

# ERICK CANTÚ-PAZ

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## Education

1994-1999 Ph.D. in Computer Science  
University of Illinois at Urbana-Champaign

1989-1994 B.S. in Computer Engineering  
Instituto Tecnológico Autónomo de México

## Research Interests

Machine Learning, Data Mining, Genetic and Evolutionary Algorithms, Stochastic Optimization.

## Experience

### July 2005–present: Principal Scientist

*Yahoo! Inc.*

My work centered on click prediction for sponsored search. Click prediction is a major factor in ranking, placement, filtering, and pricing of ads. My individual contributions included creating training sets, regression models, evaluation methods, and writing production software to rank sponsored search listings. My contributions resulted in double-digit relative gains in metrics related to user satisfaction and revenue to Yahoo! (click through rates and revenue per search). Since January 2009 I lead the click prediction team, where I directed the work of a world-class team of scientists and engineers. My work has been recognized with a team Super Star award (the highest technical recognition at Yahoo!).

### August 1999–March 2005: Computer Scientist

*Lawrence Livermore National Laboratory*

My research focused on improving the accuracy and efficiency of machine learning algorithms and on applying them to scientific data from observations and simulations. I developed improved algorithms for induction of single decision trees, ensembles of decision trees, neural network pruning, and feature selection and ranking. I worked on practical applications of machine learning in diverse fields such as astronomy, plasma physics, remote sensing, and analysis of simulation data.

### August 1994–July 1999: Graduate Fellow

*University of Illinois at Urbana-Champaign.*

My research focused on the design of reliable, efficient, and scalable parallel genetic algorithms. I derived accurate models of expected solution quality, and analyzed the effects of communication on search quality and algorithmic cost. I used these findings to optimize three types of parallel genetic algorithms to reach the desired solutions using minimum time. Adviser: David E. Goldberg. An extended version of my thesis was published by Kluwer Academic Publishers.

### October 1998–July 1999: Graduate Research Assistant

*Beckman Institute, University of Illinois at Urbana-Champaign.*

Enhanced the effectiveness and efficiency of the genetic algorithm engine of a decision support tool that generates military maneuver plans.

### August 1997–July 1999: Student Laboratory Director

*Illinois Genetic Algorithms Laboratory, University of Illinois at Urbana-Champaign.*

Oversaw the daily operations of the lab, both physically and on the Internet. Supervised four undergraduate assistants and a system administrator. Developed and executed hardware and software upgrade plans. Interacted with visitors and industrial contacts.

### **January 1997–May 1998: Graduate Teaching Assistant**

*Department of Computer Science, University of Illinois at Urbana-Champaign.*

Taught Introduction to Computing with Applications to Business and Commerce. Conducted laboratory sessions and lectured occasionally. Acted as co-head TA for one year, coordinating the efforts of twelve graduate assistants and creating instructional material.

### **January 1994–July 1994: Lecturer**

*Instituto Tecnológico Autónomo de México, Mexico City.*

Developed the syllabus and taught a parallel programming laboratory for Computer Engineering undergraduates. Also taught Introduction to Computer Science to non-engineering majors.

### **January 1994–May 1994: Lecturer**

*Universidad Anáhuac del Sur, Mexico City.*

Taught a C programming class to engineering undergraduates.

## **Awards and Recognition**

Professional Merit Award, Instituto Tecnológico Autónomo de México, 2009; awarded annually to approximately 10 alumni with at least 15 years of professional experience.

Super Star Award. Yahoo! Inc., 2008 team award; this is the highest recognition in the company.

R&D Magazine Top 100 Award, 2006 team award for the Sapphire scientific data mining software.

Fellow, International Society for Genetic and Evolutionary Computation, one of five initial Fellows elected in 2003.

Executive Board Member, International Society for Genetic and Evolutionary Computation, elected in 2004.

Nominated for best paper (5 nominees out of 158 submissions), Genetic Algorithms track, Genetic and Evolutionary Computation Conference, 2004.

Nominated for best paper (5 nominees out of 160 submissions), Genetic Algorithms track, Genetic and Evolutionary Computation Conference, 2003.

Best paper (tie), Real World Applications, Genetic and Evolutionary Computation Conference, 2002.

Fulbright Graduate Fellowship, U.S. Information Agency, 1994-1998.

