

KARTHIK C. S.

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RESEARCH INTERESTS

I am broadly interested in **Theoretical Computer Science**. In particular, I have spent the last few years proving **Hardness of Approximation** results for problems in **P** and understanding the Hardness of **Geometric** problems, such as **Clustering**, **Closest Pair**, and **Fixed Point** Computation.

EDUCATION

- **Ph.D.** in Computer Science *September 2014 – June 2019*
Weizmann Institute of Science, Rehovot, Israel
Ph.D. Thesis: New Arenas in Hardness of Approximation *Advisor:* Prof. Irit Dinur
- **M.S.** in Computer Science *September 2012 – July 2014*
École Normale Supérieure, Lyon, France *Advisor:* Prof. Hervé Fournier
Master Thesis: Lower bounds for Multilinear Branching Programs

EMPLOYMENT

- **Assistant Professor** *September 2021 – ongoing*
Rutgers University, New Brunswick, USA
- **Postdoctoral Fellow** *September 2020 – August 2021*
Host: Prof. Subhash Khot **New York University**, New York, USA
- **Postdoctoral Fellow** *September 2019 – August 2020*
Host: Prof. Amir Shpilka **Tel Aviv University**, Tel Aviv, Israel
- **Postdoctoral Fellow** *July 2019 – September 2019*
Host: Prof. Irit Dinur **Weizmann Institute of Science**, Rehovot, Israel

SELECTED ACADEMIC AWARDS AND HONORS

- **Simons Foundation Junior Faculty** Fellow 2021-24
- **Postdoctoral Matching** Scholarship at Tel Aviv University 2019
- **LIP** (Laboratoire de l'Informatique du Parallélisme) Fellowship at ENS Lyon 2013
- **Labex** (Laboratoires d'excellence) Scholarship at University of Nice-Sophia Antipolis 2012
- Kishore Vaigyanik Protsahan Yojana (**KVPY**) fellowship 2007
- National Talent Search Examination (**NTSE**) scholarship 2006

PROFESSIONAL SERVICE

Program Committee Member: UAI'22, ITCS'22, UAI'21, IPEC'21.

Reviewer for Conferences: ICALP'22, SoCG'22, STOC'22, WALCOM'22, SODA'22, FOCS'21, ESA'21, SPAA'21, CCC'21, ICALP'21, SoCG'21, STOC'21, SODA'21, FOCS'20, ICALP'20, STOC'20, ITCS'20, SODA'20, ISAAC'19, APPROX'19, ESA'19, CCC'19, ICALP'19, STOC'19, FOCS'18, PODC'18, ICALP'18, RANDOM'18, STACS'18, CSR'18, SPAA'17.

Reviewer for Journals: Games and Economic Behavior, ACM Journal of Experimental Algorithmics, Algorithmica.

Reviewer for Grant Proposals: French National Research Agency (ANR), Israel Science Foundation (ISF).

Departmental Committees at Rutgers: PhD student admissions committee 2022.

