Pat Morin

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Last updated: June 25, 2017

Education

Jan. 1998–Jan. 2001	PhD (Computer Science) from Carleton University
Sep. 1996–Jan. 1998	M.C.S. degree from Carleton University
Sep. 1991–May 1996	B.C.S. degree (highest honours) from Carleton University

Academic Awards

June 2001	Best Paper Award — SIROCCO 2001 [68]	
Jan. 2001–Dec. 2001	NSERC Postdoctoral Fellowship	$35 000/yr
May 2001	Carleton University Senate Medal	
May 1999–Apr. 2001	NSERC PGS-B Scholarship	$19 000/yr
May 1997–Apr. 1999	NSERC PGS-A Scholarship	$16 000/yr

Research Grants

2017–2018	eCampusOntario	Open Content Funding	$97 390
2013–2017	NSERC	Discovery Grant	5×$36 000
2012–2013	SSHRC	Partnership Dev	$21 000
2012–2013	NSERC	ENGAGE	$25 000
2009	Carleton University	Research Award	$15 000
2008–2010	NSERC	Discovery Accelerator	3×$40 000
2008–2012	NSERC	Discovery Grant	5×$26 000
2008	University of Sydney	Research Fellowship	$15 000
2008	National ICT Australia	Collaboration Grant	$7 000
2008	Ontario Innovation Trust	Matching Program	$24 145
2008	Canada Foundation for Innovation	New Opportunities Fund	$24 145
2007	Ontario Government	Early Researcher Award	$100 000
2007	Carleton University	Carty Fellowship	$50 000
2006	Belgian FNRS	Collaboration Grant	€5 000
2003–2007	NSERC	Discovery Grant	5×$21 000
2004	Ontario Innovation Trust	Matching Program	$83 227
2004	Canada Foundation for Innovation	New Opportunities Fund	$83 227
2002	Carleton University	Startup Grant	$30 000

Relevant Work Experience

Professor	Jul. 2013– Professor of computer science	Carleton University	Ottawa, Canada
Associate Professor	Jul. 2006–Jun. 2013 Associate professor of computer science	Carleton University	Ottawa, Canada
Assistant Professor	Jan. 2002–Jun. 2006 Assistant professor of computer science	Carleton University	Ottawa, Canada
Postdoctoral Fellow	Jan. 2001–Dec. 2001 NSERC funded postdoctoral fellow	McGill University	Montréal, Canada

Current Research Interests

Geometric computing	The study of algorithmic and combinatorial geometry problems motivated by application areas such as robust statistics [52, 56, 77, 111, 80, 114], geographic information systems [78, 81, 100, 120], molecular biology and polymer physics [53, 83, 84, 86, 96], manufacturing [67, 74, 42, 45], facility location [63, 69, 80, 114], automated cartography [75], machine learning [62], and visualization [65, 64, 66, 95]
Data structures	The design and analysis of efficient dictionaries [4, 71, 79, 115] and geometric data structures [80, 114]
Online and distributed computing	The design and analysis of communication protocols and distributed algorithms [68, 70, 76, 82, 85, 81, 94]

Professional Duties

Program Committees	ISAAC 2002, CCCG 2004, Adhoc Now 2005, AAIM 2006, ISAAC 2006, Adhoc Now 2006, CCCG 2006, SoCG 2007, Adhoc Now 2007, SWAT 2008, CCCG 2008, ISAAC 2008, CCCG 2009, EuroCG 2009, CATS 2009, CCCG 2010, CCCG 2012, COCOON 2012, ISAAC 2013, CCCG 2014, CCCG 2015, SoCG 2017
Organizing Committee	CCCG 2007, Workshop on Geometry and Graphs (2013, 2014, 2015, 2016, 2017), CCCG 2017
Program Chair	CCCG 2008
Review Boards	MITACS College of Reviewers (2008), Ontario Graduate Scholarship Selection Committee (2008), MRI Early Researcher Awards Adjudication Committee (2010, 2011, 2014)
Associate Editor	Journal of Computer and System Sciences
Managing Editor	Journal of Computational Geometry (also co-founder, with Joachim Gudmundsson)

