

Mario A. Lopez

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Research Interests

Computational geometry, algorithms and data structures, geographic information systems, computational and mathematical music theory, mathematics education.

Education

- 1991 Ph.D., Computer Science, University of Minnesota, Minneapolis, Minnesota.
- 1987 M.S., Computer Science, University of Minnesota, Minneapolis.
- 1980 B.A., Mathematics, University of Wisconsin, Madison.
- 1980 B.A., Computer Science, University of Wisconsin, Madison.
- 1980 B.A., Statistics, University of Wisconsin, Madison.

Employment

- 2011–now John Evans Distinguished Professor, University of Denver.
- 2007–now Professor, Mathematics, University of Denver.
- 2005–now Professor, Computer Science, University of Denver.
- 2001–2005 Associate Professor, Computer Science, University of Denver.
- 1997–2001 Associate Professor, Mathematics and Computer Science, University of Denver.
- 1991–1997 Assistant Professor, Mathematics and Computer Science, University of Denver.
- 1990–1991 Research Assistant, Geometry Center, Supercomputer Institute, Minneapolis, Minnesota.
- 1989–1990 Research Assistant, Computer Science, University of Minnesota, Minneapolis, Minnesota.
- 1986–1989 Teaching Assistant, Computer Science, University of Minnesota, Minneapolis, Minnesota.
- 1980–1985 Professor, Mathematics and Engineering, Central American University (UCA), San Salvador, El Salvador.
- 1983–1985 Director of Software Development, Computing Center, Central American University (UCA), San Salvador, El Salvador.
- 1980–1983 Systems Analyst, Computing Center, Central American University (UCA), San Salvador, El Salvador.

Honors and Awards

- 2011 University of Denver, John Evans Distinguished Professorship. (Note: The basis for selection is the attainment of national and international distinction for outstanding research or other creative or scholarly achievement that has significantly benefited the candidate's field.)
- 2005 University of Denver, School of Engineering and Computer Science, Outstanding Scholar Award.
- 1998 Colorado Advanced Software Institute, Outstanding Researcher Award.
- 1992 ACM-SIGGRAPH Educator's Award.
- 1988 Departmental Award for exceptional performance on PhD.D. qualifying exams.
- 1987 The Honor Society of Phi Kappa Phi, member.
- 1979 Phi Beta Kappa Honor Society, member.

Research Grants

- 2015-2017 Combinatorial Aspects of Sensor Networks (with P. Horn), \$29,479, Professional Research Opportunities for Faculty, University of Denver.
- 2012-2015 Kids Play Math: Primary School Mathematics Education and Teacher Training (with A. Arias, J. Farmer), \$500,000, Toyota USA Foundation.
- 2011-2013 Creating Engaging Environments to Teach Pre-Algebra Mathematics to Elementary Students (with A. Arias, M. Salazar, L. Agans), \$60,000, Interdisciplinary Research Fund, University of Denver.
- 2009-2011 Performing Random Walks in Parallel with Applications to Astrophysics (with J. Hoffman, F. Latremoliere), \$23,768, Professional Research Opportunities for Faculty, University of Denver.
- 2008-2011 Enhancing Early Mathematics Learning and Assessment Via Computer Games (with A. Arias, J. Farmer), \$894,075, U.S. Department of Health and Human Services.
- 2005-2007 An Interactive System for Improving Music Reading Skills (with R. Iznola), \$39,600, Center for Teaching and Learning, University of Denver
- 2001-2005 Polyhedral Approximation and Other Computational Aspects of Geometric Problems, \$158,000, National Science Foundation.
- 2002-2003 An Interdisciplinary Course in Geography and Computer Science, \$23,000, Center for Teaching and Learning, University of Denver
- 1997-2000 Geometric Techniques for Multidimensional Databases (with S. Leutenegger), \$333,743, National Science Foundation.
- 1996-1999 Computational Aspects of Problems in Convex Geometry (with S. Reisner), \$63,901, National Science Foundation.
- 1996-1998 Efficient Access Methods for Multidimensional Data (with S. Leutenegger), \$74,825, Colorado Advanced Software Institute.
- 1996-1997 An Efficient Geometric Engine for CAD Tools, \$26,602, Colorado Advanced Software Institute. Selected for Outstanding Researcher Award by a consortium of Colorado industries and universities for work on this grant.
- 1993-1994 Scheduling Software for a Space Module, \$23,215, National Aeronautics and Space Administration (NASA).

