Krzysztof Onak

Faculty of Computing & Data Sciences
Boston University
111 Cummington Mall, 138N, Boston, MA 02215

e-mail: krzysztof@onak.pl
konak@bu.edu
homepage: https://onak.pl/

Current position

Shibulal Family Career Development Assistant Professor, Computing & Data Sciences, Boston University, 2021–present

Research interests

Theoretical foundations of algorithms for big data especially in the context of machine learning, algorithms for modern parallel and distributed systems, sublinear-time algorithms, property testing, streaming, graph analytics and algorithms.

Education

- **Massachusetts Institute of Technology**, Sep 2005–Aug 2010
  Doctor of Philosophy in Computer Science
  Thesis title: "New Sublinear Methods in the Struggle Against Classical Problems"
  Advisor: Prof. Ronitt Rubinfeld
- **University of Warsaw**, Oct 2000–Jun 2005
  Master of Science in Computer Science, June 2005
  Thesis title: "Searching in Graphs—Generalization of Binary Search"
  Advisor: Prof. Krzysztof Diks
  Bachelor of Science in Mathematics, November 2004
  Thesis title: "Testing Fundamentality of a System of Units in $\mathcal{U}(\mathbb{Z}C_p)$"
  Advisor: Prof. Zbigniew Marciniak
  Bachelor of Science in Computer Science, October 2003

Past work experience

- **Research Staff Member at the IBM T.J. Watson Research Center**, 2012–2020
- **Simons Postdoctoral Fellow at Carnegie Mellon University**, 2010–2012
- **Teaching Assistant for "Introduction to Algorithms" at MIT**, Fall 2009
- **Research Intern at Microsoft Research Silicon Valley**, May–Aug 2008
  Worked on decision optimization and streaming algorithms.
- **Teaching Assistant for "Randomness and Computation" at MIT**, Spring 2008
- **Research Intern at Google Research, New York City**, Jun–Aug 2007
  Worked on parallel algorithms. In particular, developed techniques for efficient parallel agglomerative clustering. The algorithms can be implemented in any parallel architecture similar to Google's MapReduce.
- **Teaching Assistant at the University of Warsaw**, 2003–2005
- **Summer Intern at Microsoft Corporation**, Summer 2004
  Worked as a software design engineer in the Windows CE Networking group. Developed remote control over Bluetooth, and implemented an audio codec.
- **Independent Programmer at Collabo Technology**, Summer 2003
  Worked on remote collaboration software. Designed and implemented, among other things, persistent data structures and tunneling over HTTP.
- **Member of the Jury of the Polish Olympiad in Informatics**, 2001–2005
  Prepared problems, key solutions, and test data sets. Edited and typeset annual books with sample solutions. Gave lectures at training camps.

- **Tutor at Workshops and Camps of Polish Children's Fund**, 2001–2005

Detailed teaching experience

- **Guest lecture "Sublinear Graph Approximation Algorithms" at Columbia University**, Nov 2015
  Gave a guest lecture in "Algorithmic Techniques for Massive Data" (COMS6998) taught by Alexandr Andoni.
- **Minicourse "Sublinear–Time Algorithms" at the University of Warsaw**, Spring 2015
  Taught a minicourse on sublinear-time algorithms, part of a series of Open Lectures for PhD Students in Computer Science (`phdopen.mimuw.edu.pl`).
- **Lecturer in "Sublinear Algorithms" at CMU**, Spring 2012
  Taught a weekly class on the foundations of sublinear-time algorithms (streaming, sketching, property testing, subliner time algorithms, etc.).
- **Guest lecturer in a course on programming constests at CMU**, 2011–2012
  Gave guest lectures on algorithms and efficient programming techniques in a course preparing students to the ACM ICPC contest. The course was supervised by Daniel Sleator and Richard Peng.
- **Teaching Assistant for "Introduction to Algorithms" at MIT**, Fall 2009
  Taught recitations. Prepared and graded problem sets and quizzes.
- **Teaching Assistant for "Randomness and Computation" at MIT**, Spring 2008
  Prepared and taught two lectures. Prepared problem sets.
- **Teaching Assistant at the University of Warsaw**, 2003–2005
  Taught recitations and programming labs (150 hours total). Prepared and graded problem sets, exams, and final projects. Courses: Algorithms and Data Structures, Advanced Algorithms, Introduction to Programming, Concurrent Programming.
- **Tutor at Polish Olympiad in Informatics Summer Camps and Czech, Polish, and Slovak IOI Preparation Camps**, 2001–2005
  Gave lectures on algorithms and efficient programming techniques addressed to top participants in Polish, Czech, and Slovak programming competitions. One of the main goals was to prepare participants for the International Olympiad in Informatics.
- **Tutor at Workshops and Camps of Polish Children's Fund**, 2001–2005
  Gave lectures for gifted high school students on algorithms.

