DAVID TENCH

PERSONAL INFORMATION

email	dtench@protonmail.ch
website	people.cs.umass.edu/dtench/
phone	+1 (484) 264 5213

RESEARCH INTERESTS

Graph algorithms, random graphs, randomized algorithms, applications of theory to systems/networks problems, complexity theory

EDUCATION

2014-Present   University of Massachusetts Amherst

MS (completed), PhD (in progress)

GPA: 3.93 · *Comp. Sci.* · School: College of Information and Computer Science
MS Project: *Mesh: Compacting Memory Management for Unmanaged Languages*
See publications for info on Master's Project. Relevant courses include Advanced Algorithms, Approximation Algorithms, Streaming Algorithms, Information Theory, Complexity Theory, Networks, Detecting Network Interference, Artificial Intelligence, Neural Networks.
Advisors: Prof. Andrew McGregor & Prof. Emery Berger (MS Project only)

2009-2014   Lehigh University, Bethlehem, PA

Bachelor of Science in Mathematics

GPA: 3.78 · *Pure Mathematics* · School: College of Arts and Sciences
Covered foundational mathematics topics like linear algebra, probability theory, analysis, differential equations, and algebra. Completed degree in 2013, was awarded President's Scholarship, a tuition-free fifth year, based on academic performance. This facilitated a shift to computer science. Took courses in complexity theory, algorithms, AI, and programming.

PUBLICATIONS/PROJECTS

PathCache: A Network Path Prediction Toolkit

In Submission: Networked Systems Design & Implementation (NSDI 2020)

In this work, we present PathCache, a system that combines empirical data and simulated paths for accurate Internet path prediction. PathCache takes advantage of new measurement platforms providing thousands of resource-constrained vantage points and considers the problem of optimally exploring the Internets topology with a constrained measurement budget. We present a simple measurement selection strategy and provide analytic guarantees on its measurement efficiency. We find that PathCache predicts nearly correct paths (at most 1 hop difference) 75% of the time, and is so far 10% more accurate than existing path prediction systems.
Authors: Phillipa Gill, Andrew McGregor, Rachee Singh, David Tench, Albert Williams

MESH:
Compacting Memory Management for Unmanaged Languages

Programming Language Design & Implementation (PLDI 2019)

Programs written in C/C++ can suffer from serious memory fragmentation, leading to low utilization of memory, degraded performance, and application failure due to memory exhaustion. This paper introduces Mesh, a plug-in replacement for `malloc` that, for the first time, eliminates fragmentation in unmodified C/C++ applications. Mesh combines novel randomized algorithms with widely-supported virtual memory operations to provably reduce fragmentation, breaking the classical Robson bounds with high probability. Mesh generally matches the runtime performance of state-of-the-art memory

allocators while reducing memory consumption; in particular, it reduces the memory of consumption of Firefox by 16% and Redis by 39%.
Authors: Emery BERGER, Andrew McGREGOR, Bobby POWERS, David TENCH

Densest Subgraph in Dynamic Graph Streams

Mathematical Foundations of Computer Science (MFCS 2015)

In this paper, we consider the problem of approximating the densest subgraph in the dynamic graph stream model. We present a single-pass algorithm that returns a $(1 + \epsilon)$ approximation of the maximum density with high probability; the algorithm uses $O(\epsilon^2 n \operatorname{polylog}(n))$ space, processes each stream update in $\operatorname{polylog}(n)$ time, and uses $\operatorname{poly}(n)$ post-processing time where n is the number of nodes.
Authors: Andrew McGREGOR, David TENCH, Hoa VU, Sofya VOROTNIKOVA

Vertex & Hyperedge Connectivity in Dynamic Graph Streams

Principles of Database Systems (PODS 2015)

A growing body of work addresses the challenge of processing dynamic graph streams: a graph is defined by a sequence of edge insertions and deletions and the goal is to construct synopses and compute properties of the graph while using only limited memory. Linear sketches have proved to be a powerful technique in this model and can also be used to minimize communication in distributed graph processing. We present the first linear sketches for estimating vertex connectivity and constructing hypergraph sparsifiers.
Authors: Sudipto GUHA, Andrew McGREGOR, David TENCH

TEACHING EXPERIENCE

2017-Present University of Massachusetts Amherst

Teaching Assistant and Guest Lecturer

Courses include Artificial Intelligence, Probability Theory (undergraduate), Algorithms for Data Science, Advanced Algorithms. Duties include holding office hours, designing assignments, leading discussion sections. Lecture topics include graph streaming, MapReduce, data stream algorithms, AI search.

2011–2014 Lehigh University, Bethlehem, PA

Writing Tutor, TRAC program

Advised students with writing coursework in a variety of disciplines including biology, religion, engineering, philosophy, and finance. From 2013-2014, became TRAC Mentor Fellow, advising new writing tutors and teaching a semester-long course on writing instruction.
Reference: Greg SKUTCHES +1 (610) 758 4932 · TRACFellows@lehigh.edu

NOTABLE PRESENTATIONS

March 2017 Meshing: A Theoretical Approach to "Impossible" Memory Management

NSF PI meeting, Arlington VA

Presented an in-progress report on Mesh project (see Publications) for NSF "Algorithms in the Field" PI meeting.

August 2015 Densest Subgraph in Dynamic Graph Streams

MFCS 2015, Milan, Italy

See Publications for abstract of conference paper and talk.

OTHER INFORMATION

Programming

Competent in Python · 5 years experience
        Familiar with numpy/scipy, graph-tool, matplotlib, scapy, pytorch.

Some Knowedge of R · 1 year experience
        Familiar with tidyverse, ggplot2.

Awards

2014 · President's Scholarship, Lehigh University

2013 · Lemon Prize, Eckardt Society, Lehigh University:
The Eckardt Society is a selective honors society, and the Lemon Prize is awarded for outstanding academic achievement and undergraduate research in the program.

2013 · TRAC Mentor Fellowship, Lehigh University

2011 · Williams Writing Prize, 1st Place, Lehigh University

2011 · TRAC Fellow, Lehigh University

Service

2018 · UMass CICS Graduate Representative:
Graduate representatives attend and participate in faculty meetings, interview candidates for faculty positions, and represent the interests of grad students in CICS.

2018 · UMass CICS student-run diversity and inclusion event organizer
Organized student programs to discuss genered harassment in STEM workplaces. Liased with other student diversity groups such as UMASS CICS Women's organization to encourage men to become workplace allies for disadvantaged groups.

2017 · Mentored UMass CICS summer REU student

2017 · UMass CICS social committee member

Interests

Jazz saxophone performance · Martial Arts · (former) Volunteer Firefighter

March 13, 2019