



3rd International Conference
**Modelling and Simulation of
Social-Behavioural Phenomena in
Creative Societies
(MSBC-2024)**

Programme and Abstracts



TURAN UNIVERSITY



THE ASSOCIATION OF
EUROPEAN OPERATIONAL
RESEARCH SOCIETIES



ETHICS
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September 18-20, 2024
Almaty, Kazakhstan

The 3rd International Conference, **MODELING AND SIMULATION OF SOCIAL-BEHAVIORAL PHENOMENA IN CREATIVE SOCIETIES** (September 18-20, 2024, Almaty, Kazakhstan).

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Organized by

Turan University, Kazakhstan
European Association of OR Societies (EURO)
EURO Working Group on Ethics and OR
EURO Working Group on Operations Research for Development
Lithuanian Operational Research Society (LitORS)

In cooperation with

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Programme of Plenary and Contributed Sessions MSBC-2024
Turan University, Almaty, Kazakhstan

September 18, 2024

207 room

Time	Session	Chair(s)	Author(s) (presenter underlined, * – online)	Presentation
09:00 – 10:00	Registration			
10:00 – 10:10	OPENING: Chair Leonidas Sakalauskas Welcome speech by the Rector of Turan University: Rakhman Alshanov			
10:10 – 10:25	Plenary Session	Dina Razakova	Leonidas Sakalauskas	FROM THE TRAGEDY OF THE COMMONS AND IMPOSSIBILITY THEOREMS TO CONSENSUS
10:25 – 10:40			Amandyk Tuleshov	ORGANIZING RESEARCH BEHAVIOR OF EXECUTORS IN AN INTERDISCIPLINARY PROJECT ON DIGITALIZATION OF PRODUCTION
10:40 – 10:55			George Kleiner	SYSTEM ECONOMY AS A PLATFORM FOR ANALYSIS AND MODELING OF SOCIAL DEVELOPMENT
10:55 – 11:10			Maksat Kalimoldayev	DEVELOPMENT OF MATHEMATICAL MODELS AND ALGORITHMS FOR CREATING A SOFTWARE PACKAGE FOR STABILIZING COMPLEX ELECTRIC POWER SYSTEMS
11:10 – 11:25			Alexey Tsekhovoy	MODELING AGILE TEAMS IN KNOWLEDGE-ORIENTED ORGANIZATIONS: BEHAVIORAL PHENOMENA AND COGNITIVE COMPLEMENTARITY
11:25 – 11:55	Coffee Break			
11:55 – 12:45	Navigating Challenges: Economic Growth, Mental Health, and Technological Advancements in Kazakhstan (Turan University Session)	Laura Baitenova	Alibek Adalbek, <u>Seyit Kerimkhulle*</u> , Laura Baitenova, Mafura Uandykova	USING INTELLIGENT COMPUTABLE MODEL TO CLASSIFY ECONOMIC GROWTH BY KAZAKHSTAN STATISTICS
			<u>Zhanar Sagindikova</u> , Madyar Rsaev	STUDYING THE PHENOMENON OF “MENTAL TERRORISM” IN KAZAKHSTAN SOCIETY
			Sabit Rashev	USING OF ARTIFICIAL INTELLIGENCE IN TECHNOLOGICAL PROCESSES OF THE MINING AND METALLURGICAL INDUSTRY
			<u>Mukhamejanov Serzhan*</u> , Mukhamejanova Gulnar	USING ARTIFICIAL INTELLIGENCE TO OPTIMIZE BUSINESS PROCESSES: ANALYSIS AND PROSPECTS
12:45 – 14:00	Lunch			
14:00 – 15:30	System-Based Modeling and Space-Time Analysis in Economics	George Kleiner, Maxim Rybachuk	Vladimir Maltsev, <u>Olga Pyrkina*</u> , Andrei Yudanov	MODEL OF AN ENCAPSULATED KNOWLEDGE APPLICATION IN FIRM ENTREPRENEURIAL BUSINESS: FINITE STATE MACHINE WITH CONTROLLING ACTION OF ENTREPRENEUR
			Vytautas Dulskis	EFFICIENT ONLINE ESTIMATION OF DYNAMIC STRUCTURAL EQUATION MODELS: CONJECTURING ON FEASIBILITY
			Dorien DeTombe*	CLIMATE CHANGE, A SOCIETAL COMPLEX PROBLEM

			Maxim Rybachuk	ECONOMIC AGENTS AND SOCIAL INSTITUTIONS: A BEHAVIORAL INTERACTION MODEL
			Jakutis Mindaugas*	ETHNIC NATION INDEX
15:30 – 16:00	Coffee Break			
16:00 – 17:30	Game-theoretic Models of Social Processes (Part I)	Vladimir Mazalov, Suriya Kumacheva	Denis Kuzyutin, <u>Nadezhda Smirnova</u>	ON MULTI-OBJECTIVE GAME-THEORETIC MODELS WITH ASYMMETRIC PLAYERS
			<u>Guennady Ougolnitsky</u> , Olga Gorbaneva	INVESTMENT STRATEGIES AND PRIVATE INTERESTS IN THE HIERARCHICAL MANAGEMENT SYSTEMS
			Leon Petrosyan, <u>Yaroslavna Pankratova</u>	THE TIME INCONSISTENCY OF COMMUNICATION STRUCTURES IN DYNAMIC COOPERATIVE NETWORK GAMES
			Aleksandra Grinikh*	THE NEW APPROACH FOR N-PERSON PRISONER'S DILEMMA ON A HYPERGRAPH
17:30 – 19:00	Welcome Party			

September 19, 2024

207 room

Time	Session	Chair(s)	Author(s) (presenter underlined)	Presentation
08:30 – 9:00	Registration			
09:00 – 10:50	Invited Lecture	Leonidas Sakalauskas	Nilufar Abdurakhmononova	PARATRANSLATOR-UZBEK PARALLEL CORPUS: APPROACHES, CHALLENGES AND SOLUTIONS
			Cathal McSwiney Brugha	A META-SYSTEM FOR CONFLICT RESOLUTION
10:50 – 11:20	Coffee Break			
11:20 – 13:00	Game-theoretic Models of Social Processes (Part II)	Vladimir Mazalov, Suriya Kumacheva	<u>Vladislav Taynitskiy</u> , Elena Gubar, Ilyass Dahmouni	THE EFFECT OF NEWS DISSEMINATION ON INFECTION DYNAMICS: AN EVOLUTIONARY EPIDEMIC MODEL IN A NETWORK SETTING
			<u>Suriya Kumacheva</u> , Ekaterina Zhitkova, Galina Tomilina	IMPACT OF PUBLIC ATTITUDES TOWARDS VACCINATION ON INFLUENZA EPIDEMIC DYNAMICS
			Leonidas Sakalauskas, <u>Aiste Dirzyte*</u> , Vitalijus Denisovas	SIMULATING ANXIETY PROPAGATION UNDER THREAT STIMULI FLOW: A HYBRID MODEL
			Igor Tantlevskij, <u>Denis Kuzyutin</u> , Nadezhda Smirnova	A SIGNED NETWORK MODEL OF THE INTERACTION BETWEEN RELIGIOUS AND IDEOLOGICAL MOVEMENTS AND AUTHORITY IN ANCIENT JUDEA
13:00 – 14:00	Lunch			
14:00 – 15:40	Social Media Content Analysis and Deviant Behavior Detection	Nilufar Abdurakhmonova, Leonidas Sakalauskas	Milana Bolatbek	ANALYZING CORPORATE NETWORK TRAFFIC DATA FOR DETECTION AND PREVENTION OF ILLEGAL INTERNET USE
			Kuralai Azanbai*	ANALYSIS OF SYSTEMS FOR RECOGNIZING POLITICAL EXTREMISM IN ONLINE SOCIAL NETWORKS
			Zhansaya Duisenbekkyzy	RESEARCH ON THE IMPACT OF SOCIAL NETWORKS ON THE DEVELOPMENT OF BILINGUALISM IN KAZAKHSTAN

			Sharipa Temirgazieva*	DEVELOPMENT OF A METHOD FOR GRAPHICAL DESTRUCTIVE CONTENT ANALYSIS
			Nitin Agarwal*	MOBS SIMULATION GUIDED BY SOCIAL SCIENCE-BASED MULTI-THEORETICAL FRAMEWORK
15:40 – 16:10	Coffee Break			
16:10 – 17:50	(S6) Concepts, Models and Instruments for Overcoming the Complex Societal Problems (Part I)	Daiva Bubeliene, Vytautas Dulskis	Svetlana Shchepetova	FREEDOM AND DETERMINACY OF SOCIO-ECONOMIC BEHAVIOR OF INDIVIDUALS AND COMMUNITIES IN LIGHT OF THE METHODOLOGY OF SYSTEMS MODELING
			Gediminas Merkys, Sigita Balciunas, <u>Daiva Bubeliene*</u> , Sigita Vaitkevicius, Leonidas Sakalauskas	QUANTIFICATION OF THE HISTORY OF SECTORAL POLICY AND GOVERNANCE: EVALUATION OF THE EFFECTIVENESS OF GENERAL EDUCATION IN LITHUANIA 1990-2020
			Talshyn Sarsembayeva	IDENTIFYING FACTORS AND THEIR IMPACT ON THE LEVEL OF SATISFACTION WITH THE EDUCATIONAL PROCESS
			Bauyrzhan Kairatuly*	INTERDISCIPLINARY SOCIO-HUMANITARIAN STUDY OF THE CURRENT STATE, OPPORTUNITIES AND PROSPECTS OF KAZAKH SOCIETY IN THE CONTEXT OF THE CHALLENGES OF GLOBAL DIGITALIZATION AND THE DEVELOPMENT OF SOCIO-HUMANITARIAN AND POLITICAL TECHNOLOGIES FOR MANAGING THE RISKS OF THE DIGITAL SOCIETY IN KAZAKHSTAN
19:00 – 21:00	Conference Dinner			

