A Bibliography of Algorithm Experimentation

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This annotated bibliography lists sources that address methodology, tools and techniques, and standards for experimental research on algorithms. I’ve tried, in the annotation, to summarize both the content and the technical level. No attempt has been made to catalog the huge number of published examples of experimental and computational research on algorithms, although some general publication venues are listed.

We begin with a shortlist of resources for the beginning experimenter. These sources, taken together, provide good overall coverage of the main issues of experimental research, at about the graduate student level. The reference list that follows contains works on more specialized, advanced, and technical topics.

A Beginner’s Reading List.

• For general advice, tips, and guidelines on algorithmic experimental research, read Barr et al. [BGK+95], McGeoch [McG96b], [McG00], Johnson [Joh01], and Moret [Mor01].
• Bentley [Ben91] shows how to build a Unix environment that supports efficient testing and data collection. Some remarks on this subject may also be found in [McG01b].
• Ahuja, Magnanti, and Orlin [AMO93] discuss algorithmic performance measures that closely predict running times and that (to some extent) can be extrapolated across machine environments.
• For an introduction to statistical concepts and techniques that are most relevant to experimental research on algorithms, read the book by Cohen [Coh95] and/or the article by Coffin and Saltzman [CS00]. Both of these sources contain examples and illustrations drawn from algorithmic research problems. For a readable and authoritative discussion of techniques of graphical data analysis, see Chambers et al. [CCKT83].
• Crowder, Dembo, Mulvey [CDM78], and the follow-up article by Jackson et al. [JBNP91] give criteria and standards for presentation of experimental research in published work. The first provides a handy checklist for reviewers. See also Johnson [Joh01] for advice on what kind of information to include in your talk or paper. McGeoch and Moret [MM99] give guidelines for presenting talks on experimental research on algorithms.
References


[CDM78] H. P. Crowder, R. S. Dembo, and J. M. Mulvey, Reporting computational experiments in Mathematical Programming, Mathematical Programming 15 (1978), 316–329, This classic paper stands the test of time. The authors present criteria for reporting experimental results and provide a handy checklist for reviewers.


[Cle85] W. S. Cleveland, Elements of graphing data, Wadsworth, Monterey, CA, 1985, A good general reference covering both analysis and presentation.


A BIBLIOGRAPHY OF ALGORITHM EXPERIMENTATION


[LED98] Ledas research, since 1989. • A large repository of efficient C++ implementations of algorithms and data structures.


[MM99] C. C. McGeoch and B. M. E. Moret, How to present a paper on experimental work with algorithms, SIGACT News 30 (1999), no. 4, 85–90. Also available at
A BIBLIOGRAPHY OF ALGORITHM EXPERIMENTATION

www.cs.amherst.edu/~cm/hov0.ps • Advice on giving talks on experimental research in algorithms.


[Mor97] B. M. E. Moret, Bridging the gap between theory and practice, September 1997, Available at www.press.umich.edu/jpa/03-03/JEA.html • A survey of issues and opportunities in experimental algorithmics.

[Mor01] B. M. E. Moret, Toward a discipline of experimental algorithmics, this volume, 2001, • General advice on experimental methodology.


[MSF*01] C. C. McGeoch, P. Sanders, R. Fleischer, P. Cohen, and D. Peczuh, Searching for Big-Oh in the data: inferring asymptotic complexity from experiments, Experimental Algorithmics, the State of The Art; to appear as a volume of Lecture Notes in Computer Science, Springer Verlag, 2001, • Advice and techniques for inferring asymptotic behavior from data.


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