Documentation in Support of The Candidacy
For Tenure and Promotion to Associate Professor

Teaching, Scholarship, and Service
2003 – 2011

Martine Ceberio

Department of Computer Science
The University of Texas at El Paso
500 West University Avenue
El Paso, Texas 79968-0518, USA

Executive Summary

I have been an assistant professor for almost 8 years: 1 year as a visiting assistant professor, and 7 years as a tenure-track assistant professor (including a 2-year extension of my probationary period due to the birth of my two children and care of a family member for illness). Over these 8 years, I have pursued my goals of excellence in teaching and in research while establishing leadership and providing service to my community. I aimed at grooming the next generation of professionals for the challenges they will have to face and making science in my field progress, while serving the different communities I belong to and taking leadership roles in them. As a result, over the years, I have significantly polished and refined my style as a professor and contributed to my field as a researcher, both from the points of view of science and community (such as by chairing several international events, or by striving to bring researchers with common interests but usually different areas together). I have also taken part and led initiatives aiming at women-related issues: such as developing the pool of women joining engineering, and more specifically computer science, majors; leading the women's advisory council to the President at UTEP.

☐ Teaching

Over the last 8 years at UTEP, I have taught a number of classes: undergraduate- and graduate-level courses, CS (Computer Science) and MSIT (Master's of Science in Information Technology) courses. In particular, I have taught five core courses (two undergraduate courses, three graduate courses), one regularly offered elective course (artificial intelligence at both the undergraduate and graduate levels), and four special topics or topics in soft computing (undergraduate) / emerging programming paradigms (graduate).

Beyond training and mentoring students enrolled in my courses, I value mentoring and I dedicate a great part of my time to it. During my time at UTEP, I offered and taught over 10 independent study projects as an additional way to mentor students. Shortly after joining UTEP, I created the Constraint Reading and Research Group (CR2G): over the years, this group has gathered a total of four PhD students, eight Master's students, about 20 undergraduate students, and 15 high-school students.

☐ Research

My main drive in conducting research in computer science is to enhance decision-making processes: automating decisions while ensuring reliability of the process and the outcome. Most of the decisions I try to automate involve numerical models. The core of my research is in numerical constraint solving (NCS) and interval computations. My research interests mainly lie in the area of non-linear continuous constraint and optimization solving, along with the many applications of these.

During my probation period at UTEP, I received a total of $1,276,243 in federal funding, of which $596,092 as a PI of two NSF grants – one of which is an NSF CAREER grant, and additional funding from European grants. My efforts in acquiring funding have been consistent over the years, totalling over 25 submitted proposals. I have strived to impact through my research. Publishing my work has been a priority: I have published in peer-reviewed conference proceedings (30), in books as chapters (5), and in journals (15); I also participated and contributed abstracts and/or short papers in workshops. I value collaboration above all: I have worked with people across the world, e.g., in Japan (National Institute of Informatics), France (University of Nantes), Italy (University of Perugia), and across Colleges and departments at UTEP. My interdisciplinary collaborations have resulted in joint papers with researcher from departments of mathematics, biological sciences, geological sciences, and education, to name a few. I also always involved students in my work to catch any opportunity to train them and to teach them team-working first hand.

□ Service

I have consistently served on committees at UTEP, ranging from departmental to university-level committees. In particular, I have recently become chair of the Women's Advisory Council to the President (WAC) that has been putting the bulk of its efforts to making our campus family friendly. In addition, my involvement in my research community has been at many varied levels: from reviewer or program committee member for journals and many conferences, member of several NSF panels, conference chair, organizer of a number of conferences and workshops, to taking the lead in building a community of scientists and engineers interested in decision making, through the NSF-funded workshops CoProD and the popular community website constraintsolving.com. Finally, I value serving the local community and both implementing the access and excellence mission of UTEP and encouraging women to pursue computing careers. To this end, I have participated in a number of events in high-schools, at career fairs, science fairs, formal presentations, and I have worked towards including high-school students in my research, which I have been successful at over the last two years, now totalling a number of 15 high-school students (8 male / 7 female students).

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Part I

General Documents

Section 1

Curriculum Vitae

☐ **Chronology of Education**

Ph.D. May 2003, *Department of Computer Science, University of Nantes, France*

 Dissertation: "Contribution to numeric under and over-constrained CSPs: Symbolic Tools and Flexible Constraints"

 Advisors: Professors Frédéric Benhamou and Laurent Granvilliers

M.S. 1997, *Department of Computer Science, University of Nantes, France*

B.S. 1995, *Department of Mathematics, University of Poitiers, France*

☐ **Chronology of Employment**

August 2004 – Present

 Assistant Professor, *Computer Science Department, The University of Texas at El Paso, TX*

 ⋆ **Leaves:** 12 weeks in Summer 2007 and Spring 2009 (maternity leaves) and 6 weeks in Fall 2009 (medical leave)

 ⋆ **Probation period extensions:** 2-year extension (first granted in 2007, second in 2009, both for child birth)

August 2003 – August 2004

 Visiting Assistant Professor, *Computer Science Department, The University of Texas at El Paso, TX*

September 1999 – May 2003

 Student instructor, *Computer Science Department, University of Nantes, France*

☐ **Honors and Awards**

- Faculty Co-author of Best Student Paper Award (first place), NAFIPS'2011 Annual Conference, March 2011

- Faculty Marshall at UTEP's Spring 2011 Commencement

- Office of Research And Sponsored Projects Outstanding Performance Award, 2009-2010, for Outstanding Performance in Securing Extramural Funding

- NSF IMPACT Seminar Fellowship, UTEP 2006 – 2007

☐ **Service / Outreach**

☐ **Local / State Outreach**

- Summer 2011: **Faculty advisor** for two summer research projects for Early College High-School students at El Paso Community College.
- Summer 2011: **Faculty advisor** for four high-school students (3 from Da Vinci high school / 1 from Loretto Academy in El Paso) within the Nexus program at UTEP.
- April 2011: Presentation about career choices and computer science at the Young Women in Computing at New Mexico State University, Las Cruces.
- April 2011: judge at the Chapin High-School **Senior Project Symposium**.
- April 2011: **Career Fair** at Loretto Academy of El Paso (all-girls middle and high school).
- Summer 2010: **Faculty advisor** for a summer research project for Early College High-School students at El Paso Community College.
- Summer 2010: **Faculty advisor** for two high-school girls of Harmony Science Academy of El Paso, within the Nexus program at UTEP.
- April 2010: Presentation about career choices to **Early College High School Students** at El Paso Community College.
- Fall 2009, 2010: part of the **NCWIT local effort** (led by Dr. Steve Roach, UTEP) to engage high-school girls of El Paso to participate in the NCWIT Awards for Aspirations in Computing. Keynote speaker at the awards ceremony in Spring 2011 at UTEP.
- Fall 2009: Judge at the **Science Fair** of Harmony Science Academy (for elementary and middle schools), El Paso
- March 2007, 2008, 2010, 2011: **Career Expo** at Mitzi Bond Elementary School, El Paso.
- May 2008: Presentation at the **Extend Your Horizons** conference at UTEP.
- April 2008: **"Dia de los Niños"**. I helped the ACM chapter at UTEP to organize this event.
- May 2007: Presentation about Artificial Intelligence and Games at **Wiggs Middle School**, El Paso.
- I was invited in **May 2006**, by the association Proyecto Abel in **Ciudad Juarez, Mexico**, to give an invited talk to about twenty high-school students. I gave a 2-hour presentation in Spanish on the following topic: from Artificial Intelligence to Constraint Programming.

☐ **National / International Outreach**

– Member of **NAFIPS' board of directors**, since March 2011 (NAFIPS is the North American Fuzzy Information Processing Society)

– Webmaster of the **community website http://www.constraintsolving.com**.

– **Conference organization and chairing / Program committees**

 ∗ Program and general chair of the CoProD'08,'09,'10,'11 workshops (coprod.constraint-solving.com)

 ∗ Co-general chair and co-program chair of NAFIPS'2011 (nafips.cs.utep.edu), Co-general chair of SCAN'08, the 13th GAMM - IMACS International Symposion on Scientific Computing, Computer Arithmetic and Validated Numerics (scan2008.com)

 ∗ Co-organizer and member of the program committee of CPAIOR'09 workshop on Bound Reduction Techniques for Constraint Programming and Mixed-Integer Non-linear Programming (www.cs.utep.edu/mceberio/Research/br-cpaior09/)

 ∗ Program chair of the DSCP workshop at CP'05 on Distributed and Speculative Constraint Programming

 ∗ Co-chair of the RCA (Reliable Computing and their Applications) track at ACM SAC'05,'06 (Symposium on Applied Computing)

 ∗ Member of the program committee of the CSP track at SAC since 2005

 ∗ Member of the scientific committee of Virtual Concept 2005, international conference

 ∗ Member of the scientific committee of the international conference AMCS'05 (Algorithmic Mathematics and Computer Science)

– **Students**

 ∗ Supervised an undergraduate students from France for a project during a year at UTEP

 ∗ Was a external reviewer for the dissertation of a PhD candidate from the Indian Institute of Technology of Bombai, India (2009)

☐ **Department Committees**

– **Chair of the CS Colloquium committee** – since Sept. 2010

– **Advisor of the ACM chapter at UTEP** – since Sept. 2005

– Member of the **CS Faculty search committee** – Sept. 2010 - May 2011

– Member of the **CS Chair search committee** – Sept. 2008 - May 2009

– Member of the **CS Graduate committee** – since Sept. 2004

– Member of the **CS Facilities committee** – since Sept. 2005

– Member of the **CS Information Assurance committee** – since Sept. 2007

– In charge of the **department's course schedule**, under the lead of Ann Gates and later on Steve Roach – 2007 - spring 2010.

☐ **College Committees**

– Member of the **Civil Engineering Faculty search committee** – Sept. 2008 - May 2009

– Member of the working group on UTEP's **Key Strategic Direction** about enhancing students' success – Dec. 2005 - April 2006.

- Member of the working group on UTEP's **Key Strategic Direction** about research – Jan. 2005 - April 2005.
- Member of **UTEP's Integrated Curriculum group** – 2004.

☐ **University Committees**

- **Chair of the Women's Advisory Council to the President** – since Sept. 2010
- Member of **UTEP's Senate** for the CS department – since Sept. 2010
- Member of the **Executive Committee** of the **Computational Sciences Program** at UTEP – since Sept. 2008
- Member of the **MamaPhD group** at UTEP – since Sept. 2010
- Member of the **Women's Advisory Council to the President** – since Sept. 2006
- Member of the **UTEP Catalog and Calendar Committee for the Senate** – Sept. 2006 - Sept. 2008

☐ **Other Committees**

• **Served as Reviewer / Referee**

- Conferences: including CP (Principles and Practice of Constraint Programming), Workshops at CP, SAC (Symposium of Applied Computing) (for the CSP track), NAFIPS (North American Fuzzy Information Processing Society), ICORR (the International Conference On Rehabilitation Robotics), ECAI (the European Conference on Artificial Intelligence), FIE (the Frontiers In Education conference), IJCAI (the International Joint Conference in Artificial Intelligence), AAAI (Annual Conference of the Association for the Advancement of Artificial Intelligence), PSI (Ershov Memorial Conference), PARA10 (State of the Art in Scientific and Parallel Computing), ICLP08 (the 24th International Conference on Logic Programming).
- Journals: including Computing, ANOR, Reliable Computing, IJAR (International Journal of Approximate Reasoning), INFORMS Jounal on Computing, Informations Science.
- Books: Applied Interval Analysis, by Luc Jaulin, 2001; Java for Everyone (class test) by Horstmann at Wiley, 2009; Data Structures: Abstraction and Design Using Java, by Koffman and Wolfgang at Wiley, 2009.
- Proposals: Member of NSF panels in Maths/Physics (2008), CISE (2008, 2011), DUE (2010, 2011).

• **Member of Professional Societies**

- Member of ACM
- Member of the Constraint Programming Society in North America
- Member of the Association for Constraint Programming
- Member of ProfessHers
- Member of Empowering Leadership

☐ **Publications / Creative Activity (Published or Accepted)**

☐ **Chapters in Scholarly Books and Monographs**

Ch1 Martine Ceberio, Vladik Kreinovich, Andrzej Pownuk, and Barnabas Bede, "From Interval Computations to Constraint-Related Set Computations: Towards Faster Estimation of Statistics and ODEs Under Interval, P-Box, and Fuzzy Uncertainty", In: JingTao Yao (ed.), **Novel Developments in Granular Computing: Applications for Advanced Human Reasoning and Soft Computation**, IGI Global Publisher, pp. 131-147, 2010.

Ch2 Tanja Magoč, François Modave, Vladik Kreinovich, and Martine Ceberio, "Risk Management in Investment Portfolios: The Use Of Fuzzy Measures, Fuzzy Integrals and Constraint Programming", Aboul-Ella Hassanien and Ajith Abraham (Eds), Foundations on Computational Intelligence, in **Studies in Computational Intelligence**, Springer Verlag, Vol. 202/2009, pp 133-173, 2009.

Ch3 Hung T. Nguyen, Vladik Kreinovich, Francois Modave, and Martine Ceberio, "Fuzzy Without Fuzzy: Why Fuzzy-Related Aggregation Techniques Are Often Better Even in Situations Without True Fuzziness", Aboul-Ella Hassanien and Ajith Abraham (Eds), Foundations of Computational Intelligence, Springer-Verlag, 2009, Vol. 2, pp. 27-51.

Ch4 Martine Ceberio and François Modave, "Interval-based Multicriteria Decision Making", in **Modern Information Processing: From Theory to Applications**, edited by B. Bouchon-Meunier, G. Coletti, R. R. Yager (Eds), Elsevier Mathematics, pp. 281–294, 2006.

Ch5 Martine Ceberio, Ken Satoh, and Hiroshi Hosobe, "Speculative Constraint Processing with Multi-Agent Belief Revision", in Francesca Toni and Paolo Torroni (Eds.), **Computational Logic in Multi-Agent Systems** – CLIMA VI (Post-Proceedings of the 6th International Workshop on Computational Logic in Multi-Agent Systems), Lecture Notes in Artificial Intelligence, Vol. 3900, pp. 340–357, Springer-Verlag, 2006.

☐ **Refereed Journal Articles, published or accepted in Final Form**

• **Refereed Journal Articles**

J1 Aline Jaimes, Craig Tweedy, Tanja Magoc, Vladik Kreinovich, and Martine Ceberio, "Selecting the Best Location for a Meteorological Tower: A Case Study of Multi-Objective Constraint Optimization", **Journal of Uncertain Systems**, 2010, Vol. 4, No. 3.

