Abhishek Sinha — Resume

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Title

Reader — April 2022 - Present
School of Technology and Computer Science
Tata Institute of Fundamental Research, Mumbai

Education

- Doctor of Philosophy
  Laboratory for Information and Decision Systems (LIDS) — September 2012 - June 2017
  Massachusetts Institute of Technology
  Cambridge, MA, USA

- Master Of Telecommunication Engineering
  Dept. of Electrical Communication Engineering (ECE)
  Indian Institute of Science
  Bangalore, India — August 2010 - August 2012

- Bachelor Of Electronics And Telecommunication Engineering
  Dept. of Electronics and Telecommunication Engineering (ETCE)
  Jadavpur University
  Kolkata, India — August 2006 - July 2010

Work Experience

- **Tata Institute of Fundamental Research, Mumbai** — Apr 2022 - present
  Reader, School of Technology and Computer Science

- **Indian Institute of Technology Madras** — Nov 2018 - March 2022
  Assistant Professor, Dept. of Electrical Engineering

- **Qualcomm Research, San Diego, CA** — Oct 2017 - Oct 2018
  Senior Engineer, Wireless R&D

- **Nokia Bell Labs, Murray Hill, NJ** — June 2016 - August 2016
  Summer Intern, Fixed Networks and the Mathematics of Networks

- **Microsoft, Redmond, WA** — June 2014 - August 2014
  Summer Intern, Microsoft Azure and Microsoft Research

Research Interests

- Learning, Optimization, and Decision Theory: Online learning, Caching algorithms.
- Networking and Communication: Age-of-Information, Queueing Theory, Network Control, Information Theory.

Publications

Preprints

1. **A. Sinha** and R. Vaze, Optimal Algorithms for Online Convex Optimization with Adversarial Constraints, **arXiv preprint 2310.18955**.
2. S. Chaudhary and **A. Sinha**, α-Fair Contextual Bandits, **arXiv preprint 2310.14164**.
3. S. Sahoo, S. Chaudhary, S. Mukhopadhyay, and **A. Sinha**, Online Subset Selection using α-Core with no Augmented Regret, **arXiv preprint 2209.14222**.

Refereed Conference Papers

1. **A. Sinha**, BanditQ - Fair Bandits with Guaranteed Rewards, Uncertainty in Artificial Intelligence (**UAI 2024**), Barcelona, Spain.
2. **A. Sinha**, A. Joshi, R. Bhattacharjee, C. Musco. M. Hajiesmaili, No-regret Algorithms for Fair Resource Allocation, **NeurIPS 2023**, New Orleans, USA.
3. N. Mhaisen, **A. Sinha**, G. Paschos, and G. Iosifidis, Optimistic No-regret Algorithms for Discrete Caching, Proceedings of ACM **SIGMETRICS 2023**, Orlando, Florida, USA.
4. A. Joshi and **A. Sinha**, Universal Caching, Information Theory Workshop (**ITW 2022**), Mumbai, India.
5. S. Mukhopadhyay, S. Sahoo, **A. Sinha**, $k-$experts - Online Policies and Fundamental Limits, International Conference on Artificial Intelligence and Statistics **AISTATS 2022**
6. D. Paria, **A. Sinha**, LeadCache: Regret-Optimal Caching in Networks, Advances in Neural Information Processing Systems, **NeurIPS 2021**
7. Vishnu B, **A. Sinha**, Fast and Secure Routing Algorithms for Quantum Key Distribution Networks, International Conference on Communication Systems and Networks **COMSNETS 2022**, Bangalore, India.
8. A. Mandal, R. Bhattacharjee, **A. Sinha**, Optimizing Age-of-Information in Adversarial Environments with Channel State Information, **COMSNETS 2022**, Bangalore, India.
9. **S. Mukhopadhyay**, **A. Sinha**, Online Caching with Optimal Switching Regret, International Symposium on Information Theory (**ISIT 2021**), Melbourne, Australia.
10. R. Bhattacharjee and **A. Sinha**, Competitive Algorithms for Minimizing the Maximum Age-of-Information, Mathematical performance Modeling and Analysis Workshop (**MAMA 2020**), Boston, MA, USA.
11. R. Bhattacharjee, S. Banerjee, **A. Sinha**, Fundamental Limits on the regret of Online Network-Caching, Proceedings of ACM **SIGMETRICS 2020**, Boston, MA, USA.
12. S. Banerjee, R. Bhattacharjee, **A. Sinha**, Fundamental Limits of Age-of-Information in Stationary and Non-stationary environments, Proceedings of IEEE International Symposium on Information Theory (**ISIT**) 2020, LA, USA.
13. A. Srivastava, **A. Sinha**, K. Jagannathan, On Minimizing the Maximum Age-of-Information For Wireless Erasure Channels, Proceedings of **RAWNET 2019**, Avignon, France.
14. **A. Sinha**, M. Andrews, P. Ananth, Scheduling Algorithms for 5G Networks with Mid-haul Capacity Constraints, Proceedings of **WiOpt 2019**, Avignon, France.
15. **A. Sinha**, E. Modiano, Network Utility Maximization with Heterogeneous Traffic Flows, Proceedings of **WiOpt 2018**, Shanghai, China.
16. I. Kadota, **A. Sinha**, E. Modiano, "Optimizing Age of Information in Wireless Networks with Throughput Constraints", Proceedings of IEEE **INFOCOM 2018**, Honolulu, HI, USA (**Best Paper Award**).

