Dmitrii Avdiukhin

Curriculum Vitae

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dyukha.github.io

Research interests

Non-convex, distributed, and constrained optimization. Hierarchical clustering. Approximation algorithms.
Previous areas: Submodular optimization, syntax and static analysis, model generation and model checking, balanced graph partitioning.

Education

2017–current **Ph.D.**, *Indiana University*, Bloomington, IN.
Advisor: Grigory Yaroslavtsev (`http://grigory.us`)

2008–2013 **Specialist (5 years) Degree**, *Saint Petersburg State University*, GPA $4.9/5.0$.
Diploma with distinction. Thesis title: "Translation definition language for information system reengineering tools". Advisor: Iakov Kirilenko (`https://www.researchgate.net/profile/Iakov_Kirilenko`)

Experience

Summer 2022 **Research Intern**, *Amazon*.
Demonstration selection for few-shot learning for small language models.
Mentor: Ashish Khetan (`https://scholar.google.com/citations?user=AaauqDAAAAAJ`)

Summer 2020 **Research Intern**, *Amazon*.
Federated Learning under weak assumptions.
Mentor: Shiva Kasiviswanathan (`http://www.shivakasiviswanathan.com`)

Summer 2019 **Research Intern**, *Amazon*, New York.
Improving accuracy and performance of graph convolutional networks.
Mentor: Zohar Karnin (`https://sites.google.com/site/zoharkarnin`)

Summer 2018 **Software Engineer**, *Pro Unlimited @ Facebook*, Menlo Park.
Implementing balanced graph partitioning algorithm.
Mentor: Sergey Pupyrev (`https://spupyrev.github.io`)

2016-2017 **Researcher**, *ITMO University*, Saint Petersburg.
Model generation from execution traces

2013-2016 **Software Engineer**, *JetBrains*, Saint Petersburg.
SQL dialect support

2012-2013 **Software Engineer**, *Lanit Tercom*, Saint Petersburg.
Participating in project of migration a system from SQL Server to Oracle

Publications

Authors are listed in alphabetical order unless marked with $\star$

NeurIPS 2023 (under review) **D. Avdiukhin**, Vaggos Chatziafratis, Konstantin Makarychev, Grigory Yaroslavtsev. "Approximation Scheme for Metric Kernel Clustering via Sherali-Adams", 37th Conference on Neural Information Processing Systems

NeurIPS 2023 (under review) Noga Alon, **Dmitrii Avdiukhin**, Dor Elboim, Orr Fischer, Grigory Yaroslavtsev. "Optimal Sample Complexity of Contrastive Learning", 37th Conference on Neural Information Processing Systems

IJCAI 2023 **D. Avdiukhin** and G. Yaroslavtsev. "HOUDINI: Escaping from Moderately Constrained Saddles", 32nd International Joint Conference on Artificial Intelligence

AAAI 2023 **D. Avdiukhin**, S. Das, O. Fischer, F. Mirza, D. Vainstein and G. Yaroslavtsev. "Tree Learning: Optimal Algorithms and Sample Complexity", 37th AAAI Conference on Artificial Intelligence.

OPT 2022 **D. Avdiukhin** and G. Yaroslavtsev. "HOUDINI: Escaping from Moderately Constrained Saddles", 14th OPT Workshop on Optimization for Machine Learning.

OPT 2022 **D. Avdiukhin**, V. Braverman, N. Ivkin, and S. U. Stich. "Bidirectional Adaptive Communication for Heterogeneous Distributed Learning", 14th OPT Workshop on Optimization for Machine Learning.

NeurIPS 2021 **D. Avdiukhin** and G. Yaroslavtsev. "Escaping Saddle Points with Compressed SGD", 35th Conference on Neural Information Processing Systems

ICML 2021 **D. Avdiukhin** and S. Kasiviswanathan. "Federated Learning under Arbitrary Communication Patterns", 38th International Conference on Machine Learning

AAAI 2021 $\star$ S. Naumov, **D. Avdiukhin**, and G. Yaroslavtsev. "Objective-Based Hierarchical Clustering of Deep Embedding Vectors", 35th AAAI Conference on Artificial Intelligence

OPT 2020 **D. Avdiukhin**, and G. Yaroslavtsev. "Escaping Saddle Points with Compressed SGD", 12th OPT Workshop on Optimization for Machine Learning.

