

Brian Brubach

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Research Interests

Bioinformatics

- String algorithms, clustering, string comparison, assembly, genomics, and metagenomics

Algorithms and Theoretical Computer Science

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

E-commerce

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

Fairness in Machine Learning

- Clustering, classification, demographic fairness, and community cohesion

Recent Work

- Approximation algorithms for constrained clustering and new notions of fairness
- Clustering 16S rRNA genes from metagenomic samples
- Maximum duo-preservation string mapping
- Online stochastic matching with patience constraints

Education

University of Maryland, College Park

PhD Candidate in Computer Science

College Park, MD

Expected summer 2019

- **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

B.A. in Computer Science; GPA: 3.82

Camden, NJ

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

B.A. in Film and Video

Chicago, IL

Dec 2008

Honors and Awards

- 2018 **Outstanding Research Assistant**, *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**. A General Framework for Radius-based 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

College Park, MD

Lecturer

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

College Park, MD

Teaching Assistant

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)

Chicago, IL

*Teaching Artist**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)**

Chicago, IL

Parent Information Resource Center

*Program Associate**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*

- 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