September 20, 2024

207 room

Time	Session	Chair(s)	Author(s) (presenter underlined)	Presentation
08:30 – 9:00	Registration			
09:10 – 10:50	Invited Lecture	Suriya Kumacheva	Marat Akhmet	ULTRA POINCARÉ CHAOS IN SOCIAL PROCESSES
			Mansurova Madina	THE ROLE OF ARTIFICIAL INTELLIGENCE AND VISUAL ANALYTICS IN DIGITAL SOCIETY
10:50 – 11:20	Coffee Break			
11:20 – 13:00	Concepts, Models and Instruments for Overcoming the Complex Societal Problems (Part II)	Daiva Bubeliene, Vytautas Dulskis	<u>Lazzat Zhamaliyeva*</u> , Rauan Zhiyenbayeva, Akalka Zhubatkankyzy, Arinaz KabyI, Botakoz Malsova, Aigerim Azamatova	DEPRESSION STIGMA IN MEDICAL STUDENTS IN KAZAKHSTAN: ARE THERE CULTURAL DIFFERENCES?
			<u>Nauryz Baizakov*</u> , Mafura Uandykova, Gulnar Astaubayeva,	METHODS AND TOOLS TO INCREASE TRANSPARENCY AND ACCOUNTABILITY OF GOVERNMENT PROGRAMS

			Gulnar Muhamejanova, Tolkyn Mirkasimova, Anel Yeleukulova	
			<u>Anel Yeleukulova*</u> , Mafura Uandykova, Gulnar Astaubayeva, Gulnar Muhamejanova, Tolkyn Mirkasimova	METHODS OF EVALUATION AND MONITORING OF GOVERNMENT PROGRAMS IN AN UNSTABLE ECONOMIC SITUATION
			Madiyar Abibulla	AGILE METHODOLOGY IN THE DEVELOPMENT OF THE BUDGET PLANNING SYSTEM
			<u>Tomas Balezentis*</u> , Agne Zickiene, Artiom Volkov, Dalia Streimikiene, Mangirdas Morkunas, Vida Dabkiene, Erika Ribasauskiene	USING EXPERT ASSESSMENTS IN QUANTIFYING IMPACTS ON THE AGRIFOOD SUPPLY CHAINS
13:00 – 14:00	Lunch			
14:00 – 15:40	Large Language Models in an Analysis of Social-Behavioral Phenomena	Ualsher Tukeyev, Madina Mansurova	Diana Rakhimova	COLLECTION AND PREPROCESSING OF DATA FOR LLM IN THE KAZAKH LANGUAGE IN THE FIELD OF LEGISLATION
			Zhazira Shaikhiyeva*	CLUSTERIZATION OF COMMENTS USING A LARGE LANGUAGE MODEL IN FINTECH
			Ualsher Tukeyev	STUDY OF NEURAL MODELS FOR THE FORMATION OF TRANSCRIPTS OF SPEECH AND MINUTES OF MEETINGS IN TURKIC LANGUAGES
			Nazirova Elmira, <u>Usmonova Kamola*</u>	ALGORITHMIC STRATEGIES FOR STEMMING COMPLEX WORD FROM UZBEK TO ENGLISH IN MACHINE TRANSLATION
			<u>Dina Oralbekova*</u> , Orken Mamyrbayev, Sholpan Zhumagulova, Nurdaulet Zhumazhan	COMPARATIVE STUDY OF LSTM AND BERT MODELS FOR MULTI-CLASSIFICATION TASKS USING THE NER DATASET
15:40 – 16:10	Coffee Break			
16:10 – 17:50	Open Panel “Modeling Chaos in Social Systems”	Marat Akhmet, Leonidas Sakalauskas	Akylbek Zhamanshin	UNPREDICTABILITY IN COHEN-GROSSBERG NEURAL NETWORKS
			Zakhira Nugayeva	THEORETICAL INVESTIGATION OF IMPULSIVE HOPFIELD NEURAL NETWORKS DYNAMICS IN SOCIAL SCIENCE RESEARCH
			DISCUSSION & CLOSING	

THE BOOK OF ABSTRACTS

PARATRANSLATOR-UZBEK PARALLEL CORPUS: APPROACHES, CHALLENGES AND SOLUTIONS

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Currently digital linguistic available data in the internet is major means of implementation to solve problems involving natural language processing. Particularly intellectual text and speech technologies are binding with huge linguistic resources that is required all aspect of understanding human mind. Recent year's machine translation system developed rapidly due to enhancing capabilities human language infrastructure regarding to corpus technologies. In this case parallel corpora for machine translation technologies are crucial base to mine data to align appropriate matching lexemes and sentence pairs. Obviously English has vast opportunities for all world languages using AI neural system in multilingual machine translation platform and dominated in this sphere for smart technologies. We can say one vivid example is huge contribution to develop translation technology creation Europarl corpus which consists of 30 million words of 11 official languages of the European Union. Hence it can't be said that the quality of translation is not good enough for scientific and official texts from Uzbek into English. For example Google is one instance for Uzbek the fact that word sense disambiguation and terminological system is considered as a challenge.

Considering above mentioned core issues to enrich parallel corpora for machine translation we obtained scientific-practical project entitled "PRATRANSLATOR: Creation corpus based context logical electronic translation platform" (2024-2025) financed by Ministry of Higher Education, Science and Innovations of the Republic of Uzbekistan. This project focused to build parallel texts Uzbek, English, French, Russian, and Turkish. Our methodological approach is to compile the texts using translation memory and Crawler of Python to segment as the stage of betexts based web corpus and human factors for all styles translated texts into Uzbek or from Uzbek for other foreign languages. It helps to fill up the database of terminological and polisemantic words which translated in literary texts as metaphor and phraseological unites which Google mismatching segments semantically. We hope that this contribution encourages investigations on machine translation technologies and translation studies for lexicography and terminography.

AGILE METHODOLOGY IN THE DEVELOPMENT OF THE BUDGET PLANNING SYSTEM

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This paper will review the application of agile methodology in the development of a budget planning system for an online commerce company. The purpose of the paper is to review and analyze the use of agile methodology to effectively develop and manage a budget planning system in a dynamic online commerce environment.

In the context of developing a budget planning system for online commerce, agile methodology is a flexible project management approach that allows for rapid adaptation to changing business and market requirements. This is especially important for online commerce companies, where the requirements for budget planning systems can change rapidly in response to changing market conditions and customer preferences.

The author provides an overview of agile methodologies and approaches used in developing budget planning systems tailored to the specifics of online commerce. Particular attention was paid to adapting Agile principles to the needs of online commerce companies, including rapid development of iterative versions of the system, active interaction with customers to define requirements and feedback, and managing changes and priorities during the development process.

The results of the work included a description of successful agile practices and methods used in the development of budget planning systems for online commerce, as well as recommendations for the effective implementation of agile approaches in companies in this area.

USING INTELLIGENT COMPUTABLE MODEL TO CLASSIFY ECONOMIC GROWTH BY KAZAKHSTAN STATISTICS

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This study is devoted to the development of a methodology for identifying hidden problems in macroeconomic equilibrium using an intelligent computational model. It also explores the application of this model to classify economic growth based on historical GDP data (in current prices, US dollars) for the Republic of Kazakhstan from 1993 to 2023. The research adopts a systems approach, integrating algorithms from operations research and mathematical methods based on fuzzy logic with econometric methods for deep analysis of historical data from Kazakhstan's national economy. The data were obtained from open-access resources of the World Bank. By employing the intelligent computational model, the study achieves a highly accurate classification of the phases of economic growth in Kazakhstan's GDP: Overvalue, Equilibrium, and Undervalue, even under conditions of high uncertainty. The results of this study allow decision makers to make scientifically based management decisions on economic policy in setting tasks regarding resource allocation, industry priorities and long-term economic planning. Furthermore, the intelligent computational classification model can serve as a diagnostic tool to assess economic sustainability and adaptability in response to both internal challenges – such as the "resource curse" and the "middle-income trap" – and external global challenges, including market shocks, fluctuations, and technological disruptions.

MOBS SIMULATION GUIDED BY SOCIAL SCIENCE-BASED MULTI-THEORETICAL FRAMEWORK

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Samer Al-khateeb

Social media sometimes empowers potential adversarial state actors, paid trolls, and extremists to incite hysteria and coordinate nefarious actions, e.g., deviant mobs. A mob is an event organized via social media or other forms of digital communication technologies in which a group of people gathers online and/or offline to conduct an act collectively and then disperses. To an outsider, such an event may seem arbitrary; however, a sophisticated amount of coordination is involved. These mob-like events like the January 6, 2021, U.S. Capitol attack, or GameStop's stock "flashmob investing" are becoming widespread due to the affordability of social media, ease of use, effectiveness of individuals or groups in conducting coordinated acts, anonymity of the internet, etc. The prevalence of these incidents underscores the inadequacy of current systems (security, financial, etc.) in addressing such coordinated behavior. This topic is understudied due to lack of data, theoretical underpinning, and computational resources required to analyze the complex and dynamic social processes among mobbers. In this study, we develop a model that can simulate mobs guided by constructs extracted from various social science theories. We then aim to use the model to study the behavior of the mobbers, the motivation of the organizers, and attempt to infer the mob's outcome. Real-world data, albeit limited, will be used to evaluate the simulation-driven model in a real-world setting.

