

Bibliography

- [ABH97] P. Apers, H. Blanken, and M. Houtsma. *Multimedia Databases in Perspective*. Springer, 1997.
- [AFS93] R. Agrawal, C. Faoutsos, and A. Swami. Efficient similarity search in sequence databases. In *FODO'93, Chicago, IL, October 1993*, pages 69–84, 1993.
- [AG87] A. Apostolico and C. Guerra. The longest common subsequence problem revisited. *Algoritmica*, 2:315–336, 1987.
- [All96] James Allan. Incremental relevance feedback for information filtering. In *SIGIR*, pages 270–278, 1996.
- [AM95] Sunil Arya and David M. Mount. Approximate range searching. In *Symposium on Computational Geometry 1995*, pages 172–181, 1995.
- [AMN⁺98] Sunil Arya, David M. Mount, Nathan S. Netanyahu, Ruth Silverman, and Angela Y. Wu. An optimal algorithm for approximate nearest neighbor searching in fixed dimensions. *Journal of ACM*, 45(6):891–923, 1998.
- [BBK01] Christian Böhm, Stefan Berchtold, and Daniel Keim. Searching in high-dimensional spaces: Index structures for improving the performance

- of multimedia databases. *ACM Computing Surveys*, 33(3):322–373, September 2001.
- [BC92] Nicholas J. Belkin and W. Bruce Croft. Information filtering and information retrieval: Two sides of the same coin. *Communication of the ACM*, 35(12):29–38, December 1992.
- [Ben75] J. Bentley. Multidimensional binary search trees used for associative searching. *Communication of the ACM*, 18(9):509–517, 1975.
- [Ben79] J. Bentley. Multidimensional binary search trees in database applications. *IEEE Transactions on Software Engineering*, 5(4):333–340, 1979.
- [Bes95] S. N. Bespamyatnikh. An optimal algorithm for closest pair maintenance (extended abstract). In Joan Peckham, editor, *Proceedings of 11th ACM Symposium on Computational Geometry*, pages 152–161, 1995.
- [BET95] Marshall W. Bern, David Eppstein, and Shang-Hua Teng. Parallel construction of quadtrees and quality triangulations. In *WADS '93, Proceedings of 4rd Algorithms and Data Structures, August 11-13 1997, Montral, Canada*, volume 709 of *LNCS*, pages 188–199. Springer Verlag, 1995.
- [BFR78] R.L. Burden, J. Douglas Faires, and A.C. Reynolds. *Numerical Analysis*. Prindle, Weber & Schmidt, 1978.
- [BGRS99] Kevin S. Beyer, Jonathan Goldstein, Raghu Ramakrishnan, and Uri Shaft. When is "nearest neighbor" meaningful? In Catriel Beeri and Peter Buneman, editors, *Database Theory - ICDT '99, 7th International Conference, Jerusalem, Israel, January 10-12, 1999, Proceedings*, volume 1540 of *Lecture Notes in Computer Science*, pages 217–235. Springer, 1999.

- [BKK96] Stefan Berchtold, Daniel A. Keim, and Hans-Peter Kriegel. The x-tree: An index structure for high-dimensional data. In T. M. Vijayaraman, Alejandro P. Buchmann, C. Mohan, and Nandlal L. Sarda, editors, *VLDB'96, Proceedings of 22th International Conference on Very Large Data Bases, September 3-6, 1996, Mumbai (Bombay), India*, pages 28–39. Morgan Kaufmann, 1996.
- [BKK97] Stefan Berchtold, Daniel A. Keim, and Hans-Peter Kriegel. A cost model for nearest neighbor search in high-dimensional data space. In *PODS'97, Proceedings of 16th ACM Symposium on Principles of Database Systems, May 1997, Tucson, AZ*, pages 78–96. ACM, 1997.
- [BKSS90] N. Beckmann, H. P. Kriegel, R. Schneider, and B. Seeger. The r*-tree: An efficient and robust access method for points and rectangles. In *Proceedings of the 1990 ACM-SIGMOD International Conference on Management of Data, May 1990, Atlantic City, NJ*, pages 322–331. ACM, 1990.
- [BM72] Rudolf Bayer and Edward M. McCreight. Organization and maintenance of large ordered indices. *Acta Informatica*, 1(3):173–189, 1972.
- [BÖ97] Tolga Bozkaya and Z. Meral Özsoyoglu. Distance-based indexing for high-dimensional metric spaces. In Joan Peckham, editor, *SIGMOD 1997, Proceedings ACM SIGMOD International Conference on Management of Data, May 13-15, 1997, Tucson, Arizona, USA*, pages 357–368. ACM Press, 1997.
- [BÖ99] Tolga Bozkaya and Z. Meral Özsoyoglu. Indexing large metric spaces for similarity search queries. *TODS*, 24(3):361–404, 1999.

