespread use of artificial intelligence (AI) technologies. These technologies perform complex tasks that inherently require human-level intelligence. A feature of the Internet infrastructure as a "natural" environment of modern life is its transparency and the presence of digital traces of users. The application of machine learning methods to this big data has made it possible to create effective algorithmic solutions in those areas that were previously the exclusive prerogative of humans. [1] This has raised the issue of the relationship between algorithms and society. To designate the new quality that various aspects of life and social relationships acquire under these conditions, the concept of "algorithmic society" began to be used [2; 3]. It positively noted that the application of the capabilities of machine processing of big data to identify patterns and prepare effective algorithmic solutions to find their practical application in a variety of fields [4]. These are defense and environmental protection and safety, economics and consumer treatment, and the social sphere. The advantages of algorithmic solutions include independence from the human factor, reliability, high performance, and cost-effectiveness.

In several publications, authors draw attention to the ambiguous social consequences associated with the widespread use of algorithmizing and AI technologies [5; 6; 10]. It is important to consider that practical applications of algorithmic solutions are associated with the automatic determination of status, responsibilities, and rights to services; assessments of probabilities and risks in the distribution of access to resources; and generating data about target groups to influence their future behavior. Discussions about the social consequences of algorithmic decisions raise questions about the lack of transparency of algorithms; their violation of confidentiality and protection of personal data; the algorithms reflect the interests of developers and other interested parties. The use of algorithms for social control raises the issue of the need to correlate technological innovations with respect for the interests of society and the rights of citizens [7].

Algorithmic control entices the use of data of different natures and reflects the trend towards universal metrization and measurement of various aspects of social life. The growth of measurement systems is a marker of neoliberal rationality - metrization is a component of inclusive competition. More broadly, the pervasive use of metrics relates to the theme of politics and power – the desire to measure, differentiate, and evaluate. At the same time, power metrics turn out to be rooted in a wide variety of feedback loops – infrastructural, organizational, corporate, governmental, etc. [8]. Digital profiles of users are formed by assigning scores to them in five categories: personal information, solvency, credit history, social networks, and behavior. Based on algorithmic assessments, the system generates several categories of creditworthiness. This or that type of individual's actions can increase (or decrease) the rating, which is linked to the use of social benefits, career advancement, etc. [9].

Algorithmic management practices are largely related to political-economic relations and socio-cultural characteristics of society. The assessment of S. Zuboff, the author of the fundamental work “The Age of Surveillance Capitalism”, one of the most famous critics of the negative social consequences of the activities of algorithmic platforms, is indicative. In her opinion, the Chinese project of a social rating system should be understood as the result of instrumental power, based on public and private data sources, and controlled by an authoritarian state. However, despite all the differences between the Chinese and Western political and cultural traditions, the social rating system or its elements convey the general logic of surveillance capitalism and instrumental power. “With every action, Chinese users are digitized, classified, and queued for forecasting, and the same thing happens to us. We are rated by Uber, eBay, Facebook, and many other web companies, and these are only the ratings that we see" [10]. Let us add that collecting data from social networks to form credit ratings of borrowers is a regular practice in many countries of the world, including our country. Another illustrative example is the introduction of personal trajectories in education, also built in the logic of algorithmic decisions and ratings, which is planned.

In recent years, the world's scientific and applied practice has accumulated experience in empirical research devoted to special issues of perception of algorithmic decision practices. Based on a nationwide sample of the Netherlands, ideas about the usefulness, fairness, and risk of algorithmic solutions for the fields of media, health, law, the influence of social demographics, and other factors in this regard were determined [11]. Based on a series of online experiments, management researchers showed that when resolving situations that require significant human involvement, perceptions of a lack of intuition and subjective ability to make judgments contributed to a decrease in assessments of the fairness and reliability of algorithmic decisions [12]. Based on the tasks of ensuring a balance between technological innovation and public interests, the role of user ratings of media recommendation algorithms was studied according to the criteria of fairness, responsibility, transparency, and explainability [13].

