Karthik Abinav Sankararaman

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Contact

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Interests

Artificial Intelligence Foundations, Applications and Systems: Sequential Decision Making, Sequential Deep Learning, Optimization, Matching-based Market Design (Rideshare, Online Advertising, Modern Rec Sys), AI for Society (Fairness, Integrity, Climate Change), Large Scale ML Systems, Generative AI.

Education

University of Maryland, College Park
PhD. in Computer Science — **September 2014 - July 2019**
M.S. in Computer Science — **December 2016**

Indian Institute of Technology, Madras — **August 2010 - July 2014**
B.Tech Honours in Computer Science and Engineering
Minor: Operations Research

Awards

- *Top-5 most downloaded papers from TEAC '21 & '22*
- *Best/Top/Outstanding reviewer*, NeurIPS 2019, ICML 2020, NeurIPS 2021
- *Future Faculty Fellow*, University of Maryland, 2018
- *Dean's Fellowship*, University of Maryland, 2014, 2015
- *S.N. Bose Scholarship*, India, 2013
- *National Talent Search (NTSE)* Scholarship, India, 2010

Recent Work and Research Experience

Facebook/Meta, Menlo Park, USA — **September 2019 -**
Member of Technical Staff
Support teams to develop new algorithms and systems based on machine learning (particularly RL, bandits, active learning) across many problem teams (ads, hostile speech, vaccine misinfo, recommender systems, ML dev tools, Generative AI) within the company.

Microsoft Research New York City, USA — **June - September 2018**
Supported by Nicole Immorlica, Rob Schapire, Alex Slivkins

Indian Institute of Science & Microsoft Research, Bengaluru, India — **May - July 2017**
Supported by Anand Louis, Navin Goyal

IBM Almaden Research Center, San Jose, USA — **May - August 2016**

Adobe Inc., San Jose, USA — **May - August 2015**

Research Assistant at UMD, College Park, USA — **August 2014 - July 2019**

Teaching Experience

Instructor, University of Maryland — **January - May 2019**
CMSC250H - Discrete Structures (Honors) along with Prof. Bill Gasarch
Responsibilities: Designing the syllabus, homework, exams and grading policy. Weekly lecturing.

Teaching Assistant, University of Maryland — **August 2014 - December 2018**
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 — **January - April 2014**
Paradigms of Programming
Responsibilities: Grading Programming Assignments