Graduate Scholarship, Consejo Nacional de Ciencia y Tecnología, México, 1994-1998.

Honorable Mention, Instituto Tecnológico Autónomo de México, 1994.

Academic Achievement Recognition, Mexican Society of Mechanical and Electrical Engineers, 1994.

## **Professional Activities**

### **Editorial Activities**

Associate Editor, *Journal of Heuristics*.

Editorial Board Member, *Computational Optimization and Applications*. 2000-2009.

Editorial Board Member, *Evolutionary Computation*.

Editorial Board Member, *Genetic Programming and Evolvable Machines*.

Editor (with F. Fernández), Special Issue on Parallel Bio-Inspired Algorithms, *Journal of Parallel and Distributed Computing*.

Editor (with J. Foster), Special Issue of Best-of-GECCO papers, *Genetic Programming and Evolvable Machines*.

Editorial Board Member, Evolutionary Computation Book Series, Instituto Politécnico Nacional, México.

Editor (with C. Coello), Special Issue on Genetic Algorithms, *Soluciones Avanzadas*, México, 2000.

## **Conference and Workshop Organization**

Program Chair, Genetic Algorithms track, Genetic and Evolutionary Computation Conference, 2005.  
Co-chair (with F. Fernández), Workshop on Parallel Bio-Inspired Algorithms, International Conference on Parallel Processing, 2005.  
Editor-in-Chief, Genetic and Evolutionary Computation Conference, 2003.  
General Chair, Genetic and Evolutionary Computation Conference, 2002.  
Co-Program Chair (with D. Goldberg) for Genetic Algorithms and Classifier Systems track, Genetic and Evolutionary Computation Conference, 2000.  
Co-chair (with W. Punch), Evolutionary Computation and Parallel Processing Workshop, 1999, 2000.  
Electronic Publicity Chair, Genetic and Evolutionary Computation Conference, July, 1999.

## **Conference Program Committees**

Congreso Español de Metaheurísticas, Algoritmos Evolutivos y Bioinspirados, 2003, 2004.  
Encuentro Internacional de Ciencias de la Computación, 2003.  
Parallel Problem Solving from Nature, 2002–2010.  
Congress on Evolutionary Computation, 2002, 2003, 2004.  
Frontiers in Evolutionary Algorithms, 2002, 2003.  
ACM Symposium on Applied Computing, 2005  
Primer Congreso Español de Algoritmos Evolutivos y Bioinspirados, 2002.  
International Conference on Machine Learning, 2001.  
Genetic and Evolutionary Computation Conference, 1999–2009.  
International Conference of the Chilean Computer Science Society, 2000.  
Workshop on Optimization by Building and Using Probabilistic Models, 2000, 2001.

## **Reviewer**

### **Journals**

Complex Systems  
Computación y Sistemas, Mexico  
Computational Optimization and Applications  
Computer Methods in Applied Mechanics and Engineering  
Computers and Operations Research  
Evolutionary Computation (MIT Press)  
Genetic Programming and Evolvable Machines  
IEE Proceedings on Vision, Image and Signal Processing  
IEEE Transactions on Evolutionary Computation  
IEEE Transactions on Systems, Man, and Cybernetics, Part B  
Information Processing Letters  
Informs Journal on Computing  
Journal of Applied Intelligence  
Journal of Artificial Intelligence Research  
Journal of Heuristics  
Journal of the Information Processing Society of Japan  
Journal of Machine Learning Research  
Journal of Parallel and Distributed Computing  
Knowledge and Information Systems  
Neurocomputing  
The Computer Journal

## Funding Agencies

Austrian Science Fund  
National Aeronautics and Space Administration  
National Science Foundation  
Natural Sciences and Engineering Research Council of Canada  
Swiss National Science Foundation  
University Grants Committee, Hong Kong

## Memberships

Member (Fellow in 2003), International Society of Genetic and Evolutionary Computation, 2000–present.  
I was one of five architects of the transformation of ISGEC into SIGEVO, an ACM Special Interest Group on Evolutionary Computation.  
Member, ACM, 1994–present.  
Member, IEEE and the IEEE Computer Society, 1999–present.  
Member, INFORMS, 2005.  
Chair of the Council of Authors, ISGEC, elected in 2001, served until 2004.  
Executive Board Member, ISGEC, elected in 2004–present.

