KARTHIK C. S.

Contact Information

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Research Interests

I am broadly interested in Complexity Theory, and in particular in Hardness of Approximation and Hardness Amplification in Fine-Grained and Fixed-Parameter Complexity, PCPs, and Communication Complexity. I am also interested in computational aspects of Fixed Point theorems and geometric aspects of Clustering.

Education

- **Ph.D. in Computer Science** [September 2014 - June 2019]
  Weizmann Institute of Science, Rehovot, Israel
  Advisor: Prof. Irit Dinur
  Ph.D. Thesis: New Arenas in Hardness of Approximation

- **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

- **Postdoctoral Fellow**   *September 2019 - August 2020*
  Mentor: Prof. Amir Shpilka   **Tel Aviv University**, Israel

- **Postdoctoral Fellow**   *July 2019 - September 2019*
  Mentor: Prof. Irit Dinur   **Weizmann Institute of Science**, Israel

Selected Academic Awards and Honors

- **LIP** fellowship in 2013.

- **INRIA**-**ENS Cachan** fellowship in 2013 (*regretfully declined*).

- **Labex** scholarship in 2012.

- National Board for Higher Mathematics (**NBHM**) scholarship in 2008.

- Kishore Vaigyanik Protsahan Yojana (**KVPY**) fellowship in 2007.

- Indian National Mathematical Olympiad (**INMO**) Awardee in 2007.

- National Talent Search Examination (**NTSE**) scholarship in 2006.

Selected Internships

- **Sensitivity Conjecture**   *July-August 2015*
  Mentor: Dr. Satyanarayana Lokam   **Microsoft Research**, Bangalore

- **A τ conjecture for Newton Polygons**   *May-July 2013*
  Mentors: Prof. Pascal Koiran and Prof. Stéphan Thomassé   **ENS**, Lyon

- **Spectral Clustering for Convex sets**   *May-July 2012*
  Mentor: Dr. David Cohen-Steiner   **INRIA**, Sophia Antipolis

RESEARCH VISITS

- **Microsoft Research India**   *July-August 2019*
  Host: Dr. Prateek Jain

- **Shanghai University of Finance and Economics**   *June 2019*
  Host: Prof. Bundit Laekhanukit

- **University of California, Santa Barbara**   *May 2019*
  Host: Prof. Daniel Lokshtanov

- **Sorbonne University, Paris**   *April 2019*
  Host: Dr. Vincent Cohen-Addad

- **University of California, Berkeley**   *July 2018, August 2018*
  Host: Pasin Manurangsi

- **INRIA Sophia Antipolis**   *September 2013, June 2014, January 2017*
  Host: Prof. Jean-Daniel Boissonnat

PUBLICATIONS

- **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.
  To appear in **Combinatorica**.

- **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.

- **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.

- **Parameterized Intractability of Even Set and Shortest Vector Problem from Gap-ETH**
  Joint work with Arnab Bhattacharyya, Suprovat Ghoshal, and Pasin Manurangsi.
  In Proceedings of International Colloquium on Automata, Languages, and Programming (**ICALP**), 2018.

- **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 (**SICOMP**) 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 Roee 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.

- **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

- **Hardness Amplification of Optimization Problems**
  Joint work with Elazar Goldenberg.

- **On Communication Complexity of Fixed Point Computation**
  Joint work with Anat Ganor and Dömötör Pálvölgyi.

Selected Talks

- **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

- **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

SELECTED TEACHING EXPERIENCE

- **A Theorist's Toolkit**   **Teaching Assistant**
  Course Instructor: Prof. Irit Dinur   *March-July 2018*

- **CS 101: Computer Programming and Utilization**   **Teaching Assistant**
  Course Instructor: Prof. Soumen Chakrabarti   *January-April 2012*
  Course Instructor: Prof. Deepak Phatak   *August-November 2011*

PROFESSIONAL SERVICE

Reviewer for Conferences: 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.