



NATIONAL RESEARCH
UNIVERSITY

International Laboratory of Decision Choice and Analysis (DeCAn Lab)

April 2015

Our Team



Books written by our colleagues



Publication activity

- 2012 – 2 books, 19 articles in peer-reviewed journals
- 2013 – 1 book, 17 articles in peer-reviewed journals
- 2014 – 2 books, 16 articles in peer-reviewed journals

Activity of Laboratory

Fundamental and applied research, expertise, consulting in the field of the theory and practice of decision making, analysis and support

Study of organizational models and mechanisms (Aleskerov F., Belenky A., Maskin E.)

New results:

- a mathematical model of the interaction of producers and consumers of electric energy (2013-2014);
- a mathematical model for optimizing the assortment of the goods acquired for retail (2013);
- generalized bankruptcy model was investigated (2013);
- a game model of pork-barrel politics in which a government official tries to improve her re-election chances by spending on targeted interest groups (2014);
- a new mathematical model for finding an optimal strategy on railway transportation (2014).

Study of organizational models and mechanisms (Aleskerov F., Belenky A., Maskin E.)

- Aleskerov F. Game-theoretical modeling: an attempt to briefly discuss the development and prognosis// Journal of the New Economic Association, 1(17), 2013, pp.181-184. (in Russian)
- Belenky A.S. A Boolean programming problem of choosing an optimal portfolio of projects and optimal schedules for them by reinvesting within the portfolio the profit from project implementation // Applied Mathematics Letters, 25, No.10, 2012, p.1279-1284. (IF: 1.501)
- Belenky A. Three Quantitative Management Problems in Public Procurement and Decision Procedures for Their Analysis and Solving// Procedia Computer Science, v.17, 2013, pp.1142-1153.
- Belenky A. Finding Optimal Production and Selling Strategies for an Electricity Generator in a Part of a Country's Electrical Grid// Procedia Computer Science. Elsevier, 2014, 31, 1150-1159.
- Belenky A. Two Classes of Games on Polyhedral Sets in Systems Economic Studies// Network Models in Economics and Finance, Elsevier, 2014, p.35-80.
- Maskin E, Tirole J. Pandering and Pork-Barrel Politics// Working Paper, Harvard University, 2014.



Studies in social choice and voting theory

(Aleskerov F., Belenky A., Ivanov A., Karabekyan D., Karpov A., Subochev A., Rubchinskiy A., Veselova Y.)

New results:

- game-theoretic models of elections to the board of directors of a company (2012);
- new version of single transferable voting rules (2013);
- algorithms for calculation of the uncovered set and k-stable sets for the case of large numbers of alternatives (2013);
- computational results for coalitional manipulability for different rules (2011-2014);
- maximal difference of probabilistic measures in IAC and IANC models (2013).



Studies in social choice and voting theory

(Aleskerov F., Belenky A., Ivanov A., Karabekyan D., Karpov A., Subochev A., Rubchinskiy A., Veselova Y.)

- Aleskerov F.T., Karabekyan D., Sanver R.M., Yakuba V. On the manipulability of voting rules: The case of 4 and 5 alternatives// Mathematical Social Sciences 64, 2012, p.67–73.
- Aleskerov F., Karpov A. A new single transferable vote method and its axiomatic justification// Social Choice and Welfare, v.40, No.3, 2013, p.771-786.
- Aleskerov F.T., Chistyakov V.V. The threshold decision making effectuated by the enumerating preference function// International Journal of Information Technology and Decision Making, v.12, No.6, 2013, p.1-22.
- Aleskerov F., Subochev A. Modeling optimal social choice: matrix-vector representation of various solution concepts based on majority rule// Journal of Global Optimization, v.56, No.2, 2013, p.737-756.
- Aleskerov F., Habina E., Schwarts D. Binary relations, graphs and collective solutions. - M.: Fizmatlit, 2012 (ISBN 978-5-9221-1363-2), 341p. (in Russian)
- Belenky A.S. Understanding the Fundamentals of the U.S. Presidential Election System. – Springer, 2012, 444p.
- Belenky A.S. Who Will Be the Next President? A Guide to the U.S. Presidential Election System – Springer, 2013, 137p.
- Rubchinskiy A. Methods and models for management decision making. Tutorial and practical work for Academic Bachelor. URAIT, 2014. (in Russian)



Research on the analysis of scientometric data

(Aleskerov F., Karpov A., Lepskiy A., Myachin A.,
Petrushchenko V., Subochev A.)