17. J. Zhang, **A. Sinha**, J. Llorca, A. Tulino, E. Modiano, "Optimal Control of Distributed Computing Networks with Mixed-Cast Traffic Flows", Proceedings of IEEE **INFOCOM 2018**, Honolulu, HI, USA.

18. **A. Sinha**, E. Modiano, "Throughput-Optimal Broadcast in Wireless Networks with Point-to-Multipoint Transmissions", *Proceedings of the 18th ACM International Symposium on Mobile Ad Hoc Networking and Computing,* (**MobiHoc**) 2017, Chennai, India.

19. **A. Sinha**, E. Modiano, "Optimal Control for Generalized Network-Flow Problems", Proceedings of IEEE **INFOCOM 2017**, Atlanta, GA.

20. **A. Sinha**, L. Tassiulas, E. Modiano, "Throughput-Optimal Broadcast in Wireless Networks with Dynamic Topology", *Proceedings of the 17th ACM International Symposium on Mobile Ad Hoc Networking and Computing,* **(MobiHoc) 2016,** Paderborn, Germany **(Best Paper Award).**

21. **A. Sinha**, G. Paschos, E. Modiano, "Throughput-Optimal Multi-hop Broadcast Algorithms", Proceedings of the 17th ACM International Symposium on Mobile Ad Hoc Networking and Computing, **(MobiHoc) 2016**, Paderborn, Germany.

22. **A. Sinha**, G. Paschos, C.P. Li, E. Modiano, "Throughput-Optimal Broadcast on Directed Acyclic Graphs", IEEE **INFOCOM 2015**, Hong Kong, PRC.

23. **A. Sinha**, P. Mani, J. Liu, A. Flavel, D. Maltz, "Distributed Load Management in Anycast-based CDNs", *53rd Annual Allerton Conference on Communication, Control, and Computing* **(Allerton)** 2015, Monticello, IL, USA.

24. A. Chattopadhyay, **A. Sinha**, M. Coupechoux, A. Kumar, "Optimal Capacity Relay Node Placement in a Multi-hop Network on a Line", *10th International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks*, **WiOpt** 2012, Paderborn, Germany.

Journal Papers

1. S. Akhtar, Krishnakumar G, Vishnu B, and **A. Sinha**, Fast and Secure Routing Algorithms for Quantum Key Distribution Networks, in **IEEE/ACM Transactions on Networking**, vol. 31, no. 5, pp. 2281-2296, Oct. 2023, doi: 10.1109/TNET.2023.3246114..
2. **A. Sinha** and R. Bhattacharjee, Optimizing the Age-of-Information for Mobile Users in Adversarial and Stochastic Environments, **IEEE Transactions on Information Theory**, vol. 68, no. 10, pp. 6860-6880, Oct. 2022, doi: 10.1109/TIT.2022.3183045.
3. J. Zhang, **A. Sinha**, J. Llorca, A. Tulino, E. Modiano, "Optimal Control of Distributed Computing Networks with Mixed-Cast Traffic Flows", **IEEE/ACM Transactions on Networking**, vol. 29, no. 4, pp. 1760-1773, Aug. 2021, doi: 10.1109/TNET.2021.3070699.
4. R. Bhattacharjee, S. Banerjee, **A. Sinha**, Fundamental Limits on the regret of Online Network-Caching, **Proceedings of the ACM on Measurement and Analysis of Computing Systems (POMACS)**, Vol. 4, No. 2, Article 25. Publication date: June 2020.
5. **A. Sinha**, E. Modiano, "Throughput-Optimal Broadcast in Wireless Networks with Point-to-Multipoint Transmissions", **IEEE Transactions on Mobile Computing**, vol. 20, no. 1, pp. 232-246, 1 Jan. 2021, doi: 10.1109/TMC.2019.2940025
6. I. Kadota, **A. Sinha**, E. Modiano, "Scheduling Algorithms for Optimizing Age of Information in Wireless Networks with Throughput Constraints", **IEEE/ACM Transactions on Networking**, vol. 27, no. 4, pp. 1359-1372, Aug. 2019, doi: 10.1109/TNET.2019.2918736.
7. I. Kadota, **A. Sinha**, E. Uysal-Biyikoglu, R. Singh, E. Modinao, "Scheduling Policies for Minimizing Age of Information in Broadcast Wireless Networks", **IEEE/ACM Transactions on Networking**, vol. 26, no. 6, pp. 2637-2650, Dec. 2018, doi: 10.1109/TNET.2018.2873606.

