

Alejandro A. Schäffer
Curriculum Vitae
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Education: B.S. Applied Mathematics (Computer Science), University Honors
Carnegie-Mellon University, 1983
M.S. Mathematics, Honors Degree Program
Carnegie-Mellon University, 1983
Ph.D. Computer Science, Stanford University, 1988
Honors: Faculty of 1000, Genomics and Genetics Faculty Member of
of the Year for 2015
National Library of Medicine Regents Award for Scholarship
or Technical Achievement, 2010
Part of a large group receiving an NIH Merit Award, 2008
Selected as a “Highly Cited Researcher” by ISI, 20006–2011 (service ended by ISI)
National Center for Human Genome Research, Merit Award, 1996
Fannie and John Hertz Foundation Fellowship, 1986–1988
National Science Foundation Graduate Fellowship, 1983–1986
Andrew Carnegie Society Scholarship, 1982–83
National Merit Scholarship, 1980–83
Thesis Topic: Algorithmic Problems on Intersection Graphs
Advisor: Prof. Christos H. Papadimitriou
Employment Experience:
2006–2017 Clinical Investigator, National Center for Biotechnology Information, NIH
(additional title assigned due to extensive human subjects research)
1998–present Computer Scientist, National Center for Biotechnology Information, NIH
1995–1998 Computer Scientist, National Center for Human Genome Research, NIH
1988–1996 Assistant Professor, Dept. of Computer Science, Rice University
(on professional leave 1988–89, on family leave Autumn 1993)
(on Intergovernment Personnel Assignment to NIH from August 1995)
1988–89 Postdoctoral Member of Technical Staff, AT&T Bell Laboratories,
Murray Hill, NJ
1986–88 Research Student Associate, IBM Almadén Research Center,
San José, CA (summers: full-time, academic year: part-time)
1985 Summer Member of Technical Staff, AT&T Bell Laboratories, Murray Hill, NJ
1985 Winter, Spring Research Assistant, Stanford University
1984 Autumn Teaching Assistant, Stanford University
1984 Summer Member of Technical Staff, AT&T Bell Laboratories, Murray Hill NJ

1983–84
1980–83

Research Assistant, Stanford University
Part-time programmer, Computer Science Department,
Carnegie-Mellon University

Areas of Interest: Computational Biology, Algorithms, Biological Sequence Analysis,
Mammalian Genetics and Genomics, Primary Immunodeficiency Diseases

Publications:(h-index = 61 (Web of Science) or 71 (Google Scholar); g-index = 204)

1. “LUCIFER: A Latent, UNIX-Compatible, Interfaced File Emulator and Retriever”, Alejandro A. Schäffer, Carnegie-Mellon University, SPICE Document D007, 1981.
2. “A Polynomial Time Algorithm for Finding the Prime Factors of Cartesian-Product Graphs”, Joan Feigenbaum, John Hershberger, and Alejandro A. Schäffer, *Discrete Applied Mathematics* 12(1985), pp. 123–138.
3. “Recognizing Composite Graphs is Equivalent to Testing Graph Isomorphism”, Joan Feigenbaum and Alejandro A. Schäffer, *SIAM Journal on Computing* 15(1986), pp. 619–627.
4. “A Note on the Chromatic Number of the Alternative Negation of Two Graphs”, Alejandro A. Schäffer and Ashok Subramanian, *Colloquium Mathematicum* LV(1988), pp. 367–370.
5. “Convex Hulls of Piecewise-Smooth Jordan Curves”, Alejandro A. Schäffer and Christopher J. Van Wyk, *Journal of Algorithms* 8(1987), pp. 66–94.
6. “Shortest Prefix Strings Containing All Subset Permutations”, Alejandro A. Schäffer, *Discrete Mathematics* 64(1987), pp. 239–252.
7. “On Gossiping with Faulty Telephone Lines”, Ramsey W. Haddad, Shaibal Roy, and Alejandro A. Schäffer, *SIAM Journal on Algebraic and Discrete Methods* 8(1987) pp. 439–445.
8. “A Tighter Upper Bound on the Worst Case Behavior of Conway’s Parallel Sorting Algorithm”, Alejandro A. Schäffer, *Journal of Algorithms* 9(1988) pp. 321–342.
9. “Fast Parallel Algorithms for Chordal Graphs”, Joseph Naor, Moni Naor, and Alejandro A. Schäffer, (extended abstract) Proceedings of the 19th Annual ACM Symposium on Theory of Computing, 1987, pp. 355–364; (full paper) *SIAM Journal on Computing* 18(1989) pp. 327–349; more detailed version of full paper available as IBM Research Report RJ5629.
10. “Recognizing Bellman-Ford-Orderable Graphs”, Ramsey W. Haddad and Alejandro A. Schäffer, *SIAM Journal on Discrete Mathematics* 1(1988), pp. 447–471.
11. “Computing the Bump Number with Techniques from Two-Processor Scheduling”, Alejandro A. Schäffer and Barbara B. Simons, *Order* 5(1988), pp. 131–141.
12. “Time Bounds on Fault Tolerant Broadcasting”, David Peleg and Alejandro A. Schäffer, *Networks* 19(1989), pp. 803–822.
- 13a. “Storing and Searching a Multikey Table”, Amos Fiat, Moni Naor, Alejandro A. Schäffer, Jeanette P. Schmidt, and Alan Siegel, (extended abstract) Proceedings of the 20th Annual ACM Symposium on Theory of Computing, 1988, pp. 344–353.
- 13b. “An Implicit Data Structure for Searching a Multikey Table in Logarithmic Time”, Amos Fiat, J. Ian Munro, Moni Naor, Alejandro A. Schäffer, Jeanette P. Schmidt, and Alan Siegel, *Journal of Computer and System Sciences* 43(1991), pp. 406–424 (special issue for best papers presented at the 20th ACM Symposium on Computing); this is a full version of 13a.
14. “Graph Spanners”, David Peleg and Alejandro A. Schäffer, *Journal of Graph Theory* 13(1989), pp. 99–116. (cited > 250 times)
15. “A Faster Algorithm to Recognize Undirected Path Graphs”, Alejandro A. Schäffer, *Discrete Applied Mathematics* 43(1993), pp. 261–295.
16. “Recognizing Brittle Graphs: Remarks on a Paper of Hoàng and Khouzam”, Alejandro A. Schäffer, *Discrete Applied Mathematics* 31(1991), pp. 29–35.