Teaching and Supervision Duties

Thesis Committees
Ahmed Moustafa (M.E., F2002), Xiaofei Jia (M.C.S, W2003), Paul Boone (M.C.S, F2003), Karel Casteels (M.Math, W2004), Ebrahim Malalla (Ph.D, McGill, W2004), Aaron Lee (M.C.S, S2004), Liang Tang (M.C.S, W2005), Derek Bradley (M.C.S, W2005), James Kelly (M.C.S, S2006), Sébastien Collette (Ph.D, Université Libre de Bruxelles, F2006), Shai Mor (M.Sc, F2006), Qiasheng Shi (Ph.D, 2008, Simon Fraser University), Sadrul Chowdhury (M.C.S, University of Ottawa, W2008), Michel Paquette (Ph.D. W2010), Dana Jansens (M.C.S, W2010), Chris Hamilton (Ph.D, W2011, Dalhousie University), Bojan Djordjević (Ph.D, S2011, University of Sydney), Jeff Sember (Ph.D, S2011, University of British Columbia), Gregory Bint (MCS, F2014), Ahmad Biniaz (Ph.D, F2016), Kimberly Crosbie (MCS., W2017)

Comprehensive Exams
Ghada Badr (Data structures, F2002), Yihui Tang (Data structures, S2003), Julie Thorpe (Data structures, S2005), William Elazmeh (Data structures, S2006), Glenn Wurster (Algorithms, S2006), Phil Eisen (Algorithms, S2006), Daming Xu (Algorithms, F2006), Michel Paquette (Algorithms, F2006) Paul's Student (Algorithms, W2008), Amir Razavi (Data Structures, W2008), John Howat (Algorithms, F2009), Jacquelin Caron (Algorithms, F2009), Andrew Runka (Data Structures, F2011), Sander Verdonschot (Algorithms, S2011), André van Renssen (Algorithms, S2011), Eduardo Pacheco (Data Structures, S2012), Arash Nouri (Algorithms, F2014)

Students and Postdocs
David Wood (Postdoc 2002–2004), Greg Aloupis (FCAR Postdoc 2005–2006), Meng He (Postdoc 2007–2008), Mohammad Farshi (Postdoc 2007–2008), Vida Dujmović (Postdoc 2008), Paz Carmi (Postdoc 2006–2008), Vida Dujmović (NSERC Postdoc 2004–2005, 2008–2009), Yihui Tang (Ph.D, 2008), Stefanie Wuhrer (M.C.S., 2006), Harish Gopala (M.C.S., 2004), John Howat (MCS, 2009), John Howat (PhD, 2012), Dan Chen (PhD, 2013), Zhamila Abdranova (MCS, 2013), Daniel Minor (MCS, 2015), Andre van Renssen (PhD, 2014), Sander Verdonschot (PhD, 2015), Tommy Reddad (MCS, 2015), Lucas Rioux-Maldague (MCS 2015), Luis Barba (PhD, 2016), Cory Fraser (MCS, 2016), Alexis Beingessner (MCS, 2016), Luis Schulz Xavier de Silveira (PhD, in progress)

Honours Projects
Michael Hodge (Diameter Finding Algorithms, W2002), Jake Denley (Generation of Random Scenery, W2004), Darcy Dunne (A Fast Algorithm for Finding the Minimum Circular Half-Covering of a 2D Point Set), Tair Bilyalov (Random 3D Terrain in Computer Games, W2005), Jeremy Gribben (Procedural Generation of Random 3D Vehicles, W2005), Christopher Johnson (Randomized Scenery in 3D Gaming, W2005), Dmitry Karasik (IOUs in BitTorrent, W2005), Vladimir Bradateanu (Dynamically Generated Random Terrain and Trees, S2005), Jamie Suomela (Random Generation of Billboard Advertising for Use in Racing Games, S2005), Gi Wu (BitTorrent IOU Extensions, S2005), Mykola Konyk (Polyhedral Surface Reconstruction, W2006), Richard Poulin (Dynamic Workflow — Graph Drawing, S2007), Irwin Zaid (Graph Hierarchies which Approximate the Complete Euclidean Graph, F2007), Shayan Negari (Application Sharing Over the Public Internet, F2007), Rajinder Wasson (A Mediawiki Sports League Extension, W2008), Daniel Minor (Cuckoo Hashing in Python, W2008), Yini He (Fast Searching in the HTML DOM, W2008), Paul Cumming (MediaWiki 2.0, W2008), Vlad Rubinov (Fast HDR, F2009), Bryan Waite (Open Source decompression algorithms, W2010), Edward Duong (Real-time HDR, W2010), Calvin Wiebe (Halia: A JavaScript DOM Querying Algorithm, F2010), Nima Hoda (Visibility-Monotonic Polygon Deflation, W2013),[4]Troy Hildebrandt (Robust Constructive Solid Geometry, W2013), Christian Delahouse (Data Structures for Approximate String Searching, W2015)

