

Bloom Filters, Cuckoo Hashing, Cuckoo Filters, Adaptive Cuckoo Filters, and Learned Bloom Filters

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ABSTRACT

I will go over some of my past and present work on hashing-based data structures. After presenting some background on Bloom filters and cuckoo hashing, we will describe cuckoo filters, an efficient data structure for approximate set membership that improves on the well-known Bloom filter. We then discuss recent work on how to make cuckoo filters adaptive in response to false positives, which can be important for many practical problems. Finally, I will present some very recent work on how to possibly improve Bloom filters and related data structures using machine learning techniques.

Bio: Michael Mitzenmacher is a Professor of Computer Science in the School of Engineering and Applied Sciences at Harvard University. He served as Area Dean of Computer Science for Harvard from 2010 to 2013. Michael has authored or co-authored over 200 conference and journal publications on a variety of topics, including algorithms for the Internet, efficient hash-based data structures, erasure and error-correcting codes, power laws, and compression. His work on low-density parity-check codes shared the 2002 IEEE Information Theory Society Best Paper Award and won the 2009 ACM SIGCOMM Test of Time Award. His textbook on randomized algorithms and probabilistic techniques in computer science was published in 2005 by Cambridge University Press, with a second edition published in 2017. He is an ACM Fellow, and has just finished a three-year term as Chair of the ACM Special Interest Group on Algorithms and Computation Theory.

Michael Mitzenmacher graduated summa cum laude with a B.A. in mathematics and computer science from Harvard in 1991. After studying mathematics for a year in Cambridge, England, on the Churchill Scholarship, he obtained his Ph. D. in computer science at U.C. Berkeley in 1996. He then worked at Digital Systems Research Center until joining the Harvard faculty in 1999.