Vitaly Aksenov

Curriculum Vitae

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Research interests

Algorithmics and data structures, Parallel algorithms, Concurrent data structures, Network algorithms, Databases, Combinatorial structures, Number theory.

Education

2015-2018 **PhD of Computer Science**, *Team GALLIUM, INRIA and Paris 7*, France

2015-2018 **PhD of Computer Science**, *ITMO University*, Russia
Joint PhD program with Paris 7

2013-2015 **Masters of Computer Science**, *ITMO University*, Russia, *GPA – 4.9/5*
With honors

2014-2015 Bioinformatics Institute

2009-2013 **Bachelors of Computer Science**, *ITMO University*, Russia, *GPA – 5/5*
With honors

2005-2009 Physics-Mathematical Lyceum #239

Professional Experience

2022-present **Head of Research Lab in Distributed Systems**, *Biggest Social Network in Eastern Europe*
Verification of Distributed Systems (TLA+, Linearizability Check on C++) and Performance Tools (TL zero-copy serialization on C++, HTAP/Analytical requests in DB on C++)
Highlights: found and fixed bugs in the distributed database, improved the usage of memory on the serialization of RPC requests by 80%, implemented the verification tool for concurrent algorithms in C++

2018-present **Assistant Professor**, *ITMO University*, Russia
Concurrent Data Structures (Java, C++, PMDK), Parallel Algorithms (C++, OpenCilk, TBB, OpenMP), Self-adjusting Data Structures and Networks (Python, C++)
Highlights: improved the performance of sequential and concurrent indices up to 2x on skewed workloads, improved the construction of indices using the parallelism by a significant multiplicative margin

2019 **Post-doc**, *Team Alistarh, IST Austria*, Austria
Concurrent and Distributed Machine Learning: Belief-Propagation (Java) and Sparsification Techniques (Python, C++, PyTorch, CUDA, OpenMPI)
Highlights: improved the belief-propagation algorithm up to 4x, improved the distributed learning using horovod library by 20%

2013-2018 **Junior researcher**, *Computer Technologies Lab, ITMO University*, Russia
Combinatorics and Linear Algebra, Concurrent data structures (Java, C++), Parallel algorithms (C++, OpenCilk, TBB, OpenMP), Evolutionary Algorithms (Java)
Highlights: implemented a library that semi-automatically solves granularity program and improves the parallel algorithms up to 20%.

2013, July-October **Software engineer intern**, *Team "Cache Client", "Facebook, Inc."*, USA
HPHP, C++

2012-2013 **Software engineer intern**, *Department of search engine, "Mail.Ru"*, Russia
Machine Learning (C++)
Highlights: Recognition of a language (Russian, Ukranian, Kazakh) of the search query with 91%

Teaching

2023- **Course on Cloud Computing, Lecturer**, *City, University of London*, UK, BSc 3, MSci 3, MSci 4, MSc
1 lecture per week, 2 tutorials

2023- **Course on Databases, Lecturer**, *City, University of London*, UK, BSc 1
1 lecture per week, 9 tutorials

2021-2023 **Responsible for the Masters Program: Programming and Artificial Intelligence**, *ITMO University*, Russia

2021-2023 **Course on parallel algorithms and concurrent data structures, Lecturer**, *ITMO University and MIPT*, Russia, Bachelor 3, Master 1, Master 2
1 lecture per week

2020-2023 **Course on algorithms and data structures, Lecturer**, *ITMO University*, Russia, Master 1
1 lecture per week

2019-2022 **Course on algorithms and data structures, Assistant**, *ITMO University*, Russia, Bachelor 1-2

2018-2023 **Cryptography, Assistant**, *ITMO University*, Russia, Bachelor 3

2017 **Full course on algorithmics**, *Paris*, France
ENS Paris team qualified to ICPC World Finals

2017 **1-week crash-course on algorithmics**, *ETH Zurich*, Switzerland
ETH Zurich team qualified to ICPC World Finals

2016 **1-week crash-course on algorithmics**, *Toulouse University III*, France

2015 **1-week crash-course on algorithmics**, *ENS Lyon*, France

2015-2023 **Courses on Olympiads in Mathematics**, *ITMO University*, Russia

2014-2015 **Mathematical analysis, Assistant**, *ITMO University*, Russia, Bachelor 1

2014 **1-week crash-course on algorithmics**, *Harbin University*, China

2009-2016 **Courses on Olympiads in Informatics for Schoolchildren**, *ITMO University*, Russia

Grants

2022-2023 CSTT grant, 250k$

2020-2022 JetBrains grant: scholarships for students, 20k$ per year

Selected Publications

[1] Umut Acar, Vitaly Aksenov, Arthur Charguéraud, and Mike Rainey. "Provably and Practically Efficient Granularity Control". In: *Proceedings of the 34th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming* (2019), 214–228, Awarded SIGPLAN Research Highlights.