Awards

- **Simons Postdoctoral Fellowship**, 2010-2012
- **Symantec Fellowship**, Fall 2008
- **Akamai Presidential Fellowship**, 2005–2006
- **Polish Minister of Education Scholarship**, 2003–2005
- **Comarch R&D Center Scholarship**, 2003–2004
- **Diploma of the Polish Minister of Foreign Affairs for Exceptional Contribution to the Promotion of Poland in the World**, Sep 2003
- **World Champion in ACM International Collegiate Programming Contest**, Mar 2003
- **International Olympiad in Informatics: gold medal** (Sep 2000), **bronze medal** (Oct 1999)

Program committees

- The 6th Conference on Highlights of Algorithms (HALG 2021)
- The 28th Annual European Symposium on Algorithms (ESA 2020)
- The 36th Conference on Uncertainty in Artificial Intelligence (UAI 2020)
- The 35th Conference on Uncertainty in Artificial Intelligence (UAI 2019)
- The 38th IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2018)

- The 59th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2018)
- Algorithms and Systems for MapReduce and Beyond 2018 (BeyondMR 2018)
- The 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2018)
- Algorithms and Systems for MapReduce and Beyond 2017 (BeyondMR 2017)
- Algorithms and Systems for MapReduce and Beyond 2016 (BeyondMR 2016)
- The 47th ACM Symposium on Theory of Computing (STOC 2015)
- The 18th International Workshop on Randomization and Computation (RANDOM 2014)
- The 20th String Processing and Information Retrieval Symposium (SPIRE 2013)
- The 10th Annual Conference on Theory and Applications of Models of Computation (TAMC 2013)
- The 24th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2013)
- The 20th Annual European Symposium on Algorithms (ESA 2012), Design and Analysis Track
- The 36th International Symposium on Mathematical Foundations of Computer Science (MFCS 2011)

Service

- Member of the Executive Committee of DIMACS, 2019–2020
- Herman Goldstine Memorial Postdoctoral Fellowship: committee chair, 2018–2020
- Co-organizing the New York Area Theory Day, 2016–2019
- Herman Goldstine Memorial Postdoctoral Fellowship: committee member, 2014–2018
- Helping maintain `sublinear.info`, a list of open problems in sublinear algorithms, 2012–present
- Conference and journal reviewing
- Grant reviewing:
  - served on a National Science Foundation panel (2020)
  - reviewed grant proposals for the Israel Science Foundation and US-Israel Binational Science Foundation

Publications (authors in alphabetical order)

