Daniel S. Hirschberg

Department of Computer Science
University of California, Irvine
Irvine, CA 92697-3435

(949) 824-6480
dan@ics.uci.edu
http://www.ics.uci.edu/∼dan

EDUCATION

1975 Ph.D. (Computer Science), Princeton University
1973 MSE, MA, Princeton University
1971 BE(EE), City College of New York

ACADEMIC APPOINTMENTS

2018-	Professor of Computer Science
2003-18	Professor of Computer Science and EECS
1994-2003	Professor of Information and Computer Science and ECE
1987-94	Professor of Information and Computer Science
1992-93, 96-98	Associate Chair of Undergraduate Studies, ICS
1984-90	Associate Chair of Graduate Studies, ICS
1981-87	Associate Professor of Information and Computer Science
1975-81	Assistant Professor of Electrical Engineering (*Rice University*)

CONSULTING ACTIVITIES

1998-2018	several law firms Consulting expert for intellectual property cases
1984-94	Manufacturing and Consulting Services, Inc. (Scottsdale, AZ) Design and analysis of database structures for CAD/CAM
1989	A-Chip Co., Inc. (Santa Ana, CA) Design of data compression/decompression techniques
1984-89	Pick Systems, Inc. (Irvine, CA) Design of operating system data structures
1986	Computer Cognition, Inc. (San Diego CA) Design of data structures for AI applications
1978-81	University of Texas Health Science Center (Houston, TX) Database development for genetics research
1976	Argonne National Laboratories (Argonne, IL) System simulation, Numerical analysis

PROFESSIONAL SERVICE

Referee of grant proposals for Army Research Office, National Science Foundation, Israel Science Foundation, Research Grants Council (Hong Kong)
Reviewer of textbooks for several publishers
Referee of technical papers for numerous journals
Associate Editor, ACM Trans. on Mathematical Software (1988–90)
Associate Editor, Discrete Mathematics, Algorithms and Applications (2009–present)
Member of the Program Committee
- IEEE Data Compression Conference (1991,1992,1993,1994)
- Combinatorial Pattern Matching (1992,1993,1994,1996,1997,2009) [co-chair 1996]
- String Processing and Information Retrieval (1998)
- Combinatorial Optimization and Applications (2010)

PUBLICATIONS

A. Books and Book Chapters

B1 D.S. Hirschberg, "Recent results on the complexity of common subsequence problems," in *Time Warps, String Edits, and Macromolecules*, D. Sankoff and J.B. Kruskal (Eds.), Addison-Wesley (1983) 323–328.

B2 D.S. Hirschberg and D.A. Lelewer, "Context modeling for text compression," in *Image and Text Compression*, J. A. Storer, Ed., Kluwer Academic Publishers, Boston, Mass. (1992) 113–145.

B3 D.S. Hirschberg, M.J. Pazzani and K. Ali, "Average case analysis of k-CNF and k-DNF learning algorithms," in *Computational Learning Theory and Natural Learning Systems: Constraints and Prospects*, S. Hanson, M. Kearns, T. Petsche and R. Rivest (Eds.), MIT Press, Cambridge, Mass. (1994) 15–28.

B4 D. Hirschberg and G. Myers (Eds.), *Combinatorial Pattern Matching, Proceedings 1996*, *Lecture Notes in Computer Science*, vol. 1075, Springer-Verlag, Berlin (1996) 392 pp.

B5 D.S. Hirschberg, "Serial computations of Levenshtein distances," in *Pattern Matching Algorithms*, Apostolico, A. and Galil, Z. (Eds.), Oxford University Press (1997) 123–141.

B. Articles in Refereed Journals

J1 D.S. Hirschberg, "A class of dynamic memory allocation algorithms," *Communications ACM* **16**:10 (1973) 615–618.

J2 D.S. Hirschberg, "A linear space algorithm for computing maximal common subsequences," *Communications ACM* **18**:6 (1975) 341–343.

J3 A.V. Aho, D.S. Hirschberg and J.D. Ullman, "Bounds on the complexity of the longest common subsequence problem," *Journal ACM* **23**:1 (1976) 1–12.

J4 D.S. Hirschberg and C.K. Wong, "A polynomial-time algorithm for the knapsack problem with two variables," *Journal ACM* **23**:1 (1976) 147–154.