## Other

Co-instructor, Short Course on Genetic Algorithms, Caterpillar, February 9, 1999.  
Co-instructor, Short Course on Genetic Algorithms, MW Soft, December 1–4, 1998.

## Invited Talks

- 25 October 2004** “Feature Subset Selection with Genetic Algorithms,” INFORMS Annual Meeting, Denver, CO.
- 7 November 2003** “Árboles, hormigas, y otras curiosidades,” Instituto Tecnológico Autónomo de México, Mexico City, México.
- 3 September 2003** “Algoritmos Evolutivos y Aprendizaje Automático,” Universidad de Extremadura, Mérida, Spain.
- 13 July 2003** “Parallel Genetic Algorithms,” Tutorial at GECCO 2003, Chicago, IL.
- 28 May 2003** “Aplicaciones de Algoritmos Genéticos a Aprendizaje Automático,” Keynote at Congreso Mexicano de Computación Evolutiva. Guanajuato, México.
- 7 August 2002** “Problem Solving with Evolutionary Algorithms,” Lecture at Internships in Terascale Simulation Technology Program, LLNL.
- 10 July 2002** “Introduction to Parallel Genetic Algorithms,” Tutorial at GECCO 2002, New York, NY.
- 8 February 2002** “Algoritmos Genéticos Paralelos,” Keynote at Primer Congreso Español de Algoritmos Evolutivos y Bioinspirados. Mérida, Spain.
- 8 August 2001** “Sapphire: Mining Scientific Datasets,” Joint Statistical Meetings, Atlanta, GA.
- 8 July 2001** “Introduction to Parallel Genetic Algorithms,” Tutorial at GECCO 2001, San Francisco, CA.
- 14 November 2000** “Computación Evolutiva,” Jornadas Chilenas de Computación. Santiago, Chile.
- 10 December 1999** “Introduction to Parallel Genetic Algorithms,” Genetic Algorithms Day, Department of Mathematics, City College of New York, NY.

**14 July 1999** "Analysis, Design, and Implementation of Parallel Genetic and Evolutionary Algorithms," Tutorial at GECCO 1999, Orlando, FL.

**19 March 1999** "Recent Results in Parallel Genetic Algorithms," Illinois Working Group in Genetic and Evolutionary Computation Seminar, Urbana, IL.

**3 March 1999** "Parallel Genetic Algorithms," Physics Division Colloquium, Argonne National Laboratory, Argonne, IL.

## Patents

Cantú-Paz, E. Adaptive User Feedback Window. Patent application.

LuVogt, C., Cantú-Paz, E. Dynamic Layout for a Search Engine Results Page Based of Implicit User Feedback. Patent application.

Wu, S., Cantú-Paz, E., Leggetter, C., System and Method for Internet Marketing by Endorsements. Patent application.

Carson, C., Kannan, A., Cantú-Paz, E., Iyer, R., Subasic, P., LuVogt, C., Leggetter, C., Pedersen, J., Ku, D. System and method for generating functions to predict the clickability of advertisements. US Patent 7631008. Issued December 8, 2009.

Cantú-Paz, E., Kamath, C. Creating ensembles of oblique decision trees with evolutionary algorithms and sampling. US Patent 7062504. Issued Jun 13, 2006.

Kamath, C., Cantú-Paz, E. Parallel object-oriented decision tree system. US Patent 7007035 Issued Feb 28, 2006.

Kamath, C., Cantú-Paz, E. Generating ensembles of decision trees by sampling data instances at each node of the tree. US Patent 6938049. Issued Aug 30, 2005.

Kamath, C., Cantú-Paz, E., Littau, D. Using histograms to introduce randomization in the generation of ensembles of decision trees. US Patent 6,859,804. Issued Feb 22, 2005.

Kamath, C., Cantú-Paz, E. Parallel object-oriented data mining system. US Patent 6,675,164. Issued Jan, 06, 2004.

## Publications

### Book

Cantú-Paz, E. (2000). *Efficient and Accurate Parallel Genetic Algorithms*, Boston, MA: Kluwer Academic Publishers.

### Edited Books

Fernández, F. and E. Cantú Paz (Editors). *Parallel and Distributed Bio-Inspired Algorithms*. Berlin: Springer Verlag, 2010.

M. Pelikan, K. Sastry, and E. Cantú-Paz (Editors). *Scalable Optimization via Probabilistic Modeling: From Algorithms to Applications*. Berlin: Springer Verlag, 2006.