PUBLICATIONS

- **Johnson Coverage Hypothesis: Inapproximability of k -means and k -median in ℓ_p -metrics**
Joint work with Vincent Cohen-Addad and Euiwoong Lee.
In the Proceedings of the ACM-SIAM Symposium on Discrete Algorithms (SODA), 2022.
- **Applications of Random Algebraic Constructions to Hardness of Approximation**
Joint work with Boris Bukh and Bhargav Narayanan.
In the Proceedings of the Symposium on Foundations of Computer Science (FOCS), 2021.
- **On Approximability of Clustering Problems Without Candidate Centers**
Joint work with Vincent Cohen-Addad and Euiwoong Lee.
In the Proceedings of the ACM-SIAM Symposium on Discrete Algorithms (SODA), 2021.
- **Deterministic Replacement Path Covering**
Joint work with Merav Parter.
In the Proceedings of the ACM-SIAM Symposium on Discrete Algorithms (SODA), 2021.
- **On Hardness of Approximation of Parameterized Set Cover and Label Cover: Threshold Graphs from Error Correcting Codes**
Joint work with Inbal Livni Navon.
In the Proceedings of the SIAM Symposium on Simplicity in Algorithms (SOSA), 2021.
- **On Communication Complexity of Fixed Point Computation**
Joint work with Anat Ganor and Dömötör Pálvölgyi.
In *ACM Transactions on Economics and Computation* (TEAC), 9(4): 25:1–25:27, 2021.
- **On Efficient Low Distortion Ultrametric Embedding**
Joint work with Vincent Cohen-Addad and Guillaume Lagarde.
In the Proceedings of the International Conference on Machine Learning (ICML), 2020.
- **A Survey on Approximation in Parameterized Complexity: Hardness and Algorithms**
Joint work with Andreas Emil Feldmann, Euiwoong Lee, and Pasin Manurangsi.
In *Algorithms*, 13(6), 146, 2020 (*by invitation* to special issue titled ‘New Frontiers in Parameterized Complexity and Algorithms’).
- **Hardness Amplification of Optimization Problems**
Joint work with Elazar Goldenberg.
In the Proceedings of the Innovations in Theoretical Computer Science (ITCS), 2020.
- **Inapproximability of Clustering in ℓ_p -metrics**
Joint work with Vincent Cohen-Addad.
In the Proceedings of the Symposium on Foundations of Computer Science (FOCS), 2019.
- **On Closest Pair in Euclidean Metric: Monochromatic is as Hard as Bichromatic**
Joint work with Pasin Manurangsi.
In the Proceedings of the Innovations in Theoretical Computer Science (ITCS), 2019.
In *Combinatorica*, 40(4): 539–573, 2020.
- **Parameterized Intractability of Even Set and Shortest Vector Problem**
Joint work with Arnab Bhattacharyya, Édouard Bonnet, László Egri, Suprovat Ghoshal, Bingkai Lin, Pasin Manurangsi, and Dániel Marx.
In *Journal of the ACM* (JACM), 68(3): 16:1–16:40, 2021.
An earlier version with Arnab Bhattacharyya, Suprovat Ghoshal, and Pasin Manurangsi, titled *Parameterized Intractability of Even Set and Shortest Vector Problem from Gap-ETH* appeared in Proceedings of International Colloquium on Automata, Languages, and Programming (ICALP), 2018.
- **Towards a General Direct Product Testing Theorem**
Joint work with Elazar Goldenberg.
In the Proceedings of the IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS), 2018.
In *ACM Transactions on Computation Theory* (TOCT), 12(1): 7:1–7:18, 2020.
- **On the Parameterized Complexity of Approximating Dominating Set**
Joint work with Bundit Laekhanukit and Pasin Manurangsi.
In the Proceedings of the Symposium on Theory of Computing (STOC), 2018.

In *Journal of the ACM (JACM)*, 66(5): 33:1–33:38, 2019.

Invited to SIAM Journal on Computing Special Issue for STOC 2018 (*regretfully declined*).

Invited to Highlights of Algorithms (**HALG**) 2019.

- **On The Complexity of Closest Pair via Polar-Pair of Point-Sets**

Joint work with Roei David and Bundit Laekhanukit.

In the Proceedings of the Symposium on Computational Geometry (**SoCG**), 2018.

In *SIAM Journal on Discrete Mathematics (SIDMA)*, 33(1): 509–527, 2019.

- **Communication Complexity of Correlated Equilibrium with Small Support**

Joint work with Anat Ganor.

In the Proceedings of the International Conference on Approximation Algorithms for Combinatorial Optimization Problems (**APPROX**), 2018.

- **Ham Sandwich is Equivalent to Borsuk-Ulam**

Joint work with Arpan Saha.

In the Proceedings of the Symposium on Computational Geometry (**SoCG**), 2017.

- **An Efficient Representation for Filtrations of Simplicial Complexes**

Joint work with Jean-Daniel Boissonnat.

In the Proceedings of the ACM-SIAM Symposium on Discrete Algorithms (**SODA**), 2017.

In *ACM Transactions on Algorithms (TALG)*, 14(4): 44:1–44:21, 2018.

- **Did the Train Reach its Destination: The Complexity of Finding a Witness**

In *Information Processing Letters (IPL)*, 121(5): 17–21, 2017.