ULTRA POINCARÉ CHAOS IN SOCIAL PROCESSES

Marat Akhmet

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We recently launched an innovative concept in advanced dynamics known as ultra Poincaré chaos. In contrast to conventional conservative methods, this form of chaos is based entirely on the dynamics of a single trajectory. The numerical validation of this behaviour is both reliable and straightforward, making it particularly relevant for effective application in the social sciences. This approach utilizes data gathered from observations and experiments in conjunction with solutions to differential and difference equations. Additionally, we will examine the advantages of this chaotic model in confirming synchronization.

Our discussion will underscore the significance of chaotic models in analysing various domains, including economics, history, politics, and education. We will focus particularly on neural network dynamics, given that brain activity serves as a fundamental basis for all social sciences.

Building on our mathematical findings, we propose new functions designed specifically for modelling time series that have emerged in contemporary research. During our presentation, we will showcase examples of these applications, illustrating how the study of social dynamics—one of the most complex areas—can effectively utilize our insights. Finally, we will present persuasive arguments underscoring the significance of studying chaos and the presence of thresholds in the history of dynamical systems, particularly in relation to complexity. We will contrast what we refer to as “chaotic” modelling with “industrial” modelling. The relevance of chaotic models for the social sciences is driven by the inherent complexity of the dynamics involved.

ANALYSIS OF SYSTEMS FOR RECOGNIZING POLITICAL EXTREMISM IN ONLINE SOCIAL NETWORKS

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Today, one of the most crucial problems is spotting calls for political extremism on social media. These days, they're one of the primary methods for sending out these invitations because of their enormous popularity. It is demonstrated that the majority of the technologies now in use to look for appeals for political extremism on social networks are centered around message semantic analysis. Furthermore, there are many graphic resources available in contemporary social networks, which opens up a lot of space for these extreme demands. Neural network recognition performance was improved by an image pre-processing model that removed common video recording noise and allowed brightness and contrast adjustments. The efficacy of neural network analysis in identifying harmful content in photos and videos was assessed.

A new field of study, online social networks, also known as virtual or online communities, will be spurred by the internet's and social services' quick development and growth as well as the widespread notion of Web 2.0. Users' varied behaviors, or a collection of distinct processes, comprise social media. Examples include using email services, starting chat rooms and blogs, getting information from homepages linked to links, altering and sharing images and videos through the media exchange system, and so on. The primary findings of the Global Digital 2023 research state that:

- The population of the globe surpassed 8 billion on November 15, 2022, and reached 8.01 billion at the start of 2023.
- 6.8% of the world's population, or 5.44 billion people, used mobile phones as of the beginning of 2023.
- Additionally, 64.4% of people have internet access worldwide. Their number rose by 1.9% throughout the course of the year.
- Nearly 60% of the global population, or 4.76 billion individuals, were active on social networks as of the start of 2023.

These figures show that social media is increasingly being used as a communication tool in many different nations, including as a handy venue for individuals who disseminate extreme viewpoints.

There is no doubt that the most recent changes in the world will have an impact on every aspect of life. Protecting our people from the harmful news, violent films, and terrorist ideas that proliferate on social media is getting harder and harder. Additionally, a large number of political strategists, advertisers, agitators, criminals, radicals, and organizers of harmful groups are among the numerous professional manipulators that work in social networks. Social media is a great instrument for spreading propaganda, informing people about crimes, altering awareness, advertising, extremist propaganda, and inciting riots.

Social networks are becoming the primary medium via which harmful ideas and phenomena are disseminated:

1. Cyberbullying, harassment, and trolling;
2. Terrorism and extremism;
3. Politically charged destructive movements;
4. Drug addiction, pedophilia, and sexual promiscuity;
5. Risky games.

METHODS AND TOOLS TO INCREASE TRANSPARENCY AND ACCOUNTABILITY OF GOVERNMENT PROGRAMS

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As part of the project IRN AP19678174 on the topic «Development the theory and methodology for formation development programs of the RK during the transformation the economy into an innovative».

The article examines the transparency and accountability of government programs, which are the key principles of effective public administration aimed at strengthening citizens' trust and fighting corruption. In recent decades, Governments of various countries have been introducing new methods and tools to make their activities more open and accountable. Among the common methods, the authors highlight the introduction of open data, digitalization of management processes, regular publication of reports on costs and results.

Digitalization and the creation of open data platforms contribute to increasing the availability of information for citizens and organizations, which allows monitoring the implementation of government programs and the use of budget funds. Open data, as a transparency tool, provides the public with access to detailed information about government activities, thereby reducing the possibility of abuse and corruption. In addition, e-government systems simplify citizens' access to public services and make government processes more open.

The DSS information system (decision Support System) proposed by the authors is a powerful tool that can significantly increase transparency and accountability in the management of government programs. The DSS is designed to automate the processes of data collection, analysis and processing, which helps authorities to make

informed and informed decisions based on objective information. It can be actively used in government structures to monitor and evaluate the effectiveness of program implementation, budget and resource management, and real-time progress monitoring.

Thus, the introduction of technologies and transparency mechanisms can not only improve the efficiency of public administration, but also strengthen trust between society and the state.

USING EXPERT ASSESSMENTS IN QUANTIFYING IMPACTS ON THE AGRI-FOOD SUPPLY CHAINS

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Erika Ribasauskiene

The use of expert knowledge is important on poorly structured problems where statistical data are often unavailable. This research deals with the case of the Lithuanian agri-food supply chains under the unexpected events of COVID-19 pandemic and Russian-Ukrainian war. The expert assessments were aggregated by using the Power Ordered Weighted Average operator and simulation of weights in order to ensure robustness of the results.

ANALYZING CORPORATE NETWORK TRAFFIC DATA FOR DETECTION AND PREVENTION OF ILLEGAL INTERNET USE

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Nowadays the number of internet users worldwide has been increasing steadily over the years. According to the latest statistics from the International Telecommunication Union (ITU), as of 2021, approximately 4.9 billion people, or around 62.7% of the global population, were using the internet. This represents a significant increase from previous years and is indicative of the growing importance of the internet in today's digital world.

With the increasing use of corporate networks, there is a growing concern regarding employees using the internet for illegal purposes. This paper presents a comprehensive analysis of network traffic data collected from corporate network connections to detect and prevent such activities. The study involves the collection of network traffic data using tools and the analysis of this data using different techniques.

The development of internet technologies has significantly transformed various aspects of our lives. It has enhanced access to information, democratizing education and making knowledge more accessible. Communication has improved, allowing people to connect easily across the globe, fostering global collaboration. Economically, the internet has opened new business opportunities, enabling small businesses to reach a global audience and increasing competition and innovation. In healthcare, telemedicine and online resources have improved patient care, especially for those in remote areas. Additionally, the internet has enriched entertainment and cultural expression through streaming services, online gaming, and social media. Overall, these benefits have had a profound and positive impact on modern society.

While internet technologies offer numerous benefits, they also have significant drawbacks. Privacy risks and cybersecurity threats are major concerns, as personal data can be compromised. The rapid spread of misinformation and fake news can lead to confusion and mistrust. Internet addiction can negatively affect mental health, causing anxiety, depression, and social isolation. The digital divide creates inequalities in access to education, employment, and services. Additionally, the anonymity of the internet can lead to cyberbullying and online harassment, impacting the emotional well-being of individuals.

A META-SYSTEM FOR CONFLICT RESOLUTION

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The nomology, the science of the laws of the mind is used, providing frameworks based on four embedded layers that explain how people come into conflict. A decision science approach is used to structuring qualitative decisions, to put Drama Theory, and Confrontation and Collaboration Analysis, into a framework based on a succession of dichotomies, whether to use direct or indirect action, combine to form General Political Adjustment Activities, which have corresponding dilemmas: Collaboration (Harmony), Cooperation (Agreement), Confrontation (Persuasion) and Conflict (Escalation). The third dichotomy is based on whether to use a more personal approach generates eight Principal Political Adjustment Activities along with corresponding Dilemmas: Unilateralism (Backlash), Negotiation (Recognition), Credibility (Awareness), Trust (Reneged), Inducement (Rejection), Deterrence (Incitement), Positioning (Vulnerability), and Threat (Weakness). Of these, Unilateralism and Negotiation are new to Drama Theory. Also, most of the dilemmas are named here for the first time. The person involved in a conflict resolution process should try to draw the conflicted person out ,anger' to ,avoid more violence' , from ,grief' to ,show respect', from ,fear' to ,improve conditions', from ,shock' to ,include all parties', from feeling the sense of ,atrocious' to ,encourage civil society', from ,retaliation' to ,consult/train/counsel', from ,revenge' to ,bridge-building', from ,bitterness' to ,truth and reconciliation'.

