Karthik Abinav Sankararaman

Department of Computer Science
University of Maryland, College Park

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Contact Information

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Interests

Foundations and Applications of Artificial Intelligence
Recent topics: Online Learning, Online Algorithms, Discrete and Continuous Optimization, Randomized Algorithms, Causal Inference.

Education

University of Maryland, College Park
PhD. in Computer Science **September 2014 - May 2019 (Expected)**
M.S. in Computer Science **December 2016**
Committee: Aravind Srinivasan, Alex Slivkins, John Dickerson

Indian Institute of Technology, Madras **August 2010 - July 2014**
B.Tech Honours in Computer Science and Engineering
GPA: 9.01/10
Minor: Operations Research
Thesis: Maximum Flow Problem in Undirected Graphs
Advisor: Dr. N.S. Narayanaswamy

Honors

- Selected as a *Future Faculty Fellow* UMD, 2018
- **Dean's Fellowship**: University of Maryland, 2014, 2015
- Recipient of the *S.N. Bose Scholarship* 2013 given to **top 50** Indian students.
- Awardee of the *National Talent Search Examination(NTSE)* Scholarship.

Selected Publications (**Authors ordered alphabetically by last name unless specified by * which indicates primary author(s) by contribution**)

N.B.: Conferences are the primary venues of publication in Computer Science.

1. "Balancing Relevance and Diversity in Online Matching via Submodularity" — Joint work with John Dickerson, Aravind Srinivasan, Pan Xu
   The 33rd AAAI Conference on Artificial Intelligence (AAAI), 2019
2. "Matching Workers to Tasks in Crowdsourcing Platforms: Two-Sided Online Matching" — Joint work with John Dickerson, Aravind Srinivasan, Pan Xu
   The 17th International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2018
3. "Combinatorial Semi-Bandits with Knapsacks" — Joint work with Alexandrs Slivkins
   *The 21st International Conference on Artificial Intelligence and Statistics (AIStats), 2018 — **(Invited for Oral Presentation)***
4. "Allocation Problems in Ride-Sharing Platforms: Online Matching with Offline Reusable Resources" — Joint work with John Dickerson, Aravind Srinivasan, Pan Xu
   *The 32th AAAI Conference on Artificial Intelligence (AAAI), 2018 — **(Invited for Oral Presentation)***
5. "Algorithms to Approximate Column-Sparse Packing Problems" — Joint work with Brian Brubach, Aravind Srinivasan, Pan Xu
   The 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2018
6. "Attenuation-based Frameworks for Online Stochastic Matching with Timeouts" — Joint work with Brian Brubach, Aravind Srinivasan, Pan Xu
   The 16th International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2017
7. "New Algorithms, Better Bounds, and a Novel Model for Online Stochastic Matching"— Joint work with Brian Brubach, Aravind Srinivasan, Pan Xu
   The 24th Annual European Symposium on Algorithms (ESA), 2016
8. "Ensuring Privacy in Location-Based Services: An Approach Based on Opacity Enforcement" — Joint work with Yi-Chin Wu, Stèphane Lafortune
   The 14th International Workshop of Discrete Event Systems (WODES), 2014

Professional Experience

Microsoft Research New York City, NY **Summer 2018**
Mentors: Nicole Immorlica, Rob Schapire, Alex Slivkins

IBM Almaden Research Center, San Jose, CA **Summer 2016**
Manager: Shivakumar Vaithyanathan, Mentor: Prithviraj Sen
Remote Collaboration Fall 2016/Spring 2017.

Technical Report—*Karthik Abinav Sankararaman*, Prithviraj Sen, Marina Danilevsky, Sanjiv R Das, Seoyoung Kim, Rajasekhar Krishnamurthy, Shivakumar Vaithyanathan "Financial Time-Series Nowcasting with LSTM's and Imperfect Information"'

Adobe Inc., San Jose, CA **Summer 2015**
Algorithms Team headed by Anil Kamath; Mentor: Fangpo Wang

Research Experience

Causal Inference **May 2017 - Present**
Part of this project conducted as a visitor to Indian Institute of Science and Microsoft Research, Bangalore during May-July 2017
Joint work with Navin Goyal, Anand Louis
Working on algorithmic problems in theory of causal inference.

Bandit Algorithms and Online Learning **August 2016 - Present**
University of Maryland, College Park
Joint work with Alex Slivkins
Working on Bandit algorithms with global budget constraints.