17. “Optimal Node Ranking of Trees in Linear Time”, Alejandro A. Schäffer, *Information Processing Letters* 33(1989), pp. 91–96. (cited > 50 times).
18. “Finding the Prime Factors of Strong Direct Product Graphs in Polynomial Time”, Joan Feigenbaum and Alejandro A. Schäffer, invited paper for an International Conference on Algebraic Graph Theory, Leibnitz, Austria, June 1989; *Discrete Mathematics* 109(1992), pp. 77–102 (special volume devoted to this conference).
19. “A Note on Finding a Strict Saddlepoint”, Daniel Bienstock, Fan Chung, Michael Fredman, Alejandro A. Schäffer, Peter W. Shor, and Subhash Suri, *American Mathematical Monthly* 98(1991), pp. 418–419.
- 20a. “Simple Local Search Problems That Are Hard to Solve”, Alejandro A. Schäffer and Mihalis Yannakakis, *SIAM Journal on Computing* 20(1991), pp. 56–87.
- 20b. “On the Complexity of Local Search”, Christos H. Papadimitriou, Alejandro A. Schäffer, and Mihalis Yannakakis, (extended abstract) Proceedings of the 22nd Annual ACM Symposium on Theory of Computing, 1990, pp. 438–445 (This is a combined summary of 20a. and a later paper by Papadimitriou) (20a and 20b cited a total of > 150 times).
21. “Parallel Batch Update of Minimum Spanning Trees”, Alejandro A. Schäffer and Peter J. Varman, Rice Univ. Comp. Sci. Tech. Rept. 90–140.
22. “Faster Isometric Embedding in Products of Complete Graphs”, Franz Aurenhammer, Michael Formann, Ramana M. Idury, Alejandro A. Schäffer, and Frank Wagner, *Discrete Applied Mathematics* 52(1994), pp. 17–28.
23. “Markov Analysis of Multiple Disk Prefetching for External Mergesort”, Vinay Sadananda Pai, Alejandro A. Schäffer, and Peter J. Varman, (extended abstract) Proceedings of 21st International Conference on Parallel Processing, 1992, pp. III-272–279; (full paper with slightly altered title) *Theoretical Computer Science* 128(1994), pp. 211–239.
24. “Triangulating Three-Colored Graphs in Linear Time and Linear Space”, Ramana M. Idury and Alejandro A. Schäffer, *SIAM Journal on Discrete Mathematics* 6(1993), pp. 289–293.
25. “Dynamic Dictionary Matching with Failure Functions”, Ramana M. Idury and Alejandro A. Schäffer, (extended abstract) 3rd Combinatorial Pattern Matching Conference, 1992, Lecture Notes in Computer Science 644, pp. 276–287; (full paper) *Theoretical Computer Science* 131(1994), pp. 295–310.
26. “Optimal Edge Ranking of Trees in Polynomial Time”, Pilar de la Torre, Raymond Greenlaw, Alejandro A. Schäffer, (extended abstract) Proceedings of the 4th Annual ACM-SIAM Symposium on Discrete Algorithms, 1993, pp. 138–144; (full paper) *Algorithmica* 13(1995), pp. 592–618.
27. “Improved Dynamic Dictionary Matching”, Amihoud Amir, Martin Farach, Ramana M. Idury, Johannes A. LaPoutré, Alejandro A. Schäffer, (extended abstract) Proceedings of the 4th Annual ACM-SIAM Symposium on Discrete Algorithms, 1993, pp. 392–401; (full paper) *Information and Computation* 119(1995), pp. 258–282 (two versions cited a combined total of > 50 times).
28. “Faster Sequential Genetic Linkage Computations”, Robert W. Cottingham Jr., Ramana M. Idury, Alejandro A. Schäffer, *American Journal of Human Genetics* 53(1993), pp. 252–263. (cited > 1,200 times)
29. “Multiple Matching of Rectangular Patterns”, Ramana M. Idury, Alejandro A. Schäffer, (extended abstract) Proceedings of the 25th Annual ACM Symposium on Theory of Computing, 1993, pp. 81–90; (full paper) *Information and Computation* 117(1995), pp. 78–90.
30. “Multiple Matching of Parameterized Patterns”, Ramana M. Idury, Alejandro A. Schäffer, (extended abstract) 5th Combinatorial Pattern Matching Conference, 1994, Lecture Notes in Computer Science 807, pp. 226–239; (full paper) invited to *Theoretical Computer Science* 154(1996), pp. 203–224.