CLIMATE CHANGE, A SOCIETAL COMPLEX PROBLEM

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Climate change exceed state, country and continent borders. This complex societal problem is a threat to nature. Local solutions are too narrow. Worldwide measurements should be taken. The homo sapiens is a part of nature, we are not above nature. When we destroy the nature, we destroy ourselves.

The homo sapiens is only a small part in the universe, yet we think we are the owners and do a big effort to destroy the environment, by, for instance, destroying the coral which is the breeding ground of the sea species, we are destroying ourselves.

The main destroyers are the big industry which throw their waste in the air, water and in the ground, disturbing air to breath, the water to drink and the ground to grow.

Therefor we should simulate our governments the make strict regulations for the industry to forbid polluting the air, water and ground like, in the Netherlands, is done by the steel industry TaTa steel and the Tefal industry Chemours with their Pfas pollution. These pollutions of the industry are causing cancer in many species of the nature including humans. The climate change needs far-reaching decisions. Handling this worldwide threat needs a special approach of analyzing, organizing, legalizing and decision making.

These complex societal interdisciplinary problems have to be handled in a multidisciplinary way, including the knowledge of experts from different fields in order to see more phenomena of the problems and their interaction. Then the parties/stakeholders have to be considered. In complex societal issues are many different parties/stakeholders involved each with different goals, different desires and different power. In handle a complex societal problem emotion plays also an important role. Emotions in the problem handling process in the power groups as for the people outside. With the Compram methodology the facilitator explores together with the experts, then with actors and then with the people the problem in order to find directions for changing in a sustainable and acceptable way. The facilitator follows the steps of the Compram methodology

with experts and actors including the voices of society. The Compram methodology is a democratic, open methodology , in which by carefully written reports of the handling process all people can follow the way the problem is reach a certain sustainable change.

These difficult and complicated group processes are guided and structured by a facilitator in a six step approach. Experts, stakeholders and policymakers discuss the content and possible changes based on a cooperative created simulation model of the problem. The emphasizes of the methodology is on facilitating the exchange of knowledge and understanding, communication among and between the experts, stakeholders and politicians, and before implementing the changes consultation of the opinion of the people. Knowledge, power and emotions are the basic elements in handing complex societal problems.

SIMULATING ANXIETY PROPAGATION UNDER THREAT STIMULI FLOW: A HYBRID MODEL

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Anxiety is a complex psychological phenomenon shaped by various factors, including cognitive, emotional, and physiological processes, and evolved as a crucial mechanism for survival and the ability to deal with threatening stimuli. However, under certain circumstances, this response can become overly intense or dysfunctional, leading to the manifestation of anxiety disorders. A hybrid modeling approach may facilitate integrating multiple aspects of anxiety propagation, providing a more comprehensive understanding of anxiety as a response to threat stimuli. By studying how anxiety propagates in response to threat stimuli, researchers can identify potential critical points, leading to the development of more effective prevention tailored to specific anxiety triggers and propagation patterns. Next, individuals respond to threat stimuli differently, and hybrid modeling can help identify individual differences and promote the development of personalized approaches, improving outcomes for those affected by anxiety.

Previous studies have demonstrated that the rates of anxiety have been constantly increasing worldwide. The complemented cognitive model of anxiety, based on previous studies and models, can assist in explaining the cycles of this phenomenon.

Based on the cognitive theory of anxiety, it can be assumed that informational factors are the main anxiety-inducing stimuli that determine the level of anxiety in individuals and the whole population. From the point of view of this theory, an important part of the anxiety mechanism is the stimuli that trigger it, which also becomes negative information that spreads in the social space. Indeed, the anxiety cycle can be significantly influenced by threat stimuli, triggering events (e.g., media reports), and predisposing factors (e.g., general vulnerability to anxiety). Regarding triggering events, the media might play a central role.

Thus, a comprehensive hybrid modeling framework would allow the integration of a cognitive model of anxiety with real-world data to investigate and understand the dynamic process of anxiety propagation in response to threat stimuli. The suggested method combines agent-based modeling, dynamic systems modeling with differential equations, and machine learning methods. The four-level STAI methodology is applied to assess anxiety in the proposed models. Sentiment analysis of social media content is used to identify the parameters of triggering stimuli flow. The proposed models were implemented and verified using open-access data sets. The developed models can be calibrated by applying statistical methods according to indicators of anxiety measured at discrete sets of time intervals by associating them with parameters of the threat stimuli flow taken from statistical data or Internet content tracking data.

RESEARCH ON THE IMPACT OF SOCIAL NETWORKS ON THE DEVELOPMENT OF BILINGUALISM IN KAZAKHSTAN

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This article presents a research study examining the relationship between smart media usage and speech development delays in children, particularly within the context of bilingualism in Kazakhstan. The study addresses several key research questions and hypotheses, investigates them using empirical methods. The growing use of smart media among children has led to concerns about its im-pact on various developmental aspects, particularly speech development. This study examines the correlation between speech delays and smart media usage by analyzing existing data. With rapid technological advancements, children in-creasingly integrate social media platforms like YouTube, Instagram, and Face-book into their lives, where content often reflects Western culture and contem-porary slang. This research focuses on the psycholinguistic impact of media on language acquisition among primary school children, particularly in the bilin-gual context of Kazakhstan. Utilizing a linear regression model, the study ana-lyzes data from 112 children aged 2 to 6 at Nursery School No. 155 in Almaty, finding that Kazakh-speaking children frequently mix languages learned from social media, which may impede clear expression. The data indicates a negative correlation between extensive social media use and language proficiency. The study highlights the necessity of regulating children's screen time, promoting educational content, and maintaining balanced routines to enhance language de-velopment, providing valuable guidance for parents and educators in Kazakhstan.

EFFICIENT ONLINE ESTIMATION OF DYNAMIC STRUCTURAL EQUATION MODELS: CONJECTURING ON FEASIBILITY

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Model parameter estimation from data is a substantive part of statistical modeling, including dynamic structural equation modeling. With the advent of the big data era, which makes large amounts of data accessible near real-time, online parameter estimation has become more crucial than ever before. In response to these circumstances, the report elaborates on developing efficient online parameter estimation algorithms in the dynamic structural equation modeling context, which is somewhat limited in this regard. In particular, it develops one such algorithm through raw-data maximum likelihood estimation and a recursive approach for a specific dynamic structural equation model encompassing the noisy Gaussian random walk model with input from the factor-analytic model. After experimental verification of the proposed algorithm, it is reasonably conjectured that the principles applied can be employed in developing corresponding algorithms for dynamic structural equation models that are more general than the considered one.

THE NEW APPROACH FOR N-PERSON PRISONER'S DILEMMA ON A HYPERGRAPH

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Since the information became the most important thing on the market of public goods, we can use the n-person prisoner's dilemma on a hypergraph type of game to represent the wellness of each player by distributing the information as a common good. In this case, hypergraph constitutes the Internet-connections. Hyperedges of the hypergraph represent the social Internet-communities and each of them have the part of information, therefore player participates in a variety of such games. Since the behaviour of a person is the same for each simultaneous game, a player can choose only one strategy for each hyperedge he belongs to. Nodes of the hypergraph correspond to players who can observe only their own strategies and payoffs on each step of the game, however, they do not have enough information about other players' actions. Therefore, they do not know who have declined from the strategy that maximizes the sum of all players' payoffs. Under these conditions it can be complicated to recognize who should be punished for deviation. Although players have imperfect information about each others' actions, there was identified the Nash equilibrium for n-person prisoner's dilemma type of game with imperfect information on the hypergraph, that pays into account such kind of circumstances and avoids cycles.

The study considers the model of n-person "prisoner's dilemma" on a hypergraph $M(N, E)$, where the set of nodes, "N", represents the players of the game, and the set of hyperedges, "E", shows their social groups that are connected with each other via relationships in the Internet. These groups have the common knowledge that they can open to all over the World or to save. So, games are played between the participants of social communities. Therefore, they play the games simultaneously on each hyperedge of the hypergraph. The payoff function is defined taking into account that players can choose only one possible strategy for all hyperedges they belong to. In addition, we have proposed a repeated version of the model. This process is quite complicated, that is why the model takes into

account not only benefits from possession or publication of classified information, but pays attention on the player who reveals part of it. All players have pure strategies "to stay silent" and "to betray".

Players of the model cannot observe the other player strategies, that is why, in the repeated game we have some natural restrictions for the effective punishment.

In our study, we have constructed the strategy that avoids such kind of uncertainty and prevent cycles of unnecessary punishment on the hypergraph. This strategy allows to save a huge part of losses and, nevertheless, can be considered as the subgame perfect Nash equilibrium for the repeated "\$n\$-person prisoner's dilemma on the hypergraph" with imperfect information.

ETHNIC NATION INDEX

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The work deals with the most fundamental phenomena of cultural geography – ethnic nation and their quantitative evaluation that are posed by history and ethnology as well. The purpose of this study is to provide an integrated, quantitative assessment of the ethnic population. The object under investigation in this work is ethnic nations within the boundaries of the states. The main purpose of the article is to contribute to the research regarding of the ethnic nations. To achieve the stated work objective, the following work tasks have been formulated: 1) to distinguish the basic indicators describing ethnic nation; 2) to develop a methodology for calculating the index of ethnic nation. This paper presents the original methods (the new index ENI), which is based on the three-index data of Alesina [1], using factorial analysis. Scientific novelty in this work is the index of ethnic nations, which was created by combining component analysis and qualimetric ideas.