- [Bri95] Sergey Brin. Near neighbor search in large metric spaces. In Umeshwar Dayal, Peter M. D. Gray, and Shojiro Nishio, editors, *VLDB'95, Proceedings of 21th International Conference on Very Large Data Bases, September 11-15, 1995, Zurich, Switzerland*, pages 574–584. Morgan Kaufmann, 1995.
- [BWY80] J. Bentley, B. Weide, and A. Yao. Optimal expected-time algorithms for closest point problems. *ACM Transaction on Mathematical Software*, 6(4):563–580, 1980.
- [Cas96] K.R. Castelman. *Digital Image Processing*. Prentice-Hall, Inc., 1996.
- [CF80] J. M. Chang and K. S. Fu. A dynamic clustering technique for physical database design. In Peter P. Chen and R. Clay Sprowls, editors, *Proceedings of the 1980 ACM SIGMOD International Conference on Management of Data, Santa Monica, California, May 14-16, 1980*, pages 188–199. ACM Press, 1980.
- [Cha97] Timothy M. Chan. Approximate nearest neighbor queries revisited. In *Proceedings of the thirteenth annual symposium on Computational geometry, 1997, Nice, France*, pages 352 – 358. ACM Press, New York, NY, USA, 1997.
- [Chi94] Tzi-cker Chiueh. Content-based image indexing. In Jorge B. Bocca, Matthias Jarke, and Carlo Zaniolo, editors, *VLDB'94, Proceedings of 20th International Conference on Very Large Data Bases, September 12-15, 1994, Santiago de Chile, Chile*, pages 582–593. Morgan Kaufmann, 1994.
- [CK95] Paul B. Callahan and S. Rao Kosaraju. Algorithms for dynamic closest pair and n-body potential fields. In *SODA, Proceedings of 6th ACM-SIAM Symposium on Discrete Algorithms*, pages 263–272, 1995.

- [CNBYM01] Edgar Chávez, Gonzalo Navarro, Ricardo Baeza-Yates, and José L. Marroquín. Searching in metric spaces. *ACM Computing Surveys*, 33(3):273–221, September 2001.
- [Com79] Douglas Comer. The ubiquitous B-tree. *ACM Computing Surveys*, 11(2):121–137, 1979.
- [CP00] Paolo Ciaccia and Marco Patella. Pac nearest neighbor queries: Approximate and controlled search in high-dimensional and metric spaces. In *Proceedings of the 16th International Conference on Data Engineering, 28 February - 3 March, 2000, San Diego, California, USA*, pages 244–255. IEEE Computer Society, 2000.
- [CPZ97] Paolo Ciaccia, Marco Patella, and Pavel Zezula. M-tree: An efficient access method for similarity search in metric spaces. In Matthias Jarke, Michael J. Carey, Klaus R. Dittrich, Frederick H. Lochovsky, Pericles Loucopoulos, and Manfred A. Jeusfeld, editors, *VLDB'97, Proceedings of 23rd International Conference on Very Large Data Bases, August 25-29, 1997, Athens, Greece*, pages 426–435. Morgan Kaufmann, 1997.
- [CPZ98a] Paolo Ciaccia, Marco Patella, and Pavel Zezula. A cost model for similarity queries in metric spaces. In *Proceedings of the Seventeenth ACM SIGACT-SIGMOD-SIGART Symposium on Principles of Database Systems, June 1-3, 1998, Seattle, Washington*, pages 59–68. ACM Press, 1998.
- [CPZ98b] Paolo Ciaccia, Marco Patella, and Pavel Zezula. Processing complex similarity queries with distance-based access methods. In Hans-Jörg Schek, Fèlix Saltor, Isidro Ramos, and Gustavo Alonso, editors, *Advances in Database Technology - EDBT'98, 6th International Conference on Extending Database Technology, Valencia, Spain, March 23-27*,