Programming

C++, Python, SQL/Presto/Hive, PyTorch

PUBLICATIONS (HIGHLY PEER-REVIEWED) J: JOURNAL, C: CONFERENCE

1. "Contextual Bandits with Packing and Covering Constraints: A Modular Lagrangian Approach via Regression" — Joint work with Alex Slivkins, Dylan Foster
   - *(C) The 36th Annual Conference on Learning Theory (COLT), 2023*
2. "Allocation Problem in Remote Teleoperation: Online Matching with Offline Reusable Resources and Delayed Assignments" — Joint work with Osnat Ackerman Viden, Yohai Trabelsi, Pan Xu, Oleg Maksimov and Sarit Kraus
   - *(C) The 22nd International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2023*
3. "Robust Identifiability in Linear Structural Equation Models for Causal Inference" — Joint work with Navin Goyal, Anand Louis
   - *(C) The 38th Conference on Uncertainty in Artificial Intelligence (UAI), 2022*
   - *NeurIPS Workshop on Safety and Robustness in Decision Making, 2019*
4. "Online minimum matching with uniform metric and random arrivals" — Joint work with Sharmila Duppala and Pan Xu
   - *(J) Operations Research Letters, 2022 (IF: 0.76)*
5. "Bandits with Knapsacks beyond the Worst-Case" — Joint work with Alex Slivkins
   - *(C) The 35th Conference on Neural Information Processing (NeurIPS), 2021*
6. "Beyond $\log^2(T)$ Regret for Decentralized Bandits in Matching Markets" — Joint work with Soumya Basu, Abishek Sankararaman
   - *(C) The 38th International Conference on Machine Learning (ICML), 2021*
7. "Multi-armed Bandits with Cost Subsidy" — Joint work with Deeksha Sinha, Abbas Kazerouni and Vashist Avadhanula
   - *(C) The 24th International Conference on Artificial Intelligence and Statistics (AIStats), 2021*
8. "Dominate or Delete: Decentralized Competing Bandits with Uniform Valuation" — Joint work with Abishek Sankararaman and Soumya Basu
   - *(C) The 24th International Conference on Artificial Intelligence and Statistics (AIStats), 2021*
9. "Stochastic bandits for multi-platform budget optimization in online advertising" — Joint work with Vashist Avadhanula, Riccardo Colini-Baldeschi, Stefano Leonardi and Okke Schrijvers
   - *(C) The 30th Web Conference 2021 (formerly known as WWW)*
10. "Analyzing the effect of neural network architecture on training performance" — Joint work with Soham De*, Zheng Xu, Ronny Huang, Tom Goldstein
    - *(C) The 37th International Conference on Machine Learning (ICML), 2020*
    - *NeurIPS Workshop on Integration of Deep Learning Theory, 2018*
11. "Matching Algorithms for Blood Donation" — Joint work with Duncan McElfresh, Sergey Pupyrev, Christian Kroer, John Dickerson, Eric Sodomka, Zack Chauvin and Neil Dexter
    - *(C) The 21st ACM Conference on Economics and Computation (EC) 2020*
12. "Balancing the Tradeoff between Profit and Fairness in Rideshare Platforms during High-Demand Hours" — Joint work with Vedant Nanda, John Dickerson, Aravind Srinivasan, Pan Xu
    - *(C) The 34th AAAI Conference on Artificial Intelligence (AAAI), 2020*
    - *(C) Extended Abstract in the Third AAAI/ACM Conference on AI, Ethics and Society (AIES), 2020 (**Oral Presentation**)*
13. "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
    - *(C) The 15th Conference on Web and Internet Economics (WINE), 2019*
14. "Adversarial Bandits with Knapsacks" — Joint work with Nicole Immorlica, Robert Schapire, Alex Slivkins
    - *(C) The 60th IEEE Symposium on Foundations of Computer Science (FOCS), 2019*
    - *INFORMS workshop on Market Design (with EC 2019)*
    (J) Journal of the ACM (JACM), 2022 (IF: 2.35)
15. "Stability of Linear Structural Equation Model of Causal Inference" — Joint work with Navin Goyal, Anand Louis
    - *(C) The 35th Conference on Uncertainty in Artificial Intelligence (UAI), 2019*
    - *NeurIPS Workshop on Causality, 2018*
16. "Online Resource Allocation with Matching Constraints" — Joint work with John Dickerson, Kanthi Sarpatwar, Aravind Srinivasan, Kun-Lung Wu, Pan Xu
    - *(C) The 18th Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2019*