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**INTERDISCIPLINARY SOCIO-HUMANITARIAN STUDY OF THE
CURRENT STATE, OPPORTUNITIES AND PROSPECTS OF KAZAKH
SOCIETY IN THE CONTEXT OF THE CHALLENGES OF GLOBAL
DIGITALIZATION AND THE DEVELOPMENT OF SOCIO-
HUMANITARIAN AND POLITICAL TECHNOLOGIES FOR
MANAGING THE RISKS OF THE DIGITAL SOCIETY IN KAZAKHSTAN**

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This paper explores the impact of global digitalization on Kazakh society, examining both the current situation and future possibilities. We use an interdisciplinary approach, combining insights from the social sciences, humanities, and political science to understand how Kazakhstan is responding to the challenges and opportunities of a rapidly evolving digital world. The focus is on how the nation is using socio-humanitarian and political strategies to manage risks such as privacy concerns, cyber threats, and the digital divide, which affects different groups in society unevenly. Additionally, we look at how these technological changes are influencing Kazakhstan's cultural practices and social norms. Our analysis is supported by large language models (LLMs) that help synthesize information from a variety of sources, including government documents, scholarly articles, and local reports. The goal is to provide a comprehensive overview that can guide policies for a balanced digital advancement in Kazakhstan, ensuring it benefits all parts of society while preserving its unique cultural identity.

SYSTEM ECONOMY AS A PLATFORM FOR ANALYSIS AND MODELING OF SOCIAL DEVELOPMENT

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The main factor that complicates the construction of adequate and effective models of social phenomena in the context of big data, a developed Internet environment, artificial intelligence technology, etc., is the gap between the methods of modeling the processes of the dynamics of the material world, social consciousness, individual spiritual development, and real action. A theoretical and methodological platform is needed that allows the integration of models of the dynamics of the organizational structure, process flows, infrastructure, intentions, and plans of participants in economic activity. System economy is the answer - a concept representing the socio-economic space as a field of emergence, interaction, transformation and liquidation of socio-economic systems. This representation not only simplifies the process but also allows us to develop an axiomatic typology of systems, including the interrelations of their functional and morphological characteristics, to describe the main features of the algebra of socio-economic systems. A typical element of the economy in this approach is a tetrad - a relatively stable complex of organizational, process, project and environmental systems interacting with each other in the space-time continuum according to the laws of homeostasis.

The lecture will cover the main directions of development of the system economy and examples of its application in economic policy development, effective management, and sustainable development.

IMPACT OF PUBLIC ATTITUDES TOWARDS VACCINATION ON INFLUENZA EPIDEMIC DYNAMICS

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Infectious diseases, spreading with great intensity among the population, have always been one of the basic biological threats to humans. Fighting them is one of WHO's priorities. A well-known and well-studied measure to control the spread of infection is vaccination of the population in the case of many diseases. However, the COVID-19 pandemic and recent studies devoted to the impact of vaccination on the development of the pandemic have shown an ambiguous attitude to this tool, the stratification of society and the heterogeneity of its views on this issue.

Public opinion about vaccination is formed by a variety of social and epidemiological factors and ranges from strongly negative to strongly positive. Changes in the portions of those who are in favour of vaccination, those who are strongly against it, doubtful and undecided about the final decision can be described as the dynamics of opinions in the network, and reaching an equilibrium can be designed as a consensus due to de Groot.

The goal of this study is to test the hypothesis that the dynamics of opinions about vaccine prophylaxis influence the development of the epidemic process. This hypothesis is investigated using the example of an influenza epidemic. It is assumed that the population is divided into risk groups (age, occupational, etc.) and the opinion dynamics are considered for each risk group separately. It is also assumed that, as a result of the propagation of information and opinions, each agent makes a final decision about his/her vaccination. Such decisions influence the formation of immune status personally in each agent, as well as the formation of collective immunity in the population as a whole. The opinion dynamics process is completed before the seasonal influenza outbreak begins, by which time each agent has made a vaccination decision. The development of the

epidemic process is described by one of the modifications of the classical Kermack-McKendrick model.

The issue of assessing the economic risks arising from the intensive growth of morbidity for society as a whole, as well as vaccine prophylaxis as one of the tools for regulating these risks is being investigated.

The theoretical study is accompanied by simulation of opinion dynamics and epidemic process, implemented on a network model based on a random graph. The modelling is carried out using statistical data on influenza incidence and annual vaccination campaigns in the Russia. A numerical experiment based on statistical data and scenario analysis are performed.

ON MULTI-OBJECTIVE GAME-THEORETIC MODELS WITH ASYMMETRIC PLAYERS

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We consider dynamic competitive models of renewable resource extraction management (in particular, some extensions of the so-called "fish war" games -- see, e.g., Mazalov V.V. and Rettieva A. N., 2011; Breton M. and Keoula M.Y., 2014, e.t.c.). Usual assumption in those models is that each player (firm, country, e.t.c.) seeks to maximize some economic objective, and the unicriterion (scalar) game framework has been applied. However, the multi-objective approach could better describe the players' behavior in real-life applications. There are still few attempts (Crettez B. et al. (2020, 2023); Petrosjan L.A. and Yeung D. (2023); Mazalov V.V. and Rettieva A.N. (2023), Rettieva A.N. (2017, 2020, 2022, 2023); Kuzyutin D.V. et al. (2017, 2018, 2022, 2023)) to apply multicriteria games to dynamic models of renewable resource extraction.

We deal with bicriteria multistage models where the players have two separate objectives (one has economic sense, other describes the players' environmental concern). We take into account the players' asymmetry by using different parameters to estimate the resource scrap value / different discount factors / different weighting coefficients, which the player assigns to the objectives (the so-called "relative importance of the criteria" coefficients).

Following Shapley L. and Rigby F.(1959) we adopt the classical "weighted game" approach to derive optimal non-cooperative solution (namely, the feedback subgame perfect Pareto equilibrium). To determine a cooperative solution for a bicriteria model we use a specific scheme of cooperation that takes into account different level of the players' environmental concern. We compare non-cooperative and cooperative solutions and explore their properties which depend on the players' asymmetry level.

Since the utility is assumed to be transferable in some but not all criteria in the game under consideration, we need to revise the concepts of time-consistency and irrational-behavior-proofness of

the payoff distribution procedure (see Petrosyan L.A. (1977); Petrosyan L.A. and Danilov N.N. (1979); Yeung D. (2006)) when studying the problem of sustainability of a long-term cooperative solution. Namely, we design appropriate payment schedule meeting several advantageous properties. The results are illustrated with a numerical example.

We believe that the proposed approach could be extended to other classes of dynamic multi-objective games with non-transferable utilities within some objectives, in particular, when studying dynamic models of ideological discussions, where the degree of trust or loyalty of the target audience / electorate can serve as a measure of a “common renewable resource” (see, e.g., Tantlevskij I.R. et al. (2022, 2024).

The reported study was funded by RSF, project number 24-21-00302.

MODEL OF AN ENCAPSULATED KNOWLEDGE APPLICATION IN FIRM ENTREPRENEURIAL BUSINESS: FINITE STATE MACHINE WITH CONTROLLING ACTION OF ENTREPRENEUR

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Modern knowledge-based view of the firm, KBV, originated with research paper by Robert Morris Grant (1996), put forward an idea to describe firms as knowledge integrating institutions. According to this conception, the existing job hierarchy at the company serves as an effective mechanism for combining the highly specialized knowledge of its personnel, which creates a powerful synergistic effect. This approach though describing, sure enough, an important aspect of the use of knowledge by a company, leaves aside the other side of the matter - the encapsulation of knowledge within the company.

Knowledge is often transferred from one person to another placed in an opaque shell (capsule), allowing it to be used without the user “penetrating through it”. This happens, for example, when the firm develops a system of clear instructions that makes it possible, if these instructions are strictly followed, to achieve success, even if firm’s employees have no idea about the essence of job fulfilled. That is, success is achieved without expensive costs for training the employees - executors, and, therefore, highly efficiently, with huge cost savings.

The paper presents a concept of a firm as a pure encapsulator of knowledge; in this case a successful functioning of the whole firm is achieved without a detailed understanding the essence of necessary actions by all the employees handling their duties. This firm is considered as a finite state machine (a machine with a set of internal states), with some input signals which determine the necessity of changes in instructions and some possible points of intervention in these instructions. The role of the demiurge, providing pro- and reactive changes in encapsulated knowledge, is assigned to the entrepreneur.

THE ROLE OF ARTIFICIAL INTELLIGENCE AND VISUAL ANALYTICS IN DIGITAL SOCIETY

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In the contemporary digital society, artificial intelligence (AI) and visual analytics play essential roles in transforming extensive datasets into actionable insights and enhancing decision-making processes. AI's advanced algorithms automate the analysis of complex data, identifying patterns and making predictions that are crucial for managing the enormous volumes of data generated by modern technologies. This capability enables organizations to handle and interpret data more effectively than traditional methods allow.

Visual analytics complements AI by providing interactive and intuitive visual representations of data, which facilitate easier understanding and exploration. By translating raw data into visual formats such as graphs and heat maps, visual analytics helps users quickly grasp complex information and identify trends and anomalies that may not be evident through numerical data alone. This approach enhances the interpretative process, making it more accessible and actionable.

