Ilona Kulikovskikh

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Machine learning, Bio-inspired computing, Behavioral science, Evolution of mind and cognitive functions, Embodied cognition, Machine cognition and communication, Data-driven dynamical systems, **Bio-centered artificial intelligence**.

Work Experience

Nov 2018 – Nov 2019 **Postdoctoral Research Fellow**,
Centre of Research Excellence for Data Science and Advanced Cooperative Systems,
Faculty of Electrical Engineering and Computing (FER), University of Zagreb, Croatia,
Laboratory for Machine Learning and Knowledge Representation, Ruđer Bošković Institute, Croatia.

Participated in the DATACROSS project of The Centre of Research Excellence for Data Science and Advanced Cooperative Systems (CRE ACROSS-DataScience) co-financed by the Croatian Government and the European Union through the European Regional Development Fund – the Competitiveness and Cohesion Operational Programme (KK.01.1.1.01.0009).

Jan 2018 – Present **Senior Research Associate, Bio-Centered AI Lab Founder and Group Leader**,
Department of Information Systems and Technologies,
Institute of Computer Science, Mathematics and Electronics,
Samara National Research University, Samara, Russia.

Leading the research projects financed by Russian Foundation for Basic Research (18-37-00219) and Russian Federation President Grant (MK-6218.2018.9).

Jan 2018 – Present **Chief Scientific Officer (CSO), Co-Founder**,
Team Chemistry LLC, Samara, Russia.

Co-leading the start-up project financed by National Program for Innovate Science START-1-18 (C1-51885).

June 2014 – June 2016 **Research Associate**,
Laboratory of Automated Research Systems,
Samara State Aerospace University, Samara, Russia.

Participated in the project financed by National Program for Supporting Fundamental and Applied Science.

Jan 2012 – Jul 2013 **Data Scientist, Software Engineer**,
Centre for Neuropsychological Assessment, Samara, Russia.

Sep 2011 – Present **Associate Professor**,
Department of Information Systems and Technologies,
Institute of Computer Science, Mathematics and Electronics,
Samara National Research University, Samara, Russia.

Teaching postgraduate and undergraduate courses. Supervising Master's theses and students research.

Sep 2008 – Sep 2011 **Assistant Professor**,
Department of Information Systems and Technologies,
Samara State Aerospace University, Samara, Russia.

Taught postgraduate course. Supervised students research. Led the research project financed by National Program for Innovate Science U.M.N.I.K.

Feb 2008 – Jun 2010 **Data Scientist**,
Laboratory of Catalytic Converter Analysis,
JSC RosEco, VAZ Car Factory, Tolyatti, Russia.

May 2007 – Dec 2007 **Research Assistant**,
Department of Biomedical and Laser Systems,
Samara State Aerospace University, Samara, Russia.
Participated in the project financed by Russian Foundation for Basic Research.

Education

2013–2018 **Samara National Research University**, Samara, Russia,
*Doctor of Sciences in Theoretical Computer Science.
(submitted, expected an official defence and diploma)
* A post-doctoral degree called Doctor of Sciences is given to reflect second advanced research qualifications or higher doctorates in ISCED 2011

2008–2011 **Samara State Aerospace University**, Samara, Russia,
*Candidate of Sciences (Ph.D.) in Signal Processing, Data Science and Automation Control.
Diploma DKN 144158 issued 25 Nov 2011 (with distinction)
* According to the International Standard Classification of Education (ISCED) 2011, Candidate of Sciences belongs to ISCED level 8 - "doctoral or equivalent", together with PhD, DPhil, D.Lit, D.Sc, LL.D, Doctorate or similar. Candidate of Sciences allows its holders to reach the level of the Associate Professor

2002–2008 **Samara State Aerospace University**, Samara, Russia,
Computer Engineer in Data Processing.
Diploma BCA 0712081 issued Feb 4, 2008 (with distinction)

Projects

2019 – 2020 **Creating web platform for enabling efficient and profitable interactions in business and government using machine learning techniques based on cognitive maps**, *National Program for Innovate Science START-1-18 (project no. C1-51885), Russia*,
Role: **Co-PI**.