- Krzysztof Nowicki, Krzysztof Onak
  Dynamic Graph Algorithms with Batch Updates in the Massively Parallel Computation Model
  The 32nd Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2021)
- Jakub Łącki, Slobodan Mitrović, Krzysztof Onak, Piotr Sankowski
  Walking Randomly, Massively, and Efficiently
  The 52nd ACM Symposium on Theory of Computing (STOC 2020)
- Arturs Backurs, Piotr Indyk, Krzysztof Onak, Baruch Schieber, Ali Vakilian, Tal Wagner
  Scalable Fair Clustering
  The 36th International Conference on Machine Learning (ICML 2019)
- Sepehr Assadi, Krzysztof Onak, Baruch Schieber, Shay Solomon
  Fully Dynamic Maximal Independent Set with Sublinear in n Update Time
  The 30th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2019)
- Krzysztof Onak
  Round Compression for Parallel Graph Algorithms in Strongly Sublinear Space
  A note on arXiv (arXiv:1807.08745), Jun 2018
- Krzysztof Onak, Baruch Schieber, Shay Solomon, Nicole Wein
  Fully Dynamic MIS in Uniformly Sparse Graphs
  The 45th International Colloquium on Automata, Languages, and Programming (ICALP 2018)
- Artur Czumaj, Jakub Łącki, Aleksander Mądry, Slobodan Mitrović, Krzysztof Onak, Piotr Sankowski
  Round Compression for Parallel Matching Algorithms
  The 50th ACM Symposium on Theory of Computing (STOC 2018)
  Accepted to the special issue of SICOMP on STOC 2018, to appear

- Sepehr Assadi, Krzysztof Onak, Baruch Schieber, Shay Solomon
  Fully Dynamic Maximal Independent Set with Sublinear Update Time
  The 50th ACM Symposium on Theory of Computing (STOC 2018)
- Krzysztof Onak, Xiaorui Sun
  The Query Complexity of Graph Isomorphism: Bypassing Distribution Testing Lower Bounds
  The 50th ACM Symposium on Theory of Computing (STOC 2018)
- Krzysztof Onak, Xiaorui Sun
  Probability–Revealing Samples
  The 21st International Conference on Artificial Intelligence and Statistics (AISTATS 2018)
- Ilias Diakonikolas, Elena Grigorescu, Jerry Li, Abhiram Natarajan, Krzysztof Onak, Ludwig Schmidt
  Communication–Efficient Distributed Learning of Discrete Distributions
  The 31st Annual Conference on Neural Information Processing Systems (NIPS 2017)
  Accepted for oral presentation
- Arturs Backurs, Krzysztof Onak
  Fast Algorithms for Parsing Sequences of Parentheses with Few Erros
  The 35th ACM Symposium on Principles of Database Systems (PODS 2016)
- Hossein Esfandiari, Mohammad T Hajiaghayi, Vahid Liaghat, Morteza Monemizadeh, Krzysztof Onak
  Streaming Algorithms for Estimating the Matching Size in Planar Graphs and Beyond
  ACM Transactions on Algorithms 14(4), 2018
  The 26th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2015)
- Alexandr Andoni, Aleksandar Nikolov, Krzysztof Onak, Grigory Yaroslavtsev
  Parallel Algorithms for Geometric Graph Problems
  The 46nd ACM Symposium on Theory of Computing (STOC 2014)
- Venkatesan Guruswami, Krzysztof Onak
  Superlinear Lower Bounds for Multipass Graph Processing
  Algorithmica 76(3), 2016 (special issue on information complexity and applications, invited)
  The 28th IEEE Conference on Computational Complexity (CCC 2013)
- Mark de Berg, Krzysztof Onak, Anastasios Sidiropoulos
  Fat Polygonal Partitions with Applications to Visualization and Embeddings
  Journal of Computational Geometry, 4(1), 2013
  Preliminary version: The 24th Annual ACM Symposium on Computational Geometry (SoCG 2008)
- Krzysztof Onak, Dana Ron, Michal Rosen, Ronitt Rubinfeld
  A Near–Optimal Sublinear–Time Algorithm for Approximating the Minimum Vertex Cover Size
  The 23rd Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2012)
- Artur Czumaj, Morteza Monemizadeh, Krzysztof Onak, Christian Sohler
  Planar Graphs: Random Walks and Bipartiteness Testing
  Random Structures & Algorithms 55(1), 2019
  The 52nd Annual Symposium on Foundations of Computer Science (FOCS 2011)
- Alexandr Andoni, Robert Krauthgamer, Krzysztof Onak
  Streaming Algorithms via Precision Sampling
  The 52nd Annual Symposium on Foundations of Computer Science (FOCS 2011)
- Alan Edelman, Avinatan Hassidim, Huy N. Nguyen, Krzysztof Onak
  An Efficient Partitioning Oracle for Bounded–Treewidth Graphs
  The 15th International Workshop on Randomization and Computation (RANDOM 2011)
- Alexandr Andoni, Robert Krauthgamer, Krzysztof Onak
  Polylogarithmic Approximation for Edit Distance and the Asymmetric Query Complexity
  The 51st Annual Symposium on Foundations of Computer Science (FOCS 2010)
  Invited to the Special Issue of SICOMP on FOCS 2010, declined.

