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New forecasting methods in the global economy: AI, geoinformation systems and network analysis

ABSTRACT:

The article analyzes new approaches to forecasting international dynamics in the context of multipolarity and digitalization, focusing on interaction with the regions of the Global South. The research is aimed at overcoming the limitations of traditional methods through the integration of computing technologies into the analysis of complex political and economic processes. The central result is the development of information and analytical tools based on modern digital platforms. This toolkit allows one to operationalize key theoretical concepts such as the multidimensional presence of actors and the spatial determination of their decisions, providing an analysis of patterns of activity and influence in given regions. The use of artificial intelligence and geospatial analysis significantly expands the possibilities of processing large amounts of data, identifying hidden relationships and modeling scenarios. The work contributes to the development of computational social sciences by demonstrating the potential of technologically advanced, regionally oriented approaches for studying global interactions.

Keywords: AI; Network analysis; Investment; World economic relations; EU

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INTRODUCTION

The emergence of a digitally connected multipolar world necessitates the development of advanced computational methodologies capable of capturing the complexity of contemporary international economic relations. This is especially relevant for the area of forecasting economic processes, which is fundamentally important for sustainable development (especially when it comes to the development of cities in the Global South into major technology centers). This context necessitates methodological innovations that can effectively capture the complexity of emerging global configurations while maintaining regional specificity. The development of regionally-oriented, technologically advanced analytical tools becomes increasingly critical for understanding complex international interactions in a multipolar World. This article addresses the critical need for methodological innovation by developing information and analytical tools based on modern digital platforms. Our approach operationalizes key theoretical concepts such as the multidimensional presence of actors and the spatial determination of their decisions, offering a regionally-sensitive framework for analyzing complex international economic processes.

We assume, that the integration of artificial intelligence, Geographic Information Systems (GIS), and network analysis significantly expands the possibilities for processing heterogeneous data while maintaining contextual specificity—a crucial requirement for accurate forecasting of regional economy in context of a multipolar world. The article first examines contemporary digital tools for processing large datasets in international economic relations, then presents applications of these methods in Russian research contexts, and finally introduces our original ISA-Theory framework and associated methodological innovations.

RESEARCH

The formation of sustainable multipolarity and accelerated digital transformation in the 2020s pose fundamental challenges for forecasting dynamics in international economic relations, especially in relations with key regions of the Global South. Traditional approaches to the analysis of political-strategic, economic-technological, and socio-humanitarian interests demonstrate limitations in the face of increasing nonlinearity, interdependence, and agency of international actors. This context actualizes the need for comprehensive forecasting methods capable of integrating the analysis of multi-level factors.

However, the practical implementation of complex forecasting in conditions of multipolarity requires bridging the gap between theoretical models of international relations and the potential

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of advanced computing technologies. This poses the challenge of developing tools that could operationalize conceptual frameworks (such as the three -level interest model) through the use of computational data analysis methods and digital scenario modeling platforms. Their adaptability, effectiveness and potential can be assessed in the following areas:

- Analyzing the relationships between interest levels: Processing large amounts of heterogeneous data (economic indicators, political risks, social media perception data, climate indicators) requires network analysis and machine learning methods for natural language processing (NLP). These tools allow us to identify hidden patterns and causal connections that are inaccessible to traditional approaches.

- Proactive scenario planning: Assessing the long-term effects of a policy under conditions of uncertainty requires modeling a variety of alternative trajectories. Digital platforms for agent-based modeling and system dynamics provide opportunities for simulating the complex effects of heterogeneous factors (technological shifts, competitor actions).

Let's consider the groundwork for the application of new technologies in the field of defense in Russia

Modern political and economic research requires a comprehensive analysis of a large amount of data, which is generated from a variety of sources: official statistics, news reports, social media and specialized publications. The use of data parsing, chronological maps, and the use of indexes based on these methods is becoming relatively new for developing accurate forecasts and analyzing current trends. Let's consider the capabilities of these tools.

1. Parsing and trends. Political and economic processes are characterized by a high degree of interconnectedness and dynamism. For example, social media analysis through data parsing helps to identify public sentiments and protest sentiments long before they become visible in traditional sources. In 2020, a team of researchers used parsing of tweets and Facebook messages to analyze public sentiment in the run-up to the US election. Using machine learning and natural language processing, they were able to predict the main campaign themes and estimate the candidates' likelihood of winning. Analyzing data from social networks and news sources allows one to track changes in public sentiment towards political leaders and parties in real time. Combining these

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data with indexes, such as the corruption perception index or the level of democratic freedoms, helps predict the likelihood of protests or political change. In economic research, the parsing of news publications makes it possible to identify the impact of news events on stock quotes, which is especially important for analyzing the volatility of stock markets. Moreover, artificial intelligence-based parsing programs (with limited access to the tool) have been created that allow analyzing business analytics from business journals, potentially speeding up and automating the process of collecting data on potential investments in the region.