2018 – 2019 **DATACROSS project: Robust Machine learning**, *The Centre of Research Excellence for Data Science and Advanced Cooperative Systems (CREACROSS-Data-Science) co-financed by the Croatian Government and the European Union through the European Regional Development Fund - the Competitiveness and Cohesion Operational Program (KK.01.1.1.01.0009), Croatia*,
Role: **Postdoctoral Research Fellow**.

2018 – 2019 **Learning deep structured data with the phenomena of retrieval-induced forgetting (RIF)**, *Russian Foundation for Basic Research (project no. 18-37-00219), Russia*,
Role: **PI**.

2018 – 2019 **Modeling principles of machines cognition and communication with the phenomena of retrieval-induced forgetting (RIF)**, *Russian Federation President Grant (project no. MK-6218.2018.9), Russia*,
Role: **PI**.

2015 – 2017 **Recovering knowledge models for personalized and collaborative learning from multiple-choice data**, *National Program for Supporting Fundamental and Applied Science, Russia*,
Role: **PI**.

2010 – 2011 **Reducing data redundancy and models complexity with analytical decomposition method**, *National Program for Innovate Science U.M.N.I.K., Russia*,
Role: **PI**.

Teaching

Sep 2017 – Present **Associate Professor**, Samara University.
Preparing study materials and giving lectures:

- Mathematical Modeling, *postgraduate program in Applied Mathematics and Computer Science*.
- Digital Signal and Image Processing, *postgraduate program in Informatics and Computing Tools*.
- Data Mining and Big Data, *postgraduate program in Data Analysis and Software Quality Assurance*.
- Automated Software Testing, *postgraduate program in Data Analysis and Software Quality Assurance*.
- Programming in Modern Fortran, *postgraduate program in Programming Technologies for Intel Computing Platforms*.

- Software Testing and Debugging, *postgraduate program in Programming Technologies for Intel Computing Platforms*.
- Performance Engineering of Software Systems, *postgraduate program in Programming Technologies for Intel Computing Platforms*.

Mentoring postgraduate students.

Sep 2011 – Sep 2017 **Associate Professor**, Samara University.

Prepared study materials and gave lectures:

- Mathematical Modeling, *postgraduate program in Applied Mathematics and Computer Science*.
- Digital Signal and Image Processing, *postgraduate program in Informatics and Computing Tools*.
- Data Mining and Big Data, *postgraduate program in Data Analysis and Software Quality Assurance*.
- Model-Driven Software Engineering, *postgraduate program in Informatics and Computing Tools*.
- Complex Systems Modeling, *postgraduate program in Informatics and Computing Tools*.
- Computer Graphics, *undergraduate program in Informatics and Computing Tools*.
- Numerical Methods, *undergraduate program in Informatics and Computing Tools*.
- Information Technologies, *undergraduate program in Informatics and Computing Tools*.

Mentored undergraduate and postgraduate students.

Sep 2008 – Sep 2011 **Assistant Professor**, Samara University.

- Automated Research Systems Engineering, *postgraduate program in Data Processing*.

Mentored diploma students

Skills

Programming languages: C/C++, C#, Java, JavaScript, HTML, CSS, PHP, Jekyll, MATLAB, Octave, LabView, R, Python, Prolog, Erlang, Scala, Haskell, Julia, Swift, Go, SQL

Frameworks: Keras, PyTorch, Tensorflow, MXNet, Gluon, ONNX

Languages: English (C1), Chinese (B1), Japanese (A2), Korean (A2), Croatian (A2), Russian (native)