E. Cantú-Paz, Foster, J.A., Deb, K., Davis, D., Roy, R., O'Reilly, U.-M., Kendall, G., Standish, R., Beyer, H.-G., Wilson, S., Harman, M., Wegener, J., Dasgupta, D., Schultz, A.C., Potter, M.A., Jonoska, N., Dowsland, K.A., Miller, J. (Editors). *GECCO-2003: Proceedings of the Genetic and Evolutionary Computation Conference*, Berlin: Springer Verlag, 2003.

W. B. Langdon, E. Cantú-Paz, K. Mathias, R. Roy, D. Davis, R. Poli, K. Balakrishnan, V. Honavar, G. Rudolph, J. Wegener, L. Bull, M. A. Potter, A. C. Schultz, J. F. Miller, E. Burke, N. Jonoska (Editors). *GECCO-2002: Proceedings of the Genetic and Evolutionary Computation Conference*, San Francisco, CA: Morgan Kaufmann Publishers, 2002.

Whitley, D., Goldberg, D. E., Cantú-Paz, E., Spector, L., Parmee, I., and Beyer, H.-G. (Eds.) *GECCO-2000: Proceedings of the Genetic and Evolutionary Computation Conference*. San Francisco, CA: Morgan Kaufmann.

## Journal Articles

Cantú-Paz, E. and Kamath, C. (2005). An empirical comparison of combinations of evolutionary algorithms and neural networks for classification problems. *IEEE Transactions on System, Man, and Cybernetics, Part B*. 35(5), 915–927.

Cantú-Paz, E. and Kamath, C. (2003). Evolving neural networks to identify bent-double galaxies in the FIRST survey. *Neural Networks*. 16(3-4), 507–517.

Cantú-Paz, E. and Kamath, C. (2003). Inducing oblique decision trees with evolutionary algorithms. *IEEE Transactions on Evolutionary Computation*. 7(1), 54–68.

Kamath, C., Cantú-Paz, E., Fodor, I.K. and N. Tang (2002). Classifying bent-double galaxies. *IEEE Computing in Science and Engineering*. 4(4), 52–60.

Cantú-Paz, E. (2002). Order statistics and selection methods of evolutionary algorithms. *Information Processing Letters*. 82(1), 15–22.

Cantú-Paz, E. (2001). Migration policies, selection pressure, and parallel evolutionary algorithms. *Journal of Heuristics*, 7(4), 311–334.

Cantú-Paz, E. (2000). Markov chain models of parallel genetic algorithms. *IEEE Transactions on Evolutionary Computation*, 4(3), 216–226.

Cantú-Paz, E. and Goldberg, D.E. (2000). Parallel genetic algorithms: theory and practice. *Computer Methods in Applied Mechanics and Engineering*, 186, 221–238.

Pelikan, M., Goldberg, D.E., and Cantú-Paz, E. (2000). Linkage problem, distribution estimation, and Bayesian networks. *Evolutionary Computation*, 8(3), 311–340.

Cantú-Paz, E. and Goldberg, D.E. (1999) On the scalability of parallel genetic algorithms. *Evolutionary Computation*, 7(4), 429–449.

Harik, G., Cantú-Paz, E., Goldberg, D.E., and Miller, B. (1999). The gambler's ruin problem, genetic algorithms, and the sizing of populations. *Evolutionary Computation*, 7(3), 231–253.

Cantú-Paz, E. (1998). A survey of parallel genetic algorithms. *Calculateurs Parallèles, Réseaux et Systems Repartis*, 10(2), 141–171.

## Book Chapters

Cantú-Paz, E. (2007). Parameter setting in parallel genetic algorithms. In F. Lobo, C. F. Lima, Z. Michalewicz (Eds.), *Parameter Setting in Evolutionary Algorithms*, pp. 259–276, Berlin: Springer Verlag.

Cantú-Paz, E. (2005). Theory of parallel genetic algorithms. In Alba, E. (Ed.), *Parallel Metaheuristics*, Berlin: Springer Verlag.

Kamath, C., Cantú-Paz, E., Cheung, S., Fodor, I.K., Tang, N. (2005) Experiences in mining data from computer simulations. In Zurada, J. and Kantardzic, M. (Eds.), *New Generation of Data Mining Applications*, Wiley-IEEE Press.

