Maxim Rakhuba

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Education

2012–2014 **M.Sc. in Applied Mathematics and Physics**, *Moscow Institute of Physics and Technology*, Russia, *Supervisor Prof. Ivan Oseledets*.
With Honours. GPA 5.00 out of 5.00

2008–2012 **B.Sc. in Applied Mathematics and Physics**, *Moscow Institute of Physics and Technology*, Russia, *Supervisor Prof. Valery Agoshkov*.
With Honours. GPA 4.96 out of 5.00

Master Thesis

Title *Grid-based Hartree-Fock equation in low-rank format with linear complexity*

Supervisor Prof. Ivan Oseledets

Description In the master thesis a grid-based version of the Hartree-Fock equation is proposed. To get linear complexity in each mode size we used Tucker format. In order to work efficiently with the most time-consuming part (3D convolutions) we also proposed new fast convolution algorithm which is based on the cross approximation technique.

Bachelor Thesis

Title *Methods of image variational assimilation & the study of one tropical cyclone model*

Supervisor Prof. Valery Agoshkov

Description In the bachelor thesis a novel mathematical model of tropical cyclone is proposed. This model is based on averaged system of hydrodynamic equations and splitting scheme with the use of image variational assimilation.

Employment

2013–present **Junior research scientist**, *Skolkovo Institute of Physics and Technology*, Moscow region, the group "Scientific computing" (group leader Prof. Ivan Oseledets).

2015, Nov-Dec **Visiting researcher**, *University of California, Los Angeles , (Yuri Spritz research group)*.

2011–2013 **Out-of-staff researcher**, *Institute of Numerical Mathematics of Russian Academy of Sciences*, Moscow, the group "Matrix Methods in Mathematics and Applications" (group leader Prof. Eugene Tyrtyshnikov) .

Publications

Fast multidimensional convolution in low-rank tensor formats via cross approximation, *M.V. Rakhuba, I.V. Oseledets*, SIAM J. Sci. Comput, 2015, Vol. 37, A565-A582, 2015.

Grid-based electronic structure calculations: the tensor decomposition approach, *M.V. Rakhuba, I.V. Oseledets*, J. Comput. Phys. 312, 19-30, 2016.

Calculating vibrational spectra of molecules using tensor train decomposition, *M.V. Rakhuba, I.V. Oseledets*, J. Chem. Phys., pages 124101, 2016.

QTT-Finite-Element Approximation For Multiscale Problems, *V. Kazeev and I. Oseledets and M. Rakhuba and Ch. Schwab*, SAM Report 2016-06.

Speeding-up Convolutional Neural Networks Using Fine-tuned CP-Decomposition, *Lebedev, V., Ganin, Y., Rakhuba, M., Oseledets, I., & Lempitsky, V.*, ICLR, 2015.

The study of tsunami source reconstruction problem, *V.I. Agoshkov, M.V. Rakhuba, 2013*, Russ. J. Numer. Anal. Math. Modelling, Vol. 28, Issue 1, p. 1–12.

Selected Conferences

July 2016 **Making block eigensolvers really work in high dimensions**, *Invited talk, Workshop: ILAS 2016*, Leuven.

June 2015 **Grid-based electronic structure calculations: the tensor decomposition approach**, *Workshop: Low-rank Optimization and Applications, University of Bonn*.

Oct 2013 **Fast multidimensional convolution in low-rank formats via cross approximation**, *Workshop on Matrix Equations and Tensor Techniques, EPFL*, Lausanne.

Participation in Research Programs

Jan 2016 **Mathematics of Signal Processing**, *Hausdorff Trimester Program*, Bonn.

Nov 2014 **Projection Based Model Reduction**, *Oberwolfach Seminars*.

Nov 2013 **The Mathematics of Quantum Chemistry**, *Oberwolfach Seminars*.

Teaching Experience

2014–present Fast methods for partial differential and integral equations, Skoltech, (Teaching Assistant)

2014–present Numerical linear algebra, Skoltech, (Teaching Assistant)

2012–2013 Matrix methods for data compression and analysis, MIPT, (Teaching Assistant)

Skills & Interests

Languages Russian (native speaker)
English (Upper-Intermediate)
Deutsch (Pre-Intermediate)

Computer skills Python, Matlab, LaTeX, Linux, Fortran, C, MPI

Professional interests Numerical analysis, linear algebra, tensor methods, quantum chemistry, data analysis