Training

Online: **Fast AI** by Fast.ai (2019), **CS230** by Stanford University (2019), **CS231n** by Stanford University (2019), **Machine Learning** by Stanford University (Mar 30th, 2016; with distinction), **Introduction to Machine Learning** by Higher School of Economics (Mar 14th, 2016; with distinction), **The Data Scientist's Toolbox** by Johns Hopkins University (Nov 6th, 2014), **R Programming** by Johns Hopkins University (Nov 6th, 2014; with distinction), **Getting and Cleaning Data** by Johns Hopkins University (Nov 6th, 2014; with distinction), Principles of Written English. Part III by University of California at Berkeley (May 8th, 2014; with distinction), Principles of Written English. Part II by University of California at Berkeley (Feb 28th, 2014; with distinction), Introduction to Computer Science and Programming (Python) by MIT (Jan 1st, 2014; with distinction), Writing in Sciences by Stanford University (Nov 22nd, 2013), Digital Signal Processing by Ecole Polytechnique Federale de Lausanne (Dec 26th, 2013; with distinction), **Computing for Data Analysis** by Johns Hopkins University (Dec 20th, 2013; with distinction), Principles of Written English. Part I by University of California at Berkeley (Dec 15th, 2013), Crafting an Effective Writer: Tools of the Trade (Fundamental English Writing) by Mt. San Jacinto College (Dec 2nd, 2013), Functional Programming Principles in Scala by Ecole Polytechnique Federale de Lausanne (Dec 1st, 2013; with distinction), Introduction to Mathematical Thinking by Stanford University (Nov 11th, 2013; with distinction), Quantum Mechanics and Quantum Computation by University of California at Berkeley (Oct 24th, 2013; with distinction), Coding the Matrix: Linear Algebra Through Computer Science Application by Brown University (Oct 10th, 2013; with distinction)

Schools and workshops: 4th International Summer School on Data Science (Split, Croatia, Sep 9-13, 2019): Lectures on Statistics and Symbolic data analysis; International Workshop on EU and Business R&D Project Management (Zagreb, Croatia, Dec 5-7, 2018): Training on writing EU Horizon H2020 proposals; International Language School EF Educational First (Cambridge, UK, Nov 1-30, 2014): General English classes at B2.2-C1.1 CEFR levels, Professional English classes on negotiation

Scientific Community Activities

Academy membership	**Junior Member of Academy**, International Academy of Navigation and Motion Control, Saint-Petersburg, Russia
Journal reviewing	Mathematical Modelling and Analysis, International Journal of Adaptive Control and Signal Processing, Digital Signal Processing, Pattern Recognition and Image Processing, Computer Optics, Journal of Difference Equations and Applications, Computers in Human Behavior
Conference proceedings reviewing	ECML PKDD 2019, DS 2019
Program Committee membership	PIT 2014-2019, ASPAI 2019

Academic Honors

2019	**National Award for Outstanding Research**, Samara Region, Ministry of Education and Science of the Russian Federation.
2018	**Winner of Science Innovation Competition**, National Innovation Promotion Fund, START.
2018	**Russian Federation President Grant**, President Grant Committee, Interview for the official newspaper of the Russian Academy of Sciences.
2018	**National Award for Outstanding Research**, Samara Region, Ministry of Education and Science of the Russian Federation.
2018	**Outstanding Contribution in Reviewing**, The editors of *Computers in Human Behavior*.
2013	**Best Young Researcher**, Samara Region, Ministry of Education and Science of the Russian Federation.
2010 – 2011	**Best PhD Student Scholarship Award**, Government of the Russian Federation.
2009	**Best Book in Russian Education**, National Education Development Fund.
2009	**Best PhD student in Samara Region**, Ministry of Education and Science of the Russian Federation.
2009	**Winner of Youth Science and Innovation Competition**, National Innovation Promotion Fund, U.M.N.I.K.

Selected publications

Journal papers in English

57. **Kulikovskikh I.** (2019). Reducing computational costs in deep learning on almost linearly separable training data. Computer Optics (accepted)
56. **Kulikovskikh I.**, Prokhorov S., Legović T., Šmuc T. (2019). An SGD-based meta-learner with “growing" descent. Journal of Physics: Conference Series. 1368: 052008.
55. **Kulikovskikh I.**, Prokhorov S., Lipić T., Legović T., Šmuc T. (2019). BioGD: Bio-inspired robust gradient descent. PLoS ONE. 14(7): e0219004.
54. **Kulikovskikh I.M.**, Prokhorov S.A. (2018). Psychological perspectives on implicit regularization: A model of retrieval-induced forgetting. Journal of Physics: Conference Series. 1096(1): 012079.
53. **Kulikovskikh I.M.** (2018). Meixner nonorthogonal filters. Automation and Remote Control. 79(8): 1458-1473.
52. **Kulikovskikh I.M.** (2017). Cognitive validation maps for early occupancy detection in environmental sensing. Engineering Applications of Artificial Intelligence. 65: 330-335.
51. **Kulikovskikh I.M.** (2017). Anomaly detection in an ecological feature space to improve the accuracy of human activity identification in buildings. Computer Optics. 41(1): 126-133.
50. **Kulikovskikh I.M.**, Prokhorov S.A., Suchkova S.A. (2017). Promoting collaborative learning through regulation of guessing in clickers. Computers in Human Behavior. 75: 81-91.