- **On the Sensitivity Conjecture for Disjunctive Normal Forms**

Joint work with Sébastien Tavenas.

In the Proceedings of the IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (**FSTTCS**), 2016.

- **Building Efficient and Compact Data Structures for Simplicial Complexes**

Joint work with Jean-Daniel Boissonnat and Sébastien Tavenas.

In the Proceedings of the Symposium on Computational Geometry (**SoCG**), 2015.

In *Algorithmica*, 79(2): 530–567, 2017.

MANUSCRIPTS

- **Fairness of Linear Regression in Decision Making**

Joint work with Vincent Cohen-Addad, Surya Teja Gavva, Claire Mathieu, and Namrata.

- **On Complexity of 1-Center in Various Metrics**

Joint work with Amir Abboud, MohammadHossein Bateni, Vincent Cohen-Addad, and Saeed Seddighin.

- **Almost Polynomial Factor Inapproximability for Parameterized k -Clique**

Joint work with Subhash Khot.

- **Finding Diverse Solutions to Optimization Problems**

Joint work with Jie Gao, Mayank Goswami, Meng-Tsung Tsai, Shih-Yu Tsai, and Hao-Tsung Yang.

SELECTED INVITED TALKS

- **Recent Hardness of Approximation results in Parameterized Complexity**

Workshop at Hausdorff Center for Mathematics (virtual talk)

December 2021

- **Reversing Color Coding**

University of Michigan and Purdue University Joint Theory Seminar (virtual talk)

September 2021

Rutgers University Theory Seminar (virtual talk)

September 2021

Cornell University Theory Seminar (virtual talk)

September 2021

- **Hardness of Approximation for Metric Clustering**

STOC workshop: The Recent Past and Near Future of Clustering (virtual talk)

June 2021

- **Fairness in Decision Making: Is Linear Regression Fair?**

New York University Scholar Speaker Series (virtual talk)

November 2020

- **Towards a Unified Framework for Hardness of Approximation in P**
TAU Theory Fest, Tel Aviv January 2020
Frontiers of Parameterized Complexity (virtual talk) August 2020
Parameterized Complexity Workshop (virtual talk) December 2020
Combinatorics Seminar, Tel Aviv University (virtual talk) March 2021
- **Ultrametrics meet Fine-Grained Complexity**
Weizmann Institute of Science (virtual talk) July 2020
Yahoo Research Seminar (virtual talk) January 2021
- **Clustering: How hard is it to classify data?**
Google, Mountain View November 2019
Columbia University November 2019
Weizmann Institute of Science December 2019
Hebrew University of Jerusalem December 2019
- **Inapproximability of Clustering in ℓ_p -metrics**
Fine-Grained Approximation Algorithms & Complexity Workshop, Bertinoro May 2019
Shanghai University of Finance & Economics June 2019
Tel Aviv University June 2019
Microsoft Research India August 2019
Indian Institute of Science August 2019
Eötvös Loránd University, Budapest September 2019
- **New Arenas in Hardness Amplification**
Ben-Gurion University March 2019
Hebrew University of Jerusalem April 2019
Sorbonne University April 2019
- **On Complexity of Closest Pair Problem**
Indian Institute of Science August 2018
FILOFOCS Workshop, Institut Henri Poincaré, Paris October 2018
Tel Aviv University October 2018
Technion – Israel Institute of Technology January 2019
Hebrew University of Jerusalem April 2019
National Institute of Science Education and Research, Bhubaneswar August 2019
- **A Framework for Parameterized Hardness of Approximation**
Hebrew University of Jerusalem January 2018
Tel Aviv University March 2018
Stanford University July 2018
Simons Institute for Theory of Computing, Berkeley August 2018
- **An Efficient Representation for Filtrations of Simplicial Complexes**
Topology for Data Analysis Winter School, INRIA Sophia Antipolis January 2017
- **Building Efficient and Compact Data Structures for Simplicial Complexes**
Ben-Gurion University December 2015
- **In and Around the Sensitivity Conjecture**
Microsoft Research, India September 2015