ISAAC GROSOF

Computer Science Department
Carnegie Mellon University
Pittsburgh, PA, 15213

My website: isaacg1.github.io
igrosof@cmu.edu
(206) 718-6712

RESEARCH INTERESTS

Optimization and performance analysis of stochastic scheduling models for modern computing systems, especially multiserver systems, tail latency, and scheduling with predictions.

EDUCATION

2017 - pres: Pursuing PhD in Computer Science. Carnegie Mellon University, Pittsburgh, PA.
Advisor: Prof. Mor Harchol-Balter

2013 - 2017: M.E. and B.S. in Computer Science. Massachusetts Institute of Technology, Cambridge, MA. GPA 4.96/5
Master's Thesis in information-theoretic cryptography: "Secure communication: CDS, PIR, PSM"
Master's Advisor: Prof. Vinod Vaikunatanathan
Bachelor's Advisor: Prof. Frans Kaashoek

FELLOWSHIPS

2023 Siebel Scholar, a PhD fellowship recognizing academic excellence and leadership.

REFEREED PUBLICATIONS & SUBMITTED PAPERS

Link to my publications

Isaac Grosof, Ziv Scully, Mor Harchol-Balter, Alan Scheller-Wolf. "Optimal Scheduling in the Multiserver-job Model under Heavy Traffic." *Under submission.*

Isaac Grosof, Mor Harchol-Balter, Alan Scheller-Wolf. "WCFS: A new framework for analyzing multiserver systems." *Queueing Systems*, July 2022.

Isaac Grosof, Naifeng Zhang, Marijn Heule. "Towards the shortest DRAT proof of the Pigeonhole Principle." Pragmatics of SAT 2022.

Ziv Scully, Isaac Grosof, Michael Mitzenmacher. "Uniform Bounds for Scheduling with Job Size Estimates." 13th Innovations in Theoretical Computer Science Conference (ITCS 2022): Volume 215, Article 114 (2022), pp. 114:1 – 114:30, January 2022.
Invited Paper at STOC 2022: Algorithms with Predictions

Isaac Grosof, Kunhe Yang, Ziv Scully, Mor Harchol-Balter. "Nudge: Stochastically improving upon FCFS." Proceedings of the ACM Measurement and Analysis of Computer Systems – SIGMETRICS: Volume 5, Number 2, Article 99 (2021), pp. 99:1 – 99:25, June 2021, Beijing, China.
Winner of SIGMETRICS 2021 Best Paper Award.

Ziv Scully, Isaac Grosof and Mor Harchol-Balter. "The Gittins Policy is Nearly Optimal in the M/G/k under Extremely General Conditions." Proceedings of the ACM Measurement and Analysis of Computer Systems – SIGMETRICS: Volume 4, Number 3, Article 43 (Dec 2020), pp. 43:1 – 43:29, June 2021, Beijing, China.
George Nicholson Award finalist at INFORMS 2022 Annual Meeting

Ziv Scully, Isaac Grosof, Mor Harchol-Balter. "Optimal Multiserver Scheduling with Unknown Job Sizes in Heavy Traffic." *Performance Evaluation*, vol. 145, 2021, pp. 1-31.
Conference version appeared in *38th International Symposium on Computer Performance, Modeling, Measurements, and Evaluation (Performance 2020)*, Milan, Italy, November 2020.

Ben Berg, Daniel Berger, Sara McAllister, Isaac Grosof, Sathya Gunasekar, Jimmy Lu, Michael Uhlar, Jim Carrig, Nathan Beckmann, Mor Harchol-Balter, Greg Ganger. "The CacheLib Caching Engine: Design and Experiences at Scale." 14th USENIX Symposium on Operating Systems Design and Implementation (OSDI 2020), Banff, Canada, November 2020.

Isaac Grosof, Ziv Scully, Mor Harchol-Balter. "Load Balancing Guardrails: Keeping Your Heavy Traffic on the Road to Low Response Times." *Proceedings of the ACM Measurement and Analysis of Computer Systems – SIGMETRICS*: Volume 3, Issue 2, Article 42 (June 2019), pp. 42:1 – 42:31, 2019.
Conference version appeared in *Proceedings of ACM Simetrics/Performance 2019 Conference on Measurement and Modeling of Computer Systems (SIGMETRICS 19)*, Pheonix, AZ. June 2019.
Winner of SIGMETRICS 2019 Best Student Paper Award.
Invited mini-plenary paper at STOC 2021 TheoryFest

Isaac Grosof, Ziv Sculy, Mor Harchol-Balter. "SRPT for Multiserver Systems." *Performance Evaluation*, vol. 127-128, Nov. 2018, pp. 154-175.
Conference version appeared in *36th International Symposium on Computer Performance, Modeling, Measurements, and Evaluation (Performance 2018)*, Toulouse, France, December 2018.
Winner of Performance 2018 Best Student Paper Award.

Erik D. Demaine, Isaac Grosof, Jayson Lynch, and Mikhail Rudoy. "Computational Complexity of Motion Planning of a Robot through Simple Gadgets." *Ninth International Conference on Fun with Algorithms*. La Maddalena, Italy. 2018.

Erik D. Demaine, Isaac Grosof, and Jayson Lynch. "Push-Pull Block Puzzles are Hard." *International Conference on Algorithms and Complexity*. Athens, Greece. 2017.