Summer Undergraduates	Christian Leger (Relations Between Binary and Ternary Trees, S2005), Christian Muise (Data Structures for the HTML DOM, S2007), Irwin Zaid (Hierarchical Spanners, S2007), John Howat (Property-Rich Succinct Data Structures, S2007), James Mendek (Distribution-Sensitive Point Location, S2008), Shane Smith (Simple Compiler Compiler, S2010), Nima Hoda (Basic Data Structures, S2011), Nima Hoda (Polygon Reconfiguration, S2012), Troy Hildebrand (3DCSS in Chromium, S2013), Jennifer Hood (Graph Drawing, S2015)
Committees	Lab Committee (2002, 2003, 2004) Hiring Commitee (2003, 2004, 2005, 2006, 2007, 2014) Curriculum Committee (2003) Promotions and Tenure Committee (2003, 2007, 2014) RAA Evaluation Committee (2013, 2014, 2016) Development Grant Review Committee (2017)
Courses Taught	COMP5408 Advanced Data Structures (W2002, F2003, F2004, W2006, W2007, W2008, F2009, W2011, W2012, W2013, W2014) COMP4804 Algorithms II (W2003, W2004, W2005, W2006, W2010, W2017) COMP4900/5900 Computational Molecular Biology (W2006, W2007) COMP3804 Algorithms I (W2006) COMP3002 Compiler Construction (W2003, W2004, W2005, W2008, F2009, W2011, F2011) COMP2405 Internet Application Programming (W2007, W2008) COMP2402 Data Structures (F2010, F2011, F2012, F2013, F2014, F2016) COMP5804 OCICS Graduate Seminar (2004, 2005, 2006, 2007, 2008) COMP1405 Introduction to Programming (F2012, F2013, F2014)

Publications

Books

[1] P. Morin. *Open Data Structures (in Pseudocode)*. Web, 2014. A freely-available open content textbook.

[2] P. Morin. *Open Data Structures: An Introduction*. Athabasca University Press, Edmonton, 2013. Also freely available as *Open Data Structures (in Java)* at `opendatastructures.org`.

[3] P. Morin. *Open Data Structures (in C++)*. Web, 2012. A freely-available open content textbook.

Chapters in Books

[4] P. Morin. Hash tables. In Dinesh Mehta and Sartaj K. Sahni, editors, *Handbook of Data Structures and Applications*, chapter 9. CRC Press, 2004.

Papers Accepted in Refereed Journals

[5] V. Dujmović, P. Morin, and D. R. Wood. Layered separators in minor-closed graph classes with applications. *Journal of Combinatorial Theory, Series B*. Accepted in May 2017. Preliminary version appeared at FOCS 2013.

[6] A. Biniaz, P. Bose, D. Eppstein, A. Maheshwari, P. Morin, and M. Smid. Spanning trees in multipartite geometric graphs. Accepted, pending minor revisions, in April 2017.

[7] P. Morin, W. Mulzer, and T. Reddad. Encoding arguments. *ACM Computing Surveys*. Accepted in April 2017.

[8] L. Devroye and P. Morin. A note on interference in random point sets. *Computational Geometry: Theory and Applications*. Accepted in January 2017. Preliminary version appeared at CCCG 2012.

[9] P. Morin and S. Verdonschot. On the average number of edges in theta graphs. *Online Journal of Analytic Combinatorics*. Accepted in July 2016. Preliminary version appeared at *ANALCO 2014*.