New results:

- an efficiency of Russian universities by using Data Envelopment Analysis has been investigated (2012-2014);
- a new model of the data envelopment analysis for heterogeneous set of objects (2013-2014);
- a comparative analysis of the effectiveness of Russian universities according to their resource capacity (2013-2014);
- ranking of journals in Economics, Management Science and Political Science using the methods from the social choice theory (2013-2014);
- the problem of evaluation of the co-authors contributions to a joint research (2013);
- a relationship of socio-economic conditions of the Russian Federation regions with the potential and impact of science, education and innovation activity (2013);
- the model of heterogeneity of the system of higher education (2014);
- the problem of the individual prestige of professions among applicants (2014);
- different approaches (stochastic, fuzzy-set-theoretic, optimization and some others) to the problem of defining an order on a set of histograms (2014);
- the problem of stability of histogram data to distortions (2014).

Research on the analysis of scientometric data (Aleskerov F., Karpov A., Lepskiy A., Myachin A., Petrushchenko V., Subochev A.)

- Abankina I., Aleskerov F., Belousova V., Osmolovskaya A., Petruschenko V., Ogorodniychuk D., Yakuba V., Zinkovsky K. University efficiency evaluation with using its reputational component// Lecture Notes in Management Science (2012), Vol. 4: p.244–253.
- Abankina I., Aleskerov F., Belousova V., Gokhberg L., Zin'kovsky K., Kisel'gov S., Shvydun S. Typology and analysis of scientific and educational impact of Russian universities// Forsyth, v.7(3), 2013, p.50-65. (in Russian)
- Abankina I., Aleskerov F., Belousova V., Zin'kovsky K., Petruschenko V. Evaluation of the impact of universities through the data envelopment analysis// Problems of Education, 2013, 2, p.15-47. (in Russian)
- Aleskerov F., Gokhberg L., Egorova L., Myachin A., Sagieva G. Pattern Analysis in the Study of Science, Education and Innovative Activity in Russian Regions// Procedia Computer Science. 2013, v.17, pp.687-694.
- Karpov A. Equal weights coauthorship sharing and the Shapley value are equivalent// Journal of Informetrics, 2014, 8(1), 71-76.
- Lepskiy A. On the Stability of Comparing Histograms with Help of Probabilistic Methods// Procedia Computer Science. Elsevier, 2014, 31, 597-605.
- Myachin A. Analysis of global data education and patent activity using new methods of pattern analysis// Procedia Computer Science. Elsevier, 2014, 31, 468-473.
- Petrushchenko V. Accounting heterogeneity in the model of DEA// Control Sciences, 2013, 5, pp.2-11. (in Russian)

Study of the behavioral model of agents on a stock exchange (Aleskerov F., Egorova L.)

New results:

- the behavioral model of stock exchange (2012);
- a software package that simulates the stock market using this behavioral model (2013);
- the agent-based model of the stock exchange with agents being price takers and internal price mechanism (2014).

Aleskerov F., Egorova L. Is it so bad that we cannot recognize black swans?// Economic Letters, 117, No. 3, 2012, p.563-565.

Egorova L.G. Effectiveness of Different Trading Strategies for Price-takers// Procedia Computer Science. Elsevier, 2014, 31, 133-142.

Egorova L. Effectiveness of different trading strategies for price-takers// Control Sciences, 2014, 5, 34-41. (in Russian)



Study of models of ethnopolitical tension, social polarization and power indices (Aleskerov F., Kamalova R., Lipacheva A., Schwarts D.)

