KIRILL BRILLIANTOV

Zurich, Switzerland

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EDUCATION

ETH Zurich (ETH) — **Sep 2023 - Jun 2025**
Master of Computer Science — *Zurich, Switzerland*

Total Bachelor's GPA: **8.996/10.0**

Constructor (Jacobs) University Bremen (C(J)UB) — **Sep 2022 - Jun 2023**
completed Bachelor of Computer Science, GPA **1.5 / 1.0** — *Bremen, Germany*

Higher School of Economics Saint-Petersburg (HSE SPb) — **Sep 2019 - Aug 2022**
discontinued Bachelor of Computer Science, GPA **9.08 / 10.0** — *Saint-Petersburg, Russia*

PUBLICATIONS

1. **Brilliantov, K.**; Souza, A.; Garg, V. (2023). How well does Persistent Homology generalize on graphs? *Under review, ICML 2024*
2. Alferov, V.; Bliznets, I.; **Brilliantov, K.** (2023). Parameterization of (Partial) Maximum Satisfiability Above Matching in the Variable-Clause Graph. *Accepted at AAAI-24*
3. **Brilliantov, K.**; Pavutnitskiy, F.; Pasechyuk, D.; Magai, G. (2023). Applying Language Models to Algebraic Topology: Generating simplicial cycles using multi-labeling in Wu's Formula. *arXiv preprint; Under review, ICML 2024*
4. **Brilliantov, K.**; Alferov, V.; Bliznets, I. (2023). Improved Algorithms for Maximum Satisfiability and Its Special Cases. *Proceedings of the AAAI Conference on Artificial Intelligence*, 37(4), 3898-3905. https://doi.org/10.1609/aaai.v37i4.25503

RESEARCH EXPERIENCE

Uncertainty Quantification in Diffusion and Optimal Transport — **Nov 2023 - Feb 2024**
research project at ETH under supervision of Charlotte Bunne, LAS Group — *Zurich, Switzerland*

Studying Generalization Limits of Persistent Homology — **Jun 2023 - Aug 2023**
research internship at Aalto University under supervision of Vikas Garg, Amauri Souza — *Helsinki, Finland*

We studied the generalization ability of *Persistent Homology*, particularly *PersLay*-based model, for graph classification tasks [1]. We used *PAC-Bayesian* framework and did several experiments to evaluate our empirically bound.

keywords: GNNs | PH | generalization & expressivity | learning theory | PAC-Bayes

Applying Language Models to Algebraic Topology — **Feb 2022 - May 2023**
bachelor's thesis at JUB under supervision of Fedor Pavutnitksiy — *Remote*

The Wu's formula provides combinatorial description of S^2 homotopy groups using *Free Groups*. We tried to find certain elements satisfying this formula. We proposed several approximate algorithms, using a wide variety of approaches from optimization theory to neural *NLP* methods.

paid position at EIMI from Feb 2022 to Jul 2022

github, **keywords**: free groups | nlp | pytorch | huggingface

$(n, 4)$-MaxSAT and General MaxSAT **Sep 2021 - Jan 2022**
coursework at HSE SPb under supervision of Ivan Bliznets *Saint-Petersburg, Russia*

We studied the computational complexity of MaxSAT problem and its special cases. We developed an algorithm with **9.95%** for $(n, 4)$-case and **8.38%** for $(n, 3)$-case faster running time

By the end of 2023 this algorithm is the theoretical **SOTA** for (n, s)-MaxSAT ($s = 3, 4$). We published the paper at AAAI2023 and I gave an **online presentation** of the work.

keywords: exact exponential algorithms | branch & bound | measure & conquer

WORK EXPERIENCE

Backend Engineer **Jul 2021 - Oct 2021**
internship at Yandex.Direct *Saint-Petersburg, Russia*

I was a part of a team developing API. Rewrote $\approx$ **2000** lines of ancient Perl code to Java.

Learned Perl and had a great experience supporting legacy code and got a **return offer** but declined it.

keywords: Java | Spring | Kotlin

TEACHING EXPERIENCE

Bachelor's Thesis co-Supervisor **Dec 2023 - May 2024**
volunteer at CUB with Fedor Pavutnitskiy *Remote*

The student is: Pavel Almazov. We further studying ideas concerning applying ML to algebraic topology. We would like to perform several **quantitative assessments** of the developed model [3] and adopt **Reinforcement Learning** methods.

Teaching Assistant. C++ **Sep 2022 - Dec 2022**
volunteer at HSE SPb *Remote*

Helped C/C++ lecturer reviewing home assignments of **20** freshmen. Gave them feedback about readability, style, architecture, and correctness.

Teaching Assistant. Mathematical Logic **Apr 2022 - Jul 2022**
paid position at HSE SPb *Saint-Petersburg, Russia*

Helped lecturer teaching a group of **14** freshmen. Checked their **homeworks** and did **tutorials**. We covered: equinumerosity, boolean functions, boolean schemes, basics of proof theory.

Coursework Supervisor. C++ **Feb 2022 - Jun 2022**
volunteer at HSE SPb *Saint-Petersburg, Russia*

Was a mentor for a group of **3** freshmen. Helped solving technical and architectural problems. Organized regular calls and did code review. The commission **higly** rated their result.

PROJECTS

MutationDetector **Jan 2018 - Jan 2019**
coursework at high school under supervision of Kira Vyatkina *Saint-Petersburg, Russia*

Developed a GUI for analyzing protein sequences. It displays the given protein sequence and experiment parameters: difference of a mass between origin sequence and mutated.

It shows possbile mutations leading to given mass difference. Presented this project at SISC-ISSF 2019 and got first prize in the CS **poster session**.

keywords: Java | Swing