8. **A. Sinha**, L. Tassiulas, E. Modiano, "Throughput-Optimal Broadcast in Wireless Networks with Dynamic Topology", in **IEEE Transactions on Mobile Computing**, vol. 18, no. 5, pp. 1203-1216, 1 May 2019, doi: 10.1109/TMC.2018.2846246.

9. **A. Sinha**, E. Modiano, "Optimal Control for Generalized Network Flow Problems", **IEEE/ACM Transactions on Networking**, vol. 26, no. 1, pp. 506-519, Feb. 2018, doi: 10.1109/TNET.2017.2783846.

10. **A. Sinha**, G. Paschos, E. Modiano, "Throughput-Optimal Multi-hop Broadcast Algorithms", **IEEE/ACM Transactions on Networking**, vol. 25, no. 5, pp. 3088-3101, Oct. 2017, doi: 10.1109/TNET.2017.2718534.

11. **A. Sinha**, P. Mani, J. Liu, A. Flavel, D. Maltz, "Distributed Load Management Algorithms in Anycast-based CDNs", **Computer Networks, Elsevier**, 2017.

12. **A. Sinha**, G. Paschos, C.P. Li, E. Modiano, "Throughput-Optimal Multihop Broadcast on Directed Acyclic Wireless Networks", in **IEEE/ACM Transactions on Networking,** IEEE/ACM Transactions on Networking, vol. 25, no. 1, pp. 377-391, Feb. 2017, doi: 10.1109/TNET.2016.2582907.

13. A. Chattopadhyay, **A. Sinha**, M. Coupechoux, A. Kumar, "Deploy-As-You-Go Wireless Relay Placement: An Optimal Sequential Decision Approach using the Multi-Relay Channel Model", **IEEE Transactions On Mobile Computing**, vol. 16, no. 02, pp. 341-354, 2017. doi: 10.1109/TMC.2016.2561271.

14. **A. Sinha**, A. Chattopadhyay, K.P. Naveen, P. Mondal, M. Coupechoux, A. Kumar, "Optimal sequential wireless relay placement on a random lattice path", **Ad Hoc Networks, Elsevier**, Volume 21, 2014, Pages 1-17, ISSN 1570-8705, `https://doi.org/10.1016/j.adhoc.2014.04.005.`

15. **A. Sinha**, S. Das, B.K. Panigrahi, "A Linear State-Space Analysis of the Migration Model in an Island Biogeography System", **IEEE Transactions on Systems, Man and Cybernetics Part-A,** vol. 41, no. 2, pp. 331-337, March 2011, doi: 10.1109/TSMCA.2010.2058100.

Patents

- "**Integrated Scheduler for Scheduling with X-Haul Capacity Constraints**", M. Andrews, P. Ananth, **A. Sinha**, Invention submission # 81991 at Nokia Bell Labs. United States patent application US 15/630,367. 2018 Dec 27.
- "**Physical Uplink Control Channel Reliability Enhancements**", A. Sinha et al., United States patent US 10,959,232. 2021 Mar 23.
- "**Uplink Control Channel Beam Switch Procedure**", A. Sinha et al., United States patent US 11,109,380. 2021 Aug 31.