[2] Evgeniy Feder, Ichha Rathod, Punit Shyamsukha, Robert Sama, Vitaly Aksenov, Iosif Salem, and Stefan Schmid. "Lazy self-adjusting bounded-degree networks for the matching model". In: *IEEE Conference on Computer Communications (INFOCOM)*. IEEE. 2022, pp. 1089–1098.

[3] Vitaly Aksenov, Dan Alistarh, Alexandra Drozdova, and Amirkeivan Mohtashami. "The Splay-List: A Distribution-Adaptive Concurrent Skip-List". In: *34th International Symposium on Distributed Computing*. 2020, Invited to Special Issue.

[4] Vitaly Aksenov, Petr Kuznetsov, and Anatoly Shalyto. "Parallel Combining: Benefits of Explicit Synchronization". In: *22nd International Conference on Principles of Distributed Systems (OPODIS 2018)* (2018), pp. 143–158.

[5] Sergey Aganezov, Ilya Zban, Vitaly Aksenov, Nikita Alexeev, and Michael C Schatz. "Recovering rearranged cancer chromosomes from karyotype graphs". In: *BMC bioinformatics* 20.20 (2019), pp. 1–11.

[6] Vitaly Aksenov, Dan Alistarh, and Janne H Korhonen. "Scalable Belief Propagation via Relaxed Scheduling". In: *Advances in Neural Information Processing Systems* 33 (2020).

[7] Ali Ramezani-Kebrya, Fartash Faghri, Ilya Markov, Vitaly Aksenov, Dan Alistarh, and Daniel M. Roy. "NUQSGD: Provably Communication-efficient Data-parallel SGD via Nonuniform Quantization". In: *Journal of Machine Learning Research* 22.114 (2021), pp. 1–43. URL: `http://jmlr.org/papers/v22/20-255.html`.

[8] Mohammad Khalaji, Trevor Brown, Khuzaima Daudjee, and Vitaly Aksenov. "Practical Hardware Transactional vEB Trees". In: *Proceedings of the 29th ACM SIGPLAN Annual Symposium on Principles and Practice of Parallel Programming*. 2024, pp. 215–228.

[9] Vitaly Aksenov, Nikita Koval, Petr Kuznetsov, and Anton Paramonov. "Memory Bounds for Concurrent Bounded Queues". In: *Proceedings of the 29th ACM SIGPLAN Annual Symposium on Principles and Practice of Parallel Programming*. 2024, pp. 188–199.

Invited Talks

2024, April **"Static and Dynamic Networks"**, *IST Austria*, Austria

2024, April **"Self-adjusting Data Structures. Looking for Concurrency."**, *TU Berlin*, Germany

2015, February **"Combinatorial objects and their algebraic characteristics"**, *University of Geneva*, Switzerland

Professional Activities

2023- **Principles of Distributed Computing**
Publicity Chair

2024 **DISC 2024**
Program Committe

2024 **NETYS 2024**
Program Committee

2022 **OPODIS 2022**
Program Committee

2021 **Principles and Practice of Parallel Programming 2022**
External Program Committee

2021 **41st IEEE International Conference on Distributed Computing Systems**
Program Committee

2019-present **The Industrial Distributed Computing Conference Hydra**, `hydraconf.ru`
Program Committee

2017-present **The Summer School on Practice and Theory of Distributed Computing**, `sptdc.org`
Co-organizer, Program Committee

Supervision

2023 1 MSc student, 10 BSc students

2022 2 MSc students, 2 BSc students

2021 7 BSc students

2020 2 BSc students

2019 1 MSc student

2018 1 MSc student

2017 1 BSc student

More information is on the personal website: `http://ctlab.itmo.ru/~aksenov`.