- Cantú-Paz, E. and Kamath, C. (2002). On the use of evolutionary algorithms in data mining. In Abbass, H., Sarker, R., and Newton, C. (Eds.), *Data Mining: a Heuristic Approach*. pp. 48–71. Hershey, PA: IDEA Group Publishing.
- Kamath, C., Cantú-Paz, E., Fodor, I., and Tang, N. (2001). Searching for bent-double galaxies in the FIRST survey. In Grossman, R., Kamath, C., Kegelmeyer, W., Kumar, V., Namburu, R. (Eds.), *Data Mining for Scientific and Engineering Applications*. pp. 95–114. Boston, MA: Kluwer.
- Cantú-Paz, E. (2001). Genetic Algorithms. *Encyclopedia of Computers and Computer History*. Chicago, IL: Fitzroy Dearborn.
- Cantú-Paz, E. (1999). Implementing fast and flexible parallel genetic algorithms. In Chalmers, L. (Ed.), *Practical Handbook of Genetic Algorithms*. Volume III. pp. 65–84. Boca Raton, FL: CRC Press.

## Refereed Conferences

- Cheng, H. and Cantú-Paz, E. (2010). Personalized Click Prediction in Sponsored Search. *Third ACM International Conference on Web Search and Data Mining*. (pp. 351–360). New York: ACM Press.
- Cantú-Paz, E., Newsam, S., Kamath, C. (2004). Feature Selection in Scientific Applications. *International Conference on Knowledge Discovery and Data Mining*. (pp. 788–793). New York: ACM Press.
- Cantú-Paz, E. (2004). Feature Subset Selection, Class Separability, and Genetic Algorithms. In Deb, K. et al. (Eds.). *Genetic and Evolutionary Computation Conference – GECCO-2004*. (pp. 959–970). Berlin: Springer Verlag. **(One of five nominees for best paper award out of 158 submissions to the GA track.)**
- Cantú-Paz, E. (2004). Adaptive Sampling for Noisy Problems. In Deb, K. et al. (Eds.). *Genetic and Evolutionary Computation Conference – GECCO-2004*. (pp. 947–958). Berlin: Springer Verlag.
- Fernández de Vega, F., Cantú-Paz, E., López, J.I., Manzano, T. (2004). Saving Resources with Plagues in Genetic Algorithms, In Yao, X. et al. (Eds.) *Parallel Problem Solving from Nature—PPSN VIII*. (pp. 272–281). Berlin: Springer Verlag.
- Cantú-Paz, E. (2003). Pruning Neural Networks with Distribution Estimation Algorithms. In Cantú-Paz, E. et al. (Eds.). *Genetic and Evolutionary Computation Conference – GECCO-2003*. (pp. 790–800). Berlin: Springer Verlag.
- Cantú-Paz, E. and Goldberg, D. E. (2003). Are multiple runs of genetic algorithms better than one? In Cantú-Paz, E. et al. (Eds.). *Genetic and Evolutionary Computation Conference – GECCO-2003*. (pp. 801–812). Berlin: Springer Verlag. **(One of five nominees for best paper award out of 160 submissions to the GA track.)**
- Cantú-Paz, E. (2002). Feature subset selection by estimation of distribution algorithms. In W. B. Langdon et al. (Eds.). *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2002)*. (pp. 303–310). San Francisco, CA: Morgan Kaufmann Publishers
- Cantú-Paz, E. (2002). On random numbers and the performance of genetic algorithms. In W. B. Langdon et al. (Eds.). *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2002)*. (pp. 311–318). San Francisco, CA: Morgan Kaufmann Publishers
- Cantú-Paz, E. and Kamath, C. (2002). Evolving neural networks for the classification of galaxies. In W. B. Langdon et al. (Eds.). *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2002)*. (pp. 1019–1026). San Francisco, CA: Morgan Kaufmann Publishers **(Winner of best-paper award, real world applications track)**
- Kamath, C., Cantú-Paz, E., and Littau, D. (2002). Approximate Splitting for Ensembles of Trees using Histograms. In *Proceedings of the Second SIAM International Conference on Data Mining (SDM'2002)*.
- Kirshner, S., Cadez, I.V., Smyth, P., Kamath, C., and Cantú-Paz, E. (2002). Probabilistic model-based detection of bent-double radio galaxies. *International Conference on Pattern Recognition*.