AISTATS 2020 $\star$ G. Yaroslavtsev, S. Zhou, and **D. Avdiukhin**. ""Bring Your Own Greedy"+Max: Near-Optimal $1/2$-Approximations for Submodular Knapsack", 23rd International Conference on Artificial Intelligence and Statistics. `https://arxiv.org/pdf/1910.05646.pdf`

OPT 2019 **D. Avdiukhin**, C. Jin and G. Yaroslavtsev. "Escaping Saddle Points with Inequality Constraints via Noisy Sticky Projected Gradient Descent", 11th OPT Workshop on Optimization for Machine Learning, **Oral + poster**. `https://opt-ml.org/papers/2019/paper_30.pdf`

VLDB 2019 **D. Avdiukhin**, S. Pupyrev and G. Yaroslavtsev. "Multi-Dimensional Balanced Graph Partitioning via Projected Gradient Descent", 45th International Conference on Very Large Data Bases, Research Track. `https://arxiv.org/pdf/1902.03522.pdf`

KDD 2019 **D. Avdiukhin**, S. Mitrovic, G. Yaroslavtsev and S. Zhou "Adversarially Robust Submodular Maximization under Knapsack Constraints". **Oral presentation**, 9.2% acceptance rate. `https://arxiv.org/pdf/1905.02367.pdf`

INDIN 2017 **D. Avdiukhin**, D. Chivilikhin, G. Korneev, V. Ulyantsev and A. Shalyto. "Plant trace generation for formal plant model inference: methods and case study", 15th IEEE International Conference on Industrial Informatics

PSI 2015 E. Verbitskaia, S. Grigorev and **D. Avdyukhin**. "Relaxed Parsing of Regular Approximations of String-Embedded Languages", 10th International Andrei Ershov Memorial Conference on Perspectives of System Informatics

Talks and Posters

ITA 2023 "First-Order Methods in Distributed Optimization"

OPT 2022 "HOUDINI: Escaping from Moderately Constrained Saddles" (Poster)

OPT 2022 "Bidirectional Adaptive Communication for Heterogeneous Distributed Learning" (Poster)

NeurIPS 2021 "Escaping Saddle Points with Compressed SGD" (Poster)

OPT 2020 "Escaping Saddle Points with Compressed SGD" (Poster)

VLDB 2019 "Multi-Dimensional Balanced Graph Partitioning via Projected Gradient Descent"

KDD 2019 "Adversarially Robust Submodular Maximization under Knapsack Constraints"

Invited Talks

June 2023 **SIAM OP 2023**. "Escaping Saddle Points with Compressed SGD"

Feb 2023 **Google Algorithms Seminar**. "Tree Learning: Optimal Algorithms and Sample Complexity"

Dec 2021 **SPbSU, Russia**. "Escaping from Saddle Points with Compressed SGD"

Dec 2019 **Yandex, Moscow, Russia**. "Multi-Dimensional Balanced Graph Partitioning via Projected Gradient Descent"

Honors

2019 Nominated for Microsoft Research Fellowship by the Indiana University Computer Science Department (1 out of 2 per department)

2019 Nominated for Google PhD Fellowship Program by the Indiana University Computer Science Department

Teaching Experience

Fall 2022 **"Introduction to Algorithm Design and Analysis" (undergraduate)**. Indiana University, Bloomington, CSCI-B403. Associate Instructor.

Spring 2022 **"Math & logic for cognitive science" (graduate)**. Indiana University, Bloomington, CSCI-B590. Associate Instructor.

Spring 2020 **"Applied Algorithms" (graduate)**. Indiana University, Bloomington, CSCI-B505. Head Associate Instructor.

Spring 2019 **"Data Structures" (Honors, undergraduate)**. Indiana University, Bloomington, CSCI-H343. Associate Instructor.

Competitive programming

ACM ICPC	Latest result: 19th place on world semi-final, 2014 (`neerc.ifmo.ru/archive/2014/standings.html`)
Codeforces	Rating: 2135 (`codeforces.com/profile/dyukha`)
Topcoder	Rating: 1784 (`www.topcoder.com/members/dyukha`)

Skills

ML Frameworks	PyTorch
Languages	Python,Kotlin, C#, Java, Python, C++, various SQL dialects
VCS	git, Mercurial, SVN
English	TOEFL: 100, Upper-Intermediate