Awards

2022 First place on North Countries Universities Mathematical Competition, coach

2021 3rd place on North Countries Universities Mathematical Competition, coach

2015 Best ITMO University masters thesis award

2015 First prize on North Countries Universities Mathematical Competition, 6th place

2014 Student Grant of Saint-Petersburg Government

2014 First prize on International Mathematics Competition for University Students, 27th place

2014 First prize on North Countries Universities Mathematical Competition, 8th place

2008-2009 All-Russian School Olympiad in Mathematics, Prize Winner

2009 All-Russian School Olympiad in Informatics, Prize Winner

Other activities

2023-present **Judge**, *UKIEPC*

2017-present **Chief Judge**, *Bioinformatics Contest*
`contest.bioinf.me`

2016 **Scientific Committee**, *IOI*

2015-2022 **Software engineer**, *ICPC Live team on ICPC World Finals*
`https://github.com/Aksenov239/icpc-live-v2`

2012-present **Jury member**, *ICPC, North Eurasia Regionals*

2011-2017 **Jury member**, *"Russian Code Cup"*

2010-present **Jury member**, *All Russian School Team Olympiad in Informatics*

2009-present **Jury member**, *St Petersburg School Olympiad in Informatics*

2010-2015 **Jury member**, *"Codeforces.ru"*

2013-2014 **Jury member**, *"Kotlin Cup"*

Languages

Russian Native

English Intermediate *FCE Certificate, Grade B*

French Basics

Publications

[1] V Aksenov and K Kokhas. "Domino tilings and determinants". In: *Journal of Mathematical Sciences* 200.6 (2014), pp. 647–653.

[2] V Aksenov and K Kokhas. "Chip removal. Urban Renewal revisited". In: *Journal of Mathematical Sciences* 209.6 (2015), pp. 809–825.

[3] V Aksenov and K Kokhas. "Calculation of Pfaffians by a Chip Removal". In: *Journal of Mathematical Sciences* 215.6 (2016), pp. 631–648.

[4] Umut Acar, Vitaly Aksenov, and Sam Westrick. "Brief Announcement: Parallel Dynamic Tree Contraction via Self-Adjusting Computation". In: *Proceedings of the 29th ACM Symposium on Parallelism in Algorithms and Architectures*. ACM. 2017, pp. 275–277.

[5] V Aksenov, V Gramoli, P Kuznetsov, A Malova, and S Ravi. "A concurrency-optimal binary search tree". In: *European Conference on Parallel Processing*. Springer. 2017, pp. 580–593.

[6] Umut Acar, Vitaly Aksenov, Arthur Charguéraud, and Mike Rainey. "Performance challenges in modular parallel programs". In: *Proceedings of the 23rd ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*. ACM. 2018, pp. 381–382.

[7] V Aksenov, P Kuznetsov, and A Shalyto. "On Helping and Stacks". In: *Proceedings of NETYS* (2018).

[8] Vitaly Aksenov, Petr Kuznetsov, and Anatoly Shalyto. "Parallel Combining: Benefits of Explicit Synchronization". In: *22nd International Conference on Principles of Distributed Systems (OPODIS 2018)* (2018), pp. 143–158.

[9] V Aksenov, D Alistarh, and P Kuznetsov. "Brief-Announcement: Performance Prediction for Coarse-Grained Locking". In: *Proceedings of the thirty seventh annual ACM Symposium on Principles of distributed computing (PODC)* (2018), pp. 411–413.

[10] Umut Acar, Vitaly Aksenov, Arthur Charguéraud, and Mike Rainey. "Provably and Practically Efficient Granularity Control". In: *Proceedings of the 34th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming* (2019), 214–228, Awarded SIGPLAN Research Highlights.

[11] Sergey Aganezov, Ilya Zban, Vitaly Aksenov, Nikita Alexeev, and Michael C Schatz. "Recovering rearranged cancer chromosomes from karyotype graphs". In: *BMC bioinformatics* 20.20 (2019), pp. 1–11.

[12] Nikita Koval and Vitaly Aksenov. "Restricted memory-friendly lock-free bounded queues". In: *Proceedings of the 25th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*. 2020, pp. 433–434.

[13] Vitaly Aksenov, Dan Alistarh, Alexandra Drozdova, and Amirkeivan Mohtashami. "The Splay-List: A Distribution-Adaptive Concurrent Skip-List". In: *34th International Symposium on Distributed Computing*. 2020, Invited to Special Issue.

[14] Vitaly Aksenov, Dan Alistarh, and Janne H Korhonen. "Scalable Belief Propagation via Relaxed Scheduling". In: *Advances in Neural Information Processing Systems* 33 (2020).