New results:

- the mean value theorems for the power indices (2013-2014);
- the theoretical estimates for the measure of balancedness of the complete signed graphs (2013);
- the analysis of the balance of the State Duma of the Russian Federation (2013);
- the comparative analysis of polarization indices in special cases was conducted (2014);
- efficient algorithms for evaluation of power indices taking into account agents' preferences in collective decision-making bodies with rules satisfying anonymity (2014);

Aleskerov F.T., Holler M., Kamalova R. Power distribution in the Weimar Reichstag in 1919-1933// Annals of Operations Research, 2014. 215(1), 25-37.

Kamalova R.U. Ethnic heterogeneity: basic concepts and problems of measurement// Polity: An Analysis. Chronicle. Forecast, 2013, No.4 (in Russian)

Shvarts D.A. Axiomatics of power indices in the problem of voting with quota // Control Problems, 2012. No.1. p.33-41. (in Russian)

Shvarts D. Axiomatics for Power Indices in the Weighted Games// Automation and Remote Control, 2014, 75, 345-357.



Efficiency analysis of banking and financial sectors of the economy

(Aleskerov F., Penikas I.)

New results:

- key directions of proposed banking sector reforms (US and EU cases) (2012);
- comprehensive analysis of banking business models for small, medium and leading Russian commercial banks from 2006 till 2009 (2012-2013);
- Basel II regulation implementation impact for the banking system of Russia (2012-2014);
- the dependence of banking system regulatory bodies and the level of economic activity (2013);
- long-term model of systemically important banks interaction (2013-2014);
- a model of assessing the level of financial stability of the country (2014);
- a method to evaluate how an individual financial institution can disturb the whole financial system (2014);
- a model of finding key borrowers in financial networks (2014).



Efficiency analysis of banking and financial sectors of the economy

(Aleskerov F., Penikas I.)

- Aleskerov F., Andriyevskaya I., Penikas G., Solodkov V. Analysis of mathematical models of Basel II (second edition). – Fizmatlit, Moscow, 2013. 295p. (in Russian)
- Aleskerov F., Andriyevskaya I., Permjakova E. Key borrowers detected by the intensities of their short-range interactions, National Research University Higher School of Economics Basic Research Program Working Paper, Series Financial Economics, WR BRP, 33/FE/2014, 18p.
- Arzamasov V., Penikas H. A financial stability index for Israel// Procedia Computer Science. Elsevier, 2014, 31, 985-994.
- Merikas A., Merika A., Penikas H. I. Dry Bulk Time Charter Rates Joint Return Distribution Modeling: Copula-Approach// Procedia Computer Science, 2013, V.17, pp.1125-1133.
- Penikas H.I., Petrova A. An Empirical Analysis of Growth and Consolidation in Banking: A Markovian Approach for the case of Russia// International Journal of Computational Economics and Econometrics, 2014, 4(1/5), 112-129.
- Selmier II, W.T., Penikas H., Vasilyeva K. Financial Risk as a Good// Procedia Computer Science. Elsevier, 2014, 31, 115-123.

New decision rules for multi-criteria problems in the theory of criteria importance (Podinovski V.)

New results:

- different analytical and optimization decision rules (2012-2013);
- the interaction between qualitative and quantitative importance for multiobjective (2012-2014);
- decision rule for groups of criteria of equal importance (2014).

Nelyubin A.P., Podinovski V.V. A potential non-dominance in problems of choosing with uncertain information about the preferences // Artificial intelligence and decision-making, 2014, 4, p.83-95. (in Russian)

Podinovski V.V. Sensitivity analysis for choice problems with partial preference relation // European Journal of Operational Research, 2012, V.221, No.1. p.198-204.

Podinovski V.V. Non-dominance and potential optimality for partial preference relations// European Journal of Operational Research, 2013, 229, p.482-486. (IF: 2.038)

Podinovski V.V. Potential optimality of Pareto optima// Procedia Computer Science, 2013, 17, p.1107-1112.

Podinovski V.V., Podinovskaya O.V. New multicriterial decision rules in criteria importance theory// Doklady Mathematics. 2013, 88, No.1, p.486-488. (in Russian)

Podinovski V.V. Decision making under uncertainty with unknown utility function and rank-ordered probabilities// European Journal of Operational Research. 2014, Vol.239. No.2. p.537-541.



