DAVID TENCH

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EDUCATION

Ph.D., U. of Massachusetts, Amherst, Dept. of Computer Science **August 2020**
Research Areas: Algorithms (randomized, approximation, graph, streaming), systems applications
Dissertation: "Algorithms for Massive, Expensive, or Otherwise Inconvenient Graphs"

M.S., U. of Massachusetts, Amherst, Dept. of Computer Science **February 2018**
Thesis: "MESH: Compacting Memory Management for C/C++ Applications"

B.S., Lehigh University, Department of Mathematics **May 2013**

EMPLOYMENT & AFFILIATIONS

Stony Brook University, Postdoctoral Associate **2020 - present**
University of Massachusetts Amherst, Research Assistant **2014 - 2020**
Lehigh University, President's Scholar **2014**
Lehigh University, South Mountain College Undergraduate Researcher **Summer 2013**
Lehigh University, TRAC (Technology, Research, and Communication) Fellow **2011 - 2013**

RESEARCH INTERESTS

I design and analyze randomized, approximation, and graph algorithms with a focus on data streams, streaming graph algorithms & processing massive datasets. I apply these ideas to practical tasks like memory management, network measurement, filesystems, & external memory data structures. I leverage my cross-cutting theory & systems knowledge to create provably performant open source tools.

SELECTED PROJECTS

PredictRoute: A Network Path Prediction Toolkit 2018 - Present
PredictRoute predicts AS-level internet paths by efficiently using a resource–limited internet measurement platform for training. To be submitted to NSDI 2021 and released as open-source software.

- Created provably efficient algorithms for measurement selection and path prediction
- Improved path training algorithm, reducing training time from > 1 week to several hours
- Designed coverage experiments and analyzed results to validate theoretical guarantees

MESH Memory Manager 2016 - 2018
MESH (https://github.com/plasma-umass/Mesh) compacts memory in C and C++, previously thought to be impossible. Its drop-in memory manager reduces memory footprint in e.g., Firefox by 16%.

- Wrote and executed experiments in Python to empirically evaluate compaction algorithms
- Designed Mesh's compaction algorithm and proved guarantees for compaction quality and runtime

Streaming Algorithms for Max Unique Coverage & Capacitated Max Cut 2019 - Present
Presenting new algorithms in the streaming graph setting, where a massive graph is accessible as a one-time stream and available space is sublinear in stream size. To be submitted PODS 2021.

- Designed streaming algorithms to approximate max unique cover and capacitated max cut
- Proved lower space bounds for these problems

Graph Streaming Open Source Library 2019 - Present
First open-source implementation (https://github.com/tenchd/sampling) of foundational dynamic streaming algorithms for scalable and parallelizable graph computation. Early in development.

- Lead a team of students to implement and test scalable streaming graph algorithms in C++.

PUBLICATIONS

Maximum Coverage in the Data Stream Model: Parameterized and Generalized Andrew McGregor, David Tench, Hoa Vu. In *International Conference on Database Theory (ICDT) 2021*. Nicosia, Cyprus. March 2021.

Mitigating False Positives in Filters: to Adapt or to Cache? Michael Bender, Ratish Das, Martín Farach-Colton, Tianchi Mo, David Tench, Yung Ping Wang. In *SIAM Symposium on Algorithmic Principles of Computer Systems (APOCS) 2021*. Alexandria, VA (remote). January 2021.

MESH: Compacting Memory Management for Unmanaged Languages. Bobby Powers, David Tench, Emery Berger, Andrew McGregor. In *ACM Programming Languages Design and Implementation (PLDI) 2019*. Phoenix, AZ. June 2019. (Accept rate 27%)

Vertex & Hyperedge Connectivity in Graph Streams. Sudipto Guha, Andrew McGregor, David Tench. In *ACM Principles of Database Systems (PODS) 2015*. Melbourne, Australia. June 2015. (Accept rate 25%) (**52 citations**)

Densest Subgraph in Dynamic Graph Streams. Andrew McGregor, David Tench, Sofya Vorotnikova, Hoa Vu. In *Mathematical Foundations of Computer Science (MFCS) 2015*. Milan, Italy. August 2015. (Accept rate 35%) (**56 citations**)

AWARDS

President's Scholarship, Lehigh University 2014
Lemon Prize for Undergraduate Research, Eckardt Honors Society, Lehigh University 2013
TRAC Fellowship & Mentor Fellowship, Lehigh University 2011, 2013
Williams Writing Prize, Lehigh University 2011
Dean's List, Lehigh University 2009 - 2013

NOTABLE PRESENTATIONS

Meshing: A Theoretical Approach to "Impossible" Memory Management March 2017
NSF "Algorithms in the Field" PI meeting. Arlington, VA.

Densest Subgraph in Dynamic Graph Streams MFCS, August 2015
2015 Mathematical Foundations of Computer Science conference. Milan, Italy.

TEACHING

University of Massachusetts Amherst Teaching Assistant & Lecturer 2017-2019
Courses: Advanced Algorithms (Fall 2018 & Fall 2019), Algorithms for Data Science (Spring 2018), Artificial Intelligence (Spring 2017), Reasoning Under Uncertainty (Fall 2017)
Notes: Gave guest lectures, held office hours, designed & graded assignments, led discussion sections for listed courses at the undergraduate, Masters, and PhD levels.

Lehigh University Head Co-Instructor Fall 2013
Course: The TRAC Fellows Seminar
Notes: A course on research methods, educational technology, writing and communication pedagogy.

MENTORING

Mentor to 6 Graduate Students Stony Brook, Fall 2020
PhD Student Peer Mentor UMass, Fall 2019
Mentor to an REU Student UMass, Summer 2017
TRAC Fellow & Mentor Fellow Lehigh, Fall 2011 - Spring 2014

SERVICE

UMass CS Graduate Representative 2018
Advocated for grad students in faculty meetings, interviewed 40 candidates for faculty positions.

UMass CICS student-run diversity and inclusion event organizer 2018
Organized student programs to discuss gendered harassment in STEM workplaces.

Peer Reviewer 2015 - 2019
For PODC 2020, SODA 2020, FOCS 2019, SODA 2019, STACS 2018, SODA 2018, WSDM 2016, and STOC 2015.