Valentin Khrulkov

CONTACT INFORMATION

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RESEARCH INTERESTS

Machine learning, low-rank tensor decompositions, reinforcement learning, theoretical analysis of neural networks. Especially, I am interested in applications of various geometrical (differential, algebraic, topological) ideas and techniques to neural networks to further our understanding of deep learning.

EDUCATION

Skolkovo Institute of Science and Technology

Ph.D. Student, Numerical Mathematics (expected May 2020)

- Advisor: Ivan Oseledets
- Increased scholarship due to academic achievements.

Cornell University

M.S. in Mathematics, May 2016

- Advisor: Michael Stillman.
- Research on numerical computations in string theory with M. Stillman and L. McAllister.
- Research on 16^{th} Hilbert's problem with Yu. Ilyashenko.

Lomonosov Moscow State University

Specialist Degree in Mathematics, May 2014

- Advisor: Yulij Ilyashenko.
- V. Khrulkov, *Different approaches to the Josephson equation*, thesis.
- 4.95/5 GPA.
- Diploma with Honors.

PUBLICATIONS

V. Khrulkov and I. Oseledets, *Art of singular vectors and universal adversarial perturbations,* accepted as a conference paper (spotlight talk) at the Conference on Computer Vision and Pattern Recognition (CVPR) 2018.
arxiv.org/abs/1709.03582

V. Khrulkov, A. Novikov and I. Oseledets, *Expressive power of recurrent neural networks,* accepted as a conference paper (poster) at the International Conference on Learning Representations (ICLR) 2018.
openreview.net/forum?id=S1WRibb0Z

V. Khrulkov and I. Oseledets, *Desingularization of bounded-rank matrix sets,* accepted for publication by the SIAM Journal on Matrix Analysis and Applications (SIMAX).
arxiv.org/abs/1612.03973

V. Khrulkov, M. Rakhuba and I. Oseledets *Vico-Greengard-Ferrando quadratures in the tensor solver for integral equations,* presented at the 38^{th} Progress In Electromagnetics Research Symposium (PIERS), May 2017.
doi.org/10.1109/PIERS.2017.8262142

Preprints

V. Khrulkov and I. Oseledets, *Geometry Score: A Method For Comparing Generative Adversarial Networks,* submitted to the International Conference on Machine Learning (ICML) 2018.
arxiv.org/abs/1802.02664. Code: github.com/geom-score/geometry-score

A. Novikov, P. Izmailov, V. Khrulkov, M. Figurnov and I. Oseledets *Tensor Train decomposition on TensorFlow (T3F),* submitted to the Journal of Machine Learning Research (JMLR).
arxiv.org/abs/1801.01928. Code: github.com/Bihaqo/t3f

Talks

Vico-Greengard-Ferrando quadratures in the tensor solver for integral equations, talk given at the 38^{th} PIERS, St Petersburg. (May 2017)

Desingularization of bounded-rank matrix sets, talk given at the Numerical analysis seminar, Université de Genève. (October 2017)

Teaching Experience

Fall	2017	Teaching Assistant, Numerical Linear Algebra
Fall	2016	Teaching Assistant, Numerical Linear Algebra
Spring	2015	Teaching Assistant, Introduction to Real Analysis
Fall	2015	Teaching Assistant, Probability Theory

Graduate Coursework

- ❑ Tensors, Matrices and Computations
- ❑ Dynamical Systems
- ❑ Algebra
- ❑ Lie groups
- ❑ Riemannian Geometry
- ❑ Algebraic Geometry
- ❑ Relativistic Quantum Field Theory II
- ❑ Computational Physics
- ❑ Mastering Quantum Mechanics
- ❑ Algebraic Topology II
- ❑ Deep learning (self study)

Relevant Skills

Programming:	Python, TensorFlow
ML:	Deep learning, tensor based models, GANs reinforcement learning, adversarial attacks
Languages:	English (working proficiency), Russian

References

Ivan Oseledets, Associate Professor, Skolkovo Institute of Science and Technology, i.oseledets@skoltech.ru
Michael Stillman, Professor of Mathematics and Director of Graduate Studies, Cornell University, mike@math.cornell.edu