49. **Kulikovskikh I.M.**, Prokhorov S.A. (2017). Minimizing the effects of floor and ceiling to improve the convergence of loglikelihood. Procedia Engineering. 201: 779–788.

48. Prokhorov S.A. **Kulikovskikh I.M.** (2016). Pole position problem for Meixner filters. Signal Processing. 120: 8-12.

47. Prokhorov S.A., **Kulikovskikh I.M.** (2015). Unique condition for generalized Laguerre functions to solve pole position problem. Signal Processing. 108: 25-29.

Conference proceedings in English

46. **Kulikovskikh I.**, Prokhorov S., Legović T., Šmuc T. Growing descent of stochastic gradient with the generalized logistic map. In: Proceedings of the 5th Conference on Information Technology and Nanotechnology (ITNT-2019). May 21-24, 2019. Samara, Russia. pp. 338-344.

45. **Kulikovskikh I.M.**, Prokhorov S.A. A method of implicit regularization based on the phenomena of retrieval-induced forgetting (RIF). In: Proceedings of the 4th Conference on Information Technology and Nanotechnology (ITNT-2018). May 21-24, 2018. Samara, Russia. pp. 2132-2137.

44. **Kulikovskikh I.M.**, Prokhorov S.A. Modifications of log-likelihood to measure floor and ceiling effects. In: Proceedings of the 3rd Conference on Information Technology and Nanotechnology (ITNT-2017). Apr 25-27, 2017. Samara, Russia. pp. 1849-1853.

43. Prokhorov S.A., **Kulikovskikh I.M.** Fuzzy learning performance assessment based on decision making under internal uncertainty. In: Proceedings of the 7th Computer Science and Electronic Engineering Conference (CEEC'15). Sep 24-25, 2015. Colchester, UK. pp. 65-70.

Presentations in English

42. **Kulikovskikh I.**, Šmuc T. Machines in a classroom: Towards human-like active learning. 22nd Conference on Discovery Science (DS 2019). Oct 28-30, 2019. Split, Croatia.

41. **Kulikovskikh I.**, Šmuc T. Bio-inspired robust machine learning. 4th Workshop on Data Science (IWDS 2019). Oct 15, 2019. Zagreb, Croatia.

40. **Kulikovskikh I.**, Šmuc T. Robust machine learning inspired by the models of population dynamics. 12th International Ljubljana-Zagreb Workshop on Knowledge Technologies and Data Science. Oct 24-25, 2019. University of Zagreb, Zagreb, Croatia.

39. **Kulikovskikh I.** Implicit regularization of regression models based on the generalized logistic equation. Seminar on Data Science. Nov 8, 2018. Laboratory for Machine Learning and Knowledge Representation, Ruđer Bošković Institute, Zagreb, Croatia.

38. **Kulikovskikh I.** Implicit regularization of regression models based on cognitive validation maps. Keynote lecture. Apr 16, 2018. International Conference PIT 2018, Samara, Russia.

37. **Kulikovskikh I.** Implicit regularization of regression models based on the validation of dynamic cognitive maps. Seminar on Machine Learning. Mar 29, 2018. Computational Center of Russian Academy of Sciences, Moscow, Russia.

36. **Kulikovskikh I.** Implicit regularization of regression models. Seminar on Problems in Mathematics. Dec 8, 2017. Department of Mathematics, Samara University, Samara, Russia.

35. **Kulikovskikh I.M.**, Prokhorov S.A. Some lightweight algorithms for scientific computing in mobile technologies. 8th International Conference on Applied Mathematics and Scientific Computing. Jun 10-14, 2013. Šibenik, Croatia.