Publications

- *A Decentralized Geometric Approach for Formation Keeping in Unmanned Aircraft Navigation*, with S. Bereg, J. Díaz, T. Rozario, K. Valavanis. Proc. IEEE International Conference on Unmanned Aircraft Systems, 989-997, 2015.
- *The Synchronization Problem for Information Exchange Between Aerial Robots Under Communication Constraints*, with S. Bereg, E. Caraballo, J. Díaz, I. Maza, A. Ollero. Proc. IEEE International Conference on Robotics and Automation, 4650-4655, 2015.
- *Drawing the Double Circle on a Grid of Minimum Size*, with S. Bereg, R. Fabila-Monroy, D. Flores-Peñaloza, P. Pérez-Lantero. International Journal of Computational Geometry and Applications, 24(3):247-258, 2014.
- *Continuous Surveillance of Points by Rotating Floodlights*, with S. Bereg, J. Díaz, M. Fort, P. Pérez-Lantero, J. Urrutia, International Journal of Computational Geometry and Applications, 24(3):183-196, 2014.
- *Optimizing Memory Access Patterns for Cellular Automata on GPUs*, with J. Balasalle and M. Rutherford. *GPU Computing Gems*, W. Hwu (editor), Morgan Kaufmann, 2012.
- *Fitting a Two-Joint Orthogonal Chain to a Point Set*, with J. Díaz-Bañez, C. Seara, I. Ventura. Computational Geometry: Theory and Applications, Vol. 44, No. 3, 135-147, 2011.
- *On Widest Empty Wedges*, with R. Cardona, Y. Mayster. Proc. of 26th European Workshop on Computational Geometry, Dortmund, Germany, 221-224, 2010.
- *Locating an Obnoxious Line Through a Set of Weighted Points*, with M. Albow, C. Durso, Y. Mayster. Proc. of 26th European Workshop on Computational Geometry, Dortmund, Germany, 217-220, 2010.
- *Fitting a Point Set by Small Monotone Orthogonal Chains*, with J. Díaz-Bañez, C. Seara, I. Ventura. Proc. of 25th European Workshop on Computational Geometry, Brussels, Belgium, 69-72, 2009.
- *Noisy Road Network Matching*, with Y. Diez, J. Sellarès. Geographic Information Science, Lecture Notes in Computer Science, Vol. 5266, 38-54, 2008.
- *Hausdorff Approximation of 3D Convex Polytopes*, with S. Reisner. Information Processing Letters, Vol. 107, 76-82, 2008.
- *Weighted Rectilinear Approximation of Points in the Plane*, with Y. Mayster. Lecture Notes in Computer Science, Vol. 4957, 642-653, 2008.
- *Approximating a Set of Points by a Step Function*, with Y. Mayster. Journal of Visual Communication and Image Representation, Vol. 17, 1178-1189, December 2006.

- *A Network-Based Indexing Method for Trajectories of Moving Objects*, with K. Kim, K.-J. Li, S. Leutenegger. *Advances in Information Systems, Lecture Notes in Computer Science*, Vol. 4243, 344-353, 2006.
- *Building a Game Development Program*, with L. Argent, B. Depper, R. Fajardo, S. Gjertson, S. Leutenegger, J. Rutenbeck. *IEEE Computer*, Vol. 39, No. 6, 52-60, June 2006.
- *On finding a Widest Empty 1-Corner Corridor*, with J. Díaz-Bañez and J. Sellarès. *Information Processing Letters*, Vol. 98, No. 5, 199-205, 2006.
- *Locating an Obnoxious Plane*, with J. Díaz-Bañez and J. Sellarès. *European Journal of Operations Research*, Vol. 173, No. 2, 556-564, 2006.
- *Rectilinear Approximation of a Set of Points in the Plane*, with Y. Mayster. *Lecture Notes in Computer Science*, Vol. 3887, 715-726, 2006.
- *Hausdorff Approximation of Convex Polygons*, with S. Reisner. *Computational Geometry Theory and Applications*, Vol. 32, No. 2, 139-158, 2005.
- *R-trees*, with S. Leutenegger. In *Handbook of Data Structures and Applications*, D. Mehta and S. Sahni (editors), CRC Press, Chap. 21, 1-23, 2005.
- *Optimal Projections Onto Grids and Finite Resolution Images*, with J.M. Díaz, F. Hurtado, J. Sellarès. *Journal of Visual Communication and Image Representation*, Vol. 16, No. 3, 233-249, 2005.
- *Fast Pursuit of Mobile Nodes Using TPR Trees*, with D. Mehta and S. Idwan. *International Journal on Foundations of Computer Science*, Vol. 15, No. 5, 753-772, 2004.
- *Computing Largest Empty Slabs*, with with J.M. Díaz-Bañez and J.A. Sellarès. *Lecture Notes in Computer Science*, Vol. 3046, 99-108, 2004.
- *Efficient Declustering of Non-uniform Multidimensional Data Using Hilbert Curves*, with H.-C. Kim, S. Leutenegger, K.-J. Li. *Lecture Notes in Computer Science*, Vol. 2973, 694-707, 2004.
- *Optimal Coverage Paths in Ad-Hoc Sensor Networks*, with D. Mehta. *Proc. IEEE 38th International Conference on Communications*, Anchorage, Alaska, 507-511, May 2003.
- *Optimal Point Set Projections Onto Regular Grids*, with J.M. Díaz, F. Hurtado, J. Sellarès. *Proc. 14th International Symposium on Algorithms and Computation*. *Lecture Notes in Computer Science*, Vol. 2906, 270-279, 2003.
- *What Would Happen If You Ironed Out Colorado*, with P. Sutton. *GeoWorld*, Vol. 59, March 2003.
- *Linear Time Approximation of 3D Convex Polytopes*, with S. Reisner. *Computational Geometry: Theory and Applications*, Vol. 23, 291-301, October 2002.