- 1998, *Proceedings*, volume 1377 of *Lecture Notes in Computer Science*, pages 9–23. Springer, 1998.
- [Dam64] F. Damerau. A technique for computer detection and correction of spelling errors. *Communication of the ACM*, 7(3):171–176, 1964.
- [Fal96] C. Faloutsos. *Searching Multimedia Databases by Content*. Kluwer Academic Publishers, 1996.
- [FB74] Raphael A. Finkel and Jon Louis Bentley. Quad trees: A data structure for retrieval on composite keys. *Acta Informatica*, 4:1–9, 1974.
- [FK97] C. Faloutsos and I. Kamel. Beyond uniformity and independence: Analysis of r-trees using the concept of fractal dimension. In *Proceedings of the 13th ACM Symposium on Principles of Database Systems, El Paso, Texas, USA, May 4-6, 1997*, pages 609–617. ACM, 1997.
- [FSA⁺95] Myron Flickner, Harpreet S. Sawhney, Jonathan Ashley, Qian Huang, Byron Dom, Monika Gorkani, Jim Hafner, Denis Lee, Dragutin Petkovic, David Steele, and Peter Yanker. Query by image and video content: The qbic system. *IEEE Computer*, 28(9):23–32, 1995.
- [FTAA00] H. Ferhatsmanoglu, E. Tuncel, D. Agrawal, and A. El Abbadi. Vector approximation based indexing for non-uniform high dimensional data sets. In *Proceedings of the 2000 ACM CIKM International Conference on Information and Knowledge Management, McLean, VA, USA, November 6-11, 2000*, pages 202–209. ACM, 2000.
- [FTAA01] H. Ferhatsmanoglu, E. Tuncel, D. Agrawal, and A. El Abbadi. Approximate nearest neighbor searching in multimedia databases. In *Proceedings of the 17th International Conference on Data Engineering, April*

- 2-6, 2001, Heidelberg, Germany, pages 503–511. IEEE Computer Society, 2001.
- [Fuk90] K. Fukunaga. *Introduction to Statistical Pattern Recognition*. Academic Press, 2nd edition, 1990.
- [GG98] V. Gaede and O. Gunther. Multidimensional access methods. *ACM Computing Surveys*, 30(2):170–231, 1998.
- [GPR97] Alberto Gobbi, D. Poppinger, and B. Rohde. Finding biological active compounds in large databases. In *ECSOC-1, Proceedings of First International Electronic Conference on Synthetic Organic Chemistry, September 1-30, 1997*, 1997.
- [GSZ00] Claudio Gennaro, Pasquale Savino, and Pavel Zezula. A hashed schema for similarity search in metric spaces. In *Proceedings of First DELOS Network of Excellence Workshop, Information Seeking, Searching and Querying in Digital Libraries, Zurich, Switzerland, December 11-12, 2000*.
- [GSZ01] Claudio Gennaro, Pasquale Savino, and Pavel Zezula. Similarity search in metric databases through hashing. In *Proceedings of MIR 2001 - 3rd Intl Workshop on Multimedia Information Retrieval October 5, 2001. Ottawa, Canada*, 2001. In conjunction with ACM Multimedia 2001.
- [GSZ02] Claudio Gennaro, Pasquale Savino, and Pavel Zezula. D-index: Distance searching index for metric data sets. Technical report, IEI-CNR, 2002.
- [Gut84] A. Guttman. R-trees: A dynamic index structure for spatial searching. In *Proceedings of the 1984 ACM SIGMOD International Conference on Management of Data, Boston, MA*, pages 47–57, 1984.

