

Brian Brubach

Department of Computer Science
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Research Interests

Algorithms and Theoretical Computer Science

- Approximation, randomized, and online algorithms
- Combinatorial and stochastic optimization

E-commerce

- Models and algorithms for online matching, advertising, and ride-hailing platforms

Fairness, Accountability, and Transparency in Automated Systems

- Fairness in machine learning clustering and classification
- Demographic fairness
- Community cohesion and preservation
- Automated advice for addressing human bias

Mechanism Design for Social Good

- Election districting and gerrymandering regulation
- Diversity in recommenders

Bioinformatics

- String algorithms and string comparison
- Taxonomic sequence clustering
- Genome assembly
- Genomics and metagenomics broadly

Education

University of Maryland, College Park

College Park, MD

PhD Candidate in Computer Science

In progress

- **Coursework:** Computational Geometry, Computational Linguistics, Randomized Algorithms, Tangible Interactive Computing, Computational Genomics, Network Design Foundations, Foundations of Machine Learning, Biological Network Analysis, Information-centric Design of Context-aware Systems
- **Future Faculty Program (in process):** Selective, five semester program to prepare PhD students for careers in academia. Includes three one-credit seminars, teaching a course, and mentoring another student in research.
- **Advisors:** Prof. Aravind Srinivasan and Prof. Mihai Pop

Rutgers, The State University of NJ

Camden, NJ

B.A. in Computer Science; GPA: 3.82

May 2014

- **Coursework:** Mathematical Foundations of CS, Data Structures, Theory of Computation, C and Unix Systems, Computer Organization, Linear Algebra, Operating Systems

Columbia College Chicago

Chicago, IL

B.A. in Film and Video

Dec 2008

Honors and Awards

- 2019 **Outstanding Graduate Assistant**, *University of Maryland, College Park*
- 2019 **Finalist for Graduate Student Distinguished Service Award**,
University of Maryland, College Park
- 2018 **Future Faculty Fellow**, *University of Maryland, College Park*
- 2017 **Outstanding Graduate Assistant**, *University of Maryland, College Park*
- 2014 **Dean's Undergraduate Research Prize**, *Rutgers University*
- 2014 **Computer Science Academic Achievement Award**, *Rutgers University*
- 2014 **Honorable Mention - CRA Outstanding Undergraduate Researcher Award**, *Computing Research Association (CRA)*

Publications

- N/A **B. Brubach**. Meddling Metrics: the Effects of Measuring and Constraining Partisan Gerrymandering on Voter Incentives. with Aravind Srinivasan and Shawn Zhao. (*under review*).
- N/A **B. Brubach**. Vertex-weighted Online Stochastic Matching with Patience Constraints. with Nathaniel Grammel and Aravind Srinivasan. (*under review*).
- N/A **B. Brubach**. The Hard, the Soft, and the Probabilistic: Metric Clustering with Pairwise Constraints. with John P. Dickerson, Samir Khuller, Aravind Srinivasan, and Leonidas Tsepenekas. (*under review*).
- N/A **B. Brubach**. A Pairwise Fair and Community Preserving Approach to k-Center Clustering. with Darshan Chakrabarti, John P. Dickerson, Samir Khuller, Aravind Srinivasan, and Leonidas Tsepenekas. (*under review*).
- 2018 **B. Brubach**. Fast Matching-based Approximations for Maximum Duo-preservation String Mapping and its Weighted Variant. *Proc. 29th Annual Symposium on Combinatorial Pattern Matching (CPM)*, 2018.
- 2018 **B. Brubach**. A Succinct Four Russians Speedup for Edit Distance Computation and One-against-many Banded Alignment. with Jay Ghurye. *Proc. 29th Annual Symposium on Combinatorial Pattern Matching (CPM)*, 2018.
- 2018 **B. Brubach**. Algorithms to Approximate Column-Sparse Packing Problems. with Karthik A. Sankararaman, Aravind Srinivasan, and Pan Xu. *Proc. of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2018.
- 2017 **B. Brubach**. Better Greedy Sequence Clustering with Fast Banded Alignment. with Jay Ghurye, Aravind Srinivasan, and Mihai Pop. *Proc. Algorithms in Bioinformatics - 17th International Workshop (WABI)*, 2017.
- 2017 **B. Brubach**. Attenuate Locally, Win Globally: An Attenuation-based Framework for Online Stochastic Matching with Timeouts. with Karthik A. Sankararaman, Aravind Srinivasan, and Pan Xu. *Proc. of 16th International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, 2017.
- 2016 **B. Brubach**. Further Improvement in Approximating the Maximum Duo-Preservation String Mapping Problem. *Proc. Algorithms in Bioinformatics - 16th International Workshop (WABI)*, 2016.