- *Analysis of Half-Space Range Search Using k -dimensional Search Skip Lists*, with B.G. Nickerson. Proc. 14th Canadian Conference on Computational Geometry, Lethbridge, Canada, 58-62, 2002.
- *Constrained Polygon Transformations during Incremental Floorplanning*, with S. Liao and D. Mehta. ACM Transactions on Design Automation of Electronic Systems, Vol. 6, 322-342, July 2001.
- *High Dimensional Similarity Search With Space Filling Curves*, with S. Liao and S.T. Leutenegger. Proc. of the 18th International Conference on Data Engineering (ICDE), Heidelberg, Germany, 615-622, 2001.
- *Efficient Approximation of Convex Polygons*, with S. Reisner. International Journal of Computational Geometry and Applications, Vol. 10, No. 5, 445-452, October 2000.
- *A Mechanism to Detect Changing Access Patterns and Automatically Migrate Distributed Multidimensional Data*, with S. Leutenegger and R. Sheykhiet. Proc. of 8th ACM Symposium on Advances in Geographic Information Systems, 147-152, 2000.
- *Finding k -Closest Pairs Efficiently for High Dimensional Data*, with S. Liao. Proc. 12th Annual Canadian Conference on Computational Geometry, 197-204, August 2000.
- *Indexing the Positions of Continuously Moving Objects*, with S. Saltenis, C. Jensen, S. Leutenegger. Proc. of 19th ACM International Conference on Management of Data (SIGMOD), Dallas, Texas, 331-342, May 2000.
- *The Effect of Buffering on the Performance of R-Trees*, with S. Leutenegger. IEEE Transactions on Knowledge and Data Engineering, Vol. 12, No. 1, 33-44, January 2000.
- *Geometric Computation of Value Set Boundaries*, with J. Cockburn, Proceedings of the American Control Conference, 4326-4330, 2000.
- *Algorithms for Polyhedral Approximation of Multidimensional Ellipsoids*, with S. Reisner. Journal of Algorithms, Vol. 33, No. 1, 140-165, October 1999.
- *Post-optimization and Incremental Refinement of R-trees*, with Y. Garcia and S. Leutenegger. Proc. 7th ACM Symposium on Advances in Geographic Information Systems, 91-96, November 1999.
- *Geometric Computation of Value Set Contours of Affine Uncertain Systems*, with J.C. Cockburn. Proc. of European Control Conference, August 1999.
- *A Special Case of Mahler's Conjecture*, with S. Reisner. Discrete and Computational Geometry, Vol. 20, 163-177, September 1998.
- *A Greedy Algorithm for Bulk Loading R-Trees*, with Y. Garcia and S. Leutenegger. Proc. 6th International Symposium on Advances in Geographic Information Systems, 163-164, Nov. 1998.

- *On Optimal Node Splitting for R-trees*, with Y. Garcia and S. Leutenegger. Proceedings of 24th International Conference on Very Large Data Bases, New York, 334-344, 1998.
- *STR: A Simple and Efficient Algorithm for R-Tree packing*, with S. Leutenegger and J. Edgington. Proc. 13th Int'l. Conference on Data Engineering, Birmingham, U.K., 497-506, April 1997.
- *Efficient Net Extraction for Restricted Orientation Designs*, with S. Sahni and R. Janardan. IEEE Transactions on Computer Aided Design, Vol. 15, No. 9, 1151-1159, September 1996.
- *Efficient Decomposition of Polygons into L-shapes with Applications to VLSI Layout*, with D. Mehta. ACM Trans. on Design Automation of Electronic Systems, Vol. 1, No. 3, 371-395, 1996.
- *A Buffer Model for Evaluating R-tree Performance*, with S. Leutenegger, Proceedings of ACM Sigmetrics, Philadelphia, PA, 264-265, 1996.
- *Partitioning Algorithms for Corner Stitching*, with D. Mehta, Proc. of 6th Great Lakes Symposium on VLSI, 200-205, March 1996.
- *On Computing Connected Components of Line Segments*, with R. Thurimella, IEEE Transactions on Computers, Vol. 44, No. 4, 593-601, April 1995.
- *A Class of Static and Dynamic Hierarchical Interconnection Networks*, with P. Breznay, Proceedings of International Conference on Parallel Processing, Chicago, IL, 59-62, 1994.
- *Generalized Intersection Searching Algorithms*, with R. Janardan, International Journal of Computational Geometry and Applications, Vol. 3, No. 1, 39-69, 1993.
- *A Fast Algorithm for VLSI Net Extraction*, with S. Sahni and R. Janardan, Proceedings of IEEE/ACM International Conference on Computer-Aided Design, Santa Clara CA, 1993.
- *Tightly Connected Hierarchical Interconnection Networks for Parallel Processors*, with P. Breznay, Proc. International Conference on Parallel Processing, Chicago IL, 307-310, 1993.
- *An Approach To Measuring Data Structure Complexity*, with V. Rodriguez, W.T. Tsai, D. Volovik. Proc. IEEE 10th International Computer Software and Applications Conference, Chicago IL, 240-246, October 1986.