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- 34b. "Improving the Practical Space and Time Efficiency of the Shortest-Paths Approach to Sum-of-Pairs Multiple Sequence Alignment", Sandeep K. Gupta, John Kececioğlu, Alejandro A. Schäffer, (full paper of 34a.) *Journal of Computational Biology* 2(1995), pp. 459–472. (cited > 100 times)
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 45. “Approximation Algorithms for a Genetic Diagnostics Problem”, S. Rao Kosaraju, Alejandro A. Schäffer, Leslie G. Biesecker, (invited paper) Proc. 5th International Workshop on Algorithms and Data Structures, 1997, Lecture Notes in Computer Science 1272, pp. 69–92. (refereed paper) *Journal of Computational Biology* 5(1998), pp. 9–26.
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 49. “Refinement of the Gene Locus for Autosomal Recessive Juvenile Parkinsonism (AR-JP) on Chromosome 6q25.2-27 and Identification of Markers Exhibiting Linkage Disequilibrium”, Masaaki Saito, Hiroto Matsumine, Hajime Tanaka, Atsushi Ishikawa, Satoe Shimoda-Matsubayashi, Alejandro A. Schäffer, Yoshikuni Mizuno, Shoji Tsuji, (*Japanese*) *Journal of Human Genetics* 43(1998), pp. 22–31.
 50. “Computing Probabilities of Homozygosity by Descent” Alejandro A. Schäffer, *Genetic Epidemiology* 16(1999), pp. 135–149.
 51. “Coping with Complexity: Lessons from the Mathematical Sciences”, Alejandro A. Schäffer, *Human Genetics* 103(1998), pp. 5–10. (invited paper, only editorial review)
 52. “Software for Constructing and Verifying Pedigrees Within Large Genealogies and an Application to the Old Order Amish of Lancaster County”, Richa Agarwala, Leslie G. Biesecker, Katherine A. Hopkins, Clair A. Francomano, Alejandro A. Schäffer, *Genome Research* 8(1998), pp. 211–221. (cited > 75 times)
 53. “Protein Sequence Similarity Searches Using Patterns as Seeds” Zheng Zhang, Alejandro A. Schäffer, Webb Miller, Thomas L. Madden, David J. Lipman, Eugene V. Koonin, Stephen F. Altschul, *Nucleic Acids Research* 26(1998), pp. 3986–3990. (cited > 200 times)
 54. “Inverse Inbreeding Coefficient Problems with an Application to Linkage Analysis of Recessive Diseases in Inbred Populations”, Richa Agarwala, Leslie G. Biesecker, Alejandro A. Schäffer, (extended abstract) Proceedings of the 10th Annual ACM-SIAM Symposium on Discrete Algorithms, 1999, pp. 840–841; (full paper) *Discrete Applied Mathematics* 104(2000), pp. 3–44 (special issue on Computational Molecular Biology).
 55. “Inferring Tree Models for Oncogenesis from Comparative Genome Hybridization Data”, Richard Desper, Feng Jiang, Olli-P. Kallioniemi, Holger Moch, Christos H. Papadimitriou, Alejandro A. Schäffer, *Journal of Computational Biology* 6(1999), pp. 37–51. (actually published in 2000) (cited > 100 times)
 56. “Evaluation of the Clonal Relationship Between Primary and Metastatic RCC by Comparative Genomic Hybridization”, Heidi Bissig, Jan Richter, Richard Desper, Verena Meier, Peter