Theoretical and experimental studies on cluster analysis and computational text interpretation

(Mirkin B., Chernyak E., Shestakoff A.)

New results:

- a number of works on automated interpretation of text document collection (in Russian) in terms of taxonomy (in Russian, too) (2012);
- the problem of attributes generalization and refinement of objects hierarchical classification using provided attributes (2012);
- several multi criteria methods for ordering on the fixed set of classes (stratification problem) (2013);
- the method for lifting in taxonomies for computational interpretation of text collections (2013-2014);
- cluster analysis methods and the method of annotated suffix trees for textual data analysis (2013-2014);
- series of experiments for measuring similarity between sentences in case of summarization task (2014).



Theoretical and experimental studies on cluster analysis and computational text interpretation (Mirkin B., Chernyak E., Shestakoff A.)

- Aleskerov F., V.Belousova, L.Egorova, B.Mirkin 'An analysis of patterns in static and dynamic', Business-informatics, part 1 - #3(25), 2013, 3-18, part 2 - #4(26), 2013, 3-20
- Cordeiro de Amorim R., Mirkin B. Selecting the Minkowski Exponent for Intelligent K-Means with Feature Weighting// Clusters, Orders, and Trees: Methods and Applications, Springer Optimization and its Applications, Springer, 2014, 92, p.103-117.
- Chernyak E., Mirkin B. An AST Method for Scoring String-to-Text Similarity in Semantic Text Analysis// Clusters, Orders, and Trees: Methods and Applications, Springer Optimization and its Applications, Springer, 2014, 92, p.331-340.
- Chernyak E., Mirkin B. A method for refining a taxonomy by using annotated suffix trees and Wikipedia resources// Procedia Computer Science. Elsevier, 2014, 31, p.193-200.
- Chernyak E., Morenko E., Mirkin B. Conceptual maps: construction over a text collection and analysis// Analysis of Images, Social Networks and Texts Communications in Computer and Information Science, Springer, 436, 2014, p.163-168.
- Chernyak E. and Mirkin B. Using phrase-to-text relevance score to annotate research publications// Business Informatics, 2014. 2(28), p.51-62. (in Russian)
- Mirkin B.G. Clustering: A Data Recovery Approach // Chapman&Hall/CRC Press, 2012, 388p.
- Mirkin B.G., Shestakoff A. Least squares consensus clustering: criteria, methods, experiments// Lecture Notes in Computer Science, V.7814 Springer, 2013, p.764-768.
- Mirkin B. Methods for Interpretation of Data in Medical Informatics// Advances in Intelligent Analysis of Medical Data and Decision Support Systems, Studies in Computational Intelligence, v.473, 2013, p.15-22.
- Mirkin B.G. Individual approximate clusters: methods, properties, applications// Rough Sets, Fuzzy Sets, Data Mining, and Granular Computing. Issue 8170: Lecture Notes in Artificial Intelligence. Heidelberg: Springer, 2013. p.26-37.
- Mirkin B. Basics of Data Analysis: the textbook for engineering specialties. – URAIT, Moscow, 2014. (in Russian)

Studies in the framework of the belief function theory and imprecise probabilities (Lepskiy A.)

New results:

- a stochastic geometric measures of informativeness defined on polygonal contours (2012);
- the relationship between the measure of conflict of evidence and the index of decreasing of ignorance after applying of combining rule (2013);
- some general schemes of aggregation of two belief functions into a single belief function (2014);
- some quality characteristics of combining rules (2014).

Bronevich A., Karkishchenko A., Lepskiy A. Uncertainty analysis of selection of informative features and representations of images. – Moscow: FIZMATLIT, 2013, 308p.

Lepskiy A. Stochastic measure of informativity and its application to the task of stable extraction of features // Synergies of soft computing and statistics for intelligent data analysis, AISC 190, Springer-Verlag, Berlin Heidelberg, 2013, p.553-561.

Lepskiy A. Estimation of Conflict and Decreasing of Ignorance in Dempster-Shafer Theory// Procedia Computer Science, v.17, 2013, p.1113-1120.