- 2016 **B. Brubach.** New Algorithms, Better Bounds, and a Novel Model for Online Stochastic Matching. with Karthik A. Sankararaman, Aravind Srinivasan, and Pan Xu. *Proc. European Symposium on Algorithms (ESA)*, 2016.
- 2014 **B. Brubach.** Improved bound for online square-into-square packing. *Proc. of the 12th Workshop on Approximation and Online Algorithms (WAOA)*, 2014.

Invited Talks

- 2018 Bloom Filters, Minhashes, and Other Random Stuff (tutorial). *International Workshop on String Algorithms in Bioinformatics (StringBio)*, 2018.

Additional Computer Science Experience

Bioinformatics Exchange of Students and Teachers (BEST) Summer School

Heiligkreuztal, Germany

Student Researcher

June 2017

- **Summary:** BEST is a joint effort of the University of Tuebingen and the University of Maryland to provide a weeklong intensive collaboration between students and professors of both schools. Our project involved using machine learning techniques to predict clinical outcomes in neuroblastoma, a type of childhood cancer.

Georgia Institute of Technology

Atlanta, GA

Summer Research Intern

June 2015 – Aug 2015

- **Summary:** I worked with Prof. Srinivas Aluru's group in Bioinformatics on the following:
 - * Large-scale de-novo genome assembly and related problems.
 - * Efficient string algorithms.

Princeton University - Summer Program in Algorithmic and Combinatorial Thinking (PACT)

Princeton, NJ

Student and Mentor

June 2013 – Aug 2013

- **Responsibilities:** As an undergraduate participant in this summer intensive program, I fulfilled dual roles as both a student and a mentor. My responsibilities included the following:
 - * Attending regular lectures on approximation algorithms and completing homework.
 - * Attending guest lectures on a wide range of computer science topics.
 - * Presenting lectures on approximation algorithms.
 - * Mentoring high school students studying discrete mathematics.

University of Pennsylvania

Philadelphia, PA

Auditor

Jan 2013 – Dec 2013

- **Coursework:** Introduction to Algorithms, Randomized Algorithms.

Teaching Experience

University of Maryland

Lecturer

College Park, MD

Jan 2019 – May 2019

- Teaching an undergraduate non-majors course, CMSC122 Introduction to Computer Programming via the Web
- Supervising graduate and undergraduate teaching assistants

University of Maryland

Teaching Assistant

College Park, MD

Sept 2014 – Dec 2016

- Teaching discussion sections
- Developing course projects
- Managing 16 other teaching assistants as lead TA for a large course

Center for Community Arts Partnerships (CCAP)

Teaching Artist

Chicago, IL

Oct 2009 – May 2012

- Teaching filmmaking to 3rd-8th grade students in after school programs
- Partnering with classroom teachers for artist residencies during the school day
- Developing and implementing arts integration curriculum in collaboration with classroom teachers
- Student projects included: PSAs, short films, documentaries, and stop-motion animations
- CCAP received the National Arts and Humanities Youth Programming Award during my time teaching there

Other Professional Experience

Center for Community Arts Partnerships (CCAP)

Parent Information Resource Center

Program Associate

Chicago, IL

Jan 2011 – Feb 2012

- Coordinating internal evaluation and grant reporting
- Developing parent involvement and education programs
- Planning and supporting events and programs at schools and conferences
- Supervising part-time employees and interns

Departmental and Professional Service

UMD CS Department Council

June 2018 – Present

- Advising chair of computer science department as a graduate student representative

UMD CS Grad Student Executive Council

Aug 2016 – Present

- Chair (June 2018 – present), Vice-chair (June 2017 – May 2018)
- Organizing events for CS grad students, faculty, and staff
- Hosting monthly event drawing 30-40+ students

UMD CS Grad Student Admissions Volunteer

Apr 2017 – Present

- Reviewing applications
- Supporting admitted student visit day and new student orientation

Reviewer or subreviewer*June 2015 – Present*

- Association for the Advancement of Artificial Intelligence (AAAI)
- Workshop on Algorithms in Bioinformatics (WABI)
- International Symposium on Algorithms and Computation (ISAAC)
- Annual Symposium on Combinatorial Pattern Matching (CPM)
- Workshop on Approximation and Online Algorithms (WAOA)
- ACM Transactions on Algorithms (TALG)
- Networks
- Journal of Global Optimization