J2 Martine Ceberio and Vladik Kreinovich, "Computing with Tensors: Potential Applications of Physics-Motivated Mathematics to Computer Science", **Journal of Uncertain Systems**, 2010, Vol. 4, No. 3.

J3 Martine Ceberio and Vladik Kreinovich, "Diagonalization is also practically useful: a geometric idea", **Geombinatorics**, 2010, Vol. 20, No. 1, pp. 15-20.

J4 Omar Ochoa, Martine Ceberio, and Vladik Kreinovich, "How to Describe Spatial Resolution: An Approach Similar to the Central Limit Theorem", **Applied Mathematical Sciences**, 2010, Vol. 4, No. 63, pp. 3153-3160.

J5 Martine Ceberio, Vladik Kreinovich, Gunter Mayer, "For Complex Intervals, Exact Range Computation Is NP-Hard Even for Single Use Expressions (Even for the Product)", **Reliable Computing Journal**, 2007.

J6 Daniel Berleant, Martine Ceberio, Gang Xiang, Vladik Kreinovich, "Towards Adding Probabilities and Correlations to Interval Computations", **International Journal of Approximate Reasoning**, 2007.

J7 Gang Xiang, Martine Ceberio, Vladik Kreinovich, "Computing Population Variance and Entropy under Interval Uncertainty: Linear Time Algorithms", **Reliable Computing**, 2007.

J8 Martine Ceberio, Scott Ferson, Vladik Kreinovich, Sanjeev Chopra, Gang Xiang, Adrian Murguia, and Jorge Santillan, "How To Take Into Account Dependence Between the Inputs: From Interval Computations to Constraint-Related Set Computations, with Potential Applications to Nuclear Safety, Bio- and Geosciences", **Journal of Uncertain Systems**, 2007.

J9 Martine Ceberio, Vladik Kreinovich, Sanjeev Chopra, Luc Longpre, Hung T. Nguyen, Bertram Ludaescher, and Chitta Baral, "Interval-Type and Affine Arithmetic-Type Techniques for Handling Uncertainty in Expert Systems", **Journal of Computational and Applied Mathematics**, 2007, Vol. 199, No. 2, pp. 403–410.

J10 Scott Starks, Vladik Kreinovich, Luc Longpré, Martine Ceberio, Gang Xiang, Roberto Araiza, Jan Beck, Radhi Kandathi, A. Nayak, and Roberto Torres, "Towards Combining Probabilistic and Interval Uncertainty in Engineering Calculations: Algorithms for Computing Statistics under Interval Uncertainty, and Their Computational Complexity", **Reliable Computing**, Vol. 12, No 6, pp. 471–501, Dec. 2006.

J11 Frédéric Benhamou, Martine Ceberio, Philippe Codognet, Hiroshi Hosobe, Christophe Jermann, Ken Satoh, Kasunori Ueda, "Franco-Japanese Research Collaboration in Constraint Programming, R&D Project Report", **Progress in Informatics**, no 3, pp. 59-65, 2006.

J12 Chandra S. Pedamallu, Linet Ozdamar, Martine Ceberio, "Efficient Interval Partitioning – Local Search Collaboration for Constraint Satisfaction", **Journal on Computers and Operations Research**, 2006.

J13 Martine Ceberio and Vladik Kreinovich, "Fast Multiplication of Interval Matrices (Interval Version of Strassen's Algorithm)", **Reliable Computing**, Vol. 10, No. 3, pp. 241-243, April 2004.

J14 Martine Ceberio and Vladik Kreinovich, "Greedy Algorithms for Optimizing Multivariate Horner Schemes", in **ACM-SIGSAM Bulletin**, Vol. 38, No. 1 (147), pp. 8-15, March 2004.

J15 Martine Ceberio, Laurent Granvilliers, "Horner's Rule for Interval Evaluation Revisited", **Computing**, Vol. 69, No 1, pp. 51–81, 2002.

- **Refereed Conference Proceedings (peer reviewed)**

  C1 Paden Portillo, Martine Ceberio, and Vladik Kreinovich, "Towards an Efficient Bisection of Ellipsoids", Proceedings of the ITEA Live-Virtual-Constructive Conference "Test and Evaluation", El Paso, Texas, January 24-27, 2011.

  C2 Karen Villaverde, Olga Kosheleva, and Martine Ceberio, "Computations under Time Constraints: Algorithms Developed for Fuzzy Computations Can Help", Proceedings of **NAFIPS 2011, the North American Fuzzy Information Processing Society**, 2011.

C3 Xiaojing Wang, Jeremy Cummins, and Martine Ceberio, "The Bees Algorithm to Extract Fuzzy Measures from Sample Data", *best student paper award*, Proceedings of **NAFIPS 2011, the North American Fuzzy Information Processing Society**, 2011. Best Student Paper Award (first place).

C4 Aline Jaimes, Craig Tweedie, Tanja Magoc, Vladik Kreinovich, and Martine Ceberio, "Multi-Objective Optimization under Positivity Constraints, with a Meteorological Example", Proceedings of the **IEEE World Congress on Computational Intelligence WCCI'2010**, Barcelona, Spain, July 18-23, 2010, pp. 2355-2361.

C5 Carlos Acosta and Martine Ceberio, "A Constraint-Based Approach to Verification of Programs with Floating-Point Numbers", in the Proceedings of **SERP'08 - the 2008 International Conference on Software Engineering Research and Practice**, 2008.

C6 Martine Ceberio and Christian Servin, "Cascade Vulnerability Problem Simulator Tool", in the Proceedings of **the 2008 International Conference on Modeling, Simulation and Visualization Methods, MSV'08**, pp. 227–231, 2008.

C7 Yoonsik Cheon, Antonio Cortes, Martine Ceberio, and Gary T. Leavens, "Integrating Random Testing with Constraints for Improved Efficiency and Diversity", in **the 20th International Conference on Software Engineering and Knowledge Engineering, SEKE'08**, San Francisco Bay, California, USA, July 1–3, 2008.

C8 Roberto Araiza, Martine Ceberio, Naga Suman Kanagala, Vladik Kreinovich, and Gang Xiang, "Applications of 1-D Versions of Image Referencing Techniques to Hydrology and to Patient Rehabilitation", in the proceedings of **NAFIPS 2008, the North American Fuzzy Information Processing Society**, 2008.

C9 Tanja Magoč, Martine Ceberio, and François Modave, "Interval-based Multi-Criteria Decision Making: Strategies to Order Intervals", in the proceedings of **NAFIPS 2008, the North American Fuzzy Information Processing Society**, 2008.

C10 Naga Suman Kanagala, Martine Ceberio, Thompson Sarkodie-Gyan, Vladik Kreinovich, and Roberto Araiza, "Identification of Human Gait in Neuro-Rehabilitation: Towards Efficient Algorithms", in the Proceedings of the **24th Southern Biomedical Engineering Conference**, Eds. H. Nazeran, M. Goldman, and R. Schoephoerster, Medical and Engineering Publishers, pp. 153–156, 2008.

C11 Richard D. Brower, Martine Ceberio, Patricia Nava, Thompson Sarkodie-Gyan, Huiying Yu, "Identification of Human Gait using Fuzzy Inferential Reasoning", in the Proceedings of **ICORR'07, the 10th International Conference On Rehabilitation Robotics**, Netherlands, 2007.

C12 Richard Brower, Martine Ceberio, Chad MacDonald, Thompson Sarkodie-Gyan, "Determination of Human Gait Phase Using Fuzzy Inference", in the Proceedings of **ICORR'07, the 10th International Conference On Rehabilitation Robotics**, Netherlands, 2007.

C13 Martine Ceberio, Vladik Kreinovich, Andrzej Pownuk, and Barnabas Bede, "From Interval Computations to Constraint-Related Set Computations: Towards Faster Estimation of Statistics and ODEs under Interval, p-Box, and Fuzzy Uncertainty", in the proceedings of **IFSA'07 World Congress, the International Fuzzy Systems Association** (Main theme: Theory and Applications of Fuzzy Logic and Soft Computing), 2007.

C14 Stefano Bistarelli, Martine Ceberio, Eric Freudenthal, and Christian Servin, "An Optimization Approach to the Cascade Vulnerability Problem using Soft Constraints", in

the proceedings of **NAFIPS 2007, the North American Fuzzy Information Processing Society**.

C15 Michael Orshansky, Wei-Shen Wang, Martine Ceberio, Gang Xiang, "Interval-based Robust Statistical Techniques for Non-negative Convex Functions, with Application to Timing Analysis of Computer Chips", in the proceedings of **the 21st International Symposium on Applied Computing, SAC'06**, 2006.

C16 Martine Ceberio, Richard Coy, François Modave, "Multi-criteria Decision Making for Assisted Design", in the proceedings of **IPMU'06, Information Processing and Management of Uncertainty in Knowledge-based Systems**, pp. 1567–1574, 2006.

C17 Evgeny Dantsin, Alexander Wolpert, Martine Ceberio, Gang Xiang, and Vladik Kreinovich, "Detecting Outliers under Interval Uncertainty: A New Algorithm Based on Constraint Satisfaction", in the proceedings of **IPMU 2006, Information Processing and Management of Uncertainty in Knowledge-based Systems**, 2006.

C18 Olga Kosheleva and Martine Ceberio, "Processing Educational Data: From Traditional Statistical Techniques to an Appropriate Combination of Probabilistic, Interval, and Fuzzy Approaches", in the Proceedings of the **International Conference FNG'05, , Information Processing and Management of Uncertainty in Knowledge-based Systems**, 2005.

C19 Martine Ceberio, G. Randy Keller, Olga Kosheleva, Vladik Kreinovich, Roberto Araiza, M. Averill, and Gang Xiang, "Data Processing in the Presence of Interval Uncertainty and Erroneous Measurements: Practical Problems, Results, Challenges", in the Proceedings of the **Second Scandinavian Workshop on Interval Methods And Their Applications**, 2005.

C20 Martine Ceberio and Vladik Kreinovich, "Towards an Optimal Approach to Soft Constraint Problems", in the Proceedings of the **17th IMACS World Congress Scientific Computation, Applied Mathematics and Simulation (IMACS)**, 2005.

C21 Martine Ceberio, Vladik Kreinovich, Sanjeev Chopra, Bertrand Ludaescher, and Emad Saad, "Taylor Model-type Techniques for Hanlding Uncertainty in Expert Systems, with Potential Applications to Geoinformatics", in the Proceedings of the **17th IMACS World Congress Scientific Computation, Applied Mathematics and Simulation (IMACS'05)**, 2005.

C22 Martine Ceberio, Ken Satoh, and Hiroshi Hosobe, "Speculative Constraint Processing with Iterative Revision for Disjunctive Answers", in the proceedings of **CLIMA IV, Computational Logic in Multi-agent Systems**, pp.119–134, 2005.

C23 Martine Ceberio and Richard Coy, "Enhancement of Parameter Estimation using Flexible Constraints: an Application to Shock-response Study", in the Proceedings of **"Algorithmic Mathematics and Computer Science" (AMCS'05)**, 2005.

C24 François Modave, Martine Ceberio, Xiaojing Wang, Olga Garay, R. Ramirez, and R. Tejada, "Comparison of Computer Attacks: an Application of Interval-based Fuzzy Integration", in the Proceedings of **NAFIPS'05, the North American Fuzzy Information Processing Society**, 2005.

C25 Martine Ceberio, François Modave, and Xiaojing Wang, "Comparing Attacks: an Approach Based on Interval Computations and Fuzzy Integration", in the Proceedings of **FuzzIEEE'05, the IEEE International Conference on Fuzzy Systems**, 2005.

C26 P. Jaksurat, Eric Freudenthal,Martine Ceberio, and Vladik Kreinovich, "Probabilistic Approach to Trust: Ideas, Algorithms, and Simulations", in the Proceedings of the **5th International Conference on Intelligent Technologies (InTech'04)**, 2004.

C27 Martine Ceberio and François Modave, "An Interval-valued, 2-additive Choquet Integral for Multicriteria Decision Making", in the proceedings of **IPMU 2004, Information Processing and Management of Uncertainty in Knowledge-based Systems**, 2004.

C28 Martine Ceberio and François Modave, "Interval-Based Multicriteria Decision Making", in the Proceedings of **AI+MATH'04, the International Symposium on Artificial Intelligence and Mathematics**, 2004.

C29 Martine Ceberio, Laurent Granvilliers, "Solving Nonlinear Equations by Abstraction, Gaussian Elimination, and Interval Methods", in the proceedings of **FroCos 2002**, pp 117-131, 2002.

C30 Martine Ceberio, Laurent Granvilliers, "Solving Nonlinear Systems by Constraint Inversion and Interval Arithmetic", in the proceedings of **AISC 2000**, pp 127-141, 2000.

- **Refereed Workshop Proceedings (peer reviewed)**

W1 Aline Jaimes, Craig Tweedie, Tanja Magoc, Vladik Kreinovich, and Martine Ceberio, "Optimal Sensor Placement in Environmental Research: Designing a Sensor Network under Uncertainty", In: Michael Beer, Rafi L. Muhanna, and Robert L. Mullen (Eds.), Proceedings of the **4th International Workshop on Reliable Engineering Computing REC'2010**, Singapore, March 3-5, 2010, pp. 255-267.

W2 Martine Ceberio, Vladik Kreinovich, Andrzej Pownuk, "Constraint-Related Set Computations: A New FEM-Motivated Approach to Propagating Uncertainty", in the proceedings of **FEMTEC'09**.

W3 Paulo Pinheiro Da Silva, Martine Ceberio, Christian Servin, Vladik Kreinovich, "Propagation and Provenance of Probabilistic and Interval Uncertainty in Cyberinfrastructure-Related Data Processing", in the proceedings of **the NSF Workshop on Reliable Engineering Computing, REC'08**.

W4 Martine Ceberio, Scott Ferson, Vladik Kreinovich, Sanjeev Chopra, Gang Xiang, "How to Take into Account Dependence Between the Inputs: From Interval Computations to Constraint-Related Set Computations, With Potential Applications to Nuclear Safety, Bio- and Geosciences", in the proceedings of **the NSF Workshop on Reliable Engineering Computing, REC'06**, 2006.