2. The tools under consideration allow for a comprehensive analysis of time series and events. Chronological maps allow one to visualize and analyze the development of events over time, identifying key changes and their cause-and-effect relationships. For example, an analysis of political instability in a country using chronological maps can reveal periods of sharp escalation caused by specific political decisions or external factors. This method, for example, has been used to build chronological maps of financial crises, such as the 2008 crisis, which makes it possible to analyze the sequence of events and their impact on the global economy. This makes it possible to develop early warning scenarios to prevent future crises. In political science, chronological maps are used to analyze conflicts, for example, the Arab Spring was studied in detail using such "timelines" that helped identify key stages of protest movements and their correlation with economic factors.

3. Aggregated indexes for quantitative analysis. Indexes such as the index of economic freedom, the index of political stability, or the index of consumer sentiment allow one to quantify the state of political and economic systems, simplifying the process of analysis and forecasting. Such indexes accumulate information from various sources and present it in a concise form, which allows for a quick comparative analysis of countries or regions. As an example of the application of this method, we can single out the political stability index, which includes indicators such as the likelihood of protests, the level of corruption and public sentiment, and is actively used to assess investment risks in countries with unstable political situations. Consumer sentiment indices are used to predict changes in consumer demand, which allows companies and government agencies to adjust their strategies and economic policies.

The use of modern data analysis methods is successfully applied in contemporary Russian research in the field of world economy and international relations. The issues of the "digital turn" in the study of international relations, the use of methods for analyzing structured and unstructured data sets, as well as the creation of models and

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forecasting of political and economic processes based on big data are raised in publications by the Institute of Africa of the Russian Academy of Sciences and MGIMO of the Ministry of Foreign Affairs of the Russian Federation. As an example, we will cite the project of the IMI Data Mining Laboratory in consortium with the Institute of System Programming (ISP). The Russian Academy of Sciences is developing a data mining system in the field of international relations. Thanks to systems for automatically collecting information about influential foreign politicians by parsing from news and official government websites, social media profiles, biography libraries, etc., the Laboratory collects, integrates, analyzes, stores, and visualizes data to create data arrays that can later be used to assess the impact of these actors in individual international events (Zinovieva, 2024). Another method of the Laboratory is the automatic collection of arrays of information about international phenomena and the algorithmic identification of the most relevant ones for modern international processes.

Research on political actors, collection and analysis of data on them has also been used to analyze the political elites of individual countries (Suchkov, 2023). In addition, data analysis of social media discussions on the political situation in them was used to model and predict relations with them (Lisovolik, 2020). Modern publications also emphasize the importance of using artificial intelligence to automatically collect and analyze information (Lebedeva and Zinovieva, 2023) to evaluate data sets on political and economic negotiations. A major contribution was made by a study by Mexican scientists, including an analysis using big data to identify erroneous arguments in political speeches during election campaigns in Mexico and published in the publication of the Institute of System Programming of the Russian Academy of Sciences (Nieto-Benitez K., Castro-Sanchez N.C., 2024).

Another topic and area of application of modern research methods is the use of big data arrays and databases for spatial statistical analysis, as demonstrated by the MGIMO Center for Spatial Analysis of International Relations of the Ministry of Foreign Affairs of the Russian Federation under the leadership of leading researcher Okunev I.Y. The center analyzes international events, most often electoral processes in foreign countries (Okunev, 2024), using spatial autocorrelation analysis. First of all, the basic types of data correlation are distinguished and used: simple correlation, spatial correlation, two-factor spatial correlation and correlation of two spatially weighted variables. Further, on this basis, two types of spatial autocorrelation are used (correlations that are automatically detected using geoinformation systems): global and local. And to assess the local spatial autocorrelation, the authors of the Center use the

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Moran and Geary indices and the Goethis–Ord index, designed to identify cores in the periphery of spatial clusters (Okunev (a), 2024). The point of using these methods is to identify certain political and economic trends in neighboring areas, and potentially countries (in the works (as an example, information is provided on the share of support for Donald Trump in the 2016 US presidential election in different parts of the United States).

Thus, in order to conduct a modern study of international relations and the global economy, it seems necessary to use methods of automatic collection, analysis, grouping and visualization of data, the creation of various types of maps (chronological, regional, demonstrating network relationships), as well as the development and application of indexes to assess the economic relations of individual pairs of countries.

Let's consider an example of a possible application

Since 2019, the strategies of Western European countries to ensure energy transition and economic security in the face of increasing international technological competition have increasingly focused on raw materials and supply diversification (Grinyaev, 2025). This trend leads to an increased role of resource-producing countries in the EU's foreign policy field. Against this background, initiatives of large-scale infrastructure projects in the countries of the Global South are emerging in the EU (The Global Gateway, 2025). They are accompanied by a well-developed policy of economic diplomacy, the mechanisms of which can be assessed in terms of adaptability, effectiveness and potential. When considering the implementation of economic diplomacy mechanisms involving international players at various levels (including private capital, NGOs), it becomes an important task to develop such integrated forecasting tools in the field of foreign economic activity and global technological competition that would combine methods of studying the world economy with studies of political processes.