[10] P. Bose, V. Dujmović, P. Morin, and L. Rioux-Maldague. New bounds for facial nonrepetitive colouring. *Graphs and Combinatorics*, 33(4):817–832, 2017.

[11] P.-V. Khuong and P. Morin. Array layouts for comparison-based searching. *ACM Journal of Experimental Algorithmics*, 22(1), 2017. Article No. 1.3 (39 pages).

[12] P. Bose, R. Fagerberg, J. Howat, and P. Morin. Biased predecessor search. *Algorithmica*, 76(4):1097–1105, 2016. Preliminary version appeared at *LATIN 2014*.

[13] P. Bose, J.-L. De Carufel, P. Morin, A. van Renssen, and S. Verdonschot. Towards tight bounds on theta-graphs: More is not always better. *Theoretical Computer Science*, 616:70–93, 2016.

[14] P. Bose, P. Morin, and A. van Renssen. The price of order. *International Journal of Computational Geometry and Applications*, 26(3):135–149, 2016. Preliminary version appeared at *ISAAC 2014*.

[15] G. Aloupis, L. Barba, P. Carmi, V. Dujmović, F. Frati, and P. Morin. Compatible connectivity augmentation of planar disconnected graphs. *Discrete & Computational Geometry*, 54(2):459–480, 2015. Preliminary version appeared at *SODA 2015*.

[16] P. Bose, V. Dujmović, N. Hoda, and P. Morin. Visibility-monotonic polygon deflation. *Contributions to Discrete Mathematics*, 10(1):1–21, 2015. Preliminary version appears in *Proceedings of CCCG 2012*.

[17] V. Dujmović and P. Morin. On obstacle numbers. *Electronic Journal of Combinatorics*, 22(3), 2015. P3.1 (7 pages).

[18] V. Dujmović, P. Morin, and M. Smid. Average stretch factor: How low does it go? *Discrete & Computational Geometry*, 53(2):296–326, 2015.

[19] P. Bose, P. Morin, A. van Renssen, and S. Verdonschot. The Θ_5 graph is a spanner. *Computational Geometry: Theory and Applications*, 48(2):108–119, 2015. Preliminary version appears in *Proceedings of the 39th International Workshop on Graph-Theoretic Concepts in Computer Science (WG 2013)*.

[20] V. Dujmović, P. Morin, and A. Sheffer. Crossings in grid drawings. *Electronic Journal of Combinatorics*, 21(1), 2014. P1.41 (18 pages).

[21] P. Bose, V. Dujmović, P. Morin, and M. Smid. Robust geometric spanners. *SIAM Journal on Computing*, 42(4):1720–1736, 2013. Preliminary version appears in *Proceedings of the Twenty-Ninth ACM Symposium on Computational Geometry (SoCG 2013)*, ACM Press, 2013.

[22] D. Chen and P. Morin. Approximating majority depth. *Computational Geometry: Theory and Applications*, 46(9):1059–1064, 2013. Special issue of selected papers from *CCCG 2012*.

[23] D. Chen, P. Morin, and U. Wagner. Absolute approximation of Tukey depth: Theory and experiments. *Computational Geometry: Theory and Applications*, 46(5):566–573, 2013. Special issue on Geometric Optimization.

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[27] D. Charlton, E. D. Demaine, M. L. Demaine, V. Dujmović, P. Morin, and R. Uehara. Ghost chimneys. *International Journal of Computational Geometry and Applications*, 22(3):207–214, 2012. Preliminary version appears in *Proceedings of CCCG 2010*.

[28] S. Collette, V. Dujmović, J. Iacono, S. Langerman, and P. Morin. Entropy, triangulation, and point location in planar subdivisions. *ACM Transactions on Algorithms*, 8(3):29:1–29:18, 2012.

[29] P. Bose, K. Douïeb, and P. Morin. Skip lifts: A probabilistic alternative to red-black trees. *Journal of Discrete Algorithms*, 14:13–20, 2012. Special issue of selected papers from the *International Workshop on Combinatorial Algorithms (IWOCA 2010)*.