W5 Martine Ceberio, Vladik Kreinovich, and Lev Ginzburg, "On the Use of Intervals in Scientific Computing: What is the Best Transition from Linear to Quadratic Approximation?", in the Proceedings of the **Second Scandinavian Workshop on Interval Methods And Their Applications**, 2005.

W6 Scott Starks, Vladik Kreinovich, Luc Longpré, Martine Ceberio, Gang Xiang, Roberto Araiza, Jan Beck, Rathi Kandathi, A. Nayak, and Roberto Torres, "Towards Combining Probabilistic and Interval Uncertainty in Engineering Calculations", in the proceedings of the **NSF Workshop on Reliable Engineering Computing**, pp. 193–213, 2004.

W7 Martine Ceberio, Vladik Kreinovich and Lev Ginzburg, "Towards Joint Use of Probabilities and Intervals in Scientific Computing: What is the Best Transition from Linear to Quadratic Approximation?", in the Proceedings of the **Workshop on State-of-the-Art in Scientific Computing (PARA'04)**, 2004.

- **Conference/Workshop abstracts**

A1 Uram Anibal Sosa Aguirre, Martine Ceberio, and Vladik Kreinovich, "Why Curvature in L-Curve: Combining Soft Constraints", in the book of abstracts of **CoProD'11**, 2011.

A2 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, "Adding Constraints: A (Seemingly Counterintuitive but) Useful Heuristic in Solving Difficult Problems", in the book of abstracts of **CoProD'11**, 2011.

A3 Shubhra Datta, Martine Ceberio, Mario Bencomo, and George Moreno, "On the Practicality of Constraint-Based Program Verification", in the proceedings of **SCAN'10**, 2010.

A4 Karen Villaverde, Olga Kosheleva, and Martine Ceberio, "Why Ellipsoid Constraints, Ellipsoid Clusters, and Riemannian Space-Time: Dvoretzky's Theorem Revisited", in the book of abstracts of **CoProD'10**, 2010.

A5 Vladik Kreinovich, Juan Ferret, and Martine Ceberio, "Constraint-Related Reinterpretation of Fundamental Physical Equations Can Serve as a Built-In Regularization", in the book of abstracts of **CoProD'10**, 2010.

A6 Paden Portillo, Martine Ceberio, Vladik Kreinovich, "Towards an Efficient Bisection of Ellipsoids", in the book of abstracts of **CoProD'10**, 2010.

A7 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, "Why Tensors?", in: Martine Ceberio (ed.), Abstracts of the **Second Workshop on Constraint Programming and Decision Making CoProD'09**, El Paso, Texas, November 9-10, 2009, pp. 20-23.

A8 Martine Ceberio and Vladik Kreinovich, "Continuous If-Then Statements Are Computable". In: Martine Ceberio (ed.), Abstracts of the **Second Workshop on Constraint Programming and Decision Making CoProD'09**, El Paso, Texas, November 9-10, 2009, pp. 11-14.

A9 Aline Jaimes, Craig Tweedy, Tanja Magoc, Vladik Kreinovich, and Martine Ceberio, "Selecting the Best Location for a Meteorological Tower: A Case Study of Multi-Objective Constraint Optimization". In: Martine Ceberio (ed.), Abstracts of the **Second Workshop on Constraint Programming and Decision Making CoProD'09**, El Paso, Texas, November 9-10, 2009, pp. 56-60.

A10 Martine Ceberio, Vladik Kreinovich, Scott Ferson, Cliff Joslyn, "Adding Constraints to Situations when, in addition to Intervals, we also have Partial Information about Probabilities", in the proceedings of **SCAN'06** + published in the **post-proceedings of SCAN'06**, the GAMM - IMACS International Symposium on Scientific Computing, Computer Arithmetic and Verified Numerical Computations.

A11 Luc Longpré, Vladik Kreinovich, Eric Freudenthal, Martine Ceberio, Francois Modave, Neelabh Baijal, Wei Chen, Vinod Chirayath, Gan Xiang, and J. Ivan Vargas, "Privacy, Protecting, Processing, and Measuring Loss", presented at the **South Central Information Security Symposium**, 2005.

A12 Martine Ceberio, Vladik Kreinovich, Luc Longpré, Emad Saad, Bertrand Ludäscher, Chitta Baral, and Hung T. Nguyen, "Affine Arithmetic-Type Techniques for Handling Uncertainty in Expert Systems, with Applications to Geoinformatics and Computer Security", in the Proceedings of the **11th GAMM-IMACS International Symposium on Scientific Computing, Computer Arithmetic, and Validated Numerics (SCAN'04)**, 2004.

□ **Work in Progress**

- **Working Journal Papers**

WP1 "A Hybrid Solver for Extracting Fuzzy Measures from Sample Data", by Xiaojing Wang, Jeremy Cummins, and Martine Ceberio, to be submitted to the International Journal of Fuzzy Sets and Systems

- **Other Publications**

WP2 "Interval and Revisited Fourier-Motzkin Method for Largely Redundant Systems of Inequalities", by Mario Bencomo, Luis Carlos Gutierrez, and Martine Ceberio

□ **Grants and Contracts**

□ **Total Grants and Contracts**

Since September 2003,

- $ 1,276,243 in federal funding, of which $ 596,091 as PI;

- $ 8,900 from university research incentive;

- 20,000 euros from European funding, of which 5,000 euros as PI.

□ **Federal**

1. **NSF CCF 0953339 – PI** *CAREER: Symbolic-Numeric Constraint-Based Solutions for Real-World Scientific Problems*, 01/2010 to 12/2014. Amount: $564,650 + additional $24,000 REU supplement (2010, 2011).

2. **NSF CCF 0839052 – PI** *Constraint Programming and Decision Making Workshop, Co-ProD'08*, 08/2008 – 07/2010. Amount: $7,441.

3. **NSF OCI 0506429 – co-PI** of the SCI: Collaborative Research project, called *DAPLDS, a Dynamically Adaptive Protein-Ligand Docking System based on Multi-Scale Modeling*, with Michela Taufer, Pat Teller, Aug. 2005 to Jan. 2008. Amount: $ 680,152.

□ **Other**

1. **UTEP URI grant – PI** *A Hybrid Robust Solver for Problems with Uncertainty: HyRS*, Jan. 2009 to Dec. 2009. Amount: $ 5,400.

2. **NIH Grant 1 T36 GM078000-01 – senior personnel**: instructor in charge of the development of a bio-informatics-oriented lab for the course Introduction to Computer Science.

3. **UTEP URI grant – PI:** Jan-Dec. 2005, *Next Steps towards Flexibility in Problem-Solving.* Amount: $ 3,500.

4. **GRA Advance (Research assistantship)** for my master's student, Richard Coy, awarded in December 2004: support for 4.5 months of assistantship.

5. **Grant of the French Ministry of Research – PI:** to help expatriates establish collaborations between French researchers working abroad and French institutes. Sept. 2004 to Aug. 2006. Amount: 5,000 euros.

6. **PAI Egide Sakura:** external collaborator, French-Japanese project. Jan. 2004 to Dec. 2006. Amount: 15,000 euros.

☐ **List of Collaborators (last 48 months)**

- UTEP[1]: Vladik Kreinovich, Eric Freudenthal, Luc Longpre, Olga Kosheleva, Andzrej Pownuk, Paulo Pinheiro da Silva, Yoonsik Cheon

- NMSU[2]: Karen Villaverde

- TTUHSC[3]: François Modave

- Stevens Institute of Technology in New Jersey: David Klappholz

- University of Maryland: Tanja Magoc

- Dipartimento di Scienze, Pescara, **Italy**: Stefano Bistarelli

- Yeditepe University, **Turkey**: Linet Özdamar

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[1]UTEP: The University of Texas at El Paso
[2]NMSU: New Mexico State University
[3]TTUHSC: Texas Tech University Health Sciences Center

Section 2

Statement of Philosophy

I have always been passionate about teaching, helping others grow, "transforming" them. I also always strive to get the best out of myself. An academic career has proved to be the best environment for me to combine my love for teaching with my goal to always improve through my research, teaching, and service activities. I found the mission of UTEP to be a perfect match for me: access and excellence reflect my own philosophy as a professor.

I see *access* in two main ways. (1) It is about understanding the educational and personal background of our student body, and providing the students with appropriate mentoring, guidance, and training. (2) It is also, in the case of computer science, about broadening the participation to students who would normally discard the option; such as women, but also a wide range of students who would think that computing is not for them. *Excellence* drives me but it also almost goes without saying: the point about it lies mostly in understanding what one needs to excel at. In the academe, I see it obviously as a constant drive to excel in the three main components of our activities: research, teaching, and service. Although, in research and service, it goes without saying, in teaching, besides striving to excel as an instructor, I aim at making our students excellent professionals.

Finally, I believe that the goals of access and excellence can be pursued simultaneously, exactly like I aim to have my research, teaching, and service activities tied together, feeding each other with their results. Illustrations of these are that diversity, hence access, drives innovation, and therefore success in research and excellence, that similarly, collaboration creates opportunities, and that research fuels preeminence; which are three core beliefs of the College of Engineering.

☐ **Teaching**

As stated before, my teaching philosophy is aligned with my goals of access and excellence.

In practice, I implement *access* by teaching in varied ways to accomodate different learning styles, different backgrounds, and different self images (student's confidence plays an important role in their being receptive to material or not). I strive to adjust to students' needs to extents that do not slow the class progress, and I offer extensive support outside of the classroom, through well stated and attended office hours as well as appointments when more time is needed or the stated office hours are not convenient. I also propose varied activities in the classroom: work in teams / individually, to foster essential team-working skills and at the same time enable peer-mentoring useful for weaker students, while still valuing individual achievements. Although flexibility and

style accomodation have always been a priority for me, I have polished my teaching style over the years as is reflected in my teaching portfolio. Outside of the classroom, I implement *access* in other ways, by offering independent studies that constitute a way to mentor students more closely and fully adjust to their style, but without any team-work component; and by involving students in my research (at all levels: from high-school to PhD students), which offers an incredible experience to the students who grow more confident and experience team-working outside of the classroom. *Access* is also about populating the pipeline of potential incoming students. Besides the many outreach activities I have taken part in, I have been involved in developing a project for a new high-school course whose aim is to increase the participation of women and hispanic students in computing by emphasizing and nurturing their organic skills and the impact of computer science on areas that matter to the community (health, non-profit organization, etc.). This effort is aligned with the College on-going effort to increase the participation of women in engineering.

Excellence in teaching starts for me in making sure I deliver up-to-date and meaningful content to the students in a way that is appropriate for the students to retain the information, understand its ties to other areas, and be able to use it later on in their curriculum and career. My focus as an instructor is a lot on the persistence of their knowledge: I am not so much interested in their test-taking skills as I am in enriching their knowledge on the long run and teaching them life-long learning skills. To this end, I regularly revisit my own teaching skills and aim at improving the experience the students have in class or in lab with me: either through new teaching techniques, or by improving my mentoring skills. I have done this through attending workshops and presentations by CeTaL, and documenting myself. As an instructor, I also want to guarantee high standards in the training of the students who pass my courses. I am very concerned with the quality of our degrees and the reputation of UTEP and I believe that it is through meeting high standards that our students can be proud of their institution, companies will keep hiring them, and the pipeline of incoming students will be steadier. This is about creating students' role models, attracting more high-school students from the area. Among the many ideas I try to bring in the classroom to always improve students' involvement and success, I have, when the opportunity arose, involved students in textbook reviews (class testing books). I believe that such experiences make students feel that their opinions matter and also teaches them critical thinking in a different way. For students involved in my lab, I catch every opportunity to make them interact with other researchers in my community (through attending / helping in the organization of conferences) to enhance their sense of belonging in the community, which I believe helps them stay focused and become successful. I also use my research as an example as often as relevant to the courses I teach: I believe that it enhances my impact as a role model but it also helps students better understand how what is taught in class matters.

□ Research

My main drive in conducting research in computer science is to enhance decision-making processes: automating decisions while ensuring reliability of the process and the outcome. Most of the decisions I try to automate involve numerical models. The core of my research is in numerical constraint solving (NCS) and interval computations. My research interests mainly lie in the area of non-linear continuous constraint and optimization solving, along with the many applications of these. Consistently with my general philosophy, I aim at excellence in my research (my own as well as my students') while providing and enhancing access.

My research goals were to: (1) make non-linear continuous constraint and optimization problems solvers scalable, while remaining reliable (w.r.t. notions such as globality, completeness, robustness); and (2) bridge the gap between the practicality of the solvers and their lack of use by practitioners,

by building a community of decision-making researchers and domain scientists. In doing this, I seek to make an impact on the way problems are solved and which problems can be solved. I believe that this is a high payoff area. To achieve these goals, I have balanced my work between fundamental and applied research: part of my work is in exploring new computational models and designing ways to make more computations faster: I work mainly in the areas of symbolic-numeric algorithms for constraint and optimization solving, multi-criteria decision making, interval computations (e.g., through the use of different paradigms, the use of different interval arithmetic, or combinations of solvers); part is in exploring applications as both a way of getting feedback and (mostly) a creativity boost: network security, bio-medical engineering, software engineering.

Over the last 8 years at UTEP, my seeking *excellence* resulted in developing a body of work that contributed to my two goals. I have for instance contributed to multi-criteria decision making using interval computations, both enhancing the techniques with intervals and then providing with tools to manage interval decisions. I have contributed to improving the modeling of decision making by proposing faster and more stable algorithms to determine fuzzy measures from sample data. I have, in the application area, used soft constraints and adjusted them to the very different problems of diagnosing car shock absorbers and of network security. I have also been relatively successful at attracting external funding, mostly (but not only) from the National Science Foundation: I received a total of $1,276,243 in federal funding, of which $596,092 as a PI of two NSF grants, one of them being an NSF CAREER grant. I have regularly published my work mostly either at major conferences or in journals: a total of 16 journal publications and over 35 over peer-reviewed publications in conference proceedings or book chapters. My involvement in the fuzzy community was recently acknowledged by my election as one of the members of the board of directors of the North American Fuzzy Information Processing Society.