To solve these problems, our Laboratory is developing new ways to predict international economic processes, in particular the direction of foreign direct investment flows, the growing attractiveness of regions, etc., which would make it possible to more accurately identify and stimulate future economic growth points in regions with the potential to host large infrastructure projects in the face of multiple international political factors, of an institutional, cultural, and socio-economic nature.

One of these tools may be the theory of "Interest – Sources – Activity" (Ivanova, Eremin, 2024), developed as part of the Laboratory's work. It combines the methods of production placement

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theories, network and institutional research, focusing the researcher's attention on the issue of forming "directions" (vectors) for the unhindered movement of interested players (vector "I" – interests), their capital ("R" – resources) and their initiatives to scale their activities ("A" – activities). Thus, in order to assess the institutional potential of a single country in the field of promoting foreign economic diplomacy, it is proposed to assess the scale of the institutional support network formed between the players of interested players, which considers both the political framework (as vectors for their activities) and the communication system being formed (as a way to reduce their transaction costs).

The basis of the complex method

The task of the project's method group was to develop images / technical characteristics of information databases, on the basis of which new forecasting tools are supposed to work. Much emphasis was placed on solving the tasks of filling information models: collecting, analyzing, systematizing, and unifying data. The team collected and analyzed 3 initial databases: the database of strategic documents of European players and the EU in relation to partner regions, the database of investment projects of large financial institutions, the database of EU trade agreements (based on WTO data).

The geographic information system (GIS) Axiom was used to create cartographic and other databases. To work in it, a collection methodology was developed for a database of the location of mineral raw materials and production, as well as an information base for analyzing the location of multinational corporations (MNCs). Work has begun on compiling a database structure for production chains and expected investment megaprojects in the fields of "green" energy. Databases of multidimensional presence of political players have been developed and filled in, which include diplomatic missions, representations of science, culture, economics, humanitarian activities, etc. – the basis for chronological maps of the presence of countries or groups of countries in the region, which allow one to observe the frequency of decisions on the location of their organizations and their areas of concentration.

The role of AI in the implementation of this method consists of 3 key functions:

1) Processing of parsing or manual collection data inside the database, which allows for further operations with the database during cluster analysis and visualization through GIS.

2) Processing complex queries through LLM models that work with a limited pool of contexts to

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perceive the task and create an extended query in GIS

3) Performing operations with large databases in GIS (creating links based on indexes developed by the researcher, supplementing the database to identify new GIS clusters, or applying complex forms of data filtering)

The work carried out by the methodological group of the project ensured the creation of a critically important information base for the implementation of new approaches to integrated forecasting in the field of international relations. The central result was the development of structured information databases covering strategic documents of European actors, investment projects of key financial institutions and EU trade agreements. The systematization, unification and analysis of these heterogeneous data represent a fundamental stage for the subsequent application of predictive tools using new tools that allow processing large DB (500-3000 lines). To work with larger databases, the task of processing through AI and visualization in GIS with a minimum number of errors still needs to be studied.

The methodological breakthrough of the project lies in the fact that the developed methods of data collection and processing have made it possible to create spatially linked databases for the localization of mineral resources, mining facilities and the location of multinational corporations. A significant achievement is the formation of bases for the multidimensional presence of political and economic players in the target regions, including diplomatic, scientific, cultural and humanitarian aspects. These databases serve as an empirical foundation for building chronological maps of presence, identifying areas of activity concentration, and analyzing the dynamics of engagement of various actors, which operationalizes theoretical concepts of spatial analysis in international relations.

CONCLUSION

The theoretical significance of the work is confirmed by the effective integration of artificial intelligence into the analytical cycle, which implements three key functions. Firstly, automated data processing to prepare for cluster analysis and visualization in a GIS environment solves the problem of working with large amounts of unstructured information. Secondly, the use of LLM models to generate complex semantic queries based on a limited context demonstrates the potential of semantic modeling of research tasks. Thirdly, the ability of AI to perform resource-intensive operations in GIS (linking user indexes, database expansion, complex filtering) provides a practical tool for verifying hypotheses about structural relationships in the international environment.

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Thus, the presented results form a contribution to the theoretical and methodological framework of computational social sciences in relation to the study of global political and economic processes. The developed methodology for creating and processing specialized information databases, combining GIS analysis and artificial intelligence, offers a way to operationalize complex concepts of international relations, such as "multidimensional presence" and "spatial determination of decisions." This approach responds to current challenges, confirming the need and effectiveness of regionally oriented, technologically advanced infrastructures for analysis and forecasting in the context of the emerging multipolarity and digital transformation of the international system. The results obtained create a solid foundation for the further development of location theories and the expansion of the GIS visualization method among international researchers.

We are currently developing ISA-Theory and its associated indices for cross-national applications. We welcome collaboration with the international research community to expand the framework's empirical validation and theoretical refinement. This approach provides a methodologically robust integration of agent-centered and network-oriented perspectives for analyzing economic dynamics in international relations.

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