Social ratings. As part of an international comparative study conducted in 2020, the level of awareness of the social rating system was determined. The proportion of respondents who indicated that they had heard of this system was highest in Asian countries (71% in China), while awareness of it was lowest in Austria and Germany - 13% 2. According to data representative of well-developed countries and populations, respondents’ ideas about how the introduction of social ratings in our country would affect the quality of their life were as follows: developed - 27%, worsened - 42%, found it difficult to answer - 31%3. A similar structure of assessments was demonstrated by a study of perceptions of social rating practices in China [14].

The introduction of AI technologies and algorithmic solutions, being innovative processes, affect social groups in society in different ways. In this regard, the focus of our attention was on representatives of student youth as a group of advanced behavior about new technologies.

The introduction of AI technologies and algorithmic solutions, being innovative processes, affect social groups in society in different ways. In this regard, the focus of our attention was on representatives of student youth as a group of advanced behavior about new technologies. The following research questions were posed in the work:

1. What is the level of awareness among young people about AI technologies and the prevalence of their use in everyday life?
2. What is the attitude towards the possible use of social ratings because of algorithmic decisions that determine individuals’ access to various social benefits?

3. Are there variables in the space of the empirical indicators being studied that maximally differentiate respondents in terms of their acceptance/non-acceptance of the prospects for the widespread use of algorithmic solutions?

The nature of assessments of the prospects of certain phenomena also largely depends on the characteristics of the social environment in which individuals find themselves [15, p. 48–58]. The formation of quantitative research tools was preceded by qualitative procedures (interviews) that cleared out the specifics of the target audience's interpretation of the concept of AI, as well as ideas about social ratings. On this basis, to provide a unified system for correlating participants in a quantitative study, the study of ideas about using social rating algorithms was carried out by assessing a hypothetical situation in which the respondent is faced with using new technology in social practice.

Table 1 Awareness and practices of using AI technologies in everyday life, %

Variations			
To what extent are you aware of artificial intelligence technologies?			
I'm aware off	27,1	21,5	12,0
I am aware of a bit	65,2	56,1	50,9
I have heard	5,8	7,8	13,7
I'm not aware of it	0,6	5,5	10,1
Complicated	1,3	9,1	13,3
All	100,0	100,0	100,0
Have you used any of the following artificial intelligence technologies in your daily life?			
Voice assistants for mobile phones (Alice, Google Assistant, Siri, etc.)	81,3	77,1	73,7
Home voice assistants (Alice, Marusya, Alexa, Google, etc.)	41,3	30,2	30,1
Smart home devices (automation systems for household devices, for example, smart air conditioning, smart vacuum cleaner, etc.)	27,1	16,1	11,4
Voice-activated remote control (universal voice remotes for controlling household devices)	21,9	17,1	13,3
Automatic online transfer systems	63,2	45,5	28,4
Was not applied	9,0	13,8	17,7

Attitudes towards the prospects for using social rating algorithms. The research on the question of attitudes toward the available prospects for the widespread use of social ratings relates to the study of expected changes in the lifestyle of a modern person. In this regard, the methodology included a description of a possible promising situation, which then asked to evaluate the research participant: "Please guess about the following situation.Many companies have developed automated programs that collect information from various sources about the behavior and personal characteristics of people, such as their online habits or the products and services they use. These programs then assign people automatic scores that help companies decide whether to offer them loans, special offers, or other services. In some countries, based on an analysis of people's behavior, algorithmic programs can assign people a rating (social rating), which affects access to certain social benefits."

The presence of the above description was intended to be conditional on transferring the research participant into an albeit promising, but quite real situation, which, in turn, was a condition for obtaining specific and interpretable assessments. After this, respondents asked to express their attitude to various aspects of the possible implementation of the results of such social rating algorithm programs.
The level of support for the introduction of social ratings ranged from 37–28% in individual regions. According from the data presented, most respondents in the world did not express an opinion on this issue (40 and 42%, respectively). Those surveyed in Belgium were more definite, where 23% found it difficult to answer. It is characteristic that Belgium turned out to be a leader compared to other regions in the share of those who were not in favor of such initiatives (48%).
Is there a relationship between supporting the widespread use of social rating algorithms and viewing the ratings produced by these algorithms as fair? Let us consider that here the differences in the values of the variables were recorded using ordinal scales. In this situation, an adequate way to answer the question posed is a one-way Kruskal-Walli's analysis of variance. A model of the influence of the grouping variable was tested - supporting the idea of using social ratings on perceptions of the fairness of assessments that will be obtained using this technology 1. Table 53shows data on the number of respondents belonging to each gradation of the grouping variable and the average rank of the analyzed variable in each of the groups. The table also shows the results of testing the statistical hypothesis that the average ranks in each of the compared groups are equal. This hypothesis is equivalent to the assumption that there is no influence of the grouping variable on the analyzed variable.