Stochastic Optimization, Economics and Algorithms, Discrete Optimization in Machine Learning **August 2014 - Present**
University of Maryland, College Park
Joint works on multiple projects with Brian Brubach, John Dickerson, Aravind Srinivasan, Pan Xu
Working on multiple problems such as crowdsourcing algorithms, budgeted allocation and matching problems, sub-modular optimization.

Algorithms for Maximum Flow, Graph Sparsification and related problems **Aug 2013 - Aug 2014**
Indian Institute of Technology, Madras
Area of Work: Spectral Graph Theory, Convex Optimization
Joint work with Narayanaswamy N.S.

Privacy in Location Based Services **May - July 2013**
University of Michigan, Ann Arbor
Area of Work: Cyber Security
Joint work with Yi-Chin Wu, Stèphane Lafortune

Teaching Experience

Teaching Assistant, University of Maryland
CMSC250 - Discrete Structures (2 sems.), CMSC131- Intro to Programming (2 sems.), CMSC451/651- Advanced Algorithms (5 sems.)
Responsibilities: Guest Lectures, Conducting Discussion Sessions, Office Hours, Grading

Teaching Assistant, Indian Institute of Technology, Madras
Paradigms of Programming
Responsibilities: Grading Programming Assignments

Miscellaneous

External Reviewer: Transactions on Algorithms (TALG), Networks, Optimization Letters, AAMAS, EC, NIPS, ICLR, AIStats, ICML
Graduate Admissions Comittee: Department of Computer Science, UMD, 2016, 2017, 2018
Graduate Executive Council: Secretary 2017
CATS organizer: 2016-2017
Grants: FOCS 2016 Travel Award, UMD CS Travel Award (2017), SODA 2018 Travel Award, Goldhaber Travel Award (2018), ICSSA Travel Award (2018), AIStats 2018 Travel Grant

Selected Talks

1. New Algorithms for Online Stochastic Matching
   - IBM Almaden Center, Theory Group
   - IBM Almaden Center, Machine Learning Group
2. Algorithms to Approximate Column-Sparse Packing Problems
   - Symposium on Discrete Algorithms (SODA), 2018
   - Indian Institute of Technology, Madras
3. Bandits with Knapsacks
   - International Conference on Artificial Intelligence and Statistics (AISTATS), 2018
   - (parts of this work) Indian Institute of Science, Bengaluru
   - Indian Institute of Technology, Madras
   - Johns Hopkins Theory Seminar

Working Papers/Manuscripts

1. "Adversarial Bandits with Knapsacks" — Joint work with Nicole Immorlica, Robert Schapire, Alex Slivkins
   Under Review STOC 2019
2. "Stability of Linear Structural Equation Model of Causal Inference" — Joint work with Navin Goyal, Anand Louis
   Under Review AIStats 2019
3. "Mix and Match: Markov Chains and Mixing Times for Matching in Rideshare" — Joint work with Mike Curry, John Dickerson, Aravind Srinivasan, Yuhao Wan, Pan Xu
   Manuscript
4. "Why is SGD so fast for neural nets and other over-parameterized problems?" — Karthik A Sankararaman*, Soham De*, Zheng Xu, Ronny Huang, Tom Goldstein
   Preliminary version at NIPS Workshop on Integration of Deep Learning Theory, 2018
   In preparation for ICML 2019
5. "Online Stochastic Matching: New Algorithms and Bounds"— Joint work with Brian Brubach, Aravind Srinivasan, Pan Xu
   Under review Algorithmica — Short version previously appeared at ESA-2016
6. "Algorithms to Approximate Column-Sparse Packing Problems" — Joint work with Brian Brubach, Aravind Srinivasan, Pan Xu
   Under review Transactions of Algorithms (TALG) — Short version appeared in SODA-2018
7. "Attenuation-based Frameworks for Online Stochastic Matching with Timeouts" — Joint work with Brian Brubach, Aravind Srinivasan, Pan Xu
   Under review Algorithmica — Short version appeared in AAMAS-2017

Collaborators/ Co-authors

Brian Brubach, Mike Curry, Soham De, John Dickerson, Tom Goldstein, Navin Goyal, Ronny Huang, Nicole Immorlica, Stèphane Lafortune, Anand Louis, Kanthi K Sarpatwar, Robert Schapire, Prithviraj Sen, Alex Slivkins, Aravind Srinivasan, Leonidas Tsepenekas, Yuhao Wan, Kun-Lung Wu, Yi-Chin Wu, Pan Xu, Zheng Xu

Programming

C++, Python, Java

References

Available on Request.