

# Viacheslav (Slava) Borovitskiy

Ph.D. in Mathematics  
Postdoc at ETH Zürich (Machine Learning)

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<https://vab.im/>

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EDUCATION	<i>Ph.D. in Mathematics (harmonic analysis)</i>	Feb. 2022
	St. Petersburg Department of Steklov Mathematical Institute RAS Supervised by Academician Prof. S. Kislyakov	
	<i>M.Sc. jointly with B.Sc. in Mathematics, with distinction</i>	Jun. 2017
	St. Petersburg State University, Department of Mathematics and Mechanics	
AWARDS & HONORS	<i>Best Student Paper Award at AISTATS</i>	2021
	One award for best student paper and one award for best paper given out of 1527 submissions and 455 accepted papers (awards went to 0.1% of submissions)	
	<i>Finalist of the competition for the Prize for Young Mathematicians of Russia</i>	2021
	The competition was affiliated with International Congress of Mathematicians. 17 Ph.D. students were nominated by the Russian mathematical community. I was one of the 6 shortlisted	
	<i>Outstanding Paper Honorable Mention at ICML</i>	2020
FUNDING ACQUIRED	Two awards and two honorable mentions given out of 4990 submissions and 1086 accepted papers (awards and honorable mentions went to 0.08% of submissions)	
	<i>Best Poster Award at Transylvanian Machine Learning Summer School</i>	2018
	<i>Winner of the all-Russian contest of pupils' scientific projects "Junior"</i>	2012
	Awarded <i>ETH Zürich Postdoctoral Fellowship</i> ( $\approx 250\,000$ \$ for 2 years, 1 person)	2022
	Shortlisted for (opted out) Junior Research Fellowship at Merton College, Oxford Shortlisted for (not awarded) Hooke Research Fellowship at Mathematical Institute, Oxford	
WORK RECORD	Awarded <i>Junior Leader grant of BASIS Foundation for the Advancement of Theoretical Physics and Mathematics</i> ( $\approx 50\,000$ \$ for 3 years, 3 people)	2019
	As part of the team of three people led by Dr. Nikolay Osipov	
	<i>Postdoc at Learning &amp; Adaptive Systems Group, ETH Zürich</i>	Apr. 2022–Now
	<i>Researcher at Euler International Mathematical Institute, St. Petersburg</i>	2019–2022
	Ph.D. funding	
LANGUAGES	<i>Researcher and R&amp;D engineer at Chebyshev Lab, St. Petersburg University</i>	2017–2022
	Ph.D. funding. Projects in geostatistics, machine learning, dynamical systems modeling	
LANGUAGES	English (fluent), Russian (native)	Python & C++ (programming)
SCHOLAR	<a href="https://scholar.google.com/citations?user=1KqNyNMAAAAJ">scholar.google.com/citations?user=1KqNyNMAAAAJ</a>	
GITHUB	<a href="https://github.com/vabor112">github.com/vabor112</a>	

SUPERVISION	<i>Master's thesis of Iskander Azangulov</i>	St. Petersburg University, 2022
	Now Ph.D. student at Oxford University. Co-supervised with Prof. S. Tikhomirov	
	<i>Bachelor's thesis of Alexander Shulzhenko</i>	St. Petersburg University, 2022
	Now master's student at St. Petersburg University. Co-supervised with Prof. S. Tikhomirov	
	<i>Semester projects of K. Wyrwal, W. Yuan, C. Doumont</i>	ETH Zürich, 2023
	<i>Semester projects of A. Gnedina, D. Ereemeev</i>	St. Petersburg University, 2021–2022
SCIENTIFIC SERVICE	<i>Reviewing for Journal of Machine Learning Research (JMLR)</i>	2021–Now
	<i>Reviewing for Machine Learning Conferences</i>	2021–Now
	ICML (2021, 2022), NeurIPS (2021, 2023), CSR (2021), AISTATS (2021), CoRL (2022)	
	<i>Panelist for ETH Zürich Career Seed Awards (30K CHF grants for postdocs)</i>	2022
	<i>Evaluating Ph.D. Applications</i>	2022–2024
	For "Max Planck ETH Center for Learning Systems" and "ETH AI Center"	
TEACHING	<i>Guest lecture for "Probabilistic Artificial Intelligence" course at ETH Zürich</i>	2023
	In person lecture for 500+ students.	
	<i>TA for "Introduction to Machine Learning" course at ETH Zürich</i>	2023
	1000+ students. Member of the exam preparation team	
	<i>TA for "Probabilistic Artificial Intelligence" course at ETH Zürich</i>	2022
	500+ students. Leading a team of 3 Ph.D. students and 2 postdocs to create the exam	
	<i>Lecturer, original "Mini-course on Gaussian random fields in machine learning"</i>	2021
	Invited mini-course at "HSE and SPbU Joint Winter School in Mathematics and Theoretical Computer Science". Viewed by more than 150 people	
	<i>Lecture on "Laplacian Eigenmaps Algorithm for Dimensionality Reduction"</i>	2020
	St. Petersburg University, educational lecture at the "Industrial Mathematics" seminar	
	<i>Lecture on "Basic Methods of Dimensionality Reduction: PCA and Kernel PCA"</i>	2020
	St. Petersburg University, educational lecture at the "Industrial Mathematics" seminar	
ORGANIZING	<i>Steered the collaborative effort to develop the <a href="#">GeometricKernels</a> package</i>	2022–2024
	<i>Co-organized the "<a href="#">Industrial Mathematics</a>" seminar</i>	2019–2022
	Chebyshev Laboratory, St. Petersburg University	
	<i>Scientific Organizing Committee Head at ETH Zürich IML retreat</i>	2022
SOFTWARE	<a href="#">GeometricKernels</a>	
	Python framework for kernels and Gaussian processes on manifolds, graphs, and meshes. Github stars: 150+	
	<i>The theory I co-developed is implemented in popular libraries I did not contribute to:</i> e.g. <i>pathwise conditioning</i> is implemented in <a href="#">BOTorch</a> (2700+ Github stars), <a href="#">Trieste</a> (180+ Github stars) and <a href="#">GPJax</a> (300+ Github stars) which also <a href="#">implements</a> graph Matérn kernels	