- Cantú-Paz, E. (2001). Single vs. multiple runs under constant computation cost. In L. Spector et al. (Eds.) *GECCO-2001: Proceedings of the Genetic and Evolutionary Computation Conference*. San Francisco, CA: Morgan Kaufmann. (poster presentation)
- Cantú-Paz, E. (2000). Selection intensity in genetic algorithms with generation gaps. In Whitley, D., Goldberg, D. E., Cantú-Paz, E., Spector, L., Parmee, I., and Beyer, H.-G. (Eds.), *GECCO-2000: Proceedings of the Genetic and Evolutionary Computation Conference*. (pp. 911–918). San Francisco, CA: Morgan Kaufmann.
- Cantú-Paz, E. and Kamath, C. (2000). Using evolutionary algorithms to induce oblique decision trees. In Whitley, D., Goldberg, D. E., Cantú-Paz, E., Spector, L., Parmee, I., and Beyer, H.-G. (Eds.), *GECCO-2000: Proceedings of the Genetic and Evolutionary Computation Conference*. (pp. 1053–1060). San Francisco, CA: Morgan Kaufmann.
- Pelikan, M., Goldberg, D.E., and Cantú-Paz, E. (2000). Bayesian Optimization Algorithm, population size, and time to convergence. In Whitley, D., Goldberg, D. E., Cantú-Paz, E., Spector, L., Parmee, I., and Beyer, H.-G. (Eds.), *GECCO-2000: Proceedings of the Genetic and Evolutionary Computation Conference*. (pp. 275–282). San Francisco, CA: Morgan Kaufmann.
- Cantú-Paz, E. (1999). Migration policies and takeover times in genetic algorithms. In Banzhaf, W., Daida, J., Eiben, A. E., Garzon, M. H., Honavar, V., Jakiela, M., & Smith, R. E. (Eds.), *GECCO-99: Proceedings of the Genetic and Evolutionary Computation Conference*. (p. 775). San Francisco, CA: Morgan Kaufmann.
- Cantú-Paz, E. (1999). Topologies, migration rates, and multi-population parallel genetic algorithms. In Banzhaf, W., Daida, J., Eiben, A. E., Garzon, M. H., Honavar, V., Jakiela, M., & Smith, R. E. (Eds.), *GECCO-99: Proceedings of the Genetic and Evolutionary Computation Conference*. (pp. 91–98). San Francisco, CA: Morgan Kaufmann.
- Pelikan, M., Goldberg, D.E., and Cantú-Paz, E. (1999). BOA: The Bayesian optimization algorithm. In Banzhaf, W., Daida, J., Eiben, A. E., Garzon, M. H., Honavar, V., Jakiela, M., & Smith, R. E. (Eds.), *GECCO-99: Proceedings of the Genetic and Evolutionary Computation Conference*. (pp. 525–532). San Francisco, CA: Morgan Kaufmann.
- Cantú-Paz, E. (1998). Using Markov chains to analyze a bounding case of parallel genetic algorithms. In Koza, J., Banzhaf, W., Chellapilla, K., Deb, K., Dorigo, M., Fogel, D., Garzon, M., Goldberg, D. E., Iba, H. & Riolo, R. (Eds.), *Genetic Programming: Proceedings of the Third Annual Conference*. (pp. 456-462). San Francisco, CA: Morgan Kaufmann.
- Cantú-Paz, E. (1998). Designing efficient master-slave parallel genetic algorithms. In Koza, J., Banzhaf, W., Chellapilla, K., Deb, K., Dorigo, M., Fogel, D., Garzon, M., Goldberg, D. E., Iba, H. & Riolo, R. (Eds.), *Genetic Programming: Proceedings of the Third Annual Conference*. (pp. 455). San Francisco, CA: Morgan Kaufmann. (poster presentation)
- Harik, G., Cantú-Paz, E., Goldberg, D.E., and Miller, B. (1997). The gambler's ruin problem, genetic algorithms, and the sizing of populations. In Bäck, T. (Ed.), *Proceedings of the IEEE International Conference on Evolutionary Computation*. (pp. 7-12). New York, NY: IEEE Press.
- Cantú-Paz, E., & Goldberg, D. E. (1997). Modeling idealized bounding cases of parallel genetic algorithms. In Koza, J., Deb, K., Dorigo, M., Fogel, D., Garzon, M., Iba, H., & Riolo, R. (Eds.), *Genetic Programming 1997: Proceedings of the Second Annual Conference* (pp. 353–361). San Francisco, CA: Morgan Kaufmann Publishers.
- Cantú-Paz, E., & Goldberg, D. E. (1997). Predicting speedups of idealized bounding cases of parallel genetic algorithms. In Bäck, T. (Ed.), *Proceedings of the Seventh International Conference on Genetic Algorithms* (pp. 113–121). San Francisco: Morgan Kaufmann.
- Cantú-Paz, E. and Mejía Olvera, M. (1994). Experimental results on distributed genetic algorithms. In *Proceedings of the Second International Symposium on Applied Corporate Computing*. (pp. 99–107). Monterey, México.

