Maksim Velikanov

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Employment

2022 – … Researcher at **Technology Innovation Institute**, Abu Dhabi

2020 – 2022 Junior researcher and PhD student at **Skoltech**, Moscow

2017 – 2020 Junior research scientist at **Russian Quantum Center**, Moscow

Education

2022 – … Doctoral student at **Ecole Polytechnique**, Hadamard Doctoral School of Mathematics

2020 – 2022 PhD student at **Skoltech**, Center for Artificial Intelligence Technology

2018 – 2020 **M.Sc.** in Physics, **Skoltech** + **MIPT**, Center for Photonics and quantum materials + Department of General and Applied Physics

2013 – 2018 **BSc.** in Physics, **MIPT**, Department of General and Applied Physics

Machine Learning

Publications

ICLR **M. Velikanov**, D. Kuznedelev and D Yarotsky, "A view of mini-batch SGD via generating functions: conditions of convergence, phase transitions, benefit from negative momenta", **2023**, arXiv:2206.11124

NeurIPS **M. Velikanov** and D Yarotsky, "Explicit loss asymptotics in the gradient descent training of neural networks", **2021**, arXiv:2105.00507

AISTATS **M. Velikanov**, R. Kail, I. Anokhin, R. Vashurin, M. Panov, A. Zaytsev, D. Yarotsky, "Embedded Ensembles: Infinite Width Limit and Operating Regimes", **2022**, arXiv:2202.12297

arXiv **M. Velikanov** and D Yarotsky, "Convergence Rate Bounds for Optimization Under Power Law Spectral Conditions", **2022**, arXiv:2202.00992

Invited Talks

December 2022 ML workshop at **Huawei**. Title: *Spectral approach to mini-batch SGD.*

February 2022 joint **Max Planck Institute** + **University of California** seminar "Mathematical Machine learning", https://www.mis.mpg.de/montufar/seminars/
Title: *Spectral properties of wide neural networks and their implications to the convergence speed of different Gradient Descent algorithms.*

December 2021 **Chebyshev Laboratory** seminar "Industrial Mathematics", Saint-Petersburg, https://sites.google.com/view/industrial-math-seminar/
Title: *Infinitely wide neural networks.*

October 2021 **SAMPLE** conference, Gelendzhik, https://cs.hse.ru/hdilab/sample/
Title: *Explicit loss asymptotics in the GD training of neural networks.*

Quantum Physics

Publications

NJP — **M. Velikanov**, A. N. Rubtsov, B. Krippa, "Proton fraction in neutron star matter: dynamical mean-field approach", **2021**, doi:10.1088/1367-2630/abe481

Phys. Rev. B — V. Kuznetsov, L. Kulik, **M. Velikanov**, A. Zhuravlev, A. Gorbunov, S. Schmult, I. Kukushkin, "Three-particle electron-hole complexes in two-dimensional electron systems", **2018**, doi:10.1103/PhysRevB.98.205303

Conferences

ICQT 2019 — Poster "Mapping of neutron matter on correlated lattice fermions" https://conference2019.rqc.ru/

Awards and Achievements

2022 — Ilya Segalovich Award for young researchers, https://yandex.com/scholarships/

2013 — Gold medal at the International Physics Olympiad, Copenhagen Denmark, http://www.ipho2013.dk/ipho2013-results-gold

2019 — Silver medal in mathematics at all-Russian olympiad "I-Profi", season 2.

2019 — Silver medal in physics at all-Russian olympiad "I-Prof", season 2.

2014 – 2016 — Abramov Scholarship (top $\sim 15\%$ DGAP students).

Work Experience

Skoltech

2020 — Joint Huawei – Skoltech project: CNN Expressiveness.

2020 – 2021 — Constructing math exam problems for Skoltech MS admission campaign.

Russian Quantum Center

2017 – 2020 — Modeling of strongly-correlated quantum systems.

2019 – 2020 — Developing of information post-processing methods for quantum cryptography.

Teaching

2020, 2021 — Teaching assistant at Skoltech course *Theoretical Methods of Deep Learning*.

2013 – 2015 — Teaching school students at physics olympiads summer schools.

2015 — Jury member at International Experimental Physics Olympiad, Sochi.