The integration of AI and visual analytics results in a powerful synergy that enhances both data processing and visualization. This combined approach is beneficial across various sectors, including healthcare, urban planning, and business. It supports improved decision-making, fosters innovation, and addresses the multifaceted challenges of the digital era by offering deeper insights and more effective solutions.

**QUANTIFICATION OF THE HISTORY OF SECTORAL POLICY AND
GOVERNANCE: EVALUATION OF THE EFFECTIVENESS OF
GENERAL EDUCATION IN LITHUANIA 1990-2020**

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The article presents the policy analysis and assessment of the general education sector in Lithuania for 1990-2020. The main method is expertise based on quantitative survey. Dependent variable - achievements of Lithuanian students in TIMSS, PISA, PIRLS international studies. Independent variables: 1) appropriations for general education; 2) Effectiveness of educational governance and educational policy in 1990-2020, determined by expertise. The periodization of education management was based on the prototype of Kondratiev's long-wave model. It turned out that neither the dynamics of education appropriations nor the effectiveness of the sector's governance or its deficit affects the level of educational achievement. The country's educational achievement level has been positioned at the average of all countries' statistical norms for decades. During the last two electoral and government terms (2012-2016 and 2016-2020), the effectiveness of educational governance, according to experts, found itself in a deep crisis, which continues even now. The methodological experience of the study can be used to evaluate the government history of other sectors: health, social security, environmental protection, etc.

USING ARTIFICIAL INTELLIGENCE TO OPTIMIZE BUSINESS PROCESSES: ANALYSIS AND PROSPECTS

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The development of artificial intelligence (AI) in Kazakhstan is becoming a key area of the country's digital transformation, supported by state programs and the Digital Kazakhstan strategy, the National Development Plan of the Republic of Kazakhstan until 2025 and the Concept of Digital Transformation, development of the information and Communication technologies and Cybersecurity industry for 2023-2029, which defines tasks and activities in the direction of artificial intelligence.

In the context of global competition and rapid digitalization, AI opens up significant opportunities for optimizing business processes and increasing efficiency in various sectors of the economy. Special attention is paid to the use of AI for automation of production processes.

An important aspect is the emphasis on training specialists who are able to work with advanced technologies, since investments in education and personnel development are the basis for long-term success in integrating AI. Government support plays a key role in ensuring the competitiveness of the national economy on the world stage, stimulating its technological development. In addition, it is necessary to recognize the importance of international cooperation and knowledge sharing in the field of AI, which contributes to the development of best practices and the establishment of common standards and ethical principles. Awareness of the potential and limitations of AI is becoming important for effective human-machine interaction, so everyone should not only take advantage of AI, but also understand the associated risks and responsibilities. This requires the joint efforts of the state, educational institutions, business and society. AI technologies are showing significant success, and progressive regulation and government support create favorable conditions for innovative growth and talent development in this area.

The development of AI in Kazakhstan is accompanied by challenges related to the need to create a digital infrastructure, train specialists, as well as develop a regulatory framework and ethical standards. Investments in IT infrastructure and government support create favorable conditions for the introduction of AI, which in the future may become one of the key factors in the growth of Kazakhstan's economy and increase its global competitiveness.

ALGORITHMIC STRATEGIES FOR STEMMING COMPLEX WORD FROM UZBEK TO ENGLISH IN MACHINE TRANSLATION

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This article introduces a method for dividing complex words into parts and coding by focusing on vectors, affixes and word length in order to translate Uzbek into English. Each Uzbek word segment mapped to an equivalent English segment. Based on morphemes and length, we use a flowchart in order to explain how methodology works for dividing the word into segments. It also highlights the measurements of the vector, the prefix, and the suffix role in a complex word. This paper also provides algorithmic determination of complex words. Moreover, this method improves the accuracy of machine translation.

THEORETICAL INVESTIGATION OF IMPULSIVE HOPFIELD NEURAL NETWORKS DYNAMICS IN SOCIAL SCIENCE RESEARCH

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The advent of artificial intelligence and machine learning has brought transformative changes across various fields of study. Neural networks, a critical component of this technological revolution, have been at the forefront of these developments. The networks, inspired by the human brain's architecture, have demonstrated remarkable capabilities in tasks ranging from image recognition and natural language processing to predictive analytics.

While neural networks are widely recognized for their applications in processing and interpreting large datasets, their potential for advancing theoretical and applied research in the social sciences is still underexplored. Social scientists are increasingly faced with complex systems that are difficult to model using traditional statistical methods. This is particularly true in areas where the dynamics of human behavior, social interactions, and societal changes involve non-linear relationships, feedback loops, and unpredictable influences [1]. As such, there is a growing need to explore how advanced neural network models, particularly those that accommodate more intricate and less predictable dynamics, can be integrated into social science research.

This research aims to contribute to this field by studying the dynamics of Hopfield neural networks with impulsive effects [2], focusing on Poisson stable rates, synaptic connections, and unpredictable external inputs. The specific focus of this research is on the dynamic behaviors of Hopfield neural networks when subject to impulsive effects—sudden, discontinuous changes that can significantly alter the state of the network. The impulsive effects can be thought of as analogous to sudden shocks or disruptions in social systems, such as economic crises, social upheavals. By examining the effects of these impulses on the stability and behavior of the network, this study seeks to extend the theoretical understanding of how such networks can model complex social phenomena.

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COMPARATIVE STUDY OF LSTM AND BERT MODELS FOR MULTI-CLASSIFICATION TASKS USING THE NER DATASET

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This study introduces a new method for solving multi-classification tasks in the Kazakh language using LSTM and BERT models, based on datasets for named entity recognition (NER). It addresses the critical issue of limited data for the Kazakh language by adapting existing resources to explore the details of text classification. To address this gap, our study leverages the potential of existing pretrained models such as BERT, adapting methodologies from well-resourced languages. This approach utilizes the linguistic richness of Kazakh by employing sophisticated NLP strategies, enabling effective text classification despite limited available datasets. The research shows the strong performance of LSTM and BERT models in handling multi-dimensional classification tasks, making a significant contribution to the progress of natural language processing (NLP) for languages with limited datasets. The methodology in this study highlights the flexibility of modern NLP models and opens new possibilities for practical use. By using adapted datasets, the research demonstrates how these models can solve complex language problems, ensuring more accurate and detailed text classification. This approach shows the potential of advanced NLP techniques to improve the processing and understanding of underrepresented languages. Additionally, the study provides a thorough evaluation of the performance of LSTM and BERT models in the context of Kazakh, offering insights into their strengths and areas for improvement. By integrating these models into the NER framework, the research creates more robust and versatile applications, enhancing the overall effectiveness of NLP technologies in multilingual and resource-limited environments. This broader focus not only contributes to the theoretical understanding of NLP but also has practical implications for developing more inclusive and effective language processing tools.

INVESTMENT STRATEGIES AND PRIVATE INTERESTS IN THE HIERARCHICAL MANAGEMENT SYSTEMS

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An important issue concerns an allocation of private investments between industrial and financial assets. Unfortunately, financial investments are often much more profitable than industrial ones that diminishes an economic growth. It is very important to study the possibilities of a state regulator to support private industrial investments by interest rates.

Another important issue is a coordination of interests of the administration of enterprises and their employees. Even if an enterprise has a sufficient financial resource it may be used for a non-purpose objectives. Also, the employees may use an essential part of their own resources (for example, time) for private objectives (a side activity). If the side activity is more profitable than the purpose one then the employee will be not efficient. The administration can restrict a side activity of the employees but that incurs administrative control costs.

We propose a difference Stackelberg game as a model of resource allocation in the hierarchical management system of the type "investor - enterprises - employees" and analyze it by computer simulation based on the method of qualitatively representative scenarios. A non-purpose resource use and private interests of the agents are considered. A dependency of the optimal strategies of private investments on the interest rates determined by a state regulator is revealed. A role of the model functions of production, income from private activity, and administrative costs is shown.

THE TIME INCONSISTENCY OF COMMUNICATION STRUCTURES IN DYNAMIC COOPERATIVE NETWORK GAMES

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In classical cooperative differential network games, it is supposed that the communication network is given, and players interact through this given network. In our model, we suppose that before starting the game players choose partners with whom they want to play (communicate) directly and if the partners choices coincide the link in the network is established. But there are restrictions on the set of partners and on the number of partners for each player. After the network is formed the game develops as usual differential network game. In the cooperative setting the players agree to choose such network that in the corresponding cooperative differential network game on the chosen network the maximal joint payoff will be reached. It is proved that in many cases if we allow to reconsider the previously chosen network at some time instant when the corresponding game develops along the cooperative trajectory the new admissible network can be constructed which will provide higher joint cooperative payoff in the subgame starting from this time instant. This shows the instability of cooperative network structure. The method is proposed which partly resolves this problem.

