

Sivakanth Gopi

Curriculum Vitae

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Interests

I am broadly interested in Theoretical Computer Science with a special focus on Coding Theory and its applications to Cryptography, Distributed Storage, Data Privacy, Pseudorandomness and Complexity Theory. I am also interested in Differential Privacy, especially in Privacy Preserving Machine Learning.

Work

- 2020 – **Senior Researcher**, *Algorithms group, Microsoft Research Redmond*.
2018 – 2020 **Postdoctoral Researcher**, *Algorithms group, Microsoft Research Redmond*.

Education

- 2013 – 2018 **PhD in Theoretical Computer Science**, *Princeton University*, Advisor: Prof. Zeev Dvir, PhD Thesis: *Locality in Coding Theory*.
2009 – 2013 **B.Tech in Computer Science and Engineering with Honors, and Minor in Mathematics**, *Indian Institute of Technology Bombay*, GPA: 9.77/10.

Conference Publications

Differentially private fine-tuning of language models.

Da Yu, Saurabh Naik, Arturs Backurs, Sivakanth Gopi, Huseyin Inan, Gautam Kamath, Janardhan (Jana) Kulkarni, Yin Tat Lee, Andre Manoel, Lukas Wutschitz, Sergey Yekhanin and Huishuai Zhang.

International Conference on Learning Representations, ICLR 2022.

Trellis BMA: coded trace reconstruction on IDS channels for DNA storage.

Sundara Rajan Srinivasavaradhan, Sivakanth Gopi, Henry Pfister and Sergey Yekhanin.
International Symposium on Information Theory, ISIT 2021.

Numerical Composition of Differential Privacy.

Sivakanth Gopi, Yin Tat Lee and Lukas Wutschitz.
Neural Information Processing Systems, NeurIPS 2021.

Differentially private n-gram extraction.

Kunho Kim, Sivakanth Gopi, Janardhan Kulkarni and Sergey Yekhanin.
Neural Information Processing Systems, NeurIPS 2021.

Fast and Memory Efficient Differentially Private-SGD via JL Projections.

Zhiqi Bu, Sivakanth Gopi, Janardhan Kulkarni, Yin Tat Lee, Judy Hanwen Shen and Uthaiapon Tantipongpipat.
Neural Information Processing Systems, NeurIPS 2021.

Locally Private Hypothesis Selection.

Sivakanth Gopi, Gautam Kamath, Janardhan Kulkarni, Aleksandar Nikolov, Zhiwei Steven Wu and Huanyu Zhang.
Conference on Learning Theory, COLT 2020.

Differentially Private Set Union.

Sivakanth Gopi, Pankaj Gulhane, Janardhan Kulkarni, Judy Hanwen Shen, Milad Shokouhi and Sergey Yekhanin.

International Conference on Machine Learning, ICML 2020.

Theory and Practice of Differential Privacy, TPDP 2020 (Contributed Talk) .

CSPs with Global Modular Constraints: Algorithms and Hardness via Polynomial Representations.

Joshua Brakensiek, Sivakanth Gopi and Venkatesan Guruswami.

ACM Symposium on Theory of Computing, STOC 2019.

Spanoids - an abstraction of spanning structures, and a barrier for LCCs.

Zeev Dvir, Sivakanth Gopi, Yuzhou Gu and Avi Wigderson.

Innovations in Theoretical Computer Science, ITCS 2019.

On Maximally Recoverable Local Reconstruction Codes.

Sivakanth Gopi, Venkat Guruswami and Sergey Yekhanin.

Symposium on Discrete Algorithms, SODA 2019.

Lower bounds for 2-query LCCs over large alphabet.

Arnab Bhattacharyya, Sivakanth Gopi and Avishay Tal.

RANDOM 2017.

Outlaw distributions and locally decodable codes.

Jop Briët, Zeev Dvir and Sivakanth Gopi.

Innovations in Theoretical Computer Science, ITCS 2017.

Locally testable and Locally correctable Codes Approaching the Gilbert-Varshamov Bound.

Sivakanth Gopi, Swastik Kopparty, Rafael Oliveira, Noga Ron-Zewi and Shubhangi Saraf.

Symposium on Discrete Algorithms, SODA 2017.

Competitive analysis of the top-K ranking problem.

Xi Chen, Sivakanth Gopi, Jieming Mao and Jon Schneider.

Symposium on Discrete Algorithms, SODA 2017.

Lower bounds for affine invariant LCCs and LTCs.