Table 3. Testing a model for linking support for the idea of widespread use of social ratings with consideration of their assessments as fair

Grouping variable – support for the idea of widespread use of social ratings		№	Average Rank	Test statistics	
Belgium					
Fairness of ratings constructed using social rating algorithms	Not supported	148	110,55	Chi-square	81,6
	Neutral	70	168,27	Significance	0,000
	Supported	86	211,85		
Fairness of ratings constructed using social rating algorithms	Not supported	507	558,25	Chi – square	659,4
	neutral	740	847,27	Significance	0,000
	Supported	606	1332,87		
Fairness of ratings constructed using social rating algorithms	Not supported	106	194,66	Chi – square	121,0
	Neutral	215	206,53	Significance	0,000
	Supported	188	344,45		

In terms of content, we see that in all regions the grouping variable has a significance level (0.000) about the idea of the fairness of assessments constructed using social rating algorithms. This gives grounds to reject the original hypothesis of no influence. The data in Table 5 allows us to trace the nature of this dependence. Let us recall that the variables under study have a certain order. Accordingly, the average

rank of perceptions about the fairness of social ratings was lowest in the group of those who did not support the introduction of social ratings (and vice versa). In other words, a higher level of support for social ratings is associated with ideas about the fairness of the ratings that this technology offers.

The study examined the question of what circumstances are most significant in terms of differentiating respondents in terms of their support (or not) for the idea of widespread use of social rating algorithms. For this purpose, statistical procedures of discriminant analysis and logistic regression consistently applied.

The capabilities of discriminant analysis involve, among other things, identifying differences between a priori specified groups of objects in several variables simultaneously [16]. Concerning our study, the grouping variable was the dichotomized variable of support for the idea of widespread use of social ratings. The discriminant variables that were used to search for differences between the components of the grouping (dependent) variable were indicators of the content blocks of the research tools.

Table 4. Standardized canonical discriminant function coefficients.

Variables	Functions	Variables	Functions
Attitudes towards new technologies		Socio-demographic characteristics	
Index of inclusion in the new digital technological environment	0,467	Male	-0,298
Inclusion in the field of AI		Shared values	
Level of awareness of AI technologies	0,235	Independence (independence in judgments, assessments)	0,358
Using AI technologies in everyday life (voice assistants)	0,377	Patriotism (love for the Motherland, well-being of the country and its people)	-0,402
Duration of media consumption		Career (personal success, public recognition, respect from others)	0,271
The average daily duration of use of the social network Instagram	0,341	Creativity (opportunity for creative activity)	-0,278

The test for the significance of differences in the average values of the discriminant function fixes the value of the “Significance” indicator equal to 0.000, which indicates the significance of the differences in the average values1. The differentiation of respondents in connection with support/avoidance of the widespread use of social ratings is associated with indicators characterizing various aspects of people’s lives. These include respondents’ attitudes towards new technologies; involvement in the field of AI; duration of media consumption; value orientations; and social demography. See Table 6 for details.

To determine which variables and with what weight influence the dependent variable, regression analysis was used. A logistic regression procedure was used to determine the contribution of independent variables (predictors) to increasing the likelihood that an individual will support the idea of using social ratings. The logistic regression results are shown in Table 7.

From the entire list of analyzed variables, only those predictors that turn out to be statistically significant are presented. For each predictor, the coefficient "B" is given. The larger the B value, the greater the likelihood of the predictor influencing the dependent variable.