COLLECTION AND PREPROCESSING OF DATA FOR LLM IN THE KAZAKH LANGUAGE IN THE FIELD OF LEGISLATION

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This article presents the process of preparing a dataset for a question-answer system in the state language in the field of legislation of the Republic of Kazakhstan. The data were web crawled from the websites of the Information and Legal System of Regulatory Legal Acts of the Republic of Kazakhstan “Adilet” and the “Institute of Legislation and Legal Information of the Republic of Kazakhstan” of the Ministry of Justice (Zqai). The collection of these datasets took a rigorous parsing process to ensure the achievement of data quality and consistency. The first formed dataset consists of the header, date, text, and source fields, while the second one includes the number, date, question, and answer features. The amount of data collected from the ‘Adilet’ website is more than 500 thousand sentences, and the question-answer dataset from the ‘Zqai’ website consists of 740 questions and answers with a size of more than 18 thousand sentences. These datasets have a gigantic meaning in large language models where the construction of advanced question-answer systems is of great meaning. All of this will allow assisting users with legal queries in natural languages.

ECONOMIC AGENTS AND SOCIAL INSTITUTIONS: A BEHAVIORAL INTERACTION MODEL

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The study aims to develop an agent-based model that reflects the interaction of economic agents with the system of economic institutions of society. The interaction of agents with institutions is considered a two way process of establishing social norms corresponding to the mentality of agents and changing the valuepsychological structure of the mentality of agents under existing institutions. It is assumed that each agent finds himself in various situations of choice during his life activity in which he can adhere to one or another line (pattern) of behavior. On the one hand, his behavior is influenced by the initial value attitudes, and on the other hand, by the institutional norms that apply in this situation. Economic utility (benefit) plays an essential role in this process, influencing the agent's decision regarding following the dominant institutions in society and forcing him to risk his own reputation. The proposed system of coordinates "mentality – institutions" gives us a new description of the development of civil society in the country. In a developed society, the mentality of people and formal institutions do not contradict each other and are in balance (harmonious state). At the other extreme, there is a situation where each agent pursues only his interests. Various intermediate (transitional) configurations are also possible, where there is a struggle between formal and informal institutions and individual, group, and public interests. The result of the study is an agent-based model implemented on experimental data, which makes it possible to assess the degree of mutual influence of the mentality and civil society institutions and formulate conditional recommendations for bodies developing the country's social and economic policies.

FROM THE TRAGEDY OF THE COMMONS AND IMPOSSIBILITY THEOREMS TO CONSENSUS

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In order to understand the phenomena of today's social behavior, the following abstract approach is considered. Assume a set (group, community, network, etc.) of agents (individuals, persons, network nodes, etc.) is monitored and analyzed concerning the use of some resource. This model is often considered the "tragedy of the commons" (G. Hardin, 1968). The resources on which decisions are made may be economic and environmental, and, more recently, the use of shared resources in digital space is becoming increasingly relevant (G.M. Greco and L. Floridi, 2004). The central concept becomes "consensus," an agreement between agents regarding the group solution or decision. In distributed data systems, say, in blockchain, the consensus is the agreement of a group of participants regarding the meaning of some state and data consistency. The role of impossibility theorems, including Arrow and Fisher-Lynch-Paterson theorems, formulated and explored with the application of non-classic logic models and reflexive game theory in constructing consensus algorithms, is discussed (V. Gisin, 2023). This approach helps us explain certain paradoxes of "group thinking." The methodology of mathematical-computer modeling of social behavior phenomena, using structural equation modeling, game theory, and multi-agent modeling methods, is also reviewed.

IDENTIFYING FACTORS AND THEIR IMPACT ON THE LEVEL OF SATISFACTION WITH THE EDUCATIONAL PROCESS

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The study is aimed at identifying factors affecting the satisfaction of students of higher educational institutions of Kazakhstan. Based on correlation analysis and questionnaire methods using the Likert scale, the authors assessed various aspects of the educational process and their impact on the psycho-emotional state of students. The results of the study show that student satisfaction is closely related to the quality of teaching, the availability of resources and the overall organization of the educational process. In addition, the study highlights the importance of psychological support and attention to the individual needs of students. Recommendations are offered to improve the educational process and increase the overall level of student satisfaction.

This study analyzed the results of a survey aimed at identifying factors using a Likert scale. Through the use of questionnaires divided into five parts, including satisfaction, supervisors' performance, personal data, and psycho-emotional state, the study provided valuable information about students' perceptions of the educational environment. Correlation coefficients revealed strong connections between a number of factors. For example, the relationship between helping students determine the direction of scientific research and satisfaction with the educational process, as well as between control of class attendance and satisfaction with the educational process, indicate the importance of active support and organization, including an advisor/supervisor in educational activities. Important relationships were also identified between the assessment of the dean's office and the level of satisfaction with curators, which indicates the importance of the coordinated work of various faculty management bodies for the overall satisfaction of students.

Interesting conclusions were also obtained regarding the mental health of students. The low correlation between GPA and levels of anxiety or depression indicates that students' grades are not influenced by their mental state. However, the high correlation

between teachers' friendly, objective, and correct behavior and low levels of depression among students highlights the importance of the role of teachers in ensuring the psycho-emotional well-being of students. Thus, the results of the study can be used to develop and implement management strategies that can contribute to improving the educational process and overall well-being of students.

CLUSTERIZATION OF COMMENTS USING A LARGE LANGUAGE MODEL IN FINTECH

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The article presents a detailed study of the application of natural language processing models in financial technology. The focus is on the selection of a suitable large language model, as well as the process of training it and selecting hyperparameters to classify comments as efficiently as possible. The detailed methodology used to train the model is described, including data preprocessing, model architecture selection, hyperparameter selection and optimization, and performance evaluation. The article also highlights the importance of testing and validating natural language processing models in financial technology. Emphasizes that robust testing and validation are critical to ensuring the accuracy and reliability of model predictions, and provides examples of their application. This work represents a valuable contribution to the field of artificial intelligence in fintech, providing practical guidance and deep insights for practitioners and researchers. Finally, practical recommendations are offered and possible directions for further research in this area are discussed.

FREEDOM AND DETERMINACY OF SOCIO-ECONOMIC BEHAVIOR OF INDIVIDUALS AND COMMUNITIES IN LIGHT OF THE METHODOLOGY OF SYSTEMS MODELING

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The socio-economic behavior of individuals and communities is interdependent but not predetermined; a person potentially has freedom of thought, choice, and behavior. Nevertheless, the prevailing worldview and the established structure of relationships between actors almost everywhere lead to the phenomenon of displacement of goals and functions of systems, which manifests itself in the form of many deep-rooted and interconnected problems. The modern methodology of system modeling allows us to identify vicious contour connections in the socio-economic behavior of individuals and communities, explain the emergence of mental-institutional traps, and substantiate ways out of them. In this case, the necessary elements of a model explanation are archetypes and patterns of both individuals and communities. This puts on the agenda the task of combining the methods of cognitive modeling and computer agent-oriented and systemically integrating simulation. System models should reflect the contour mutual influence of various factors in space, time, and subjective perception of situations.

A SIGNED NETWORK MODEL OF THE INTERACTION BETWEEN RELIGIOUS AND IDEOLOGICAL MOVEMENTS AND AUTHORITY IN ANCIENT JUDEA

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A graph-theoretic framework has been successfully used since the seminal papers of Heider F., 1946; Cartwright D. and Harary F., 1956, to study positive and negative relations between different “actors” (individuals or social groups) in signed social networks. The elementary bricks of such a network are the triangles, i.e., the groups of three actors (vertices) connected by the links that could be either positive (which corresponds to trust, support, friendship, collaboration etc.) or negative (distrust, confrontation, enmity etc.). It has been empirically established that the distribution of the links' signs determines whether the considered triple is balanced or not. More precisely, a triangle is said to be balanced (it means the corresponding elementary social network with its relations system is stable) if and only if the product of the links' signs is positive. Since the seminal paper of Harary F., 1953, many results on how to characterize and measure the degree of (partial) structural balance in a given more complex signed network have been presented (see, e.g., Antal T. et al., 2006; Aref S. and Wilson M., 2017; Estrada E., 2019; Mazalov V. and Chirkova J., 2022).

Following Tantlevskij I. et al., 2021, 2022, 2024; Evmenova E. and Gromov D., 2021, we employ the so called “weighted signed network” framework to describe and study the system of relations between main religious and ideological sects – Pharisees, Sadducees and Essenes at several consequent stages of the early Judaism evolution in II-I c. BCE. Since we additionally take into account the Hasmonean rulers as the 4-th important actor, we focus on the networks with 4 vertices and 6 links which could be naturally visualized as the tetrahedrons.

We study properties of such networks and provide a measure of the degree of structural balance based on the balance degrees of all the

tetrahedron faces. As it turns out, this measure is consistent with known historical facts and evidence of the development of the main religious movements and authority interaction in ancient Judea, at least in the stages of the II-I centuries BCE that we have considered. The reported study was funded by RSF, project number 24-18-00479.

THE EFFECT OF NEWS DISSEMINATION ON INFECTION DYNAMICS: AN EVOLUTIONARY EPIDEMIC MODEL IN A NETWORK SETTING

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This paper delves into the ramifications of fake news dissemination on the spread of pandemics, aiming to gauge its influence on contagion levels, a pivotal factor in pandemic surveillance. To assess and regulate contagion, we've adapted a traditional SIR model, incorporating informed citizens exposed to both real and fake information streams. Our methodology combines conventional analysis with an evolutionary game framework, wherein the ratio of individuals correctly informed through authentic pandemic news evolves over time. We posit that exposure to distinct news types influences participants' behavior, thereby impacting contagion rates and the acceptance of real versus fake news. Our findings underscore the necessity for swift governmental action against fake news upon pandemic declaration to curb infection spikes. This study underscores the imperative for stringent measures to combat fake news during initial panic stages, as well as the significance of beliefs and collective coordination post-pandemic control. Our model accounts for virus spread in a scale-free network, where an ongoing evolutionary game unfolds among network neighbors. The model's control parameter is the flow of pandemic information, and we present the structure of optimal control alongside numerical simulations to illustrate our findings.