J5 D.S. Hirschberg, "An insertion technique for one-sided height-balanced trees," *Communications ACM* **19**:8 (1976) 471–473.

J6 A.K. Chandra, D.S. Hirschberg and C.K. Wong, "Approximate algorithms for some generalized knapsack problems," *Theoretical Computer Science* **3**:3 (1976) 293–304.

J7 D.S. Hirschberg, "Algorithms for the longest common subsequence problem," *Journal ACM* **24**:4 (1977) 664–675.

J8 D.S. Hirschberg, "An information theoretic lower bound for the longest common subsequence problem," *Information Processing Letters* **7**:1 (1978) 40–41.

J9 D.S. Hirschberg, "Fast parallel sorting algorithms," *Communications ACM* **21**:8 (1978) 657–661.

J10 A.K. Chandra, D.S. Hirschberg and C.K. Wong, "Bin packing with geometric constraints in computer network design," *Operations Research* **26**:5 (1978) 760–772.

J11 D.S. Hirschberg and C.K. Wong, "Upper and lower bounds for graph-diameter problems," *Journal of Comb. Theory (B)* **26**:1 (1979) 66–74.

J12 D.S. Hirschberg, A.K. Chandra and D.V. Sarwate, "Computing connected components on parallel computers," *Communications ACM* **22**:8 (1979) 461–464.

J13 D.S. Hirschberg, "On the complexity of searching a set of vectors," *SIAM Journal on Computing* **9**:1 (1980) 126–129.

J14 D.S. Hirschberg and J.B. Sinclair, "Decentralized extrema-finding in circular configurations of processors," *Communications ACM* **23**:11 (1980) 627–628.

J15 M. Kumar and D.S. Hirschberg, "An efficient implementation of Batcher's odd-even merge algorithm and its application in parallel sorting schemes," *IEEE Trans. on Computers* **C-32**:3 (1983) 254–264.

J16 L.L. Larmore and D.S. Hirschberg, "Efficient optimal pagination of scrolls," *Communications ACM* **28**:8 (1985) 854–856.

J17 J. Hester and D.S. Hirschberg, "Self-organizing linear search," *Computing Surveys* **17**:3 (1985) 295–311.

J18 J.H. Hester, D.S. Hirschberg, S.-H.S. Huang and C.K. Wong, "Faster construction of optimal binary split trees," *Journal of Algorithms* **7**:3 (1986) 412–424.

J19 D.S. Hirschberg and L.L. Larmore, "Average case analysis of marking algorithms," *SIAM Journal on Computing* **15**:4 (1986) 1069–1074.

J20 D.S. Hirschberg and L.L. Larmore, "The Set LCS problem," *Algorithmica* **2** (1987) 91–95.

J21 D.S. Hirschberg and D.J. Volper, "Improved update/query algorithms for the interval valuation problem," *Information Processing Letters* **24** (1987) 307–310.

J22 D.S. Hirschberg and L.L. Larmore, "New applications of failure functions," *Journal ACM* **34**:3 (1987) 616–625.

J23 D.S. Hirschberg and L.L. Larmore, "The least weight subsequence problem," *SIAM J. on Computing* **16**,4 (1987) 628–638.

J24 J. Hester and D.S. Hirschberg, "Self-organizing search lists using probabilistic backpointers," *Communications ACM* **30**:12 (1987) 1074–1079.

J25 D.A. Lelewer and D.S. Hirschberg, "Data compression," *Computing Surveys* **19**:3 (1987) 261–297. Reprinted in *Japanese BIT Special issue in Computer Science* (1989) 165–195.

J26 J.H. Hester, D.S. Hirschberg, and L.L. Larmore, "Construction of optimal binary split trees in the presence of bounded access probabilities," *Journal of Algorithms* **9**:2 (1988) 245–253.

J27 D.S. Hirschberg and L.L. Larmore, "The Set-Set LCS problem," *Algorithmica* **4**:4 (1989) 503–510.

J28 C. Ng and D.S. Hirschberg, "Lower bounds for the stable marriage problem and its variants," *SIAM J. on Computing* **19**:1 (1990) 71–77.