[15] Ali Ramezani-Kebrya, Fartash Faghri, Ilya Markov, Vitaly Aksenov, Dan Alistarh, and Daniel M. Roy. "NUQSGD: Provably Communication-efficient Data-parallel SGD via Nonuniform Quantization". In: *Journal of Machine Learning Research* 22.114 (2021), pp. 1–43. URL: http://jmlr.org/papers/v22/20-255.html.

[16] Evgeniy Feder, Ichha Rathod, Punit Shyamsukha, Robert Sama, Vitaly Aksenov, Iosif Salem, and Stefan Schmid. "Brief-Announcement: Lazy Self-Adjusting Bounded-Degree Networks for the Matching Model". In: *ACM Symposium on Parallelism in Algorithms and Architectures* (2021).

[17] Vitaly Aksenov, Vincent Gramoli, Petr Kuznetsov, Di Shang, and Srivatsan Ravi. "Optimal Concurrency for List-Based Sets". In: *International Conference on Parallel Computing Technologies*. Springer. 2021, pp. 386–401.

[18] Vitaly Aksenov, Ohad Ben-Baruch, Danny Hendler, Ilya Kokorin, and Matan Rusanovsky. "Execution of NVRAM Programs with Persistent Stack". In: *International Conference on Parallel Computing Technologies*. Springer. 2021, pp. 117–131.

[19] Evgeniy Feder, Ichha Rathod, Punit Shyamsukha, Robert Sama, Vitaly Aksenov, Iosif Salem, and Stefan Schmid. "Lazy self-adjusting bounded-degree networks for the matching model". In: *IEEE Conference on Computer Communications (INFOCOM)*. IEEE. 2022, pp. 1089–1098.

[20] Vitaly Aksenov, Trevor Brown, Alexander Fedorov, and Ilya Kokorin. "Unexpected Scaling in Path Copying Trees". In: *Proceedings of the 28th ACM SIGPLAN Annual Symposium on Principles and Practice of Parallel Programming*. 2023, pp. 438–440.

[21] Vitaly Aksenov, Anton Paramonov, Iosif Salem, and Stefan Schmid. "Self-adjusting linear networks with ladder demand graph". In: *International Colloquium on Structural Information and Communication Complexity*. Springer. 2023, pp. 132–148.

[22] Vitaly Aksenov, Ilya Kokorin, and Alena Martsenyuk. "Parallel-Batched Interpolation Search Tree". In: *International Conference on Parallel Computing Technologies*. Springer. 2023, pp. 109–125.

[23] Vitaly Aksenov, Michael Anoprenko, Alexander Fedorov, and Michael Spear. "Brief Announcement: BatchBoost: Universal Batching for Concurrent Data Structures". In: *37th International Symposium on Distributed Computing (DISC 2023)*. Schloss Dagstuhl-Leibniz-Zentrum für Informatik. 2023.

[24] Vitaly Aksenov, Nikita Koval, Petr Kuznetsov, and Anton Paramonov. "Memory Bounds for Concurrent Bounded Queues". In: *Proceedings of the 29th ACM SIGPLAN Annual Symposium on Principles and Practice of Parallel Programming*. 2024, pp. 188–199.

[25] Mohammad Khalaji, Trevor Brown, Khuzaima Daudjee, and Vitaly Aksenov. "Practical Hardware Transactional vEB Trees". In: *Proceedings of the 29th ACM SIGPLAN Annual Symposium on Principles and Practice of Parallel Programming*. 2024, pp. 215–228.

[26] Ilya Kokorin, Dan Alistarh, and Vitaly Aksenov. "Wait-free trees supporting asymptotically efficient range queries". In: *IPDPS*. 2024.

[27] Evgeniy Feder, Anton Paramonov, Pavel Mavrin, Iosif Salem, Stefan Schmid, and Vitaly Aksenov. "POSTER: Toward Self-Adjusting k-ary Search Tree Networks". In: *IPDPS*. 2024.

[28] Zakhar Iakovlev and al. "Trigram-Based Persistent IDE indices with Quick Startup". In: *1st IDE Workshop on ICSE 2024*.

[29] Ravil Galiev, Michael Spear, and Vitaly Aksenov. "The Next 700 Benchmarking Frameworks for Concurrent Data Structures". In: *Proceedings of the 2024 Workshop on Advanced Tools, Programming Languages, and PLatforms for Implementing and Evaluating algorithms for Distributed systems*. 2024, pp. 1–9.