Books in Russian

34. Prokhorov S.A., **Kulikovskikh I.M.** Numerical methods and algorithms for correlation-spectral analysis with orthogonal decomposition method. Samara: Insoma-press, 2019. 254 p. [in Russian]

33. Prokhorov S.A., **Kulikovskikh I.M.** Numerical methods, algorithms, and software implementation for computational and natural experiments. Samara: Insoma-press, 2019. 208 p. [in Russian]

32. Prokhorov S.A., **Kulikovskikh I.M.** Classical orthogonal functions and its applications. Part I. Orthogonal functions of exponential type: 2nd edition. Samara: Insoma-press, 2019. 200 p. [in Russian]

31. Prokhorov S.A., **Kulikovskikh I.M.** Classical orthogonal functions and its applications. Part I. Orthogonal functions of exponential type. Samara: Samara Scientific Center of the Russian Academy of Sciences, 2013. 200 p. [in Russian]

30. Prokhorov S.A., **Kulikovskikh I.M.** Orthogonal models of correlation and spectral characteristics of stochastic processes. Samara: Samara Branch of Russian Academy of Sciences, 2008. 301 p. [in Russian]

29. **Kulikovskikh I.M.** (2007). Algorithms and software implementation for correlation-spectral analysis with Jacobi elliptic functions. In Prokhorov S.A. (ed.) Applied analysis of stochastic processes. Samara: Samara Scientific Center of the Russian Academy of Sciences, pp. 347-360. [in Russian]

Journal papers in Russian

28. Prokhorov S.A., **Kulikovskikh I.M.** (2018). Regularizing orthogonal models of probabilistic characteristics by validating their basic properties. Software & Systems. 31(1): 99-101. [in Russian]

27. **Kulikovskikh I.M.**, Prokhorov S.A. (2018). Reducing the complexity of the model of individual and group adaptive testing with multiple choice based on a fuzzy cognitive map. Software systems and computational methods. 4: 15-26. [in Russian]

26. **Kulikovskikh I.M.** (2017). Improving interpretability of regression models by building a tree-step cognition model. Software & Systems. 30(4): 601-608. [in Russian]

25. **Kulikovskikh I.M.** (2016). An approach to feature extraction to detect occupancy in buildings using ecological factors. Izvestia of Samara Scientific Center of the Russian Academy of Sciences. 18(4-4): 754-759. [in Russian]

24. **Kulikovskikh I.M.**, Prokhorov S.A., Suchkova S.A., Matytsin E.V. (2016). Complex system for collaborative learning based on fuzzy models to describe systems behavior with partial knowledge. Izvestia of Samara Scientific Center of the Russian Academy of Sciences. 18(4-4): 760-765. [in Russian]

23. **Kulikovskikh I.M.** (2016). Computing coefficients of nonorthogonal Meixner filters with GNU Octave. Journal of Radio Electronics. 6: 8. [in Russian]

22. Prokhorov S.A., Suchkova S.A., **Kulikovskikh I.M.** (2015). Diagnostic tests clustering in English prepositions learning according to Bloom's taxonomy. Izvestia of Samara Scientific Center of the Russian Academy of Sciences. 17(2-5): 1097-1103. [in Russian]

21. **Kulikovskikh I.M.** (2015). Optimality condition for Meixner filters. Journal of Radio Electronics. 4: 11. [in Russian]

20. Prokhorov S.A., **Kulikovskikh I.M.** (2015). An efficient implementation of the estimates of Fourier coefficients with limited computational resources. Software & Systems. 3: 113-118. [in Russian]

19. Prokhorov S.A., **Kulikovskikh I.M.** (2012). Building software systems with objects interaction diagram. Software & Systems. 3: 5-8. [in Russian]

18. Prokhorov S.A., **Kulikovskikh I.M.** (2009). Numerical-analytical approach to computing integrals at constructing orthogonal models. Journal of Samara State Technical University. Ser. Physical and Mathematical Sciences. 2(19): 140-146. [in Russian]

