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 — College Park, MD
PhD Candidate in Computer Science — *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 — 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

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*).

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