Arnab Bhattacharya and Sivakanth Gopi.

Conference on Computational Complexity, CCC 2016.

On the number of rich lines in truly high dimensional sets.

Zeev Dvir and Sivakanth Gopi.

International Symposium on Computational Geometry, SoCG 2015.

2-Server PIR with sub-polynomial communication.

Zeev Dvir and Sivakanth Gopi.

ACM Symposium on Theory of Computing, STOC 2015.

CO-WINNER OF BEST PAPER AWARD

One-bit compressed sensing: Provable support and vector recovery.

Sivakanth Gopi, Praneeth Netrapalli, Prateek Jain and Aditya V. Nori.

International Conference on Machine Learning, ICML 2013.

Synthesis from incompatible specifications.

Pavol Cerný, Sivakanth Gopi, Thomas A. Henzinger, Arjun Radhakrishna and Nishant Totla.

International Conference on Embedded Software, EMSOFT 2012.

Preprints and Manuscripts**Private Convex Optimization via Exponential Mechanism.**

Sivakanth Gopi, Yin Tat Lee and Daogao Liu.

Lower Bounds for Maximally Recoverable Tensor Code and Higher Order MDS Codes.

Joshua Brakensiek, Sivakanth Gopi and Visu Makam.

Improved Maximally Recoverable LRCs using Skew Polynomials.

Sivakanth Gopi and Venkatesan Guruswami.

Journal Publications

Differentially Private Set Union.

Sivakanth Gopi, Pankaj Gulhane, Janardhan Kulkarni, Judy Hanwen Shen, Milad Shokouhi and Sergey Yekhanin.

Journal of Privacy and Confidentiality, 11(3). doi: [10.29012/jpc.780](https://doi.org/10.29012/jpc.780).

Preliminary version appeared in ICML 2020.

Maximally Recoverable LRCs: A field size lower bound and constructions for few heavy parities.

Sivakanth Gopi, Venkatesan Guruswami and Sergey Yekhanin.

IEEE Transactions on Information Theory, 2020. DOI: [10.1109/TIT.2020.2990981](https://doi.org/10.1109/TIT.2020.2990981).

Preliminary version appeared in SODA 2019.

Spanoids - an abstraction of spanning structures, and a barrier for LCCs.

Zeev Dvir, Sivakanth Gopi, Yuzhou Gu and Avi Wigderson.

SIAM Journal on Computing, 49(3), 465–496, 2020. DOI: [10.1137/19M124647X](https://doi.org/10.1137/19M124647X).

Preliminary version appeared in ITCS 2019.

Outlaw Distributions and Locally Decodable Codes.

Jop Briët, Zeev Dvir and Sivakanth Gopi.

Theory of Computing, Volume 15(12), pp. 1-24, 2019. DOI: [10.4086/toc.2019.v015a012](https://doi.org/10.4086/toc.2019.v015a012).

Preliminary version appeared in ITCS 2017.

Gaussian width bounds with applications to arithmetic progressions in random settings.

Jop Briët and Sivakanth Gopi.

International Mathematics Research Notices (IMRN), 2018, rny238.

DOI: [10.1093/imrn/rny238](https://doi.org/10.1093/imrn/rny238).

Locally testable and Locally correctable Codes Approaching the Gilbert-Varshamov Bound.

Sivakanth Gopi, Swastik Kopparty, Rafael Oliveira, Noga Ron-Zewi and Shubhangi Saraf.

IEEE Transactions on Information Theory, Volume 64 Issue 8, Aug 2018, Pages: 5813 - 5831.

DOI: [10.1109/TIT.2018.2809788](https://doi.org/10.1109/TIT.2018.2809788).

Preliminary version appeared in SODA 2017.

Competitive analysis of the top-K ranking problem.

Xi Chen, Sivakanth Gopi, Jieming Mao and Jon Schneider.

IEEE Transactions on Information Theory, Volume 64 Issue 9, Sep 2018, Pages: 6139 - 6160.

DOI: [10.1109/TIT.2018.2851986](https://doi.org/10.1109/TIT.2018.2851986).

Preliminary version appeared in SODA 2017.

2-Server PIR with sub-polynomial communication.

Zeev Dvir and Sivakanth Gopi.

INVITED ARTICLE in Journal of the ACM (JACM), Volume 63 Issue 4, Nov 2016, Article 39.

DOI: [10.1145/2968443](https://doi.org/10.1145/2968443).