Access also drives part of my research activities. I am a firm believer in open research, sharing experience and information. I also value diversity, of backgrounds, genders, and levels. As a result, I seek collaborations: I have collaborated with a number of researchers within UTEP across departments and colleges, in other US institutions (e.g., Stevens Institute of Technology in New Jersey), and abroad (e.g, Japan, Italy). My interdisciplinary collaborations resulted in joint papers with for instance researchers from departments of mathematics, geological sciences, education. When my work is not to be performed in the framework of a collaboration with colleagues, I always involve students, which results in co-authored-only publications. Integrating students to my research (to research in general) is, as was shown multiple times in education research articles, a way of retaining them and increasing their chances of success. I created a research group, CR2G (Constraint Research and Reading Group, http://cr2g.constraintsolving.com), shortly after starting my tenure-track period. Over the years, the group has gathered students at all levels: undergraduate, graduate, PhD levels, and more recently, high-school students during summer internships and projects. A total of four PhD students have been members of CR2G, three of them left UTEP while under my supervision before graduation due to family reasons (in 2007, 2009, 2011), one is expected to graduate by Summer 2012. Nine Master's students have been involved as well, five of which graduated, one is expected to graduate by early fall 2011, one by Spring 2012, and one joined Rice's Computational Sciences PhD program in Summer 2011. Many undergraduate students (over 20) were involved, with different success rates to keep them in the graduate program. Recently, I have put efforts in recruiting high-school students for summer internships. I am now totalling a number of 15 high-school students who have been involved in summer internships or projects with me. I am glad to report that a large majority of them are female: I believe that involving female students will increase the participation of women by creating role models. Finally, as part of my effort to give access to research, I also value universal access through online presence (which also

increases the visibility of UTEP). CR2G developed and maintained a research community website, http://constraintsolving.com, which attracts a significant amount of web traffic of over 1,000 unique visitors a month from over 62 countries.

□ Service

All of the activities presented above can only be performed well and the objectives met if all actors act in good intelligence and citizenship. I believe in acting as such for the institution I belong to, my research community, as well as the local community. As a result, I have been active at UTEP through committees at all levels (department, college, university). In particular, I used the opportunity of being the department's ACM student chapter advisor to broaden my outreach activities: for instance, the ACM chapter is very active in the annual NCWIT awards in aspirations in computing and I was the keynote speaker at the El Paso award ceremony in spring 2011. Also, I am passionate about women's issue and involvement in academe: I am a member of the MamaPhD group on campus, and also, a member of the Women's Advisory Council to the President (WAC) for several years, I recently became chair of this council and we have been doing our best to make our campus family friendly.

In my research community, my involvement has been at many varied levels: from being reviewer or program committee member for journals and many conferences, member of several NSF panels, conference and program chair, organizer of a number of conferences and workshops, to taking the lead in building a community of scientists and engineers interested in decision making, through the NSF-funded workshops CoProD and the popular community website constraintsolving.com.

Finally, I value serving the local community and both implementing the access and excellence mission of UTEP and encouraging women to pursue computing careers. To this end, I have participated in numbers of events in high-schools, at career fairs, science fairs, formal presentations, and I have worked towards including high-school students in my research, which, as noted earlier, I have been successful at over the last two years, now totalling a number of 15 high-school students (8 male / 7 female).

Part II

Teaching Portfolio

2.1 Professional Information

2.1.1 Statement of teaching goals and professional reflection

As mentioned in my statement of teaching philosophy, I strive to ensure (1) access to knowledge and to students and (2) excellence in my teaching skills and students' acquired skills. Accordingly, my teaching goals are: (1) to reach out to all students under my supervision, to provide varied ways for them to access knowledge, and to give rise to students' curiosity and autonomy; and (2) to hold myself to high standards in terms of teaching, and my students to high standards in terms of academic performance.

As a result, over the last eight years, I have tried very varied ways to improve my teaching style to reach my first goal, and I have never failed to hold both students and myself to high standards to meet my second goal by never accepting lower performance and working hard on instauring a culture of excellence and more recently some idea of an etiquette in the classroom.

Not all my efforts and trials were successful. However, I show, in what follows, that I was able to learn from failed attempts, and regardless of trial and error, and that I always sought improvement.

Finally, if I had to define my style in short, I would say "student-centered".

2.1.2 List of courses taught, Teaching load information, including level and class size

Overview

Since fall 2003, I have taught:

- at the **undergraduate** level:

  - CS1401: Introduction to Computer Science (4 times)
  - CS2402: Data Structures (9 times)

- at the **graduate** level:

  - MIT 5310: Fundamentals of Computers (2 times)
  - CS5350: Advanced Algorithms (2 times)
  - CS5303: Logical Foundations of Computer Science (4 times)

- **cross-listed** courses (UG and G):

  - CS4320 / CS5314: Artificial Intelligence (4 times)

as well as special topics and topics in intelligent computing and in emerging computing paradigms focused on or related to my research, at the undergraduate and graduate levels, such as Constraints, Optimization, and Problem-Solving applied to Game Development.

Courses numbered CS1XXX, CS2XXX, CS3XXX, or CS4XXX are undergraduate-level courses, CS3XXX and CS4XXX being upper division courses. Courses numbered CS5XXX are graduate-level courses.

Independent studies

Since Fall 2004, I have offered independent studies almost every semester, except in Fall 2007 (first semester after my first maternity leave), Fall 2008, and Fall 2009 (first semester after my second maternity leave and a semester during which I also had to take another family-related leave). In total, I have mentored 17 students (graduate and undergraduate) in independent studies. The list of independent studies I have offered in reported in Table 2.1.

Term	Subject	Type	Enrollment	Topic
Fall 2004	CS 4371	Computer Science Problems	1	Constraint solving techniques
Spring 2005	CS 4371	Computer Science Problems	1	Constraint solving techniques
	CS 5391	Individual Studies	1	Global optimization
Summer 2005	CS 5391	Individual Studies	1	Constraint hierarchies
Fall 2005	CS 5399	Individual Studies	1	Constraint solving techniques
Spring 2006	CS 5391	Individual Studies	1	Constraint solving and security
	CS 4371	Computer Science Problems	1	Expert systems for constraint modeling
	CS 4371	Computer Science Problems	1	Bio-informatics: Predication of the 2ndary structure of RNA
Fall 2006	CS 4371	Computer Science Problems	2	Constraint solving techniques
Spring 2007	CS 4371	Computer Science Problems	1	Artificial intelligent for games
	CS 5391	Individual Studies	1	Constraint solving and security
Spring 2008	CS 4371	Computer Science Problems	1	Constraints and optimization For real-world applications (focus on industry)
Spring 2009	CS 4371	Computer Science Problems	1	Constraints for Data Analysis in Gait Therapy
Spring 2010	CS 5391	Individual Studies	1	Program verification
Fall 2010	CS 5391	Individual Studies	1	Constraint solvers
Spring 2011	CS 5391	Individual Studies	1	Continuous constraint solving

Table 2.1: List of independent studies offered from fall 2003 to spring 2011

Lectures

The list describing my teaching load since Fall 2003 in terms of lectures in reported in Table 2.2.

Term	Subject	Course Title	Enroll.
Fall 2003	CS 2402	Data Structures (co-teaching with F. Fernandez)	30
	MIT 5310	Foundations of Computers	25
Spring 2004	CS 2402	Data Structures (co-teaching with F. Fernandez)	32
	CS 2402	Data Structures (co-teaching with F. Fernandez)	15
	CS 5314	Artificial Intelligence	11
Fall 2004	MIT 5310	Fundamentals of Computers	18
Spring 2005	CS 4320	Artificial Intelligence	19
	CS 5314	Artificial Intelligence (cross listed with CS4320)	8
Fall 2005	CS 2402	Data Structures	26
	CS 5303	Logical Foundations of Computer Science	18
Spring 2006	CS 2402	Data Structures	32
	CS 4320	Artificial Intelligence	28
	CS 5314	Artificial Intelligence (cross listed with CS4320)	8
Summer 2006	CS 4390	Special Topics in Computer Science: on Constraints and Optimization	12
	CS 5354	Topics in Intelligent and Soft Computing: on Constraints and Optimization	15
Fall 2006	CS 2402	Data Structures	39
	CS 5303	Logical Foundations of Computer Science	16
Spring 2007	CS 2402	Data Structures	26
	CS 5303	Logical Foundations of Computer Science	6
Fall 2007	CS 2402	Data Structures	41
	CS 4320	Artificial Intelligence	3
	CS 5314	Artificial Intelligence (cross listed with CS4320)	7
Spring 2008	CS 2402	Data Structures	38
	CS 5303	Logical Foundations of Computer Science	19
Summer 2008	CS 4365	Topics in Soft Computing: Problem solving applied to Game Design	20
	CS 5354	Topics in Intelligent Computing: Constraints and Optimization	5
Fall 2008	CS 2402	Data Structures	36
	CS 5350	Advanced Algorithms	22
Spring 2009	CS 1401	Introduction to Computer Science	39
	CS 5303	Logical Foundations of Computer Science	15
Fall 2009	CS 1401	Introduction to Computer Science	46
	CS 1401	Introduction to Computer Science	32
	CS 1401	Introduction to Computer Science	21
Spring 2010	CS 1401	Introduction to Computer Science	38
	CS 1401	Introduction to Computer Science	11
	CS 5303	Logical Foundations of Computer Science	14
Fall 2010	CS 5350	Advanced Algorithms	25
Spring 2011	CS 5303	Logical Foundations of Computer Science	16

Table 2.2: List of lectures from fall 2003 to spring 2011

2.1.3 New courses and/or major course revisions

- **Biology-related material in CS1401:**

In 2009, I was involved in Dr. Steven Alley's grant 1 T36 GM078000-01 from the National Institute of Health. As the instructor of CS1401 (Introduction to Computer Science), I was in charge of instilling a bio-related flavor to this class, in an effort to better appeal to non-CS-major students taking the class, and in particular, students from biology and biology-related disciplines. I made a conscious effort to specifically use more examples related to biology during lectures, and as this course usually has between 3 and 4 lab sections, I dedicated one lab section to biology-related topics. I ran, in parallel to other lab sections, a semester-long lab offering only biology-related lab topics. This opportunity of dedicating a full lab section to only biology-related topics happened only in spring 2009 as we had a teaching assistant funded by the grant fully dedicated to the "biology" lab section.

After that (starting in Fall 2009), due to concurring factors: there was no more such teaching assistant support, the enrollment of students picked, and the number of teaching assistants for this class was reduced from 4 to 2, I could not sustain the experience. Instead I reversed to a situation in which all lab sections received the same lab topics (not to overload the TA's grading activities) and for that reason, I was not able to offer only biology-related labs (not all students were biology students and it would not have been fair to the students nor to computer science to put a unique emphasis on biology). I nevertheless continued to propose lab topics related to biology, but at a lesser rate (maybe one out of 3 or 4). I continued to do this until spring 2010, after which I have not taught CS1401 again.

In 2011, within the scope of the same above-mentioned NIH grant, Vladik Kreinovich and I have started to brainstorm about the design of a new introductory course for non-computer-science majors. Our discussions, which have involved Thomas Boland from Biomedical Engineering at UTEP, have led us to consider ways to teach introductory programming through tools that are relevant to bio-related students (such as matlab, mobile programming). The goal is to have such a course designed and ready to be held by September 2012.

- **Summer courses:**

Summer courses can be critical for our students to graduate (to fulfill the requirements of their degree plan). I have several times offered summer courses to add to the pool of courses that students could pick from. In particular, in summer 2008, to better serve the students' needs, I have designed a survey in concertation with Ann Gates (CS chair at that time), sent out to all of our CS students, polling them about their course preferences.
⋆ *The survey sent out to students in available in appendix, Section 2.3.*

All the summer courses listed below were project-based courses as I believe that the understanding of many concepts requires first-hand hands-on experience, and this is the case of constraint programming.

1. **CS4390: Special topic on Constraint Programming for Video-Games**: undergraduate level, summer 2006.
   All projects were related to video-games and/or animation, therefore resulting in topics such as constraints and 3D animation, constraints for scene lighting.

2. **CS5354: Topics in Intelligent Computing: Constraint Programming**: graduate level, summer 2006.

   In my graduate class, the projects were related to the students' research activities (if a connection was possible), such as constraints and security, constraints and bioinformatics; or could be very general if there was no overlap with the students' research, such as constraints for generating and solving sudoku puzzles, constraints for controlling air traffic at the airport of Chicago.

3. **CS4365: Topics in Soft Computing: Problem-Solving applied to Game Design**: undergraduate level, summer 2008.

   This course was very hands-on and we dissected the game design process, always emphasizing problem-solving skills required and techniques used to reach our goals. In teams of 2 to 3 students, all students developed their own video game by the end of the 8-week-long course.

4. **CS5354: Topics in Intelligent Computing: Constraints**: graduate level, summer 2008.

   This course was conducted in a way that was similar to the summer-2006 course. I only added optimization techniques as part of the covered material. Similar types of research projects were proposed (either related to the students' research topics, or more general).

Developing courses related to constraints was a way for me to integrate state-of-the-art research, including mine, in the covered material and therefore expose students to the excitement of research.

2.1.4 Evidence of curriculum development, including sample syllabi and course materials

Changes in CS1401: Introduction to Computer Science

☐ **Modification of the lecture plan.** While teaching CS1401, in collaboration with Mary Kay Roy at UTEP, we regularly had discussions around the content and layout of the lecture plan, always aiming at providing a better experience to our students, enhancing their success. As part of these efforts, I volunteered to review textbooks for this course; I even had one of my classes "class-test" one of the books.

We eventually decided to defer the original lectures that covered objects and classes early in the semester towards the end of the semester. Our reason for doing this was that we wanted students to fully grasps programming concepts such as control structures, logical expressions before to be distracted by object-oriented programming considerations.

⋆ *Attached in appendix, Section 2.3 are copies of emails inviting me to review textbooks, as well as copies of syllabi emphasizing the change of lecture plans.*

☐ **Changes in grading.** I also recommended to change the way final grades were computed, by mostly decreasing the lab participation grade, from 14% to 7%, redistributing the 7% onto areas that better reflected students' skills (such as exams or labs).

☐ **Course material.** Every semester, I work on improving my class notes and I work at reinventing lab topics. Therefore, over the severl times I taught CS1401, I have, in collaboration with Mary Kay Roy, our valuable TAs and peer-leaders, significantly contributed to the material that can be used for teaching this course.

CS2402: Data Structures – lab evolution

I taught CS2402 nine times. Originally, when I joined UTEP, I co-taught this course with Franck Fernandez, who was lecturer in computer science at that time. I followed his lecture plan and advices for content and lab level. I then taught this class alone and made it evolve to a course in which I would offer five significant labs a semester, each covering a major topic and several sub-topics of the course. I developed my own lecture notes and set of labs, which I aimed at rarely repeating. As a result, I developed a large set of labs.

