

# Ilona Kulikovskikh

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Machine learning, Bio-inspired computing, Behavioral science, Evolution of mind and cognitive functions,  
Machine cognition and communication, Human-centric artificial intelligence

## Work Experience

- Nov 2018 – **Postdoctoral Research Fellow**,  
Nov 2019 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 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 – **Senior Research Associate, Group Leader**,  
Present Department of Information Systems and Technologies,  
Institute of Computer Science, Mathematics and Electronics,  
Samara National Research University, Samara, Russia.  
Led the research projects financed by Russian Foundation for Basic Research (18-37-00219) and Russian Federation President Grant (MK-6218.2018.9).
- Jan 2018 – **Chief Scientific Officer (CSO), Co-Founder**,  
Present Team Chemistry LLC, Samara, Russia.  
Co-led the start-up project financed by National Program for Innovate Science START-1-18 (C1-51885).
- June 2014 – **Research Associate**,  
June 2016 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 – **Data Scientist, Software Engineer**,  
Jul 2013 Centre for Neuropsychological Assessment, Samara, Russia.
- Sep 2011 – **Associate Professor**,  
Present Department of Information Systems and Technologies,  
Institute of Computer Science, Mathematics and Electronics,  
Samara National Research University, Samara, Russia.  
Taught postgraduate and undergraduate courses. Supervised Master's theses and students research.
- Sep 2008 – **Assistant Professor**,  
Sep 2011 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 – **Data Scientist**,  
Jun 2010 Laboratory of Catalytic Converter Analysis,  
JSC RosEco, VAZ Car Factory, Tolyatti, Russia.
- May 2007 – **Research Assistant**,  
Dec 2007 Department of Biomedical and Laser Systems,  
Samara State Aerospace University, Samara, Russia.  
Participated in the project financed by Russian Foundation for Basic Research.

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## 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)

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## 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-Principal Investigator**.
- 2018 – 2019 **Robust Machine learning**, *The Centre of Research Excellence for Data Science and Advanced Co-operative 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: **Principal Investigator**.
- 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: **Principal Investigator**.
- 2015 – 2017 **Recovering knowledge models for personalized and collaborative learning from multiple-choice data**, *National Program for Supporting Fundamental and Applied Science, Russia*,  
Role: **Principal Investigator**.
- 2010 – 2011 **Reducing data redundancy and models complexity with analytical decomposition method**, *National Program for Innovate Science U.M.N.I.K., Russia*,  
Role: **Principal Investigator**.

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## Teaching

- Sep 2017 – **Associate Professor**, Samara University.  
Present 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*.

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

Mentoring postgraduate students.

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

Sep 2017 Preparing study materials and giving lectures:

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

Mentoring undergraduate and postgraduate students.

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

Sep 2011 o Automated Research Systems Engineering, *postgraduate program in Data Processing*.

Mentoring diploma students

## 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.
- 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.

## Skills

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|-----------------------|--|
| 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 Machine Learning by **Stanford University**, Introduction to Machine Learning by **Higher School of Economics**, The Data Scientist's Toolbox, R Programming, Getting and Cleaning Data by **Johns Hopkins University**, Principles of Written English. Part III by **University of California at Berkeley**, Principles of Written English. Part II by **University of California at Berkeley**, Introduction to Computer Science and Programming (Python) by **MIT**, Digital Signal Processing by **Ecole Polytechnique Federale de Lausanne**, Computing for Data Analysis by **Johns Hopkins University**, Principles of

Written English. Part I by **University of California at Berkeley**, Crafting an Effective Writer: Tools of the Trade (Fundamental English Writing) by **Mt. San Jacinto College**, Functional Programming Principles in Scala by **Ecole Polytechnique Federale de Lausanne**, Introduction to Mathematical Thinking by **Stanford University**, Quantum Mechanics and Quantum Computation by **University of California at Berkeley**, Coding the Matrix: Linear Algebra Through Computer Science Application by **Brown University**

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 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

## Selected publications

- Journal papers in English
55. **Kulikovskikh I.**, Prokhorov S., Legović T., Šmuc T. (2019). An SGD-based meta-learner with "growing" descent. Journal of Physics: Conference Series. 1368. (accepted)
  54. **Kulikovskikh I.**, Prokhorov S., Lipić T., Legović T., Šmuc T. (2019). BioGD: Bio-inspired robust gradient descent. PLoS ONE. 14(7): e0219004.
  53. **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.
  52. **Kulikovskikh I.M.** (2018). Meixner nonorthogonal filters. Automation and Remote Control. 79(8): 1458-1473.
  51. **Kulikovskikh I.M.** (2017). Cognitive validation maps for early occupancy detection in environmental sensing. Engineering Applications of Artificial Intelligence. 65: 330-335.
  50. **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.
  49. **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.
  48. **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.
  47. Prokhorov S.A. **Kulikovskikh I.M.** (2016). Pole position problem for Meixner filters. Signal Processing. 120: 8-12.
  46. 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
45. **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.
  44. **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.
  43. **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.
  42. 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.
- Conference presentations in English
41. **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.
  40. **Kulikovskikh I.**, Šmuc T. Bio-inspired robust machine learning. 4th Workshop on Data Science (IWDS 2019). Oct 15, 2019. Zagreb, Croatia.
  39. **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.
  38. **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.
  37. **Kulikovskikh I.** Implicit regularization of regression models based on cognitive validation maps. Keynote lecture. April 16, 2018. International Conference PIT 2018, Samara, Russia.
  36. **Kulikovskikh I.** Implicit regularization of regression models based on the validation of dynamic cognitive maps. Seminar on Machine Learning. March 29, 2018. Computational Center of Russian Academy of Sciences, Moscow, Russia.
  35. **Kulikovskikh I.** Implicit regularization of regression models. Seminar on Problems in Mathematics. December 8, 2017. Department of Mathematics, Samara University, Samara, Russia.
- Books in Russian
34. Prokhorov S., **Kulikovskikh I.** Numerical methods and algorithms for correlation-spectral analysis with orthogonal decomposition method. Samara: Insoma-press, 2019. 254 p. [in Russian]
  33. Prokhorov S., **Kulikovskikh I.** Numerical methods, algorithms, and software implementation for computational and natural experiments. Samara: Insoma-press, 2019. 208 p. [in Russian]
  32. Prokhorov S., **Kulikovskikh I.** 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., **Kulikovskikh I.** 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., **Kulikovskikh I.** Orthogonal models of correlation and spectral characteristics of stochastic processes. Samara: Samara Branch of Russian Academy of Sciences, 2008. 301 p. [in Russian]
  29. Prokhorov S., **Kulikovskikh I.** Applied analysis of stochastic processes. Samara: Samara Scientific Center of the Russian Academy of Sciences, 2007. 582 p. [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). A method for improving interpretability of regression models based on a tree-step building 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 object 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]
- Preprints
15. **Kulikovskikh, I.M.**, Šmuc T. (2019). Machines in a classroom: Towards human-like active learning. 2019.
  14. **Kulikovskikh, I.M.**, Legović T. (2019). Accelerating the convergence of gradient descent on separable data with the models of population dynamics. 2019.
  13. **Kulikovskikh, I.M.** (2019). Reducing computational costs in deep learning on almost linearly separable training data.

- Software patents
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 to Assess Learning 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. Analyser of Incomplete Data 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.

Other  
peer-reviewed  
papers in  
English and  
in Russian

Available upon request

## References

References upon request