- Schraml, Alejandro A. Schäffer, Guido Sauter, Michael J. Mihatsch, Holger Moch, *American Journal of Pathology* 155(1999), pp. 267–274. (cited > 75 times)
57. “A Genetic Map of Microsatellites in the Domestic Cat (*Felis catus*)”, Marilyn Menotti-Raymond, Victor A. David, Leslie A. Lyons, Alejandro A. Schäffer, James F. Tomlin, Michelle K. Hutton, Stephen J. O’Brien, *Genomics* 57(1999), pp. 9–23. (cited > 250 times)
 58. “*Atm* Haploinsufficiency Results in Increased Sensitivity to Sublethal Doses of Ionizing Radiation in Mice”, Carrolee Barlow, Michael A. Eckhaus, Alejandro A. Schäffer, Anthony Wynshaw-Boris, *Nature Genetics* 21(1999), pp. 359–360. (cited > 50 times)
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 60. “Genetic Linkage of Hyper-IgE Syndrome to Chromosome 4”, Bodo Grimbacher, Alejandro A. Schäffer, Steven M. Holland, Joie Davis, John I. Gallin, Harry L. Malech, T. Prescott Atkinson, Bernd H. Belohradsky, Rebecca H. Buckley, Fausto Cossu, Teresa Español, Ben-Zion Garty, Nuria Matamoros, Laurie A. Myers, Robert P. Nelson, Hans D. Ochs, Eleonore D. Renner, Nele Wellinghausen, Jennifer M. Puck, *American Journal of Human Genetics* 65(1999), pp. 735–744. (cited > 200 times)
 61. “IMPALA: Matching a Protein Sequence Against a Collection of PSI-BLAST-Constructed Position-Specific Score Matrices”, Alejandro A. Schäffer, Yuri I. Wolf, Chris P. Ponting, Eugene V. Koonin, L. Aravind, Stephen F. Altschul, *Bioinformatics* 15(1999), pp. 1000–1011. (cited > 200 times)
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 65. “A Fast and Scalable Radiation Hybrid Map Construction and Integration Strategy”, Richa Agarwala, David L. Applegate, Donna Maglott, Gregory D. Schuler, Alejandro A. Schäffer, *Genome Research* 10(2000), pp. 350–364. (cited > 100 times)
 66. “Somatic Deletions in Hereditary Breast Cancers Implicate 13q21 as a Putative Novel Breast Cancer Susceptibility Locus”, Tommi Kainu, Suh-Hang Hank Juo, Richard Desper, Alejandro A. Schäffer, Elizabeth Gillanders, Ester Rozenblum, Diana Freas-Lutz, Don Weaver, Dietrich Stephan, Joan Bailey-Wilson, Olli-P. Kallioniemi, Mika Tirkkonen, Kirsi Syryjäkoski, Tuula Kuukasjärvi, Pasi Koivisto, Ritva Karhu, Kaija Holli, Adalgeir Arason, Gudrun Johannsdottir, Jon Thor Bergthrosson, Hrefna Johannsdottir, Valgardur Egilsson, Rosa Björk Barkardottir, Oskar Johannsson, Karin Haraldsson, Therese Sandberg, Eva Holmberg, Henrik Grönberg, Håkan Olsson, Åke Borg, Paula Vehmanen, Hannaleena Eerola, Päivi Heikkilä, Seppo Pyrhönen, Heli Nevanlinna, *Proceedings of the National Academy of Sciences USA* 97(2000), pp. 9603–9608. (cited > 100 times)
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71. “Heritability of Life Span in the Old Order Amish”, Braxton D. Mitchell, Wen-Chi Hsueh, Terri M. King, Toni I. Pollin, John Sorkin, Richa Agarwala, Alejandro A. Schäffer, Alan R. Shuldiner, *American Journal of Medical Genetics* 102(2001), pp. 346–352. (cited > 100 times)
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