- Krzysztof Onak, Ronitt Rubinfeld
  Maintaining a Large Matching or a Small Vertex Cover
  The 42nd ACM Symposium on Theory of Computing (STOC 2010)
- Avinatan Hassidim, Jonathan A. Kelner, Huy N. Nguyen, Krzysztof Onak
  Local Graph Partitions for Approximation and Testing
  The 50th Annual Symposium on Foundations of Computer Science (FOCS 2009)
- Krzysztof Onak
  Testing Distribution Identity Efficiently
  A short note on arXiv (arXiv:0910.3243), Oct 2009
- Andrew McGregor, Krzysztof Onak, Rina Panigrahy
  The Oil Searching Problem
  The 17th Annual European Symposium on Algorithms (ESA 2009)
- Alexandr Andoni, Piotr Indyk, Krzysztof Onak, Ronitt Rubinfeld
  External Sampling
  The 36th International Colloquium on Automata, Languages and Programming (ICALP 2009)
- Alexandr Andoni, Krzysztof Onak
  Approximating Edit Distance in Near–Linear Time
  SIAM Journal on Computing, 41(6), 2012 (special issue on STOC 2009)
  Preliminary version: The 41st ACM Symposium on Theory of Computing (STOC 2009)
- Huy N. Nguyen, Krzysztof Onak
  Constant–Time Approximation Algorithms via Local Improvements
  The 49th Annual Symposium on Foundations of Computer Science (FOCS 2008)
- Nicholas Harvey, Jelani Nelson, Krzysztof Onak
  Sketching and Streaming Entropy via Approximation Theory
  The 49th Annual Symposium on Foundations of Computer Science (FOCS 2008)
- Alexandr Andoni, Andrew McGregor, Krzysztof Onak, Rina Panigrahy
  Better Bounds for Frequency Moments in Random–Order Streams
  A short note on arXiv (arXiv:0808.2222), Aug 2008
- Krzysztof Onak
  Testing Properties of Sets of Points in Metric Spaces
  The 35th International Colloquium on Automata, Languages and Programming (ICALP 2008)
- Shay Mozes, Krzysztof Onak, Oren Weimann
  Finding an Optimal Tree Searching Strategy in Linear Time
  The 19th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2008)
- Ilias Diakonikolas, Homin K. Lee, Kevin Matulef, Krzysztof Onak, Ronitt Rubinfeld, Rocco A. Servedio, Andrew Wan
  Testing for Concise Representations
  The 48th Annual Symposium on Foundations of Computer Science (FOCS 2007)
- David Karger, Krzysztof Onak
  Polynomial Approximation Schemes for Smoothed And Random Instances of Multidimensional Packing Problems
  The 18th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2007)
- Krzysztof Onak, Paweł Parys
  Generalization of Binary Search: Searching in Trees and Forest–Like Partial Orders
  The 47th Annual Symposium on Foundations of Computer Science (FOCS 2006)