I also aimed at preparing our students to mature thinking and problem solving. As a result, I would always write my labs as problems to solve, and not so much as a list of steps to implement: students had to come up with their own sequence of steps and solving techniques. In a similar aim to better prepare our students to upper-division courses, I would always require them to turn in a report along with their implemented solution of the given lab problem.

⋆ *Some labs are provided as appendix, Section 2.3.*

CS5303: Logical Foundations of Computer Science

I have taught CS5303 4 times. I have originally followed the lecture outline gotten from Francois Modave who was teaching it before me. During Spring 2007, when there were two sections of CS5303 open, Vladik Kreinovich and I (instructor for one section each) coordinated our efforts in order to make the experience of students from both sections fair and equitable. I taught this class alone the last two times (spring 2010 and spring 2011).

Since spring 2011, I have made this course evolve significantly to a team-work project-based class with a lot of references to practical use of logic. Giving weekly quizzes and homework, as well as two exams, article presentation, tutorial writing assignments, I have developed a significant body of teaching material.

⋆ *Samples of the teaching material is available in appendix, Section 2.3.*

Evidence of teaching style evolution

One of my main concerns while teaching is to engage all students. This is the reason why I like to diversify the activities in class (in group, individual) as well as the types of assignments (articles, tutorials, exercises, presentations). I have for instance gotten used to giving an individual quiz at the beginning of the class (covering material from previous lectures or reading assignments), and then giving the same quiz in groups at the end of the class (when I know I will cover the quiz' topics again in the time between the two quizzes). This allow for a very different group dynamic in which all participants have already had time to think about the topics at hand, and where there is a grade at stake. This is a way to implement the "Think Share Learn Report" technique.

⋆ *Evidence of repeated quizzes as individual and in-groups is available in appendix, Section 2.3.*

Another way I found of engaging students is to remind them that they are accountable for their work and performance, that they have to perform, and that so do I. Since experience showed me that hoping that such culture would be in place from showing good practice did not work, I decided to take action over it and since fall 2010, I have been doing the following:

- Asking students to sign the syllabus of their course as they would sign a contract: agreeing

to behave as stated in the syllabus, and acknowledging that they know what is in for them in this course: material, grading, etc.;

- Making some room in the final semester grade for participation: this shows students that their participation is valued, required, and rewarding (5%); and

- Having all students fill out a daily form: at the end of each class session, students have to turn in a daily form in which they have the opportunity to reflect on their own attitude by grading themselves about their attendance (on time or not), their participation (passive, active), their preparedness (prepared or not). I find it a subtle way to daily remind students about their duties as students.

As a result, I observed, over the two semesters during which I conducted this experience, that only one student did not completely adhere to the culture by still missing class and arriving late. Besides, all others were always on time, would always let me know in advance if they were going to miss class, never used their cell phones in class, and most importantly showed great dedication to the class.

⋆ *A syllabus "as a contract" is available in appendix, Section 2.3. To be noted is also the level of detail regarding students' expected behavior as opposed to previous syllabi (also available in appendix for comparison).*
The daily form is also available.

Integration of research and teaching

Finally, as I am passionate about my research and I believe that showing such passion to students can only have a positive impact, I strive to including topics related to my research as often as relevant.

As trivial examples, each time I taught a course either focused or related to constraints in summer (2006 and 2008), I have add a perfect opportunity to expose my students to my research. I would then let them know about state-of-the-art tools and current research in the covered areas. Also, teaching CS5303 on Logical Foundations of Computer Science is an ideal context for me to introduce constraints. Since I give projects for students to work on during the semester, there is always at least one project that is related to constraints.

At the other end of the spectrum, I also managed to integrate my research into introductory courses in computer science:

- In CS2402, I would start each semester with a lab topic related to the use of stacks and queues. I would never use exactly the same topic, but I would pick a topic that can be viewed as a constraint problem. Therefore, when going through the solution with my students, I would expose them to the similarity of their solving approach to the constraint programming approach.

- In CS1401, thanks to the requirement that students should attend seminars, in 2009, I opened the research workshop,CoProD, I annually organize to my CS1401 students. As a result, about 10 students attended my workshop and benefitted from the opportunity to attend talks given by leaders in constraint programming (such as Bart Selman or Rina Dechter).

2.1.5 Evidence of use of technology to complement instruction

I always look for ways to improve our students' experience. Over the years, I have polished my style as an instructor, I have also tried technology tools with varied success rates. In what follows, I describe what were my main attempts at using technology.

CourseMine

I used UTEP's "coursemine" in summer 2008 for both classes I was teaching at that time (CS4365: Problem-Solving for Game Design, and CS5354: Constraints). It was merely a simple trial of technology in a constant attempt to provide our students with a better experience.

It was convenient by some respect. However, overall, I did not find it as convenient as maintaining my own website for teaching. Also, I like the openness of my website: anyone can access it and use any of my teaching material. This was not the case of coursemine in which everything was login-and-password-protected. Moreover, my own TA was not allowed to access and edit my course content, so I decided not to pursue the experience any further than summer 2008.

A documented and interactive website

I use my website as a way to enhance my research and UTEP's visibility, but also as an access tool: access to resources and information for my students. In an effort to improve the access, I transformed my website several times. The two last versions are still reachable: (former) http://www.cs.utep.edu/mceberio/research; (last) http://www.martineceberio.fr.

I make efforts to update as much information as possible for my students on my course pages. Also, as vailable on my latest website, I make possible and engage students in contributing to their course website as visible on, for instance, http://www.martineceberio.fr/teaching/CS5350 at the bottom. I alway seek ways to engage them more, to make them own their own courses.

To spark off their participation, I counted their online participation in the participation grade counting towards their final grade.

Instant messenging

In an effort to better engage conversation with my students as well as to provide help virtually "round the clock", I started to use instant messenging with my students. It was successful in the sense that students who would otherwise not dare to seek help used it, some who could not commute everyday to UTEP used it, some who had a schedule conflicting with mine used it.

However, the success of it was in large part due to the fact that most people used some kind of messenging tool at that time. Therefore, using it was not seen a task to keep in mind, since instant messenging tools were always on on pretty much anybody's computer[1].

The down side of it is that when people, including me, gradually stopped using it, its purpose was easily defeated. I do not use instant messenging with my students anymore. I make a point in replying emails very timely though.

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[1] In that respect, I point out that the chat room of blackboard for instance never worked for me as it required me to log in and have it open specifically, and that ended up being just yet another constraint.

Up-to-date "'trendy" material

I recently introduced mobile app development in the material I teach. As part of the discussions related to the design of a new computer science course for non-major graduate students, as described in Subsection 2.1.3, the need to mobile app development was brought up. I decided to pilot an introduction to computer science through mobile app programming this summer 2011 both for the summer research project that I supervise at EPCC and for the Nexus student interns in my research lab. All high-school students have been working and successfully progressing on the basics of computer science through Android programming over the past 3 weeks. I plan to survey them at the end of summer to better understand the use of this "trendy" mean in getting high-school students involved in and excited about computer science.

The students currently develop an app for genetic sequence comparison as well as an app for my research group CR2G.

Online surveys

Without additional surveys, the only formal feedback we receive from students is the one they provide during end-of-semester evaluations. I find that by the time we actually receive this feedback (sometimes at half of the subsequent semester), it is too late to make any adjustment to the course that was evaluated. Therefore, in an effort to always better serve my students, I like to survey my students at mid-term so that the feedback I receive is timely and allows me to make adjustment to the class as needed. Besides, it also lets students know that their opinion is valued and will be taken into account.

I started requesting mid-term surveys from CeTAL and used this mean to receive earlier feedback during a few semesters, including summer to make up for the lack of evaluations at all. I then decided to organize my own through anonymous surveys on surveymonkey.com. During 2009 and 2010, due to my leaves, I was not able to set up such surveys, but I resumed them in spring 2011.

⋆ *I am attaching examples of surveys and results of the provided surveys in appendix, Section 2.3.*

2.1.6 Professional development in teaching, including workshops and seminars presented and attended

- I attend **CETaL**[2] and other workshops on campus as my schedule allows. However, I have mostly attended such workshops until a few years back, and over recent times, I have not been able to attend many of them, if any. To compensate, I have documented myself to improve my teaching and mentoring skills, through books such as "Taking Back the Classroom" written by Kirk, or "The Elements of Mentoring" by Johnson and Ridley.

- I was also an **NSF ADVANCE IMPACT fellow** from May 2006 to May 2007. Being an IMPACT fellow provides with the opportunity, during a complete year, to be part of a diverse group of faculty (from accross UTEP: several departments, colleges, tenured and un-tenured faculty). This group is given a one-week workshop about integrating Research, Teaching and Service (and the fourth one that is emphasized: Life) and the associated challenges. At the end of the May (2006) week-long workshop, all fellows have to turn in a project for integrating R/T/S during the year of the fellowship. During the year, the group meets once a month to

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[2]CETaL: Center for Effective Teaching and Learning, at UTEP.

discuss their progress, with respect to their individual project. At the end of the following May (2007) week-long workshop for the new IMPACT fellows, all fellows have to make a presentation about the benefits of the program over the year, and turn in a report assessing their work in integrating R/T/S with respect to the original project. This experience taught me a lot about the three components: Research / Teaching / Service – R/T/S, and how to integrate them. From this experience, I learned very interesting ideas, such as the "Just In Time Teaching" concept that I integrated to my teaching. I also recently came accross the "Think Share Learn Report" concept and I immediately integrated it successfully in my teaching.

- I have attended **NSF workshops associated with specific programs**: BPC community meeting, in Los Angeles, CA, in 2010 and CE21 community meeting in New Orleans, LA, in 2011. Although these meetings have some focus on the preparation of a proposal writing, they also offer a lot of brainstorming as well as informational sessions that helped me enrich my views about teaching, mentoring, as well as reaching out to minorities. In particular, I have attended sessions on gender balance and these have provided me insight on way to handle gender differences and unbalance in my classes. For instance, it has made me realize even more clearly the need to make sure that all groups are engaged and that different groups react to different triggers.

- I sought improvement in my teaching by volunteering to be a **reviewer for textbooks**. I found the experience very rewarding as a teacher as it gave me the opportunity to critically assess the way another teacher was presenting his ideas about data structures. It helped me a lot in my teaching by reinforcing some of my ideas about teaching, but also by providing me with new angles and examples for presenting part of the material I usually teach. In particular, I have reviewed two textbooks for publisher Scott and Jones, one for Elsevier, as well as *Java for Everyone* (class test) by Horstmann at Wiley, 2009, and *Data Structures: Abstraction and Design Using Java*, by Koffman and Wolfgang at Wiley, 2009.

- In a constant effort for improving my teaching, I also regularly conduct **additional students' evaluations** of my courses, usually at mid-term. I first did it through CeTAL and later on using surveymonkey.com. Such evaluations provide me with valuable information about how the course is going, and the timeline of these evaluations allows me to adjust my teaching style to the needs of my students over the course of the semester. I also believe that conducting these evaluations is another way to show our students that their input is respected and valued: indeed, after each midterm evaluations, I take the time to discuss the outcome of the evaluations with my students, and I tell them how their opinions are going to impact the course. This is one of the ways I implement both my values of respect and communication. ⋆ *See CeTAL evaluations' criteria and scores in appendix, Section 2.3.*

- I was part of the **UTEP AWARE program** during the academic year 2004-2005. I believe that the more I know about the university, the better I can help my students and project an image that is professional.

- I recently came across information about **QPR (Question, Persuade, & Refer) training** on campus offered by the University Counseling Center. Such a training seems essential as we daily interact with students and the better prepared we are to face emergency situations, the better for our students' sake. This is even more so these days as we have a significant number of students living across the border, who are in distress due to the situation in Cd Juarez. I am currently taking actions to organize such a training for the members of the Women's

Advisory Council. The reason for picking this council is that response to students' distress has been part of our council's conversation but also because the variety of participants of this council makes the impact of such training broader: hopefully members taking the training will organize such training in their own area of UTEP later on. I personally plan to organize students' training in fall 2011.

2.2 Evidence of Teaching Quality

2.2.1 Student evaluations and comments, tabulated and summarized

Students' evaluations

In what follows, I report the students' evaluations of my courses (when available).

Spring 2009 and Fall 2009's evaluations are omitted because in spring 2009, I taught only 5 weeks (the rest of the semester being taken as maternity leave) and about the same in fall 2009 (the rest of the semester being taken as a leave for family and health reasons), and it is not clear whose teaching the evaluations actually reflect (mine or my adjunct).

Also, the numbers of students do not match the ones listed before as enrollment: the numbers listed hereafter reflect the number of students who actually filled out evaluations for the given courses.

Summer classes were at first not evaluated: this explains why my summer-2006 courses do not appear in the list of evaluations.

Term	Subject	Course Title	Enroll.	Instructor	Course
Spring 2004	CS 2402	Data Structures	31	4.6	4.45
	CS 5314	Artificial Intelligence	11	4.6	4.0
Fall 2004	MIT 5310	Fundamentals of Computers	18	4.4	4.1
Spring 2005	CS 4320	Artificial Intelligence	13	4.6	4.2
	CS 5314	Artificial Intelligence	5	4.6	4.4
Fall 2005	CS 2402	Data Structures	20	4.6	4.4
	CS 5303	Logical Foundations of Computer Science	15	4.9	4.7
Spring 2006	CS 2402	Data Structures	22	4.6	4.3
	CS 4320	Artificial Intelligence	26	4.8	4.2
	CS 5314	Artificial Intelligence	6	4.2	4.2
Fall 2006	CS 2402	Data Structures	28	4.0	4.1
	CS 5303	Logical Foundations of Computer Science	14	4.4	4.4
Spring 2007	CS 2402	Data Structures	14	4.3	4.3
	CS 5303	Logical Foundations of Computer Science	6	4.3	4.2
Fall 2007	CS 2402	Data Structures	27	4.5	4.4
	CS 4320 / 5314	Artificial Intelligence	8	4.6	4.0
Spring 2008	CS 2402	Data Structures	29	4.6	4.4
	CS 5303	Logical Foundations of Computer Science	16	4.5	4.1
Summer 2008	CS 4365	Topics in Soft Computing	5	4.6	4.4
Fall 2008	CS 2402	Data Structures	39	4.1	4.1
	CS 5350	Advanced Algorithms	22	4.25	4.0
Spring 2010	CS 1401	Introduction to Computer Science	38	4.15	4.1
	CS 5303	Logical Foundations of Computer Science	14	3.7	3.4
Fall 2010	CS 5350	Advanced Algorithms	25	4.5	4.3

Although my evaluations' scores fluctuated, the semesters of lower scores match times of hardness in my personal life (e.g., Fall 2006, Spring 2010) that in particular required me to be away from the classroom more than usual, and I showed I was always able to rebounce and get back to better performance.