Awards and Honors

- Recipient of the **Google India Research Awards (2023)**, in the area Algorithms and Theory, together with Prof. Rahul Vaze.
- Recipient of the **INSA Medal for Young Scientists (2021)**, awarded by the Indian National Science Academy, New Delhi, India
- Recipient of the **Best Paper Award** in **IEEE INFOCOM 2018**, Honolulu, HI, USA
- Recipient of the **Best Paper Award** in **ACM MobiHoc 2016**, Paderborn, Germany
- Recipient of the **Best Poster Award** in JTG/IEEE ITSoc Summer School 2022
- Recipient of Prof. Jnansaran Chatterjee Memorial **Gold Medal** and T.P. Saha Memorial **Gold Centered Silver Medal** from Jadavpur University, Kolkata in the year 2010
- Recipient of *Senior Jagadis Bose National Science Talent Search* **(JBNSTS)** scholarship, 2007 (awarded to approximately twenty students annually among all branches of science, engineering, and medicine in the state of West Bengal, India)

Major Academic Achievements

- Secured **All India Rank 2** (out of approximately 1,00,000 students) in the *Graduate Aptitude Test in Engineering* (**GATE**) 2010, in Electronics and Communication Engineering.
- Ranked **2nd** in the department (ETCE) at **Jadavpur University**, Kolkata
- Secured **All India Rank 16** in *West Bengal Joint Entrance Examination* (**WBJEE 2006**) in the Engineering entrance test (out of approximately 80,000 students)

Teaching

- **Fall 2023**: Probability (CSS.207.1)
- **Fall 2022**: Probability (CSS.207.1)
- **Spring 2022**: Topics in Random Processes and Concentrations (EE6112)
- **Fall 2021**: Probability Foundations for Electrical Engineers (EE5110)
- **Spring 2021**: Topics in Random Processes and Concentrations (EE 6112)
- **Fall 2020**: Advanced Topics in Artificial Intelligence (EE 6180)
- **Spring 2020**: Topics in Random Processes and Concentrations (EE 6112)
- **Fall 2019**: Advanced Topics in Artificial Intelligence (EE 6180)
- **Spring 2019**: Topics in Random Processes and Concentrations (EE 6112)

Student advising & Mentoring

- **Post Doc**
  1. Samrat Mukhopadhyay* (currently an Assistant Professor at the dept. of Electronics Engg. at IIT (ISM) Dhanbad)
  2. Shahbaz Akhtar* (currently a faculty member at PCE Purnea, India)
- **Ph.D.**
  1. Krishnakumar
- **M.S.**
  1. Siddhant Chaudhary (student at the Chennai Math. Inst.)
  2. Debjit Paria* (Quantitative researcher at Millennium)
  3. Subhankar Banerjee*[1] (co-advised with Prof. K. Giridhar. Now a PhD student at UMD)
- **Undergraduate/ Dual-degree**
  1. Sourav Sahoo* (currently a PhD student at MIT)
  2. Abhijeet Vyas* (currently a PhD student at Purdue University)
  3. Arunabh Srivastava* (currently a PhD student at the University of Maryland)
  4. Vishnu B* (Oracle)
  5. Bodagala Viswa Chaitanya* (Qualcomm)
- **Project Associate**
  1. Ativ Joshi
  2. Rajarshi Bhattacharjee* (currently a PhD student at U. Mass. Amherst)
  3. Avijit Mandal* (currently a PhD student at Duke University)

[1] the symbol * indicates that the student has graduated

Grants

- Recipient of an unrestricted gift from Google as a part of **Google India Faculty Research Award (2023)** in the category of Algorithms and Theory.
- Recipient of a US-India NSF-DST collaborative grant with **Prof. Mohammad Hajiesmaili** from **University of Massachusetts Amherst**, coordinated by IDEAS-Technology Innovation Hub (TIH) at the Indian Statistical Institute, Kolkata.
- Founder and Principal Investigator for the **IoE**-sponsored potential Center of Excellence (CoE) Intelligent Networks, IIT Madras
- Recipient of an unrestricted gift from **Qualcomm (USA)**

Academic Visits

- **Yale Institute of Network Science** Summer 2015
  - Worked with Prof. Leandros Tassiulas on Throughput-Optimal Broadcasting in time-varying networks. Work resulted in a best paper award in MobiHoc 2016.

Professional/ Voluntary Services

- Member of Project Review and Steering Group (PRSG) for a Ministry of Electronics & Information Technology sanctioned project carried out in SAMEER, Chennai
- TPC member of COMSNETS 2021, WiOpt 2020, SPCOM 2020, WiOpt 2021.
- **Served as an anonymous reviewer** for major journals and conferences in the area of Networking, Machine learning, and Information Theory
- Served on the executive board of **Sangam** (the Indian student association at MIT) as the webmaster during the academic year 2015-2016.