- [Hal52] A. Hald. *Statistical Theory with Engineering Applications*. John Wiley & Sons, Inc., 1952.
- [HB99] S. Hettich and S. D. Bay. The uci kdd archive. Irvine, CA: University of California, Department of Information and Computer Science, 1999. <http://kdd.ics.uci.edu>.
- [HD80] P.A.V. Hall and G.R. Dowling. Approximate string matching. *ACM Computing Surveys*, 12(4):381–402, December 1980.
- [HKR93] D.P. Huttenlocker, G.A. Klanderman, and W.J. Rucklidge. Comparing images using the hausdorff distance. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 15(9):850–863, September 1993.
- [HNP95] Joseph M. Hellerstein, Jeffrey F. Naughton, and Avi Pfeffer. Generalized search trees for database systems. In Umeshwar Dayal, Peter M. D. Gray, and Shojiro Nishio, editors, *VLDB'95, Proceedings of 21th International Conference on Very Large Data Bases, September 11-15, 1995, Zurich, Switzerland*, pages 562–573. Morgan Kaufmann, 1995.
- [HPS71] P. Hoel, S. Port, and J. Stone. *Introduction to Probability Theory*. Houghton Mifflin Company, 1971.
- [HS95] G.R. Hjaltason and H. Samet. Ranking in spatial databases. In *SSD'95, Portland, ME, August, 1995*, volume 951 of *LNCS*, pages 83–95. Springer Verlag, 1995.
- [HSE⁺95] James L. Hafner, Harpreet S. Sawhney, William Equitz, Myron Flickner, and Wayne Niblack. Efficient color histogram indexing for quadratic form distance functions. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 17(7):729–736, 1995.

- [IM98] P. Indyk and R. Motwani. Approximate nearest neighbors: Towards removing the curse of dimensionality. In *Proceedings of the Thirtieth Annual ACM Symposium on the Theory of Computing, Dallas, Texas, USA, May 23-26, 1998*, pages 604–613, 1998.
- [JMM95] H. V. Jagadish, Alberto O. Mendelzon, and Tova Milo. Similarity-based queries. In *Proceedings of the Fourteenth ACM SIGACT-SIGMOD-SIGART Symposium on Principles of Database Systems, May 22-25, 1995, San Jose, California*, pages 36–45. ACM Press, 1995.
- [Kai85] T. Kailath. *Modern Signal Processing*. Springer Verlag, 1985.
- [KF92] I. Kamel and C. Faloutsos. Parallel r-trees. In *Proc. of the ACM SIGMOD Conf., June, 1992*, pages 195–204, 1992.
- [KF93] I. Kamel and C. Faloutsos. On packing r-trees. In *CIKM'93, Proceedings of the Second International conference on Information and Knowledge Management, Washington, DC, November, 1993*, pages 490–499, 1993.
- [Kle97] Jon M. Kleinberg. Two algorithms for nearest-neighbor search in high dimensions. In *STOC'97, Proceedings of the twenty-ninth annual ACM symposium on Theory of computing, 1997 , El Paso, Texas, United States*, pages 599–608, 1997.
- [Knu98] D.E. Knuth. *Sorting and Searching*, volume 3 of *The Art of Computer Programming*. Reading, Massachusetts: Addison-Wesley, 2nd edition, 1998.
- [Koh84] T. Kohonen. *Self-Organization and Associative Memory*. Springer-Verlag, 1984.
- [KOR99] Eyal Kushilevitz, Rafail Ostrovsky, and Yuval Rabani. Efficient search for approximate nearest neighbor in high dimensional spaces. In