[30] P. Bose, J. Howat, and P. Morin. A distribution-sensitive dictionary with low space overhead. *Journal of Discrete Algorithms*, 10:140–145, 2012. Preliminary version appears in *Proceedings of the 16th International Workshop on Algorithms and Data Structures (WADS 2009)*, LNCS, pages 110-118. Springer, 2009.

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[32] D. Chen, V. Dujmović, L. Devroye, and P. Morin. Memoryless routing in convex subdivisions: Random walks are optimal. *Computational Geometry: Theory and Applications*, 45(4):178–185, 2012. Preliminary version appears at EuroCG 2010.

[33] V. Dujmović, J. Howat, and P. Morin. Biased range trees. *Algorithmica*, 62(1):21–37, 2012. Preliminary version appeared in *Proceedings of the 20th ACM-SIAM Symposium on Discrete Algorithms (SODA 2009)*, pages 486–495, 2009.

[34] V. Dujmović, J. Gudmundsson, P. Morin, and T. Wolle. Notes on large angle crossing graphs. *Chicago Journal of Theoretical Computer Science*, 2011. Special issue of selected papers from *Computing: The Australasian Theory Symposium (CATS 2010)*.

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[38] J. Gudmundsson, P. Morin, and M. Smid. Algorithms for marketing-mix optimization. *Algorithmica*, 60(4), 2011.

[39] P. Bose, S. Collette, S. Langerman, A. Maheshwari, P. Morin, and M. Smid. Sigma-local graphs. *Journal of Discrete Algorithms*, 8:15–23, 2010.

[40] L. Devroye, J. Gudmundsson, and P. Morin. On the expected maximum degree of Gabriel and Yao graphs. *Advances in Applied Probability*, 41(4):1123–1140, 2009.

[41] P. Bose, V. Dujmović, F. Hurtado, S. Langerman, P. Morin, and D. R. Wood. A polynomial bound for untangling geometric planar graphs. *Discrete & Computational Geometry*, 42(2):570–585, 2009. Preliminary version appeared at *Topological and Geometric Graph Theory (TGGT 2008)*.

[42] P. Bose, P. Morin, M. Smid, and S. Wuhrer. Clamshell casting. *Algorithmica*, 55(4):666–702, 2009. Preliminary version appears in *Proceedings of CAD'07*.

[43] P. Bose, V. Dujmović, F. Hurtado, and P. Morin. Connectivity-preserving transformations of binary images. *Computer Vision and Image Understanding*, 113(10):1027–1104, October 2009.

[44] R. Atanassov, P. Bose, M. Couture, A. Maheshwari, P. Morin, M. Paquette, M. Smid, and S. Wuhrer. Algorithms for optimal outlier removal. *Journal of Discrete Algorithms*, 7:239–248, 2009.

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[46] J. Erickson, F. Hurtado, and P. Morin. Centerpoint theorems for wedges. *Discrete Mathematics & Theoretical Computer Science*, 11(1):45–54, 2009.

[47] P. Bose, P. Carmi, M. Couture, A. Maheshwari, P. Morin, and M. Smid. Spanners of complete *k*-partite geometric graphs. *SIAM Journal on Computing*, 38(5):1803–1820, 2009. Preliminary version appears in *Proceedings of the 8th Latin American Theoretical Informatics Symposium (LATIN2008)*, 2008.

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[49] P. Bose, H. Guo, E. Kranakis, A. Maheshwari, P. Morin, J. Morrison, M. Smid, and Y. Tang. On the false-positive rate of Bloom filters. *Information Processing Letters*, 108:210–213, 2008.

[50] P. Carmi, V. Dujmović, P. Morin, and D. R. Wood. Distinct distances in graph drawings. *Electronic Journal of Combinatorics*, 15(R107), August 2008.

[51] D. Bremner, D. Chen, J. Iacono, S. Langerman, and P. Morin. Output-sensitive algorithms for Tukey depth and related problems. *Statistics and Computing*, 18(3):259–266, September 2008.

[52] P. Morin. An optimal randomized algorithm for *d*-variate zonoid depth. *Computational Geometry: Theory and Applications*, 39(3):229–235, 2008.