Preliminary version appeared in STOC 2015.

Lower Bounds for Constant Query Affine-Invariant LCCs and LTCs.

Arnab Bhattacharyya and Sivakanth Gopi.

ACM Transactions on Computing Theory (TOCT), Volume 9 Issue 2, May 2017, Article 7.

DOI: [10.1145/3016802](https://doi.org/10.1145/3016802).

Preliminary version appeared in CCC 2016.

Invited Talks

Private Convex Optimization via Exponential Mechanism.

Boston Privacy Seminar, co-organized by Harvard, Boston and Northeastern Universities (Mar 2022)

CSPs with Global Modular Constraints: Algorithms and Hardness via Polynomial Representations.

CSP Seminar (Jun 2021)

Fast and Memory Efficient Differentially Private-SGD via JL Projections.

Google Privacy Seminar (May 2021)

Spanoids - An Abstraction of Spanning Structures, and a Barrier for LCCs .

Highlights of Algorithms (HALG) 2020 (Sep 2020)

CSPs with Global Modular Constraints: Algorithms and Hardness via Polynomial Representations.

Theory seminar, University of Washington (Mar 2019)

CSDM Seminar, Institute for Advanced Study (IAS), Princeton (Mar 2020)

Gaussian width bounds with applications to arithmetic progressions in random settings.

Combinatorics seminar, Rutgers University (Oct 2018)

Combinatorics seminar, Georgia Tech (Nov 2018)

Maximally recoverable local reconstruction codes.

Workshop on Coding and Information Theory, CMAS, Harvard University (Apr 2018)

On the number of rich lines in truly high dimensional sets.

Discrete Math Seminar, Rutgers University (Apr 2015)

2-Server PIR with sub-polynomial communication.

CSDM Seminar, Institute for Advanced Study (IAS), Princeton (Dec 2015)

Theory Seminar, Rutgers University (Feb 2015)

China Theory Week, Shanghai Jiao Tong University (Aug 2015)

Theory Seminar, CMU (Nov 2015)

Theory Seminar, IISc Bangalore (Dec 2015)

CCC Satellite workshop, Kyoto University (Jun 2016)

DIMACS Workshop on Cryptography and its Interactions, Rutgers University (Jul 2016)

Canadian Discrete and Algorithmic Mathematics Conference (CanADAM) 2017, Toronto (June 2017)

Theses

2018 **Locality in Coding Theory**, *PhD Thesis*, Princeton University.

Advisor: [Zeev Dvir](#)

2013 **Stability of Linear Threshold Functions**, *Undergraduate Thesis*, IIT Bombay.

Advisors: [Prahladh Harsha](#) (TIFR) and [Srikanth Srinivasan](#) (IITB)

Internships

- Fall 2016 **Microsoft Research, Redmond.**
Coding for distributed storage
Mentor: Sergey Yekhanin
- Summer 2012 **Microsoft Research, Bangalore.**
One Bit Compressed Sensing
Mentors: Prateek Jain and Aditya Nori
Testing Coverage Functions
Mentor: Deeparnab Chakrabarty
- Summer 2011 **IST Austria.**
Synthesis from Incompatible Specifications
Mentors: Pavol Černý and Thomas Henzinger

Honours and Awards

- **Best paper award** at STOC 2015
- Awarded **Institute Silver Medal** given to the most outstanding student of Computer Science department, IIT Bombay
- Awarded **Institute Academic Prize** for the year 2010-11 by IIT Bombay
- Represented India and won a **Gold Medal** in the **International Physics Olympiad-2009** held in Mexico
- Ranked 3rd in the **all India IIT entrance examination** 2009 taken by around 400,000 students (IITJEE-2009)
- **Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship**, a national fellowship for students interested in science by Dept. of Science and Technology, India
- **National Talent Search (NTS) Scholarship** by National Council of Education Research and Training (NCERT), India
- **Aditya Birla Scholarship**, awarded to outstanding engineering undergraduates in India
- **INMO Scholarship** by National Board for Higher Mathematics (NBHM), India
- **A*STAR India Youth Scholarship** by Agency for Science, Technology and Research (ASTaR), Government of Singapore

Teaching Experience

Graduate Teaching Assistant at Princeton University for:

- Theory of Computation
- Reasoning about Computation

Undergraduate Teaching Assistant at IIT Bombay for:

- Linear Algebra
- Differential Equations
- Computer Programming & Utilization
- Modern Physics