- STOC'98, Proceedings of the thirtieth annual ACM symposium on Theory of computing, 1998 Dallas, Texas, United States*, pages 614 – 623, 1999.
- [Lev65] V. Levenshtein. Binary codes capable of correcting spurious insertions and deletions of ones. *Problem of Information Transmission*, 1:8–17, 1965.
 - [MMLP97] Javed Mostafa, Snehasis Mukhopadhyay, W. Lam, and Mathew Palakal. A multilevel approach to intelligent information filtering: Model, system, and evaluation. *Transaction on Information Systems*, 15(4):368–399, October 1997.
 - [MS94] Masahiro Morita and Yoichi Shinoda. Information filtering based on user behaviour analysis and best match text retrieval. In W. Bruce Croft and C. J. van Rijsbergen, editors, *Proceedings of the 17th Annual International ACM-SIGIR Conference on Research and Development in Information Retrieval. Dublin, Ireland, 3-6 July 1994 (Special Issue of the SIGIR Forum)*, pages 272–281. ACM/Springer, 1994.
 - [Nav01] Gonzalo Navarro. A guided tour to approximate string matching. *ACM Computing Surveys*, 33(1):31–88, 2001.
 - [NBE⁺93] Wayne Niblack, Ron Barber, William Equitz, Myron Flickner, Eduardo H. Glasman, Dragutin Petkovic, Peter Yanker, Christos Faloutsos, and Gabriel Taubin. The qbic project: Querying images by content, using color, texture, and shape. In *Proceedings of Storage and Retrieval for Image and Video Databases (SPIE) 1993*, pages 173–187, 1993.
 - [NHS84] Jürg Nievergelt, Hans Hinterberger, and Kenneth C. Sevcik. The grid file: An adaptable, symmetric multikey file structure. *TODS*, 9(1):38–71, 1984.

- [NW70] S. Needleman and C. Wunsch. A general method applicable to the search for similarities in the amino acid sequences of two protein. *Journal of Molecular Biology*, 48:444–453, 1970.
- [OS89] A.V. Oppenheim and R.W. Schafer. *Discrete-Time Signal Processing*. Prentice-Hall, Inc., 1989.
- [PAL99] S. Pramanik, S. Alexander, and J. Li. An efficient searching algorithm for approximate nearest neighbor queries in high dimensions. In *ICMCS 1999, IEEE International Conference on Multimedia Computing and Systems, June 7-11 , 1999, Florence, Italy*, volume 1. IEEE Computer Society, 1999.
- [PL99] Sakti Pramanik and Jinhua Li. Ab-tree: Angle based index tree for approximate nearest neighbor search. Technical Report, Michigan State University, Department of Computer Science, February 1999. <http://www.cse.msu.edu/~pramanik/research/papers/AB-tree.pdf>.
- [PM97] A. Papadopoulos and Y. Manolopoulos. Performances of nearest-neighbor queries in r-trees. In *ICDT'97, Proceedings of the 6th International Conference on Database Theory, 1997, Delphi, Greece*, pages 394–408, 1997.
- [PMD01] Dimitris Papadias, Nikos Mamoulis, and Vasilis Delis. Approximate spatio-temporal retrieval. *ACM Transactions on Information Systems (TOIS)*, 19(1):53 – 96, January 2001.
- [RL85] Nick Roussopoulos and Daniel Leifker. Direct spatial search on pictorial databases using packed r-trees. In Shamkant B. Navathe, editor, *Proceedings of the 1985 ACM SIGMOD International Conference on Management of Data, Austin, Texas, May 28-31, 1985*, pages 17–31. ACM Press, 1985.