Benjamin Grosof, Janine Bloomfield, Paul Fodor, Michael Kifer, Isaac Grosof, Miguel Calejo, and Theresa Swift. "Automated Decision Support for Financial Regulatory/Policy Compliance, using Textual Rulelog." *RuleML 2015*. Berlin, Germany. 2015.

OTHER PUBLICATIONS & PAPERS

Isaac Grosof, Michael Mitzenmacher. "Incentive Compatible Queues Without Money". *Under revision.*

Isaac Grosof, Mor Harchol-Balter, Alan Scheller-Wolf. "Stability for Two-Class Multiserver-job Systems" *Under revision.*

Isaac Grosof. "Open Problem - M/G/k/SRPT Under Medium Load." *Stochastic Systems*. Sep. 2019.

Isaac Grosof. "Optimal Scheduling in Modern Queueing Systems." *Thesis Proposal*. Apr. 2022.

TALKS GIVEN

MIT & Harvard Seminars, September 2022: *Optimal Scheduling in the Multiserver-job Model.*

STOC 2022: *Stochastic Scheduling with Predictions*, invited speaker in the Algorithms with Predictions workshop.

MIT LIDS Seminar March 2022, Cors/INFORMS International Meeting 2022: *Work-Conserving Finite-Skip Models*

INFORMS 2021: *Multiserver-Job Systems.*

SIGMETRICS 2021: *Nudge: Stochastically Improving upon FCFS.*

YEQT 2021 & UW Seminar: *Asymptotically Optimal Multiserver Scheduling*, invited speaker.

SIGMETRICS 2019, INFORMS 2019 Annual Meeting: *Load Balancing Guardrails: Keeping Your Heavy Traffic on the Road to Low Response Times.*

INFORMS 2018 Open Problem Session: *M/G/k/SRPT under medium load.*

Performance 2018, MAMA workshop at SIGMETRICS 2018, Columbia Seminar 2018, INFORMS 2018 Annual Meeting: *SRPT for Multiserver Systems.*

TEACHING

Fall 2020: TA for CMU 15-850, Advanced Algorithms (graduate level), assisting Prof. Anupam Gupta.

Fall 2019: TA for CMU 15-857, Analytical Performance Modeling & Design of Computer Systems (graduate level), assisting

Prof. Mor Harchol-Balter.

Fall 2016 & Spring 2017: TA for MIT 6.1220 (MIT 6.046 at the time), Design and Analysis of Algorithms (undergraduate level), assisting Profs. Shafi Goldwasser, Nir Shavit, & Vinod Vaikunatanathan in fall 2016 and Profs. Debayan Gupta, Aleksander Madry & Bruce Tidor in spring 2017.

Fall 2015: Lab assistant for MIT 6.1010 (MIT 6.S04 at the time, 6.009 between), Fundamentals of Programming (undergraduate level), assisting Profs. Adam Chipala and Srini Devadas.

LEADERSHIP AND UNIVERSITY SERVICE

2019 - pres.: President of the CMU Humanist League, a philosophical discussion group devoted to the ideal of discourse over dogma.

2022 - pres.: Founding member of CSD PhD Student Council, a student group which organizes social bonding events within the department.

2021 - pres.: Organizer of CSD weekly board games & socializing dinner event.

2021: Organizer of Computer Science Department (CSD) Introductory Course, which introduces new PhD students to the department.

2020 - 2021: CSD Admissions Committee member for the Theory group, reviewed ~ 200 applications.

Fall 2020: Organizer of CSD Theory Lunch Seminar series.

2020: Led events for CSD Open House.

2016: President of Random Hall, an MIT dorm of 93 residents.

PROFESSIONAL SERVICE

Reviewed papers for ACM SIGMETRICS, IFIP Performance, Management Science, and IEEE/ACM Transactions on Networking, ITCS, INFORMS Journal on Computing, ACM Performance Evaluation Review.

EMPLOYMENT

Summer 2019: Facebook, Menlo Park, CA.
- Research Intern to develop a machine-learning-based SSD admission policy for Facebook's Tao caching architecture.
- Improved the tradeoff between hit ratio and SSD write rate.

Summer 2018: Microsoft Research, Seattle, WA.
- Research Intern to develop novel FPGA algorithms for linear algebra and solving linear programs.

Summer 2016: Jane Street Capital, LLC, New York City, NY.
- Software developer for non-obtrusive data collection about in-house trading.
- Software developer responsible for updating trading simulation package to accommodate new trade specification format.

Summer 2015: Coherent Knowledge, Seattle, WA.
- Knowledge Engineer to build demonstrations for the financial and natural language domains using the declarative logic programming language Ergo.

2013 - 2014: MIT Undergraduate Research Opportunities Program, Cambridge, MA.
- Researcher in Complexity Theory proving computational hardness of block puzzles and related agent motion problems.

Summer 2014: EMC Isilon, Seattle, WA.
- Software developer to replace the previous ad-hoc build platform with a modern Jenkins-based build platform.

PROJECTS

2018 - pres.: Programmatically-generated artwork:
`https://isaacg1.github.io/2018/12/06/programmatically-generated-artwork.html`

2014 - 2017: Author of new programming language: *Pyth*
- Pyth is one of the best programming languages for solving tasks with the shortest possible programs.
- Available at `https://github.com/isaacg1/pyth`