MARINA KNITTEL

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RESEARCH INTERESTS

My research focuses on graph algorithms for fairness and scalability on massive networks. Some of my previous and ongoing works include: (1) massively parallel matching, edge coloring, clustering, minimum cut, and geometric embedding, (2) fair hierarchical clustering and resource allocation, and (3) incentive structures in multi-agent games of influence and matching markets.

EDUCATION

University of Maryland, College Park — College Park, MD
PhD in Computer Science — *Expected: May 2023*
MS in Computer Science, 3.97 GPA — *May 2020*

Advisors: Prof. MohammadTaghi Hajiaghayi and Prof. John Dickerson
Coursework: Approximation Algorithms, Modern Discrete Probability, Algorithms in Machine Learning, Computational Geometry, Algorithmic Lower Bounds, Computational Linguistics, Quantum Information Theory, Computational Genomics

Harvey Mudd College — Claremont, CA
B.S. in Computer Science and Mathematics, 3.75 GPA — *May 2018*
High Distinction, Honors in Math and Computer Science, Dean's List
Advanced Coursework: Advanced Algorithms, Computational Complexity, Graph Theory, Convex Set Theory, Machine Learning, Artificial Intelligence, Logic, Advanced Linear Algebra

HONORS AND AWARDS

External	ARCS Endowment Award	2021 - 2022
	AAMAS Student Scholarship	2020
University of Maryland	Ann G Wylie Dissertation Fellowship	2021
	Dean's Fellow	2018 - 2020
Harvey Mudd College	Class of '94 Award	2018
Palo Alto High School	Sandra Forsythe Memorial Scholarship	2014

PUBLICATIONS AND PRESENTATIONS

[abc] *Denotes that authors are listed* ***alphabetically****. This is the convention in theoretical computer science. Computer science traditionally uses competitive conferences (15-30% accepted) as the main publication venue.*

Conference:

1. Marina Knittel, Samuel Dooley, and John P. Dickerson, "The Dichotomous Affiliate Stable Matching Problem: Approval-Based Matching with Applicant-Employer Relations". *In submission to AAAI.*
2. [abc] AmirMohsen Ahanchi, Alexandr Andoni, MohammadTaghi Hajiaghayi, Marina Knittel, and Peilin Zhong, "Massively Parallel Tree Embeddings for High Dimensional Spaces". *In submission to STOC.*
3. [abc] Alexandr Andoni, MohammadTaghi Hajiaghayi, Marina Knittel, and Peilin Zhong, "$\widetilde{O}(\sqrt{\log n}/\epsilon^2)$-round MPC algorithm for $1-\epsilon$ Weighted Bipartite Matching". *Prepared for submission.*

4. [abc]MohammadTaghi Hajiaghayi, Marina Knittel, Jan Olkowski, and Hamed Saleh, "Improved Adaptive Massively Parallel Algorithms for Cut Problems". *Prepared for submission.*
5. [abc]MohammadTaghi Hajiaghayi, Marina Knittel, Hamed Saleh, and Hsin-Hao Su, "Adaptive Massively Parallel Constant-round Tree Contraction". Innovations in Theoretical Computer Science (ITCS), 2022.
6. [abc]Fotini Christia, Michael Curry, Constantinos Daskalakis, Erik Demaine, John P. Dickerson, MohammadTaghi Hajiaghayi, Adam Hesterberg, Marina Knittel, and Aidan Millif, "Scalable Equilibrium Computation in Multi-agent Influence Games on Networks". The Association for the Advancement of Artificial Intelligence (AAAI), 2021.
7. [abc]Sara Ahmadian, Alessandro Epasto, Marina Knittel, Ravi Kumar, Mohammad Mahdian, Benjamin Moseley, Sergei Vassilvitskii, Philip Pham, and Yuyan Wang. "Fair Hierarchical Clustering". The Conference on Neural Information Processing Systems (NeurIPS), 2020.
8. [abc]MohammadTaghi Hajiaghayi and Marina Knittel, "Matching Affinity Clustering: Improved Hierarchical Clustering at Scale with Guarantees". The International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2020. Extended abstract.
9. [abc]Soheil Behnezad, Mahsa Derakhshan, MohammadTaghi Hajiaghayi, Marina Knittel, and Hamed Saleh, "Streaming and Massively Parallel Algorithms for Edge Coloring". The 27th Annual European Symposium on Algorithms (ESA), 2019.
10. Jordan R. Abrahams, David A. Chu, Grace Diehl, Marina Knittel, Judy Lin, William Lloyd, James C. Boerkoel Jr., and Jeremy Frank, "DREAM: An Algorithm for Mitigating the Overhead of Robust Rescheduling". The 29th International Conference on Automated Planning and Scheduling (ICAPS), 2019.
11. Hoaxing Du, Yi Sheng Ong, Marina Knittel, Ross Mawhorter, Ivy Liu, Gianluca Gross, Reiko Tojo, Ran Libeskind-Hadas, and Yi-Chieh Wu, "Multiple Optimal Reconciliations with Gene Duplication, Loss, and Coalescence". The 17th Asia Pacific Bioinformatics Conference (APBC), 2019.

