

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering
Department of Electrical Engineering and Computer Science

Seth Pettie, associate professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D. 2003 University of Texas at Austin, Computer Science, Austin, TX
B.A. 1998 Brandeis University, Computer Science, Waltham, MA

Professional Record:

2013 – 2014 Visiting Professor, Computer Science, University of Aarhus, Aarhus, Denmark
2012 – present Associate Professor (with tenure), Department of Electrical Engineering and Computer Science, University of Michigan
2006 – 2012 Assistant Professor, Department of Electrical Engineering and Computer Science, University of Michigan
2003 – 2006 Post-doctoral Researcher, Algorithms and Complexity Group, Max Planck Institute for Computer Science, Saarbrücken, Germany

Summary of Evaluation:

Teaching: Professor Pettie is an accomplished instructor. His courses range from core undergraduate courses such as Discrete Mathematics and Theory of Computation to upper-level and graduate courses on Algorithms, as well as special-topics courses for graduate and undergraduate students. Over the years, he has contributed to significant development of courses at the undergraduate and graduate level. Student letters noted the clarity of his explanations, his genuine concern for student learning, his help with skill development, and his overall effectiveness as a teacher. Student letters also comment that Professor Pettie was particularly adept at helping them develop their own problem-solving skills.

Professor Pettie has graduated two Ph.D. students who are currently tenure-track assistant professors at other universities. He also supervised two post-doctoral scholars who also went on to secure tenure-track assistant professorships. Professor Pettie has advised two master's students and supervised two undergraduate projects. He has also mentored a high school student, leading to a journal submission.

Research: Professor Pettie's research focuses on: (1) combinatorial algorithms and data structures, (2) distributed computing theory, and (3) extremal combinatorics. His work investigates fundamental building blocks from which many theoretical constructs and practical

algorithms are built, and also addresses abstract mathematical challenges that arise in the analysis of such building blocks. In the last seven years, Professor Pettie answered several long-standing difficult questions in unexpected ways, e.g., by refuting the well-known 3SUM Conjecture, the Füredi-Hajnal Conjecture and a conjecture by Alon et al. on the length of Davenport-Schinzel sequences. Another example is his sharp lower bounds on the compressibility of graph metrics. Professor Pettie also developed the fastest known algorithms for exact and approximate maximum-weight matching on general graphs—a classic problem with many applications.

Professor Pettie has been successful in funding his research program from a sequence of NSF grants, including a CAREER award in 2008. His total funding exceeds \$2.2M. During his time in rank, he has published over 25 peer-reviewed archival papers, and has an h-index of 23.

Recent and Significant Publications:

Leonid Barenboim, Michael Elkin, Seth Pettie, Johannes Schneider, “The Locality of Distributed Symmetry Breaking,” *J. ACM* 63(3) 20:1-20:45, 2016.

Seth Pettie, “Sharp Bounds on Davenport-Schinzel Sequences of Every Order,” *J. ACM* 62(5): 36:1-36:40, 2015.

Allan Grønlund Jørgensen, Seth Pettie, “Threesomes, Degenerates, and Love Triangles,” *FOCS* 2014, 621-630.

Ran Duan, Seth Pettie, Hsin-Hao Su, “Scaling Algorithms for Weighted Matching in General Graphs,” *SODA* 2017, 781-800.

Yi-Jun Chang, Tsvi Kopelowitz, Seth Pettie, “An Exponential Separation between Randomized and Deterministic Complexity in the LOCAL Model,” *FOCS* 2016, 615-624.

Service: Professor Pettie has made outstanding contributions to service. He has taken leadership roles in several internal service assignments: chairing casebook committees, chairing the Fischer Chair Task Force, organizing the Theory Seminar, and serving as the director of the Theory Lab. Externally, Professor Pettie has been an active member of numerous program committees including those of the top-tier conferences such as Foundations of Computer Science (FOCS), Symposium on Discrete Algorithms (SODA), and Symposium on Theory of Computing (STOC). He also served on editorial boards and co-organized a Dagstuhl seminar on Hardness in P, with leading researchers.

External Reviewers:

Reviewer A: “In all his work he demonstrated an impressive amount of originality, ingenuity and technical ability.”

Reviewer B: “Seth is one of the rare researchers in algorithms and data structures who are exceptional in both breadth and depth. He is fearless in tackling some of the toughest problems in the field that have known, notoriously complicated algorithms (which few in the world can understand, let alone make progress on).”

Reviewer C: “Seth is an expert in algorithms and data structures. He frequently has brilliant insights that let him solve problems no one else has been able to solve, and in brand new ways.”

Reviewer D: “This result [establishing a new 3-SUM lower bound] has caught the community by surprise, and has opened up new directions for research on this and many related problems.”

Reviewer E: “I think Seth is one of the deepest thinkers currently working in the area of data structures and combinatorial algorithms, and his accomplishments are far beyond those needed to justify a promotion to Full Professor.”

Reviewer F: “Seth Pettie’s oeuvre includes a lot of papers that I wish I had written ... Seth Pettie would be a strong contender for a full professor position at my university...”

Reviewer G: “Prof. Pettie made significant progress on extremely fundamental computational problems, in many cases providing the first improvement after a hiatus of several decades, improving on results of legendary figures in the area of algorithms...”

Summary of Recommendation: Professor Pettie has established a high-impact record of teaching, scholarly research, and service at the University of Michigan. It is with the support of the College of Engineering Executive Committee that I recommend Seth Pettie for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.



Alec D. Gallimore, Ph.D.
Robert J. Vlasic Dean of Engineering
College of Engineering

May 2018