⋆ *Actual student evaluations are available in appendix, Section 2.3.*

Grade distribution

I report below the average grade distribution (in percentage of each letter assigned) over all the graduate courses and undergraduate courses I have taught:

Level	A	B	C	D	F
Graduate	53.2	30	9.6	4.9	2.2
Undergraduate	27.9	31.8	19.8	10.4	10.2

⋆ The detailed grade distribution table is available in appendix, Section 2.3.

Students comments and adjustment of my teaching

In what follows, I review topics that were mentioned regularly in my evaluations (positively, negatively, or both) and I describe how I addressed the comments by for instance adjusting my teaching style.

- **Textbooks.** Over the semesters I have taught at UTEP, I have sometimes received comments about the textbook I had chosen. And I could honestly not argue much about the comments since I was not either convinced myself: it is sometimes not trivial to find a good textbook. This is even more true since a good textbook for me as an instructor is a textbook that covers all the important material in a relevant manner. On the contrary, a useful textbook for students tends to have appeal as one of its most important criteria, of course, content ranking shortly after.

  I have therefore, over the years and for all the courses I have taught, always sought a good solution to the textbook problem: either finding a good textbook, good set of textbooks, or no textbook with a list of recommended readings.

  This is what I have done for CS5303, course for which I have sucessively:

  - adopted a textbook that was not particularly liked,
  - decided not to have a textbook but instead a list of recommended readings: this idea was received with very nuanced success. I hence decided to reverse my decision for the subsequent semesters;
  - adopted 2 textbooks and added a list of recommended readings: first I made sure the requirement of two textbooks would not be a financial burden to our students but picking reasonably-priced books, then I made efforts to indeed make use of both books. Since this last change, I have not received any comment about the textbook in students' evaluations.

  In the case of CS2402, I have in 2006 decided to part away from the usual Java-language-based textbook in an effort to force the students to focus on concepts / pseudocodes of algorithms, as opposed to intricate syntactic details of Java. To this end, I decided to adopt "Data Structures and Algorithms", by Aho, Ullman and Hopcroft (Eds. Addison-Wesley), an older, less visually appealing book with however all the content presented the "right" way. Students appeared to be quite puzzled by the book at first, even though some told me, after the end of the semester, that they had realized, eventually, that this book was very good. I tried the experiment twice (spring and fall terms of 2006) and surveyed my students about their needs in terms of a textbook. There was no clear conclusion to be drawn. As a results, I decided in spring 2007 to, instead, propose a pool of suggested books, enforcing that every student in my class should own one textbook among the given list, and I surveyed again the students before spring break to better understand their needs, and propose a fully adapted textbook. The result convinced me to fully reverse back to a more traditional textbook requirement after that.

  ⋆ See: http://www.cs.utep.edu/mceberio/teaching/, follow Archives and CS2402, spring 2007.

- **Projects.** I like to make most of the courses I teach semester-long project-based courses. Exceptions to this are for instance the CS2402 and CS1401 course because they are introductory and students need shorter-term milestones to be kept on track.

  Although the feedback about semester-long projects has always been overally positive, some students had more nuanced comments pointing out that they needed more safe-guards and milestones for the project during the semester as well as more time in class to work on the project. Some have also expressed that they would prefer shorter-term assignments.

  I did not give up on the semester-long projects. However, I established a sequence of progressing deliverables for the students to turn in over the course of the semester, as a way for them to see their grade gradually build up and avoid the surprise of the end-of-semester assessment. I also proposed, in parallel to the semester-long projects, shorter-term assignments to address the comment requesting more and smaller-scale activities. Moreover, I made sure to regularly announce the current status of the course through a "to date / to go" kind of report so that students know what to expect for the rest of the semester and can plan their time accordingly. This required me to post future assignments very much ahead of time.

  These changes are visible, for instance, on the website of the last two courses I taught (CS5350 in fall 2010, and CS5303 in spring 2011) where the complete list of assignments is available.

  ⋆ *See: http://www.martineceberio.fr/teaching/CS5350 or http://www.martineceberio.fr/teaching/CS5303. See also in appendix, Section 2.3, emails sent to students about the progress of the class.*

- **Teaching style: board vs. slides.** I teach for the most part writing notes on the board: I rarely use slide presentations. I received some comments about it, mostly expressing that students would like to be able to have the class notes.

  Still I continue to use the board only as I like to make my lectures interactive and slides just do not work well for me. However, I worked on meeting students' needs by posting notes or resources for the class on the website of my courses.

  ⋆ *See any of my course websites available from http://www.cs.utep.edu/mceberio/teaching or http://www.martineceberio.fr/teaching.*

- **Use of instant messenging:** I started to use instant messenging with my students in fall 2005. I received very positive feedback in the students' evaluations about this way of interaction. I continued to use it until around 2010, using it gradually less and less. I finally stopped using it as I do not use this kind of messenger any more. I have not received any comment about students' needing more interaction: as a very student-centered instructor, I dedicate a lot of my time to my students, reply to their emails very fast, and make a lot of time for them as needed; hence I think that instant messenging was not essential.

- **Homework vs Quizzes:** I have received conflicting comments about my balance of homework assignment and quizzes over the semesters. In particular, on the one hand, some students commented on the fact that I give too many quizzes in comparison to the few homework assignments to turn in; on the other hand, some other students have expressed that they like very much the many quizzes as it keeps them under pressure to work regularly.

Here is what I used to do: I value quizzes as a way to remind students that they have to work consistently over the semester, to inform them about what topics matters and about my examination style, as well as to reward the students who consistently work. So my style is to give quizzes every week, except on exam's weeks. Concerning homework, I value it too, but find it hard to grade homework for all students every week. As a result, I used to give hand-outs for students to work on but would only seldomly pick them up for grading.

Here is how I changed the homework-quizzes balance since fall 2010: I did not give up on quiz frequency and I still make a point in turning the grades back during the next lecture session. However, I have solved the homework problem by assigning weekly homework that is "to be turned in" but will only picked up randomly. Students who want feedback but were not randomly picked can turn their homework in anyway and they will receive feedback as well. In practice, it means that every week, I have about 5 to 7 homework assignments to grade: it is much more reasonable than grading the whole class, and it still keeps students under some kind of pressure.

⋆ *See on the website of my two previous courses (http://www.martineceberio.fr/teaching/) for the list of assignments.*

- **Projects / Labs:** In projects as well as in labs, I like to have students work in group: for labs, in pairs; for projects in groups of 3 or 4 students. I conducted pair work in labs for CS2402 during two semesters and then, due to difficulty to resolve conflicts (students dropping the course and their team mate being left alone; students not participating at all and leaving the other working alone; etc.), I decided to go back in spring 2008 to individual lab assignments, at least for introductory computer science courses, as conflicts were too much of a distraction for students who should have otherwise focused on their actual work. For projects in upper-division computer science courses and graduate courses, on the other hand, I stuck to group work as I believe that team-work is an essential skill that I aim to teach as well as the course material, and also because group work allows to tackle more complex and interesting projects.

  However, in an aim to satisfy more students, and to get the best of both worlds, I have tried several other configurations, including:

  - (1) individual projects: but several students working on the same project topic had to work together to share their experiences. At the end, the work had to be the one of each individual student.
    ⋆ *See CS5350 fall 2010: http://www/martineceberio.fr/teaching/.*

  - (2) similar to the first configuration, but this time the group work is also rewarded through group assignments. Individual assignments and deliverables are also given. That was my last experiment and it seemed to work fine. Depending on students' feedback (not yet received at the time I am writing this document), I will repeat the experience in CS5350 in fall 2011 and conduct a specific students' survey about this type of configuration.
    ⋆ *See CS5303 spring 2011: http://www/martineceberio.fr/teaching/.*

2.2.2 Theses and dissertations supervised

Supervision of PhD students

1. **Luis David Lopez Gutierrez**: joined UTEP in May 2006 (after we had been in contact and had begun to work remotely together since January 2006). He was funded by the NSF DAPLDS project (see Research and Scholarship) during Summer 2006. He also received a CONACYT scholarship in Fall 2006. We worked together until Spring 2007. He left UTEP while under my supervision, during Summer 2007 due to family reasons.

2. **Mai Ahn Nguyen**: joined UTEP in January 2009 and left UTEP while under my supervision in summer 2009 to go back to his country (Vietnam) for family reasons. He barely started working on constraints with me during that time.

3. **Xiaojing Wang**: was originally Francois Modave's student and she joined my research group when he left in fall 2009. Except during her maternity leave in Spring 2011, she has since then been working on optimization algorithms for fuzzy measures extraction. We have considered varied topics such as hybrid solvers, interval representation of decisions, and applications to software quality assessment. We published one joint article (at NAFIPS'11, which won the best student paper award), and are finalizing both a journal article and another conference article. She is expected to take her comprehensive exam during summer 2011 and defend in summer 2012.

4. **Aziza Aouhassi**: joined UTEP in January 2011 (after I had been in contact with her since fall 2009). She worked in CR2G, my research group, on optimization algorithms as well as on the solver my Master's student currently develops. She left UTEP while under my supervision in May 2011 to go back to her country for family reasons.

Supervision of Master's students

1. **Richard Coy**, worked on his Master's thesis from Summer 2004 to November 2005. The subject of his thesis was: Making Constraints Flexible: a Concrete and User-oriented Approach. In particular, he worked on defining and implementing a general framework for flexible constraints, and on specifying a graphical interface for this purpose. The title of his thesis was: *Solving Inconsistent Continuous Constraint Satisfaction Problems: an Application to Shock-Absorbers Quality Testing*. We published a joint work on this topic at the International Conference on Algorithmic Mathematics and Computer Science (AMCS'05), where Richard presented his work.

2. **Carlos Acosta**, worked with me from September 2005 until December 2007, on Constraint Programming for Software Verification. The title of his thesis was: *A Constraint-Based Approach to Verification of Programs with Floating-Point Numbers*. Verification is a very crucial, ex- pensive and difficult part of software development. Carlos showed that the use of constraints makes this stage of development easier, as well as more reliable.
   <u>Evidence of success</u>: After his defense, based on his work, he was offered a full-time research assistant position for a period of 3 years, allowing him to get his PhD, in the CNRS[3] team, at the University of Nice Sophia-Antipolis (France), led by Professor Michel Rueher.

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[3]CNRS: Centre National de Recherche Scientifique.

Current position: For personal reasons, Carlos decided not to accept the position in France. He currently works at in El Paso.

3. **Geetanjali Mesineni**, worked with me from Summer 2006 to July 2007, on a Master's project. She built a low-maintenance, high-content website for constraint solving. This was a necessary resource for the constraint community.
Evidence of success: http://www.constraintsolving.com, the website she built and that is now (under its new design) maintained by my research team CR2G, has an average of over 1,000 unique visitors a month.
Current position: Geetanjali currently works as a software engineer in Boston.

4. **Naga Suman Kanagala** joined my research group at the end of 2007 and graduated in Summer 2009. He worked on a Master's project on the topic of Intelligent Systems for Gait Therapy. He developed a tool to help clinicians make a reliable diagnosis of gait pathologies, and guide them through the therapy stage. Evidence of success: We were able to publish his work at a biomedical conference.
Current position: He currently works in Ohio at Rockwell Collins as a Software Engineer.

5. **Christian Servin** worked on Constraint Programming and Security from 2006 to May 2009. His specific area of research was the Cascade Vulnerability Problems, in networks, that he chose to address using soft constraint programming techniques. In this work, we have collaborated with Dr. Eric Freudenthal (UTEP) and Dr. Stefano Bistarelli (University of Perugia, Italy).
Evidence of success: Based on his current work on constraints and security, Christian was proposed a fully sponsored internship in the lab of Stefano Bistarelli, in Italy. He decided not to go, however, we were able to write several articles in collaboration with Dr. Bistarelli.

Current position: Christian is now a PhD student in the Computational Sciences program at UTEP, under the supervision of Dr. Kreinovich.

6. **Antonio Cortes** worked on soft constraints for graphical interfaces. He worked with me during 2006 and decided to move on to another topic at the time of my first maternity leave. He joined Dr. Cheon's research group in Fall 2007. While working with Dr. Cheon, Antonio pursued research related to constraints and I continued to provide advise on this topic. We had a joint paper published in the proceedings of SEKE. I was a member of his thesis committee.

7. **Paden Portillo** worked with me from summer 2009 to spring 2011. He first worked with me as an undergraduate student (year 2010) and then as a master's student (fall 2010 and spring 2011, in the Master's in Software Engineering).
Evidence of success: During his work with me, he focused on circular interval arithmetic and its potential use to solve constraints, as well as on optimization algorithms, drafting the design of a speculative algorithm. Along with Vladik Kreinovich and myself, he wrote an article on an efficient bissection of ellipsoids that was accepted at the ITEA Live-Virtual-Constructive Conference "Test and Evaluation", El Paso, Texas, January 24-27, 2011.
Current position: Paden decided to suspend his research activities at CR2G in summer 2011 due to family circumstances.

8. **Mario Bencomo** worked with me from spring 2010 to summer 2011. He first worked with me as an undergraduate student (year 2010) and then as a master's student (spring 2011).

Evidence of success: During his work with me, he focused on global constraints and rectangular systems of linear inequalities. Along with one of my other undergraduate students, Luis Gutierrez, he wrote an article on reducing systems of linear inequalities: this article is in the proceedings of the ITEA Live-Virtual-Constructive Conference "Test and Evaluation", El Paso, Texas, January 24-27, 2011.

Current position: Mario left UTEP in summer 2011 while under my supervision to join Rice University in Houston, TX, where he received a full scholarship for the PhD program in Computational Sciences and Applied Maths.

9. **Christian Del Hoyo** joined my research group in Fall 2009 while he was taking an independent study with me on constraint solvers. He is now working on a symbolic-numeric constraint solving flexible platform. He is expected to graduate in summer 2012.

10. **Shubhra Datta** joined my research group in spring 2010. Her work is about program verification using constraints. Her approach consists in combining symbolic techniques (close to formal methods) with interval constraint solvers. She is expected to graduate in early fall 2011.

2.2.3 Thesis committees

Below are listed the students for which I was in the Master's thesis or project committee. My involvement in the work of these students varied vastly, but in general, I also advised them: meeting with them to review their work, propose changes and research directions.