Presentations:

1. "Scalable Equilibrium Computation in Multi-agent Influence Games on Networks". AAAI-21. Full presentation, short presentation, and poster.
2. "Fair Hierarchical Clustering". NeurIPS-20. Short presentation and poster.
3. "Matching Affinity Clustering: Improved Hierarchical Clustering at Scale with Guarantees". AAMAS-20. Presentation.
4. "Fair Hierarchical Clustering". The Sets & Partitions Workshop at NeurIPS-19. Invited presentation and poster.
5. "A Cost Function for Hierarchical Clustering". Google internal seminar-19. Presentation.
6. "Trade-offs Between Communication, Rescheduling, and Success Rate in Uncertain Multi-Agent Schedules". IntEX Workshop at ICAPS-18. Presentation.

Workshop Papers, etc.:

1. Marina Knittel, Samuel Dooley, and John P. Dickerson, "The Binary Affiliate Matching Problem: Approval-Based Matching with Applicant-Employer Relations". The INFORMS Workshop on Market Design at the 22nd Conference on Economics and Computation (EC), 2021. Workshop.
2. [abc]Sara Ahmadian, Alessandro Epasto, Marina Knittel, Ravi Kumar, Mohammad Mahdian, and Philip Pham. "Fair Hierarchical Clustering". The Sets & Partitions Workshop at the 33rd Con-

ference on Neural Information Processing Systems (NeurIPS), 2019. Workshop; subsumed by conference submission.

3. [abc]Soheil Behnezad, Mahsa Derakhshan, MohammadTaghi Hajiaghayi, Marina Knittel, and Hamed Saleh, "Edge Coloring: MPC and Streaming Algorithms". The 33rd International Symposium on Distributed Computing (DISC), 2019. Brief announcement; subsumed by ESA-19 paper.

4. David A. Chu, Grace Diehl, Marina Knittel, Judy Lin, Liam Lloyd, James C. Boerkoel Jr., and Jeremy Frank, "Trade-offs Between Communication, Rescheduling, and Success Rate in Uncertain Multi-Agent Schedules". The Integrated Planning, Acting and Execution Workshop (IntEx) at The 28th International Conference on Automated Planning and Scheduling (ICAPS), 32-40, 2018. Workshop; subsumed by ICAPS-19 paper.