17. Prokhorov S.A., **Kulikovskikh I.M.** (2008). Approximating correlation and power spectral density models with Sonin-Laguerre orthogonal functions. Journal of Samara State Technical University. Ser. Physical and Mathematical Sciences. 2(17): 185-191. [in Russian]

16. Prokhorov S.A., **Kulikovskikh I.M.** (2007). Frequency characteristics of Sonin-Laguerre orthogonal functions. Journal of Samara State Technical University. Ser. Physical and Mathematical Sciences. 2(15): 123-127. [in Russian]

Software patents

15. **Kulikovskikh I.M.**, Shaldybina O.N. Web platform for enabling efficient "machine-machine" and "human-human" interactions. Submitted to Federal Institute for Industrial Property.

14. **Kulikovskikh I.M.** Package for Analysis of Convergence Rates of RIF-based Gradient Methods. Pat. No. 2019667794 issued Dec 27, 2019 by Federal Institute for Industrial Property.

13. **Kulikovskikh I.M.** Library for Robust Bio-inspired Machine Learning. Pat. No. 2019667690 issued Dec 26, 2019 by Federal Institute for Industrial Property.

12. **Kulikovskikh I.M.**, Bezrukov D.V. Software Implementation of Long-Term Memory for CNN. Pat. No. 2018664362 issued Oct 30, 2018 by Federal Institute for Industrial Property.

11. **Kulikovskikh I.M.**, Nazarova E.A. Software Implementation of Fuzzy Machine Learning Algorithms. Pat. No. 2018664363 issued Oct 30, 2018 by Federal Institute for Industrial Property.

10. **Kulikovskikh I.M.**, Ponomarev E.A. Software Implementation of Grouped Machine Learning Algorithms Based on the Phenomenon of Retrieval-Induced Forgetting. Pat. No. 2018665162 issued Nov 6, 2018 by Federal Institute for Industrial Property.

9. **Kulikovskikh I.M.**, Prokhorov S.A., Suchkova S.A. Fuzzy Learning Assessment System for Measuring Leaning Performance with Partial Knowledge. Pat. No. 2015660296 issued Dec 16, 2015 by Federal Institute for Industrial Property.

8. **Kulikovskikh I.M.**, Prokhorov S.A., Suchkova S.A. Machine Learning System For Teaching English Prepositions. Pat. No. 2015618129 issued Jul 31, 2015 by Federal Institute for Industrial Property.

7. **Kulikovskikh I.M.**, Prokhorov S.A., Tselishev D.V. Mobile Application for Analysing Fourier Coefficients in Demanding Computational Tasks. Pat. No. 2014619047 issued Sep 8, 2014 by Federal Institute for Industrial Property.

6. **Kulikovskikh I.M.**, Prokhorov S.A., Mayorov A.P. Mobile Android-Based Handbook of Basic Orthogonal Exponential Functions. Pat. No. 2013660124 issued Oct 24, 2013 by Federal Institute for Industrial Property.

5. **Kulikovskikh I.M.**, Prokhorov S.A., Bogdanova Ya.Yu. Incomplete Data Analyser for iOS. Pat. No. 2013611627 issued Jan 30, 2013 by Federal Institute for Industrial Property.

4. **Kulikovskikh I.M.**, Prokhorov S.A., Phillippova N.S. Software for Data Mining in Photoplethysmographic Signals. Pat. No. 2013611625 issued Jan 30, 2013 by Federal Institute for Industrial Property.

3. Grebnev V.V., Malchikov G.D., Zarazhevskij V.I., Kravchenko I.E., Prokhorov S.A., **Kulikovskikh I.M.** Software for Catalytic Data Analysis. Pat. No. 2010616641 issued Oct 6, 2010 by Federal Institute for Industrial Property.

2. **Kulikovskikh I.M.**, Prokhorov S.A. Software for Analysis of Jacobi Generalized Orthogonal Polynomials. Pat. No. 2009614285 issued Aug 14, 2009 by Federal Institute for Industrial Property.

1. **Kulikovskikh I.M.**, Prokhorov S.A. SCAN: Research Software for Spectral-Correlation Analysis with Analytical Fourier Decomposition Method. Pat. No. 2009613943 issued Jul 24, 2009 by Federal Institute for Industrial Property.