1. **Courtney Barnes (April 2010)**
   Title of the Master's thesis: Bayesian Non-Parametric Regression with a Flexible Error Term Distribution
   Thesis advisor: Ori Rosen (Math Department)

2. **Delia Villanueva (November 2009)**
   Title of the Master's thesis: New Genetic Algorithms
   Thesis advisor: Heidi Taboada (Industrial Engineering Department)

3. **Paul Rolon (December 2008)**
   MIT presentation

4. **Tsheten Wangchuk (December 2008)**
   MIT presentation

5. **Antonio Cortes (May 2008)**
   Title of the Master's thesis: Enhancing Test Data Generation using Constraint Programming
   Thesis advisor: Yoonsik Cheon (CS Department)

6. **Benjamin Betancourt (December 2007)**
   Title of the Master's thesis: Recognition of Objects Using Fuzzy Logic
   Thesis advisor: Thompson Sarkodie-Gyan (ECE Department)

7. **Sandhya Gorripati (December 2007)**
   Title of the Master's project: Investigations into Instrumented Gait Analysis.
   Advisor: Thompson Sarkodie-Gyan (ECE Department)

8. **Gang Xiang (July 2007)**
   Title of the PhD manuscript: Fast Algorithms to Compute Statistics under Interval Uncertainty, with Applications to Computer Science and to Electrical and Computer Engineering.
   PhD advisor: Vladik Kreinovich (CS Department)

9. **David Sevilla (April 2007)**
   Title of the Master's thesis: Computerized Method for Finding the Ideal Patient-Specific Location to Place an Equivalent Electric Dipole to Derive an Estimation of the Electrical Activity of the Heart
   Thesis advisor: Joseph Pierluissi (ECE Department)

10. **David Kadjo (April 2007)**
    Title of the Master's thesis: Recognition of Partially Occluded Objects Using Fuzzy Logic
    Thesis advisor: Thompson Sarkodie-Gyan (ECE Department)

11. **Kristian Dillon (July 2006)**
    Title of the Master's thesis: Optimal Position of the Electric Dipole Model for the Simulation of the Standard Twelve Lead Electrocardiogram and Easilead System.
    Thesis advisor: Joseph Pierluisi (ECE Department)
    Other committee members: Gregory Lush, Zainul Abedin.

12. **Annette Arrigucci (December 2005)**
    Title of the thesis: Testing the Effect of Training with Synthetic Speech on Task Performance with a Mixed Human and Synthetic Speech Interface.
    Thesis advisor: David Novick (CS Department)

13. **Sanjeev Chopra (August 2005)**
    Title of the thesis: Affine Arithmetic-Type Techniques for Handling Uncertainty in Expert Systems.
    Thesis advisor: Vladik Kreinovich (CS Department)

14. **Linda Susan Draper (July 2005)**
    Title of the thesis: Free Space Optical Bus Architecture
    Thesis advisor: Brian D'Auriol (CS Department)

15. **Neelabh Baijal (April 2005)**
    Title of the thesis: Privacy in Statistical Databases: an Approach using Cell Suppression.
    Thesis advisor: Luc Longpré (CS Department)

16. **Juan Rene Roldan (May 2004)**
    Title of the thesis: Feasibility Study of the LARPBS Optical Bus Parallel Model.
    Thesis advisor: Brian D'Auriol (CS Department)
    Other committee member: David Zubia
    Note: The defense (held in May 2004) was not successful. We, the committee, decided to ask for additional work, and request that Juan defend again at a later date. The same committee evaluated the work of Juan and gathered again for his final defense in 2005.

2.2.4   Supervision of undergraduate students

I have coordinated CR^{2}G, Constraint Research and Reading Group, since 2004. Students at all levels, from high-school to PhD students are involved in this group. In my research group, I value

and encourage peer mentoring and follow the Affinity Research Group model[4].

The undergraduate students in CR2G are generally introduced to research through easy research-oriented projects. The objective is to offer them an opportunity to experience research without drowning them and compromising their success in class. I have then had several undergraduate students grow into mature researchers (such as Luis Gutierrez, Jerald Brady).

Among the former students of CR2G, the one listed hereafter were the most active ones.

1. **Jerald Brady** (funded by David Novick's NSF MII grant from Summer 2006 to Spring 2007) worked on interval computations: he extended existing libraries to make it easier for the group to test our algorithms.
   Current position: PhD student in the Environmental PhD program at UTEP.

2. **Antonio Bologna** was the webmaster of the website of our research group: at that time, it was http://www.cr2g.org (now http://cr2g.constraintsolving.com). He was in charge on listing applications of constraint programming to real-world applications.
   Current position: Master's student in computer science at UTEP.

3. **Brandon Marin** worked on using constraints for light effects, and scene lighting. His background in physics made him a very good candidate for this kind of applications. He graduated in Spring 2008. He originally planned to continue his education with a Master's degree in Europe.
   Current position: Being a member of CR2G was very instrumental in his being accepted for a Master's degree at the Imperial College Parc (London, UK) where leading research teams in constraint satisfaction are located. Due to personal reasons, he decided to accept a job offer in the US instead.

4. **Carlos Silva** (also took an independent study with me in the Fall 2006) worked with Christian Servin in the area of constraints and security (in particular, soft constraints).

5. **Tonatiuh Mendoza** was part of the group during 2007, and worked with Naga Suman Kanagala in the early design of a graphical tool for gait therapy.

6. **Carlos Azcarate** (Fall 2006 - Fall 2007, funded by MII during the Fall 2007) first worked on distributed constraints and later on, developed an add-on to an interval library for optimization.

7. **Essau Ramirez** (Spring 2007 - Fall 2008) worked on constraint programming techniques for gait pathology diagnosis and therapy. The objective of their project was to build a graphic tool that uses interval constraints and optimization solving techniques to determine patterns in the gait.

8. **George Moreno** (Spring 2010) worked in my research group on developing a flexible constraint solver. Due to many commitments outside the university (George also worked full time at HP), George had to suspend his research activities in summer 2010.

9. **Luis Martinez** (Spring 2010 - Fall 2010) worked on designing educational modules related to constraints and optimization, stimulating problem-solving skills for high-school students.

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[4]The Affinity Research Group is a "cooperative learning approach to involving students with diverse backgrounds", see https://www.createspace.com/3374426 for more details.

Due to many commitments outside the university (Luis also worked full time at UTEP's police), Luis had to suspend his research activities in Spring 2011.

10. **Luis Carlos Gutierrez** (since Spring 2010) has worked with me in the area of global constraints and rectangular systems of inequalities related to tensor decomposition. He has also been very active in mentoring high-school students hosted in my lab or trained at EPCC during summer (2010, 2011).

Other students who were part of the group include: Paden Portillo, Antonio Cortes, Antonio Bologna, Carlos Acosta, Christian Servin (before they graduated and worked on his master's thesis with me), Edgar Padilla, Angel Silva, Cesar Valenzuela, Bryant Fuentes, Marisol Chacon.

REU students supervised

Thanks to UTEP's REU Summer Site in Intelligent Computing directed by Olac Fuentes at UTEP, I was able in summer 2010 and summer 2011 to supervise and mentor a total of 3 undergraduate students.

- **Summer 2010.**

  1. **Jeremy Cummins** from Youngstown State University, Ohio, worked on an optimization algorithm for fuzzy measure extraction under my supervision as well as my PhD student's, Xiaojing Wang. It is important to note that our joint work resulted in one article published in the proceedings of NAFIPS'11 that won the best student paper award (as detailed in Subsection 2.2.5.

- **Summer 2011.**

  1. **Michael Watke** from Presbyterian College, in Clinton, South Carolina, a senior computer science (and math minor) student, currently works on improving a genetic algorithm's approach to generating optimal pair-wise test suites.
  2. **Robert Bixler** from Alma College, Michigan, a senior computer science (and math minor) student, currently works on two different algorithms for fuzzy measure extraction: a hybrid algorithm and a speculative algorithm, both involving one interval component. He works under my supervision as well as my PhD student's, Xiaojing Wang.

Other groups supervised

During the Spring 2006, I also coordinated, with François Modave, another research group, on Computational Biology, called ISaCoBi, for Intelligent Systems and Computational Biology. The undergraduate students of ISaCoBi took independent studies with François Modave and myself on a Computational Biology-related topic. Two PhD students were also part of the group: David Herrera and Xiaojing Wang. We would meet once a week for presentations of students or faculty on topics of interest to the group.

2.2.5 Honors and awards to supervised students

1. Best student paper award for the following article: Xiaojing Wang, Jeremy Cummins, and Martine Ceberio, "The Bees Algorithm to Extract Fuzzy Measures from Sample Data", *best student paper award*, Proceedings of **NAFIPS 2011, the North American Fuzzy Information Processing Society**, 2011.

2. Two of my undergraduate students, Luis Gutierrez and Luis Martinez, supervised one summer research project for early-college high-school students in summer 2010, at El Paso Community College within the MSEIP project directed by Dr. Alvarez: their project won second place at the end-of-summer project competition (based on project achievement, poster, and presentation).
   ⋆ A letter of Dr. Alvarez, commenting on this achievement as well as on my teaching skills, is available in appendix, Section 2.3.

2.2.6 Career achievements of mentored students

The students listed below are those with most notable achievement records so far.

1. **Christian Servin (grad. 2009)** is now a student in the Computational Sciences PhD program at UTEP.

2. **Naga Suman Kanagala (grad. 2009)** is now a Software Engineer at Rockwell Collins in Ohio. He is also half-way done with his MBA from the university of Iowa.

3. **Mario Bencomo (UG grad. 2010)** recently left my research group in which he was a graduate research assistant, to join (summer 2011) Rice University's PhD program in Computational Sciences and Applied Maths, with full scholarship.

Among other students who have been under my supervision, it is to be noted that several undergraduate students decided to continue with a Master's or PhD degree.

2.2.7 Community and/or school-based projects guided and produced in connection with courses

EPCC summer research projects Nexus mentoring

2.2.8 Letters peers who have observed classes or reviewed course materials

Supplemented as appendix to this teaching portfolio are letters from peers with whom I have taught or who have been able to observe me while teaching. Supplemented letters are from:

1. Dr Francois Modave (associate professor at Texas Tech University Health Center; at UTEP at the time of our co-teaching experience), with whom I co-taught Artificial Intelligence in Spring 2004;

2. Mary Kay Roy (lecturer at UTEP in computer science), who was teaching CS1401 at the same time as I was: we had weekly meetings with our teaching assistants and lengthy discussions

about the curriculum of this course. She was able to review extensively material that I prepared for this course.

3. Dr Maria Alvarez (professor at El Paso Community College) is in charge of the summer research projects program in which I am involved as faculty advisor and in which I have held seminars.

2.3 Appendix: List of Supporting Documents

2.3.1 Course information and evaluations

- Students evaluations of my teaching

- Grade distribution for all courses taught

2.3.2 Teaching improvement efforts

- Mid-term surveys

  - Original "by-hand" survey: for CS2402 in 2005
  - Survey using *surveymonkey.com* for cs5303 for spring 2011, and the results

- Evidence from my website:

  - Archives of teaching activities (2003 to 2007): http://www.cs.utep.edu/mceberio/teaching
  - Recent teaching activities (2010-2011) with interaction from students:
    CS5350: http://www.martineceberio.fr/teaching/CS5350 (fall 2010);
    CS5303: http://www.martineceberio.fr/teaching/CS5303 (spring 2011).

- Documents used in class:

  - Students' daily form
  - Syllabus to sign
  - Lecture plan uploaded on website during semester as an update to initial plan for CS5350 during fall 201

- Survey to determine the need for CS summer classes in 2008

2.3.3 Curriculum development

- Syllabi

  1. CS 2402: fall 2005
  2. CS5303: fall 2006, spring 2011

- Change in the lecture plan of CS1401: syllabus with objects taught early, syllabus with objects taught late (change proposed in collaboration with Mary Kay Roy)

- Examples of labs developed for CS2402 (zipped files): fall 2005, fall 2007, fall 2008.

- Examples of assignments:

    1. List of projects for CS5350 during fall 2010
    2. Tutorial assignment for CS5303 during spring 2011 showing the different parts assigned to groups and to individual students

2.3.4 Letters from peers who have observed classes or reviewed course materials

1. Dr Francois Modave (associate professor at Texas Tech University Health Center; at UTEP at the time of our co-teaching experience), with whom I co-taught Artificial Intelligence in Spring 2004;

2. Mary Kay Roy (lecturer at UTEP in computer science), who was teaching CS1401 at the same time as I was: we had weekly meetings with our teaching assistants and lengthy discussions about the curriculum of this course. She was able to review extensively material that I prepared for this course.

3. Dr Maria Alvarez (professor at El Paso Community College) is in charge of the summer research projects program in which I am involved as faculty advisor and in which I have held seminars.

2.3.5 Letters from research students

1. Carlos Acosta, former Master's student (graduated in 2007)

2. Shubhra Datta, current Master's student (expected graduation date: Fall 2011)

3. Mario Bencomo, former Master's student (now PhD student at Rice University)

4. Christian Del Hoyo, current Master's student (expected graduation date: Spring 2012)

5. Luis Carlos Gutierrez, current undergraduate student (expected graduation date: Spring 2013)

Part III

Research and Scholarship

3.1 Evidence of Success in Research and Publication

3.1.1 Research Overview

My main drive in conducting research in computer science is to enhance decision-making processes: automating decisions while ensuring reliability of the process and the outcome. Most of the decisions I try to automate involve numerical models.

The core of my research is in numerical constraint solving (NCS) and interval computations. My research interests mainly lie in the area of non-linear continuous constraint and global optimization solving, along with the many applications of these.

Some background: *Numerical constraint solving (NCS) techniques are important components of intelligent systems. They can efficiently tackle hard continuous nonlinear problems, such as financial analysis, simulation and synthesis of electronic circuits, failure diagnosis, decision support systems, molecular biology, geometrical problems. NCS (propagation) techniques made formerly intractable problems very practical: e.g., one famous circuit design problem from Ebers and Moll, formerly solved with a precision of four significant digits in fourteen months using a network of 31 workstations, could be solved in a couple of milliseconds on one workstation thanks to constraint solving algorithms.*

NCS is different from (constraint) logic programming (LP). Constraint programming (CP) is a declarative way of programming. It can only be related to LP as an offspring of it. Constraint Logic Programming (CLP) first extended logic programming by including new kinds of predicates called constraints, which are not necessarily clauses, and are therefore handled differently by the constraint solver. Constraint solvers also extend logic programming solving processes by including solving procedures other than backwards reasoning, in particular constraint propagation. CLP is dedicated to combinatorial, discrete problems. It was extended to Constraint Programming (CP), handling more solving procedures and continuous problems. It is important to note that the field is usually divided into two main research streams: constraints over discrete domains (leading to work on combinatorial problems), and constraints over continuous domains (leading to mostly work on non-linear problems). NCS is dedicated to the latter.