- [Rob81] John T. Robinson. The k-d-b-tree: A search structure for large multi-dimensional dynamic indexes. In Y. Edmund Lien, editor, *Proceedings of the 1981 ACM SIGMOD International Conference on Management of Data, Ann Arbor, Michigan, April 29 - May 1, 1981*, pages 10–18. ACM Press, 1981.
- [RV97] Paul Resnick and Hal R. Varian. Guest editors’ introduction to the special issue on recommender systems. *Communication of the ACM*, 40(3), 1997.
- [Sam88] Hanan Samet. Hierarchical representations of collections of small rectangles. *ACM Computing Surveys*, 20(4):271–309, 1988.
- [Sam95] H. Samet. The quad-tree and related hierarchical structures. *ACM Computing Surveys*, 16(2):187–260, 1995.
- [SK83] D. Sankoff and J. Kruskal. *Time Warps, String Edits, and Macromolecules: The Theory and Practice of Sequence Comparison*. Addison-Wesley, 1983.
- [SM83] Gerald Salton and Michael J. McGill. *Introduction to Modern Information Retrieval*. McGraw-Hill Book Company, 1983.
- [Smi97] John R. Smith. *Integrated Spatial and Feature Image Systems: Retrieval, Analysis, and compression*. PhD thesis, Graduate School of Arts and Sciences, Columbia University, 1997.
- [SO95] M. Stricker and M. Orengo. Similarity of color images. In *Storage and Retrieval for Image and Video Databases III SPIE Proceedings 2420*, pages 381–392, 1995.
- [SRF87] Timos K. Sellis, Nick Roussopoulos, and Christos Faloutsos. The r+-tree: A dynamic index for multi-dimensional objects. In Peter M.

- Stocker, William Kent, and Peter Hammersley, editors, *VLDB'87, Proceedings of 13th International Conference on Very Large Data Bases, September 1-4, 1987, Brighton, England*, pages 507–518. Morgan Kaufmann, 1987.
- [SW85] Hanan Samet and Robert E. Webber. Storing a collection of polygons using quadtrees. *ACM Transactions on Graphics*, 4(3):182–222, 1985.
- [TS96] Y. Theodoridis and T. Sellis. A model for the prediction of r-tree performance. In *PODS'96, Proceedings of the 15th Symposium on Principles of Databases Systems, June 1996, Montreal, Canada*, pages 161–171, 1996.
- [TTSF00] C. Traina, A.J. Traina, B. Seeger, and C. Faloutsos. Slim-trees: High performance metric trees minimizing overlap between nodes. In *EDBT 2000, Proceedings of the 7th EDBT International Conference, March 2000, Konstanz, Germany*, pages 51–65, 2000.
- [Uhl91] J.K. Uhlmann. Satisfying general proximity/similarity queries with metric trees. *Information Processing Letters*, 40(4):175–179, November 1991.
- [Wat95] M. Waterman. *Introduction to Computational Biology*. Chapman and Hall, 1995.
- [WFHC92] Steven P. Wartik, Edward A. Fox, Lenwood S. Heath, and Qi Fan Chen. Hashing algorithms. In William B. Frakes and Ricardo A. Baeza-Yates, editors, *Information Retrieval: Data Structures & Algorithms*, pages 293–362. Prentice-Hall, 1992.

- [WJ96] D.A. White and R. Jain. Similarity indexing with the ss-tree. In *Proceedings of the 12th International Conference on Data Engineering, New Orleans, USA*, pages 516–523, 1996.
- [WSB98] Roger Weber, Hans-Jörg Schek, and Stephen Blott. A quantitative analysis and performance study for similarity-search methods in high-dimensional spaces. In Ashish Gupta, Oded Shmueli, and Jennifer Widom, editors, *VLDB'98, Proceedings of 24rd International Conference on Very Large Data Bases, August 24-27, 1998, New York City, New York, USA*, pages 194–205. Morgan Kaufmann, 1998.
- [YI99] A. Yoshitaka and T. Ichikawa. A survey on content-based retrieval for multimedia databases. *IEEE Transactions on Knowledge and Data Engineering*, 11(1):81–93, 1999.
- [Yia93] P.N. Yianilos. Data structures and algorithms for nearest neighbor search in general metric spaces. In *ACM-SIAM Symposium on Discrete Algorithms (SODA)*, pages 311–321, 1993.
- [Yia99] P.N. Yianilos. Excluded middle vantage point forests for nearest neighbor search. In *Sixth DIMACS Implementation Challenge: Nearest Neighbor Searches workshop*, January 1999.
- [ZSAR98] Pavel Zezula, Pasquale Savino, Giuseppe Amato, and Fausto Rabitti. Approximate similarity retrieval with m-trees. *VLDB Journal*, 7(4):275–293, 1998.