Table 7 Regression model – predictors of support for widespread use of social rating algorithms

Predictors	B	Exp (B)	valid	Significance
Attitudes towards new technologies				
Generalized Orientation Index	0,489	1,63	26,309	0,000
Inclusion in the field of AI				
Informative	0,212	1,236	5,808	0,016
Mobile voice assistant practices	0,674	1,963	15,407	0,000
Media consumption per day				
Instagram	0,146	1,157	8,93	0,003
Ценностные представления				
Career	0,339	1,404	6,786	0,009
Independence	0,376	1,457	7,105	0,008
Patriotism	-0,363	0,696	12,309	0,000
creation	-0,339	0,712	7,111	0,008
Socio-demographic characteristics				
Sex : male	-0,455	0,635	11,217	0,001
Constant	-1,585	0,205	9,685	0,002
Nagelkerk R-square	0,139			

The indicators of the accuracy of the model's prediction calculated during the logistic analysis procedure indicate its satisfactory quality. The overall accuracy of the prediction is 63.6%. At the same time, the model correctly predicts the fact of support for the widespread use of social rating algorithms in 71.1% of cases and the fact of non-supporting – in 54.5% of cases.

In connection with the results of the regression model and the obtained coefficient values, let us pay attention to several points. The greatest predictive power in the model is those associated with the use of AI technologies (mobile voice assistants) in everyday practice and the general attitudes of respondents towards new technologies. If respondents have these characteristics, the likelihood of supporting the use of social rating algorithms increases by 64 and 48%, respectively, compared to those who do not have such characteristics. The predictor related to social demography has a high value - the probability of supporting the idea of social ratings is 45% higher among men than among women.

The role of predictors that reflect individual components of value consciousness turns out to be significant (within the framework of this model). Thus, among respondents focused on such a value as independence, that is, independence in assessments and judgments, the likelihood of supporting widespread use of social rating algorithms is 37% higher compared to those who do not share this value. The model also reflects that high orientation toward career achievements also increases the likelihood of supporting the idea of using social ratings (by 33%). Support for social ratings is more likely to be found in those who do not share the values of patriotism (by 36%) and do not consider the possibility of creative activity among the values that are significant to them (by 33%). The role of the duration of daily media

consumption has also been recorded. At the same time, the value of coefficient B turns out to be relatively low here compared to other predictors. In this regard, we can say that among respondents with high consumption of the social network Instagram, there may be slightly greater support for social ratings (by 14%).

Conclusion

The study showed that the level of awareness among students about AI technologies is relatively low. Most respondents—from half to two-thirds in the study regions—indicated that they know about this phenomenon, "but not much." For most respondents, mastering the practical applications of AI technologies occurs in the field of digital communications and various services that used in everyday life. The most common in this regard is the use of voice assistants on smartphones. Support for social ratings is inherent in respondents who have a high generalized index of inclusion in digital technologies, which implies a higher (than others) level of awareness, active consumer behavior in this area, etc. It can be assumed that those who support the implementation of social rating algorithms in one way or another relate to those social segments in which the diffusion of innovations begins to spread earlier than in other groups. The ambiguous assessment of the prospects for the introduction of social ratings, and the interpretation of the algorithmic decisions made in this case by a significant proportion of respondents as unfair indicates the need for informed decisions in this area. This is especially true since the level of awareness about AI technologies among young people in general turns out to be low. Support for the idea of social ratings is associated with manifestations of life activity that reflect the general involvement of young people in digital practices.

References

[1] Encyclopedia of epistemology and philosophy of science. M.: Kanon+. 2009. 1247 p. ISBN 978-5-88373-089-3. EDN SAAGNR.

[2] Burrell J., Fourcade M. The Society of Algorithms // Annual Review of Sociology. 2021. Vol. 47. P. 213–237. DOI 10.1146/annurev-soc-090820-020800.

[3] Walorska A. M. The Algorithmic Society // Redesigning Organizations. Concepts for the Connected Society / D. Feldner (ed.). Cham: Springer Nature Switzerland AG, 2020, pp. 149–160. ISBN 978-3-030-27956-1. DOI 10.1007/978-3-030-27957-8_11.

[4] Kissinger G., Schmidt E., Huttenlocker D. Artificial intelligence and the new era of humanity. M.: Alpina PRO, 2022. 200 p. ISBN 978-5-907534-65-0.

[5] IT Press, 2006. 288 p. ISBN 0-262-07247-5.

[6] Pasquale F. The Black Box Society. The Secret Algorithms That Control Money and Information. Cambridge, MA: Harvard Univ. Press, 2015. 311 p. ISBN 978-0-674-36827-9.