17. "A Unified Approach to Online Matching with Conflict-Aware Constraints" — Joint work with Hao Cheng, John Dickerson, Yexuan Shi, Aravind Srinivasan, Yongxin Tong, Leonidas Tsepenekas, Pan Xu
    - *(C) The 33rd AAAI Conference on Artificial Intelligence (AAAI), 2019*
18. "Balancing Relevance and Diversity in Online Matching via Submodularity" — Joint work with John Dickerson, Aravind Srinivasan, Pan Xu
    - *(C) The 33rd AAAI Conference on Artificial Intelligence (AAAI), 2019*
19. "Assigning Workers to Tasks in Crowdsourcing Platforms: Two-Sided Online Matching" — Joint work with John Dickerson, Aravind Srinivasan, Pan Xu
    - *(C) The 17th Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2018*
20. "Combinatorial Semi-Bandits with Knapsacks" — Joint work with Alexandrs Slivkins
    - *(C) The 21st International Conference on Artificial Intelligence and Statistics (AIStats), 2018 — **(Invited for Oral Presentation)***
21. "Allocation Problems in Ride-Sharing Platforms: Online Matching with Offline Reusable Resources" — Joint work with John Dickerson, Aravind Srinivasan, Pan Xu
    - *(C) The 32th AAAI Conference on Artificial Intelligence (AAAI), 2018 — **(Invited for Oral Presentation)***
    (J) Full version in Transactions on Economics and Computation (TEAC), 2021 (IF: 4.32)
    (Award): Top-5 most downloaded papers, among papers published in TEAC '21 & '22 and Top-20 most downloaded among all papers published in TEAC
22. "Algorithms to Approximate Column-Sparse Packing Problems" — Joint work with Brian Brubach, Aravind Srinivasan, Pan Xu
    - *(C) The 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA), 2018*
    - *(J) Full version in ACM Transactions of Algorithms (TALG), 2019 (IF: 0.4)*
23. "Attenuation-based Frameworks for Online Stochastic Matching with Timeouts" — Joint work with Brian Brubach, Aravind Srinivasan, Pan Xu
    - *(C) The 16th Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2017*
    - *(J) Full version in Algorithmica, 2019 (IF: 0.49)*
24. "Improved Algorithms for Online Stochastic Matching"— Joint work with Brian Brubach, Aravind Srinivasan, Pan Xu
    - *(C) The 24th Annual European Symposium on Algorithms (ESA), 2016*
    - *(J) Full version in Algorithmica 2020 (IF: 0.49)*
25. "Ensuring Privacy in Location-Based Services: An Approach Based on Opacity Enforcement" — Joint work with Yi-Chin Wu, Stèphane Lafortune
    - *(C) The 14th International Workshop of Discrete Event Systems (WODES), 2014*

Thesis

1. "Sequential Decision Making with Limited Resources"
   PhD Thesis, University of Maryland College Park, 2019

Manuscripts

1. "Improved Approximation Algorithms for Stochastic-Matching Problems" — Joint work with Marek Adamczyk, Brian Brubach, Fabrizio Grandoni, Aravind Srinivasan and Pan Xu - *Arxiv 2021*
2. "BayesFormer: Transformer with Uncertainty Estimation" — Joint work with Sinong Wang and Han Fang - *Arxiv 2022*
3. "Improved Adaptive Algorithm for Scalable Active Learning with Weak Labeler" — Joint work with Yifang Chen, Alessandro Lazaric, Matteo Pirotta, Dmytro Karamshuk, Qifan Wang, Karishma Mandyam, Sinong Wang, Han Fang - *Arxiv 2022*

Voluntary Service

Senior Program Committee/Area Chair/Meta-reviewer. IJCAI '21, AAMAS '22, ACML '22, AAAI Safe and Robust AI Track '23, IJCAI '23, ACML '23

Conference (reviewer and program committee). EC, NeurIPS, ICLR, AIStats, ICML, UAI, SODA, AAAI, WWW, IJCAI, COLT, CIKM, STOC, AI for Social Impact @ AAAI, AI for social good @ NeurIPS, NeurIPS Reproducibility Challenge, Global Challenges in EC

Journal (reviewer). Transactions on Algorithms, Networks, Optimization Letters, JAAMAS, Mathematics of Operations Research, Operations Research, Transactions of Signal Processing, Discrete Optimization, Artificial Intelligence, Nature-Scientific Reports, IEEE Transactions on Neural Networks and Learning Systems, Journal of Machine Learning Research (JMLR), Journal of Artificial Intelligence (JAIR), Journal of the ACM (JACM), Neural Computation

Mentor in "New in ML" workshop: Mentoring new researchers on writing machine learning papers.

Session Chair AAMAS '22

Graduate Admissions Committee (UMD). CS department, UMD, 2016, 2017, 2018