J29 D.S. Hirschberg and D.A. Lelewer, "Efficient decoding of prefix codes," *Communications ACM* **33**:4 (1990) 449–459.

J30 L.L. Larmore and D.S. Hirschberg, "A fast algorithm for optimal length-limited codes," *Journal ACM* **37**:3 (1990) 464–473.

J31 C. Ng and D.S. Hirschberg, "Three-dimensional stable matching problems," *SIAM J. Discr. Math.* **4**:2 (1991) 245–252.

J32 D.S. Hirschberg and L.L. Larmore, "The traveler's problem," *Journal of Algorithms* **13** (1992) 148–160.

J33 D.S. Hirschberg and S.S. Seiden, "A bounded-space tree traversal algorithm," *Information Processing Letters* **47** (1993) 215–219.

J34 S.S. Seiden and D.S. Hirschberg, "Finding succinct minimal perfect hashing functions," *Information Processing Letters* **51** (1994) 283–288.

J35 L.M. Stauffer and D.S. Hirschberg, "Systolic self-organizing lists under transpose," *IEEE Trans. on Parallel and Distributed Systems* **6**:1 (1995) 102–105.

J36 D.S. Hirschberg and L.M. Stauffer, "Dictionary compression on the PRAM," *Parallel Processing Letters* **7**:3 (1997) 297–308.

J37 D. Eppstein and D.S. Hirschberg, "Choosing subsets with maximum weighted average," *Journal of Algorithms* **24** (1997) 177–193.

J38 M. Dillencourt, D. Eppstein, and D. S. Hirschberg. "Geometric thickness of complete graphs," *J. Graph Algorithms and Applications* **4**:3 (2000) 5–17. Reprinted in *Graph Algorithms and Applications 2*, Giuseppe Liotta, Robert Tamassia, and Ioannis G Tollis, ed., (2004).

J39 D.S. Hirschberg and M. Regnier, "Tight bounds on the number of string subsequences," *Journal of Discrete Algorithms* **1**:1 (2000) 123–132.

J40 M. Mamidipaka, D. Hirschberg, and N. Dutt, "Adaptive low power address encoding techniques using self-organizing lists," *IEEE Trans. on Very Large Scale Integration Systems* **11**:5 (2003) 827–834.

J41 D. Eppstein, M.T. Goodrich, and D.S. Hirschberg, "Improved combinatorial group testing algorithms for real-world problem sizes," *SIAM J. on Computing* **36**:5 (2007) 1360-1375.

J42 G.I. Bell, D.S. Hirschberg, and P. Guerrero-Garcia, "The minimum size required of a solitaire army," *Integers: Electronic Journal of Combinatorial Number Theory* **7** (2007), #G07 `http://www.integers-ejcnt.org/vol7.html` (22 pages).

J43 P. Baldi, R. Benz, D.S. Hirschberg, and S. Swamidass, "Lossless compression of chemical fingerprints using integer entropy codes improves storage and retrieval," *Journal of Chemical Information and Modeling* **47**:6 (2007) 2098-2109.

J44 M.T. Goodrich and D.S. Hirschberg, "Improved adaptive group testing algorithms with applications to multiple access channels and dead sensor diagnosis," *Journal of Combinatorial Optimization* **15**:1 (2008) 95-121.

J45 P. Baldi, D.S. Hirschberg, and R. Nasr, "Speeding up chemical database searches using a proximity filter based on the logical exclusive-or," *Journal of Chemical Information and Modeling* **48**:7 (2008) 1367-1378.

J46 P. Baldi and D.S. Hirschberg, "An intersection inequality sharper than the Tanimoto triangle inequality for efficiently searching large databases," *Journal of Chemical Information and Modeling* **49**:8 (2009) 1866-1870.

J47 R. Nasr, D.S. Hirschberg, and P. Baldi, "Hashing algorithms and data structures for rapid searches of fingerprint vectors," *Journal of Chemical Information and Modeling* **50**:8 (2010) 1358-1368.

J48 D. Eppstein and D. Hirschberg, "From discrepancy to majority," *Algorithmica* **80**:4 (2018) 1278-1297.

C. Papers in Conference Proceedings and Workshops

C1 A.V. Aho, D.S. Hirschberg and J.D. Ullman, "Bounds on the complexity of the longest common subsequence problem," *Proc. 15th IEEE Symp. on Switching and Automata Theory*, New Orleans, LA (1974) 104–109.