[7] The Algorithmic Society. Technology, Power, and Knowledge / Eds. M. Schuilenburg, R. Peeters. London: Routledge, 2022. 214 p. DOI 10.4324/9780429261404.

[8] Beer D. Metric Power. London: Palgrave Macmillan, 2016. 236 p. ISBN 978- 1137556486.

[9] Leibkuechle P. Trust in the Digital Age – The Case of the Chinese Social Credit System // Redesigning Organizations. Concepts for the Connected Society / 27957-8_21.

[10] Zuboff S. The era of supervisory capitalism. The battle for the human future on new frontiers of power. M.: Gaidar Institute Publishing House, 2022. 781 p. ISBN 978-5-93255-613-9.

[11] In AI we trust? Perceptions about automated decision-making by artificial intelligence / T. Araujo, N. Helberger, S. Kruikemeier, C. H. de Vreese // AI & Society. 2020. Vol. 35, No. 3. P. 611–623. DOI 10.1007/s00146-019-00931-w. EDN EEIWSR.

[12] Lee M. K. Understanding perception of algorithmic decisions: Fairness, trust, and emotion in response to algorithmic management // Big Data & Society. 2018. No. 1. P. 1–16. DOI 10.1177/2053951718756684.

[13] Shin D. User Perceptions of Algorithmic Decisions in the Personalized AI System: Perceptual Evaluation of Fairness, Accountability, Transparency, and Explainability // Journal of Broadcasting & Electronic Media. 2020. Vol. 64, no. 4.
[14] Ruvinsky R. Z., Ruvinskaya E. A., Komarova T. D. Public perception of digital profiling and social rating practices: the situation in Russia and China // Sociodynamics. 2021. No. 12. pp. 56–76. DOI 10.25136/2409- 7144.2021.12.36824. EDN GGVZLL.

APPLICATION OF DRONES IN SECURITY AND RESCUE OPERATIONS

Guliyeva Sevinc
Gadirov Aykhan
Azerbaijan State Oil and Industry University

Abstract
It is known that the fields of application of drones are wide. One of these application areas, security and search and rescue, is one of the main areas where the surveillance capabilities of drones are applied. Thermal and acoustic sensors are important tools as the main parts of drones applied in these areas. With their help, it is possible to find people who remain in extremely difficult areas - disaster zones. Which is one of the main purposes of drones.In the article, the areas of application of drones and the application of drones in security and search and rescue operations were considered. Thermal and acoustic sensors, which are their main parts, and some models are mentioned.
Keywords*:* Drones, Security, Search and Rescue, Thermo Sensors, Acoustic Sensors

Introduction
In terms of areas of application, the sphere of use of drones is quite wide. Although they are mainly used for similar purposes, the use of drones in each field has its own characteristics.
The fields of application of drones have expanded even more recently.

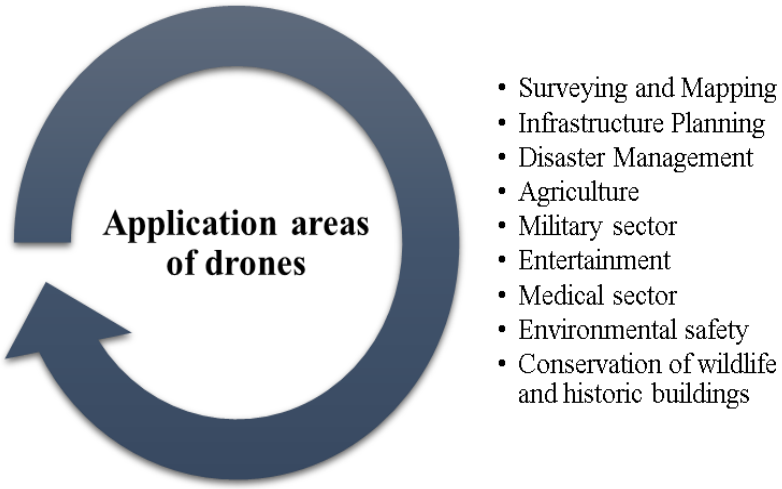

Figure 1. Application areas of drones

Let's take a look at some of the main application areas:

- Agriculture – Drones are used in agriculture for soil and field analysis, crop monitoring, plantation, livestock management, crop health check, plant growth monitoring, weather forecasting, moisture, dryness, etc., etc. [1]