DEVELOPMENT OF A METHOD FOR GRAPHICAL DESTRUCTIVE CONTENT ANALYSIS

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Social media platforms play an important role in facilitating the spread of extremism by influencing people's views, opinions and perceptions. These platforms are increasingly being used by extremist elements to spread propaganda, radicalize and recruit youth. Therefore, research on identifying extremism on social media platforms is necessary to prevent its impact and negative consequences.

A comprehensive and comparative study of datasets, classification methods, and screening methods using an online extremism detection tool is essential. The review concludes that there is a lack of publicly available, class-balanced and objective data sets to better identify and classify extremism on social media.

The purpose of this research is to create a system for identifying ISIS and Al-Qaeda flags from images. Dataset augmentation and training were performed using image augmentation using CNN deep learning networks.

The study is devoted to the study and application of machine learning methods aimed at solving the problems of identifying potentially dangerous information on the Internet. The study examines machine learning algorithms used to detect extremist images, terrorist incitement content, and propaganda materials.

MODELING AGILE TEAMS IN KNOWLEDGE-ORIENTED ORGANIZATIONS: BEHAVIORAL PHENOMENA AND COGNITIVE COMPLEMENTARITY

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The report analyzes the key challenges that the leader of a knowledge-oriented organization faces when forming an Agile team. Particular attention is paid to cognitive complementarity and distribution of roles according to the PAEI code of Itzhak Adizes. The team must demonstrate a balanced combination of four roles: Producing (P), Administrating (A), Entrepreneurial (E) and Integrating (I), as well as possess four types of thinking: systems-analytical, critical, creative and lateral.

The formation of such a balance is accompanied by difficulties in integrating different cognitive and behavioral styles, which often leads to conflicts and dominance of one type of thinking. The report offers approaches to address these challenges, focusing on preventing cognitive inertia and maintaining team productivity in the face of diversity.

It also explores the challenges of moving from a traditional hierarchical structure to a flexible Agile model, and how to maintain a balance between team autonomy and management control. The conclusion examines approaches to predicting and managing cognitive and organizational dynamics during the transition to Agile, inviting conference participants to discuss these issues through the lens of socio-behavioral modeling.

STUDY OF NEURAL MODELS FOR THE FORMATION OF TRANSCRIPTS OF SPEECH AND MINUTES OF MEETINGS IN TURKIC LANGUAGES

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The aim of the work is to create a technology of neural models of transcripts of speech at meetings in Turkic languages and the formation of meeting minutes. The following languages are taken as objects of study: Kazakh, Azerbaijani, Kyrgyz, Turkish, Turkmen, Uzbek.

To achieve the stated goal of studying the technology of neural models of transcripts of speech and the formation of meeting minutes in Turkic languages, the following tasks are set in the project:

- development (selection) and study of the technology of speech recognition of Turkic languages into the text of the transcript;
- development and study of machine translation of the text of transcripts of Turkic languages into the Kazakh language;
- development and study of the formation of short meeting minutes from the text of transcripts in the Kazakh language;
- development and research of machine translation of a brief meeting protocol from Kazakh into Azerbaijani, Kyrgyz, Turkish, Turkmen, Uzbek languages;
- evaluation of the developed technology of neural models for the formation of speech transcripts and meeting protocols in Turkic languages.

Currently, individual research results have been obtained for the first two tasks.

METHODS OF EVALUATION AND MONITORING OF GOVERNMENT PROGRAMS IN AN UNSTABLE ECONOMIC SITUATION

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As part of the project IRN AP19678174 on the topic «Development the theory and methodology for formation development programs of the RK during the transformation the economy into an innovative».

In an unstable economic situation, methods of evaluating and monitoring government programs are becoming particularly relevant, as they make it possible to effectively adapt strategic decisions and ensure the sustainable development of social and economic initiatives. The article discusses the key aspects and approaches to the assessment and monitoring of government programs in conditions of economic instability.

The main attention is paid to modern methods that allow evaluating the effectiveness of programs in the context of changing economic conditions. In particular, performance and impact assessment methods such as cost-benefit analysis, monitoring of key performance indicators and adaptive management are considered. The importance of an integrated approach, including quantitative assessment methods, is emphasized, which makes it possible to more accurately identify the impact of programs on social and economic processes.

The article also focuses on the need for constant monitoring of external factors, such as economic fluctuations, changes in legislation and the international situation, which may affect the implementation of government programs. The methods of rapid response to changes in the situation are described, which makes it possible to adjust programs in a timely manner and minimize negative consequences.

In addition, attention is paid to the use of information technology to increase transparency and effectiveness of monitoring. Recommendations are offered on the integration of modern analytics and data visualization tools, which contributes to deeper analysis and informed decision-making.

In conclusion, the article emphasizes the need for continuous improvement of methods for evaluating and monitoring government programs in order to ensure their adaptability and effectiveness in an unstable economic situation. Assessment and monitoring should become not only control tools, but also active management tools that contribute to sustainable development and increase social and economic stability.

DEPRESSION STIGMA IN MEDICAL STUDENTS IN KAZAKHSTAN: ARE THERE CULTURAL DIFFERENCES?

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Introduction. Stigmatizing attitudes and discrimination from health care providers can have negative consequences for patients with mental disorders (Riffel T, 2020, Hankir AK, 2014, Evans-Lacko S, 2018). Understanding the extent of stigma in the current cultural context of Kazakhstan is important for medical education strategies that promote the development of socially equitable health care. This study examines the level of depression stigma among medical students and its association with demographic variables.

Methods. An online survey was conducted among 286 students at two medical universities. The Depression Stigma Scale (Griffiths, 2008) was prepared for use in Russian and Kazakh languages according to the adaptation rules. The vast majority of students (93%) were of Kazakh nationality, who studied in Kazakh (SKL) or Russian (SRL) languages. The prevalence of stigma, as well as the relationship with gender and study language, were analyzed.

Results. The mean age of the participants was 18.8 ± 2.24 years; there were 186 (65%) women. The number of students who chose to answer in Kazakh was 175 (61%), in Russian – 111. More than 80% (95%CI 75-85%) of respondents believed that people with depression could snap out of it if they wanted: the highest level of stigmatization for this statement was found in SKLs (88.6%) compared to SRLs (66.7%), $p < 0.001$. 33% considered depression a sign of personal weakness (34.9% SKL, 29.7% SRL, $p = 0.369$). 42% of all respondents believed that depression is not a real medical illness; among men this opinion was held by 52%, among women 36% ($p = 0.009$); among SKL 45.1%, among SRL 36% ($p = 0.128$).

As for more extreme stigmatization, 30.4% of respondents believe that people with depression are dangerous (32.6% SKL and 27% SRL, $p = 0.321$), 28.3% - that it is better to avoid them, 45.1% - that people with depression are unpredictable (49.1% SKL and 38.7% SRL, $p=0.085$).

A third of respondents (41% men and 29% women, $p=0.041$; 36% SKL and 28.8% SRL, $p=0.21$) stated that they would not tell anyone if they were depressed.

31.8% would not employ people with depression, while SRLs are almost 2 times more likely to make this statement compared to SKLs (45% (95%CI 35-45%) and 23.4% (95%CI 17 -30%), $p<0.001$).

Half of the respondents (45.1% (95% CI 39-51%)) said that they would not vote for a politician suffering from depression (41.4% SD and 51.4% SD, $p = 0.091$).

Conclusion. Medical students had high levels of stigma towards patients with depression. For at least two items with significant differences were found between the responses of students answering in different languages.

UNPREDICTABILITY IN COHEN-GROSSBERG NEURAL NETWORKS

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Cohen–Grossberg neural networks were firstly proposed by Cohen M. and Grossberg S. in 1983 [1]. The class of models has intensive applications within various engineering and scientific fields such as neuro-biology, population dynamics and computing technology. Moreover, Cohen–Grossberg neural networks include as sub-classes cellular and Hopfield neural networks. This is why, many researchers are focused on investigating the dynamics of Cohen–Grossberg neural networks, in particular, periodic and almost periodic oscillations. In turn, a few years ago, Professor Akhmet M. and his colleague extended the concept of recurrent motions to unpredictable ones [2]. The newly introduced movements have chaotic dynamics. In our study, we provide theoretical as well as numerical results for recurrent oscillations in Cohen-Grossberg neural networks with variable inputs and strengths of connectivity for cells, which are unpredictable functions. A special case, when the coefficients are compartmental with periodic and unpredictable ingredients is also carefully researched. By numerical and graphical analysis, it is shown how a constructive technical characteristic, the degree of periodicity, reflects contributions of the ingredients in final outputs of the neural networks. Sufficient conditions are obtained to guarantee the existence of exponentially stable unpredictable outputs of the models. They are specified for Poisson stability by utilizing the original method of included intervals. Examples with numerical simulations that support the theoretical results are provided.

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