WORK AND ACADEMIC EXPERIENCE

Toyota Technological Institute at Chicago June 2021 - August 2021
Research Intern; Advised by Avrim Blum and Saeed Seddighin *Chicago, IL*

· Conducted research in fair allocation with a focus on EFX (envy free up to any one item) solutions
· Developed algorithms and proved solution existence and nonexistence for new instances

Amazon May 2020 - August 2020
Research Scientist Intern *Seattle, WA*

· Learned and evaluated dense embeddings of ads metadata for click-through rate prediction
· Parsed and vectorized complex boolean expressions as a part of ads metadata

Google LLC May 2019 - August 2019
Software Engineering Intern *Seattle, WA*

· Developed and bounded efficient algorithms for hierarchical clustering without over-representation
· Migrated and improved open sourced tools for graph regularization using Keras (TensorFlow)

Facebook, Inc. May 2018 - August 2018
Software Engineering Intern *Menlo Park, CA*

· Developed, trained, and tuned new neural network models for suggesting Instagram accounts to follow
· Incorporated handling for sparse, crossed, and bucketized features in the training pipeline

NASA Ames & Harvey Mudd College August 2017 - June 2018
Senior Capstone Project Manager and Member *Claremont, CA*

· Led a team of 5 in a research-based project in scheduling algorithms
· Researched new methods for optimizing multi-agent system rescheduling with limited communication
· Theoretically and experimentally verified effect of communication on success

Rutgers University May 2017 - August 2017
REU Scholar in Theoretical Computer Science *Piscataway, NJ*

· Summer 2017 NSF-funded REU position under Professor Eric Allender at DIMACS
· Studied the Minimum Circuit Size Problem, Kolmogorov Random Strings and the Polynomial Hierarchy
· Modified the Turing machine to produce a hierarchy almost isomorphic to the Polynomial Hierarchy

Harvey Mudd College August 2016 - May 2018
Researcher in Computational Biology *Claremont, CA*

· Developed a new algorithm for fast and effective reconciliation for non-binary phylogenetic trees
· Proved various mathematical properties of a data structure used in phylogenetic reconciliation research
· Analyzed effectiveness of the binary phylogenetic tree reconciliation algorithm

Bloomberg LP May 2016 - July 2016
Software Engineering Intern *New York City, NY*

· Built a service to assume a front end process and lighten client machine processing load
· Gained a deeper understanding of computer systems, C++, and elegant and adaptable coding practices

Harvey Mudd College June 2015 - May 2016
Researcher in Web Development *Claremont, CA*

· Improved a research websites appeal and functionality (HTML, CSS, Javascript, PHP and Drupal)
· Trained new researchers in web development and coding practices to join the web development team

Napses May 2014 - August 2014
Web Development Intern *Santa Barbara, CA*

· Programmed a blog in JavaScript (jQuery), HTML, and CSS, using Bootstrap for a start-up

TEACHING EXPERIENCE

Teaching Assistant September 2018 - December 2019
University of Maryland, College Park *College Park, MD*

· Courses: Discrete Structures, Cryptography
· Responsibilities: Led recitations, held tutoring hours, graded tests

Grader and Tutor January 2015 - May 2018
Harvey Mudd College *Claremont, CA*

· Courses: Algorithms, Computational Complexity, Machine Learning, Data Structures & Program Development, Introductury Computer Science, Multivariable Calculus
· Responsibilities: Held tutoring hours, graded homeworks

Homework Hotline Tutor September 2014 - December 2016
Harvey Mudd College *Claremont, CA*

· Provided free over-the-phone tutoring for K-12 students

SERVICE, WORKSHOPS, AND LEADERSHIP

Academic Paper Review	ESA (2021), ICALP (2021), SIDMA (2021), GAIW (2021), AAAI (2020), Algorithmica (2019)	
External	Google CSRMP Class of 2021	2021
	CRA-WP Grad Cohort for Women	2021
University of Maryland	Grad CS LGBTQ+ Initiative Founder	2019 - Present
	Executive Committee Member	2018 - Present
	Peer Mentor	2021 - Present
	Capital Area Theory Seminar Organizer	2019 - 2020
	CS Women Mentor	2018 - 2020
	Graduate Admissions Volunteer	2018 - 2019
Harvey Mudd College	Committee for Activities Planning Member	2017 - 2018
	Women in Math Club President	2017 - 2018
	LGBTQ+ Club Mentor	2017 - 2018
	Orientation Leader	2015 - 2017
	Dorm President	2016 - 2017
	Dorm Treasurer	2015 - 2016