[53] P. K. Agarwal, R. Klein, C. Knauer, S. Langerman, P. Morin, M. Sharir, and M. Soss. Computing the detour and spanning ratio of paths, trees and cycles in 2d and 3d. *Discrete & Computational Geometry*, 39(1):17–37, 2008. Related results are contained in Conference Paper [96].

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[55] G. Aloupis, E. D. Demaine, S. Langerman, P. Morin, J. O'Rourke, I. Streinu, and G. T. Toussaint. Unfolding polyhedral bands. *Computational Geometry: Theory and Applications*, 39(1):30–42, 2008. Special issue of selected papers from *The 16th Canadian Conference on Computational Geometry (CCCG 2004), 2004.*

[56] H. Gopala and P. Morin. Algorithms for bivariate zonoid depth. *Computational Geometry: Theory and Applications*, 39(1):2–13, 2008. Special issue of selected papers from the *16th Canadian Conference on Computational Geometry (CCCG 2004).*

[57] G. Aloupis, P. Bose, and P. Morin. Reconfiguring triangulations with edge flips and point moves. *Algorithmica*, 47(4):367–378, 2007. Special issue of selected papers from the *12th International Symposium on Graph Drawing*, pages 1–11, volume 3383 of LNCS, Springer-Verlag.

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[60] P. Bose, J. Czyzowicz, Z. Gao, P. Morin, and D. R. Wood. Simultaneous diagonal flips in plane triangulations. *Journal of Graph Theory*, 54(4):307–330, 2006. Preliminary version appears in *Proceedings of the 17th ACM-SIAM Symposium on Discrete Algorithms*, pages 212-221, 2006.

[61] D. Krizanc, P. Morin, and M. Smid. Range mode and range median queries on lists and trees. *Nordic Journal of Computing*, 12:1–17, 2005. Preliminary version appears in *Proceedings of the Fourteenth Annual International Symposium on Algorithms and Computation (ISAAC 2003)*, volume 1906 of LNCS, pages 517-526, 2003.

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[64] V. Dujmović, P. Morin, and D. R. Wood. Layout of graphs with bounded tree-width. *SIAM Journal on Computing*, 34(3):553–579, 2005.

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[126] Growing a spanning tree of a graph. IMPA Probability and Combinatorics Seminar, February 2017.

[127] Turán-type theorems for triangles in convex point sets. Shonan-Village Meeting on Geometric Optimization, May 2016.

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[129] Encoding arguments. Probability, Combinatorics, and Geometry: Ninth Annual Workshop, April 2014.

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[131] On the expected maximum degree in Yao graphs. Dagstuhl Seminar on Geometric Networks, Metric Space Embeddings and Spatial Data Mining, November 2009.

[132] Randomized algorithms I, II, and III. New Zealand Institute of Mathematics and its Applications. Programme in Algorithmics, December 2008. .

[133] Distribution-sensitive point location. Sydney Theory Day, May 2008.

[134] Algorithms for zonoids. East Coast Combinatorial Conference (ECCC 2007), April 2007.

[135] Disctribution-sensitive point location in convex subdivisions. Algorithms Seminar, McGill University, December 2006.

[136] An optimal algorithm for d-variate zonoid depth. Algorithms Seminar, Université Libre de Bruxelles, October 2006.

[137] Recent results on data depth and outlier removal in 2d. Radcliffe Institute Seminar on Computational Aspects of Statistical Data Depth Analysis, Cambridge, MA, USA, July 2006.

[138] Centerpoint theorems for wedges. Japan Workshop on Discrete and Computational Geometry, Kanezawa, Japan, May 2005.

[139] Realizing partitions respecting full and partial order information. UPC Computational Geometry Seminar, May 2005.

[140] Computing the center of area of a convex polygon. DIMACS Workshop on Data Depth: Robust Multivariate Analysis, Computational Geometry and Applications, May 2003.

[141] Output-sensitive algorithms for computing nearest-neighbour decision boundaries. MITACS Workshop on Facility Location, Ottawa, Canada, May 2003.

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[146] Progressive TINs: Algorithms and applications. Max-Planck-Institut für Informatik, August 1997.

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