## INVITED TALKS

*I gave 30+ talks at seminars/conferences in 10 countries.* Below are a few selected ones.

*Geometric Gaussian Processes* *Jul. 2023*  
ELLIS Talk, ISTA, Austria

*Geometric Gaussian Processes* *Feb. 2023*  
OxCSML Seminar, University of Oxford, UK

*Geometry-aware Gaussian Processes* *Dec. 2022*  
Workshop on Gaussian Processes, Spatiotemporal Modeling, and Decision-making  
NeurIPS 2022, USA

*Geometry-aware Gaussian Processes for Machine Learning* *Oct. 2022*  
Geometry Seminar, ETH Zürich, Switzerland

*On a Common Ground Between Geological Modeling  
and Machine Learning* *Jun. 2022*  
Centro Pi Seminar, Instituto de Matemática Pura e Aplicada (IMPA), Brazil

*Gaussian Processes on Riemannian Manifolds for Robotics* *Jul. 2021*  
Workshop on Geometry and Topology in Robotics (R:SS'21), Virtual

The full list of talks is available at <https://vab.im/talks/>.

## PAPERS

(PUBLICATIONS)

### MACHINE LEARNING

D. Robert-Nicoud, A. Krause, **V. Borovitskiy**. Intrinsic Gaussian Vector Fields on Manifolds. Accepted by AISTATS 2024. **Oral**

M. Yang, **V. Borovitskiy**, E. Isufi. Hodge-Compositional Edge Gaussian Processes. Accepted by AISTATS 2024.

P. Rosa, **V. Borovitskiy**, A. Terenin, J. Rousseau. Posterior Contraction Rates for Matérn Gaussian Processes on Riemannian Manifolds. In Neural Information Processing Systems, 2023. **Spotlight**

B. Fichera, **V. Borovitskiy**, A. Krause, A. Billard. Implicit Manifold Gaussian Process Regression. In Neural Information Processing Systems, 2023.

E. Noskova, **V. Borovitskiy**. Bayesian optimization for demographic inference. In G3: Genes, Genomes, Genetics, 2023.

**V. Borovitskiy\***, M. R. Karimi\*, V. R. Somnath\*, A. Krause. Isotropic Gaussian Processes on Finite Spaces of Graphs. In International Conference on Artificial Intelligence and Statistics, 2023.

F. Pavutnitskiy\*, S. O. Ivanov\*, E. Abramov\*, **V. Borovitskiy\***, A. Klochkov\*, V. Vialov\*, A. Zaikovskii\*, and A. Petiushko. Quadric hypersurface intersection for manifold learning in feature space. In International Conference on Artificial Intelligence and Statistics, 2022.

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\* Equal contribution

M. Hutchinson\*, A. Terenin\*, **V. Borovitskiy**\*, S. Takao\*, Y. W. Teh, and M. P. Deisenroth. Vector-valued Gaussian Processes on Riemannian Manifolds via Gauge-Independent Projected Kernels. In Neural Information Processing Systems, 2021.

N. Jaquier\*, **V. Borovitskiy**\*, A. Smolensky, A. Terenin, T. Asfour and L. Rozo. Geometry-aware Bayesian Optimization in Robotics using Riemannian Matérn Kernels. In Conference on Robot Learning, 2021.

**V. Borovitskiy**\*, I. Azangulov\*, A. Terenin\*, P. Mostowsky, M. P. Deisenroth, N. Durrande. Matérn Gaussian Processes on Graphs. In International Conference on Artificial Intelligence and Statistics, 2021.