Lepskiy A. Determination of Symmetry Parameters of Objects in Noisy Images// Pattern Recognition and Image Analysis, v.23, No.3, 2013, p.408-414.

Bronevich A., Lepskiy A. Imprecision Indices: axiomatic, properties and applications// Int. J. of General Systems, 44, 2015, p.3-23.

Lepskiy A. General Schemes of Combining Rules and the Quality Characteristics of Combining// F. Cuzzolin (Ed.): BELIEF 2014, LNAI 8764, Springer-Verlag, 2014, p.29-38.



Development and study of applied game-theoretic models

(Karpov A., Kalugina E., Kiselgof S., Shvydun S., Sorokin K.)

New results:

- a generalization of the probabilistic voting model in two-candidate elections (2012);
- a game-theoretic model of an escalating conflict (2013);
- the different convergence properties for probabilistic game-theoretic correlated voting model (2013);
- a game-theoretic model of the co-authorship sharing problem (2014);
- a new mathematical model for a personnel selection problem that includes the comparison of employers and candidates, different aggregation procedures and matching (2014).

Dodlova M., Kiselgof S., Menyashev R., Sorokin K., Khmelnytskaya E., Chernina E. Tariffs on public transport and demand modeling (for example, commuter rail in the Moscow region)// Problems of Economics, 6, 2013, p.100-119. (in Russian)

Zakharov A.V., Sorokin C.S. Policy convergence in a two-candidate probabilistic voting model// Social Choice and Welfare, 2014, 43(2), p.429-446.

Shvydun S., Kalugina E. An Effective Personnel Selection Model// Procedia Computer Science. Elsevier, 2014, 31, p.1102-1106.



Mathematical models of the choice of the university by applicants (Kiselgof S.)

New results:

- the model of generalized one-to-many matchings with preferences as interval orders (2013);
- the problem of choosing a non-manipulable stable mechanism with minimal risk of getting inefficient matchings for the case of the simplest semiorders (2013);
- stable mechanism with a reduced risk of inefficiency for a wide class of preference relations (2013);
- constrained-stability concept; stable mechanism for many-to-many matching with exact quotas (2014);
- computational experiments for comparison of different non-manipulable stable-mechanisms in case of preferences being semiorders (2014).

Kiselgof S.G. Modeling admission campaign: colleges of varying quality and entrants with a quadratic utility function // Problems of Control, No.5, 2012.

Kiselgof S. Matchings with Interval Order Preferences: Efficiency vs Strategy-proofness// Procedia Computer Science. Elsevier, 2014, 31, p.807-813.

Kiselgof S. Generalized matchings for preferences represented by simplest semiorder: Stability and pareto optimality// Automation and Remote Control, 2014, 75(6), p.1069-1077.

Development of choice rules for a large number of alternatives (Aleskerov F., Shvydun S.)

New results:

- a set of interval superposition algorithms accompanied with ranking model for its further application to search engines (2012 - 2014).
- several clustering algorithms for large volumes of multidimensional data (2012-2014);
- different choice procedures with special properties for a large number of alternatives (2013-2014);
- a software which implements different choice procedures (2013);
- a complexity of two-stage choice procedures as well as its runtime on real data (2014).

Aleskerov F., Mitichkin E., Shvydun S., Yakuba V. Super-threshold Procedures and Their Application to the Search Problem// Procedia Computer Science, v.17, 2013, p.1121-1124.

Aleskerov F.T., Mitichkin E.O., Chistyakov V.V., Shvydun S.V., Iakuba V.I. Method for selecting valid variants in search and recommendation systems (variants)// World Intellectual Property Organization, Patent Scope, Publication Number WO/2014/148948, International Application Number PCT/RU2013/001180, Publication Date 25.09.2014, International Filing Date 27.12.2013.

Aleskerov F.T., Mitichkin E.O., Chistyakov V.V., Shvydun S.V., Iakuba V.I. Patent #2543315 Method for selecting valid variants in search and recommendation systems (variants), Priority 22.03.2013, Registered in the State Register of Russian Federation 27.01.2015.



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