Mejía Olvera, M. and Cantú-Paz, E. (1994) DGENESIS—Software para la ejecución de algoritmos genéticos distribuidos. In *Memorias de la XX Conferencia Latinoamericana de Informática* (pp. 935–946). Atizapán de Zaragoza, México. (In Spanish)

## Other Publications

Cantú-Paz, E., Cheung, S.-C., and Kamath, C. (2004), Retrieval of Similar Objects in Simulation Data Using Machine Learning Techniques, *Proceedings of SPIE*. Vol. 5298. Image Processing: Algorithms and Systems III. E. R. Dougherty, J. T. Astola, K. O. Egiazarian, Eds. (pp. 251–258). San Jose, CA.

Kamath, C. and Cantú-Paz, E. (2002). Classification of bent-double galaxies: experiences with ensembles of decision trees. In *Proceedings of the Fifth International Workshop on Mining Scientific Datasets*. (held in conjunction with the Second SIAM International Conference on Data Mining.)

Cantú-Paz, E. (2001). Supervised and unsupervised discretization methods for evolutionary algorithms. In *Workshop on Optimization by Building and Using Probabilistic Models at GECCO 2001*. (pp. 213–216). San Francisco, CA.

Kamath, C. and Cantú-Paz, E. (2001). Creating ensembles of decision trees by randomizing the decision at a node. Signal and Imaging Sciences Workshop, Lawrence Livermore National Laboratory, November 19–20, 2001.

Kamath, C., Cantú-Paz, E., Fodor, I.K., Tang, N. (2001). Using data mining techniques to find bent-double radio galaxies in the FIRST survey. *Proceedings of SPIE*. Vol. 4477. Astronomical Data Analysis, J.-L. Starck, F.D. Murtagh, Eds. (pp. 11–19). San Diego, CA.

Cantú-Paz, E., Kamath, C. (2001). Creating ensembles of decision trees through sampling. *Interface: Computer Science and Statistics*. Volume 34.

Cantú-Paz, E. and Kamath, C. (2000). Combining evolutionary algorithms with oblique decision trees to detect bent double galaxies. In *Proceedings of SPIE*. Vol. 4120. Applications and Science of Neural Networks, Fuzzy Systems, and Evolutionary Computation III, B. Bosacchi, D. B. Fogel, J. C. Bezdek, Eds. (pp. 63–71). San Diego, CA.

Cantú-Paz, E. (2000). On the effects of migration on the fitness distribution of parallel evolutionary algorithms. In *Workshop on Evolutionary Computation and Parallel Processing at GECCO-2000*. (pp. 3–6). Las Vegas, NV.

Kamath, C., Cantú-Paz, E. (2000) On the design of a parallel object-oriented data mining toolkit. In *Workshop on Distributed and Parallel Knowledge Discovery at KDD-2000*. Boston, MA.

Fodor, I., Cantú-Paz, E., Kamath, C., and Tang, N. (2000). Finding Bent-Double Radio Galaxies: A Case Study in Data Mining. *Interface: Computer Science and Statistics*. Volume 33. New Orleans, LA.

Cantú-Paz, E. (1999). Migration policies, selection pressure, and parallel evolutionary algorithms. In Brave, S., Wu, A. (Eds.) *Late Breaking Papers at the Genetic and Evolutionary Computation Conference*. Orlando, FL.

Cantú-Paz, E. and Mejía Olvera, M. (1995). Algoritmos genéticos paralelos. *Soluciones Avanzadas*, 3(17). 12–19.