**Best student paper award**

J. T. Wilson\*, **V. Borovitskiy**\*, A. Terenin\*, P. Mostowsky\*, M. P. Deisenroth. Pathwise Conditioning of Gaussian Processes. In Journal of Machine Learning Research, 2021.

**V. Borovitskiy**\*, A. Terenin\*, P. Mostowsky\*, and M. P. Deisenroth. Matérn Gaussian processes on Riemannian manifolds. In Neural Information Processing Systems, 2020.

J. T. Wilson\*, **V. Borovitskiy**\*, A. Terenin\*, P. Mostowsky\*, and M. P. Deisenroth. Efficiently sampling functions from Gaussian process posteriors. In International Conference on Machine Learning, 2020.

**Outstanding paper honorable mention**

HARMONIC ANALYSIS

**V. Borovitskiy**. Littlewood–Paley–Rubio de Francia inequality for multi-parameter Vilenkin systems. In Mathematische Nachrichten, 2023.

**V. Borovitskiy**<sup>†</sup>, N. Osipov<sup>†</sup>, A. Tselishchev<sup>†</sup>. Burkholder meets Gundy: Bellman function method for general operators on martingales. In *Advances in Mathematics*, 2022.

**V. Borovitskiy**<sup>†</sup>, S. Kislyakov<sup>†</sup>. Interpolation of abstract Hardy-type spaces. In Journal of Mathematical Sciences, 2022.

**V. Borovitskiy**. Littlewood–Paley–Rubio De Francia Inequality for the Two-Parameter Walsh System. In Journal of Mathematical Sciences, 2022.

**V. Borovitskiy**<sup>†</sup>, N. Osipov<sup>†</sup>, A. Tselishchev<sup>†</sup>. On the Bellman function method for operators on martingales. In Doklady Mathematics, 2021.

**V. Borovitskiy**. Weighted Littlewood–Paley inequality for arbitrary rectangles in  $\mathbb{R}^2$ . In St. Petersburg Mathematical Journal, 2021.

**V. Borovitskiy**. K-closedness for weighted Hardy spaces on the torus  $\mathbb{T}^2$ . In Journal of Mathematical Sciences, 2018.

GEOSTATISTICS

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\* Equal contribution      <sup>†</sup> Alphabetic ordering

N. Ismagilov, **V. Borovitskiy**, M. Lifshits, and M. Platonova. Boolean Spectral Analysis in Categorical Reservoir Modeling. In Mathematical Geosciences, 2021.

**PAPERS**  
(PREPRINTS)

I. Azangulov<sup>\*\*</sup>, A. Smolensky<sup>\*\*</sup>, A. Terenin, **V. Borovitskiy**. Stationary Kernels and Gaussian Processes on Lie Groups and their Homogeneous Spaces II: non-compact symmetric spaces. [arXiv:2301.13088](https://arxiv.org/abs/2301.13088). 2023. In review for JMLR.

I. Azangulov<sup>†</sup>, **V. Borovitskiy**<sup>†</sup>, A. Smolensky<sup>†</sup>. On power sum kernels on symmetric groups. arXiv preprint [arXiv:2211.05650](https://arxiv.org/abs/2211.05650). 2022.

N. Jaquier, L. Rozo, M. González-Duque, **V. Borovitskiy**, T. Asfour. Bringing motion taxonomies to continuous domains via GPLVM on hyperbolic manifolds. arXiv preprint [arXiv:2210.01672](https://arxiv.org/abs/2210.01672). 2022.

I. Azangulov<sup>\*\*</sup>, A. Smolensky<sup>\*\*</sup>, A. Terenin, **V. Borovitskiy**. Stationary Kernels and Gaussian Processes on Lie Groups and their Homogeneous Spaces I: the compact case. arXiv preprint [arXiv:2208.14960](https://arxiv.org/abs/2208.14960). 2022. In review for JMLR. Revision pending.

**PAPERS**  
(NON-ARCHIVAL)

K. Wyrwal, **V. Borovitskiy**. Residual Deep Gaussian Processes on Manifolds for Geometry-aware Bayesian Optimization on Hyperspheres. In NeurIPS 2023 Workshop on Adaptive Experimental Design and Active Learning in the Real World, 2023.

N. Ismagilov, I. Azangulov, **V. Borovitskiy**, M. Lifshits, and P. Mostowsky. Bayesian Inference of Covariance Parameters in Spectral Approach to Geostatistical Simulation. In ECMOR XVII, 2020.

N. Ismagilov, **V. Borovitskiy**, M. Lifshits, and M. Platonova. Boolean spectral analysis in categorical reservoir modelling. In Petroleum Geostatistics, 2019.

T. Malygina, **V. Borovitskiy**, Y. Porozov. Reproducibility Project: DeepSite. Poster at Transylvanian Machine Learning Summer School 2018. [10.13140/RG.2.2.35686.06723/1](https://arxiv.org/abs/10.13140/RG.2.2.35686.06723/1), 2018.

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<sup>\*\*</sup> Joint first author

<sup>†</sup> Alphabetic ordering