C2 D.S. Hirschberg, "A slightly better bound for the vertex connectivity problem," *Proc. Conf. of Info. Sci. and Systems*, Baltimore MD, Johns Hopkins Univ. (1975) 257–258.

C3 D.S. Hirschberg, "Parallel algorithms for the transitive closure and the connected component problems," *Proc. 8th ACM Symp. on Theory of Computing*, Hershey PA (1976) 55–57.

C4 D.S. Hirschberg, "Complexity of common subsequence problems," *Fundamentals of Computation Theory*, Poznan Poland, *Lecture Notes in Computer Science*, vol. 56, Springer-Verlag, Berlin (1977) 393–398.

C5 D.S. Hirschberg, "A lower worst-case complexity for searching a dictionary," *Proc. 16th Allerton Conf. on Communications, Control, and Computing*, Monticello IL, Univ. of Ill. (1978) 50–53.

C6 D.S. Hirschberg, "Election processes in distributed systems", *Proc. 18th Allerton Conf. on Communications, Control, and Computing*, Monticello IL, Univ. of Ill. (1980) 823.

C7 M. Kumar and D.S. Hirschberg, "An efficient implementation of Batcher's odd-even merge algorithm and its application in parallel sorting schemes," *Proc. Conf. of Info. Sci. and Systems*, Baltimore MD, Johns Hopkins Univ. (1981).

C8 D.S. Hirschberg, "Parallel graph algorithms without memory conflicts," *Proc. 20th Allerton Conf. on Communications, Control, and Computing*, Monticello IL, Univ. of Ill. (1982) 257–263.

C9 D.S. Hirschberg and D.J. Volper, "A parallel solution for the minimum spanning tree problem," *Proc. Conf. of Info. Sci. and Systems*, Baltimore MD, Johns Hopkins Univ. (1983) 680–684.

C10 D.S. Hirschberg and L.L. Larmore, "Average case analysis of marking algorithms," *Proc. 22nd Allerton Conf. on Communications, Control, and Computing*, Monticello IL, Univ. of Ill. (1984) 508–509.

C11 L.L. Larmore and D.S. Hirschberg, "Breaking a paragraph into lines in linear time," *Proc. 22nd Allerton Conf. on Communications, Control, and Computing*, Monticello IL, Univ. of Ill. (1984) 478–487.

C12 D.S. Hirschberg and L.L. Larmore, "The Least Weight Subsequence Problem," *Proc. 26th IEEE Symp. on Foundations of Computer Science*, Portland Oregon (1985) 137–143.

C13 R.R. Razouk and D.S. Hirschberg, "Tools for efficient analysis of concurrent software systems," *Proc. of SOFTFAIR II, A Second Conference on Software Development Tools, Techniques, and Alternatives*, San Francisco CA (1985).

C14 J.H. Hester and D.S. Hirschberg, "Generation of optimal binary split trees," *Proc. 24th Allerton Conf. on Communications, Control, and Computing*, Monticello IL, Univ. of Ill. (1986) 308–313.

C15 L.L. Larmore and D.S. Hirschberg, "Length-limited coding," *Proc. First ACM-SIAM Symposium on Discrete Algorithms*, San Francisco (1990) 310–318.

C16 D.A. Lelewer and D.S. Hirschberg, "Streamlining context models for data compression," *Proc. IEEE Data Compression Conference*, Snowbird UT (1991) 313–322.

C17 D.S. Hirschberg, M.J. Pazzani and K. Ali, "Average case analysis of k-CNF and k-DNF learning algorithms," *Second Annual Workshop on Computational Learning Theory and Natural Learning Systems: Constraints and Prospects*, Berkeley CA (1991).

C18 S. Bhatia, D.S. Hirschberg and I.D. Scherson, "Shortest paths in orthogonal graphs," *Proc. 29th Allerton Conf. on Communications, Control, and Computing*, Monticello IL, Univ. of Ill. (1991) 488–497.

C19 L.M. Stauffer and D.S. Hirschberg, "Transpose coding on the systolic array," *Proc. IEEE Data Compression Conference*, Snowbird UT (1992) 162–171.

C20 D.S. Hirschberg and M.J. Pazzani, "Average case analysis of learning k-CNF concepts," *Proc. Ninth International Machine Learning Conference*, Aberdeen Scotland, Morgan Kaufmann, San Mateo (1992) 206–211.

C21 D.S. Hirschberg and L.M. Stauffer, "Parsing algorithms for dictionary compression on the PRAM," *Proc. IEEE Data Compression Conference*, Snowbird UT (1994) 136–145.

C22 L.M. Stauffer and D.S. Hirschberg, "PRAM algorithms for static dictionary compression," *Proc. IEEE 8th International Parallel Processing Symposium*, Cancun Mexico (1994) 344–348.

C23 D. Eppstein and D.S. Hirschberg, "Choosing subsets with maximum weighted average," *Proc. 5th MSI Workshop on Computational Geometry*, Stonybrook NY (1995) 7–8.

C24 J.K. Martin and D.S. Hirschberg, "On the complexity of learning decision trees," *Proc. 4th Int. Symp. on Artif. Intell. and Math.*, Fort Lauderdale FL (1996) 112–115. [Expanded version in "The time complexity of decision tree induction," Tech. Rpt. 95–27, ICS Dept., UC Irvine (August, 1995).]

C25 M.B. Dillencourt, D.E. Eppstein and D.S. Hirschberg, "Geometric thickness of complete graphs," *Graph Drawing: 6th Int'l Symp.*, Montreal Canada, *Lecture Notes in Computer Science*, vol. 1547, Springer-Verlag, Berlin (1998) 102–110.

C26 D.S. Hirschberg, "Bounds on the number of string subsequences," *Proc. Symp. on Combinatorial Pattern Matching*, Warwick UK, *Lecture Notes in Computer Science*, Springer-Verlag, Berlin (1999) 115–122.

C27 M. Mamidipaka, D. Hirschberg, and N. Dutt, "Low power address encoding using self-organizing lists," *Proc. ACM/IEEE Int'l Symp. on Low Power Electronics and Design*, Huntington Beach CA (2001) 188–193.

C28 M. Mamidipaka, D. Hirschberg, and N. Dutt, "Efficient power reduction techniques for time multiplexed address buses," *Proc. 15th ACM Int'l Symp. on System Synthesis*, Kyoto (2002) 207–212.

C29 D. Eppstein, M.T. Goodrich, and D.S. Hirschberg, "Improved combinatorial group testing algorithms for real-world problem sizes," 9th Workshop Algorithms and Data Structures (WADS), Waterloo, 2005. *Lecture Notes in Comp. Sci.* **3608** (2005) 86–98.

C30 M.T. Goodrich, and D.S. Hirschberg, "Efficient parallel algorithms for dead sensor diagnosis and multiple access channels," *Proc. 18th ACM Symposium on Parallelism in Algorithms and Architectures* (SPAA), Cambridge MA (2006) 118–127.

C31 D.S. Hirschberg and P. Baldi, "Effective compression of monotone and quasi-monotone sequences of integers," *Proc. IEEE Data Compression Conference*, Snowbird UT (2008) 520.

C32 D.S. Hirschberg, "Constructing problems of geometric combinatorics," *Gathering for Gardner Conference* (G4G9), Atlanta GA (2010), 8 pp.

C33 M.T. Goodrich, D.S. Hirschberg, M. Mitzenmacher, and J. Thaler, "Cache-oblivious dictionaries and multimaps with negligible failure probability," *Proc. Mediterranean Conference on Algorithms*, Kibbutz Ein-Gedi Israel (2012), *Lecture Notes in Computer Science*, vol. 7659, Springer-Verlag, Berlin (2012) 203–218.

C34 D. Eppstein, M. Goodrich, and D. Hirschberg, "Combinatorial pair testing: distinguishing workers from slackers," *Algorithms and Data Structures Symposium* (WADS) 2013, *Lecture Notes in Computer Science*, vol. 8037, Springer-Verlag, Berlin (2013) 316–327.

C35 D. Eppstein and D. Hirschberg, "From discrepancy to majority," *Proc. 12th Latin American Theoretical Informatics Symposium* (LATIN 2016), Ensenada, Mexico, (2016) 390–402.