The power of constraint programming, and NCS in particular, has attracted the attention of major companies, s.a. manufacturers Michelin and Dassault, the French railway authority SNCF, airlines Swissair, SAS, and Cathay Pacific, and Hong Kong International Terminals. Nevertheless, NCS has yet to address a lot of challenges, and research in this field is very active. One of them is the lack of knowledge of researchers and domain scientists about constraints in general and their use in decision making processes, making NCS techniques under-utilized in real-world scientific projects.

In this context, my research goals are to:

- make non-linear continuous constraint and global optimization problems solvers scalable, while remaining reliable (w.r.t. notions such as globality, completeness, robustness); and

- bridge the gap between the practicality of the solvers and their lack of use by practitioners, by building a community of decision-making researchers and domain scientists.

In doing this, I seek to make an impact on the way problems are solved and which problems can be solved. I believe that this is a high payoff area. My efforts in achieving these goals result in balancing my work between fundamental (Goal 1 – G1) and applied research (Goal 2 – G2):

- part of my work is in exploring new computational models and designing ways to make more computations faster: I work in the areas of symbolic-numeric algorithms for constraint and optimization solving, multi-criteria decision making, interval computations (e.g., through the use of different paradigms – J2 of my CV –, the design of new interval arithmetic – C1 –, or combinations of solvers – C3 –); and

- part is in exploring applications as both a way of getting feedback and (mostly) a creativity boost: network security, bio-medical engineering, software engineering (e.g., J1, C6, C19, Ch2).

3.1.2 Highlights of Research Successes and Impacts

Consistent with my two main goals as stated above, I have contributed to the following areas:

Decision making

My work in the area of decision making revolves around the following topics: constraint solving, multi-criteria decision making, optimization, and uncertainty. These are the essential components of what I am striving to build: tools for more efficient (mostly numerical) problem solving. Constraints are for the hard requirements of the problems, multi-criteria decision making help model the soft part, optimization is often what decision comes down to, and uncertainty is part of all numerical models I consider as I explain below.

□ **Constraint solving.**

As mentioned before, I am mostly interested in solving constraints as they are part of most of the decision processes I will address. Over the last years, I have explored ideas to speed up the solving process. The main directions I have pursued and contributed to are the following:

- **Speculations** to speed up the constraint solving process in a distributed decision setting. The idea was to acknowledge two very likely scenarios: (1) decisions are likely to be made at different geographical locations or at least not only by one single decision maker; (2) in such a setting, partial decisions might be delayed and might even never be provided (e.g., communication failure).

  I worked on this with my colleagues, Drs. Satoh and Hosobe, from the National Institute of Informatics in Tokyo, Japan, where I spent a total of about 2 months as an invited researcher (spanning from spring 2004 to spring 2005)[5]. In this joint work, that assumed a master-slave setting, we proposed and developed an operational procedure to speculate and revise beliefs about the partial solution of the addressed problem (see articles Ch4 and C22).

  I later proposed to extend this work to a more general setting. This work is planned to be carried out under grant NSF CAREER#0953339.

- Efficient **search space exploration** can significantly speed up the solving process. In particular, the traditional constraint solving approach using intervals (boxes) to model the full search space and ensure reliability relies on an exploration of the search space of the type: branch-and-prune (or branch-and-narrow, or any variation of these). This means that branching will occur at some point: it is actually very critical since it will allow to separate solutions. Extensive research and proposals exist on how to branch / bisect the search space.

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[5]This collaboration started with the Sakura project – see list of grants in vitae and article J11 –.

This joint work with Linet Ozdamar (at the time of the article, from Nanyang Singapore, and now at Izmir University in Turkey) proposed an interval partitioning technique, to guide the search, based on simple local search (see article J12).

- Different **computation paradigms**. Recently, I have looked into possibilities to use circular interval arithmetic, as opposed to box / rectangular interval arithmetic. We approached the problem geometrically, considered different sub-search spaces, such as ellipsoids, and proposed an efficient bisection for these (see article C1). This was to be put in the context of exploration / search algorithms based with the need of branching. I plan to extend this line of research to optimization by using it as a way to detect basins to "dive" into.

  With my colleague, Dr. Kreinovich, as well as with my students (but with them, from the application point of view), I have also explored the use of tensors (see article J2).

□ **Multi-criteria decision making (MCDM) and optimization.**

I view MCDM as a natural extension of my previous dissertation work on soft constraints. It is concerned with processes when one has to make a decision based on several, possibly conflicting, criteria. The decision consists in general in a "reasonable" or best tradeoff between the satisfaction of these criteria. In this sense, it is very similar to the concept of soft constraints, for which when constraints can't be met at once, a tradeoff will be sought. The main conceptual difference is that in MCDM there is no requirement that safe values of the criteria satisfaction be defined, as is the case in constraints (feasible / unfeasible regions are modeled).

The preferred approach, used and developed over the years I have worked on MCDM, was that of using a Choquet integral and fuzzy measures to combine the criteria satisfaction levels. This work was conducted in large part in collaboration with Dr. Modave (at that time from CS at UTEP, now at Texas Tech University Health Center in El Paso). My contributions to the area of MCDM are at various levels.

- **Interval MCDM.** The approach to MCDM based on the use of fuzzy measures heavily relies on the existence of such a fuzzy measure. In theory, experts would be queried to provide meaningful such values. In practice, it is not a reasonable approach for two reasons: (1) for a problem involving n criteria, $2^n - 2$ values need to be provided; (2) values of the fuzzy measures are meaningless to an expert and therefore the odds of getting meaningful values are very low.

  Instead, we assumed that giving the possibility of providing intervals / ranges of values rather than "exact" values would be more practical. This required us to revisit the computation through the Choquet integral and make sure that the interval computations involved would not result in an "explosion" of the interval width (which could have been dramatic for the meaningfulness of the result). Instead, we showed that no such "explosion" would occur (see articles C27, C28, and Ch3).

  To later address the ambiguity created by interval decisions, we proposed strategies to interpret the interval results (see article C9).

  This line of work significantly contributed to the area of MCDM by allowing more flexibility and practicality to the setting, as well as by providing ways to interpret the subsequent results in a meaningful and strategic way.

- **Fuzzy measure extraction through constraints and optimization**

  This work was mostly conducted with students.

As an improvement to the above-outlined problem of the need for a fuzzy measure, I also worked on the possibility of extracting fuzzy measures from sample data. For instance, let's say that we want to assess the quality of software. We have access to an expert's assessments of some pieces of code. For each of these pieces of code, we can objectively assess (or get the expert's opinion on) the level of satisfaction of each of the criteria. We will use these data to reverse engineer the fuzzy measure that models this expert's reasoning. We call this "fuzzy measure extraction".

Our approach to doing so was to model and solve the problem as an optimization problem. Originally it is a pure constraint problem if the expert is always very consistent in his/her assessments, but that would be seldom the case, hence failing the constraints. As a result, we aim at determining the fuzzy measure values that best model the expert's assessments.

To solve this problem, we tuned a bees algorithm and showed improvement in the speed and scalability of the extraction process (see article C3 – best student paper award at NAFIPS'11). In an aim to conduct a reliable solving process, we then combined this algorithm with an interval solver: this resulted in speeding the process and providing even better solution results (the corresponding journal article is in progress). We are currently working on slight modification of the monotonicity constraints to speed up the process even more. Our promising results are work in progress to be submitted soon.

□ **Uncertainty and interval computations.**

Most of my work is concerned with problems that can be expressed with variables of continuous ranges. Aiming at complete/global solving processes, I usually model the variables' ranges using intervals and then conduct computations with these. The potential overestimation resulting from interval computations, as well as the mere fact that intervals are not as sharp as single values, generates a need for more information, or strategies of choice (as already pointed out with C9). Also, the models I work with come from potentially uncertain sources: for instance, from measurements that are never 100% accurate. As a result, my research deals with uncertainty and resulted in several contributions, ranging from affine-arithmetic-type techniques for uncertainty handling in expert systems (J9 and C16 from a different angle), a combination of probabilistic and interval uncertainty in engineering calculations (J10, and also for instance C13 and C19).

Applications

As mentioned earlier, I value applications because (1) they provide a nice way to show the applicability and practicality of my research findings (hence promoting the field as is my goal G2), and (2) they usually bring new consideration to my thinking process (configurations I would otherwise not have thought about, new kinds of complex problems that need to be addressed and deserved a different solving approach, etc.).

As a result, over the years, I have considered various domains of applications: some of which more on the side of pure applications, most of them more as starting point for new solving techniques. In particular, I have worked on varied topics such as:

- Engineering applications: soft constraints applied to the diagnosis of shock absorbers for cars (C23)

- Bio-medical engineering application, namely Gait Therapy: constraints applied to the determination of healthy gaits, to help diagnose abonormal ones (C8, C10, C11, C12).

- Network security (C6, C14, C24)

- Software engineering (C5, C7)

- Investment portfolios (Ch2)

3.1.3 Impact on Community

I have also devoted part of my time building a community of people federated around a common interest in decision-making and usually decision problems of numerical nature (although not restricted to). My efforts have spanned in two complementary directions: (1) building and maintaining a community website; (2) organizing a series of annual workshops, CoProD, that brings together exactly these kind of people: decision-making researchers with domain scientists. Both efforts have been successful so far.

The community website I have designed and that I maintain with my research group students is http://www.constraintsolving.com. It was released in July 2007 and it now receives a steady attention from the community with about over 1,000 unique visitors a month. Recently I was approached by a researcher at Siemens to include their geometric constraint solvers on constraintsolving.com, which we did[6]. I also use this website as a reference for an introduction to constraints for all students who are new to my research group: they then get to add to it as they see fit (e.g., the FAQ part of it, or others).

I first organized CoProD in fall 2008 (see http://coprod.cs.utep.edu) as a satellite event of the 13th GAMM - IMACS International Symposium on Scientific Computing, Computer Arithmetic and Verified Numerical Computations SCAN'08 that was held at UTEP (I was co-chair of this international conference, see http://www.scan2008.com for more information). Each of the workshops since then gathered about 30 people from the national and international community, ranging from high-school students that I host as interns during summer to very prominent researchers in decision making and in applied fields, such as Rina Dechter from UC Irvine (2009) and Xiaobai Sun from Duke University (2011). CoProD is hosted at UTEP every odd year and at the location of the SCAN conference on even years: the next meeting will be in Novosibirsk, Russia in Fall 2012.

3.1.4 List of articles in refereed scholarly journals

*Important note: In the lists below, the names of authors who were students at the time we wrote the article are followed by an " * ".*

J1 Aline Jaimes*, Craig Tweedy, Tanja Magoc*, Vladik Kreinovich, and Martine Ceberio, "Selecting the Best Location for a Meteorological Tower: A Case Study of Multi-Objective Constraint Optimization", **Journal of Uncertain Systems**, 2010, Vol. 4, No. 3.

J2 Martine Ceberio and Vladik Kreinovich, "Computing with Tensors: Potential Applications of Physics-Motivated Mathematics to Computer Science", **Journal of Uncertain Systems**, 2010, Vol. 4, No. 3.

J3 Martine Ceberio and Vladik Kreinovich, "Diagonalization is also practically useful: a geometric idea", **Geombinatorics**, 2010, Vol. 20, No. 1, pp. 15-20.

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[6]Evidence of this request is available in appendix of this section.

J4 Omar Ochoa*, Martine Ceberio, and Vladik Kreinovich, "How to Describe Spatial Resolution: An Approach Similar to the Central Limit Theorem", **Applied Mathematical Sciences**, 2010, Vol. 4, No. 63, pp. 3153-3160.

J5 Martine Ceberio, Vladik Kreinovich, Gunter Mayer, "For Complex Intervals, Exact Range Computation Is NP-Hard Even for Single Use Expressions (Even for the Product)", **Reliable Computing Journal**, 2007.

J6 Daniel Berleant, Martine Ceberio, Gang Xiang*, Vladik Kreinovich, "Towards Adding Probabilities and Correlations to Interval Computations", **International Journal of Approximate Reasoning**, 2007.

J7 Gang Xiang*, Martine Ceberio, Vladik Kreinovich, "Computing Population Variance and Entropy under Interval Uncertainty: Linear Time Algorithms", **Reliable Computing**, 2007.

J8 Martine Ceberio, Scott Ferson, Vladik Kreinovich, Sanjeev Chopra*, Gang Xiang*, Adrian Murguia*, and Jorge Santillan*, "How To Take Into Account Dependence Between the Inputs: From Interval Computations to Constraint-Related Set Computations, with Potential Applications to Nuclear Safety, Bio- and Geosciences", **Journal of Uncertain Systems**, 2007.

J9 Martine Ceberio, Vladik Kreinovich, Sanjeev Chopra*, Luc Longpre, Hung T. Nguyen, Bertram Ludaescher, and Chitta Baral, "Interval-Type and Affine Arithmetic-Type Techniques for Handling Uncertainty in Expert Systems", **Journal of Computational and Applied Mathematics**, 2007, Vol. 199, No. 2, pp. 403–410.

J10 Scott Starks, Vladik Kreinovich, Luc Longpré, Martine Ceberio, Gang Xiang*, Roberto Araiza*, Jan Beck, Radhi Kandathi*, A. Nayak, and Roberto Torres*, "Towards Combining Probabilistic and Interval Uncertainty in Engineering Calculations: Algorithms for Computing Statistics under Interval Uncertainty, and Their Computational Complexity", **Reliable Computing**, Vol. 12, No 6, pp. 471–501, Dec. 2006.

J11 Frédéric Benhamou, Martine Ceberio, Philippe Codognet, Hiroshi Hosobe, Christophe Jermann, Ken Satoh, Kasunori Ueda, "Franco-Japanese Research Collaboration in Constraint Programming, R&D Project Report", **Progress in Informatics**, no 3, pp. 59-65, 2006.

J12 Chandra S. Pedamallu*, Linet Ozdamar, Martine Ceberio, "Efficient Interval Partitioning – Local Search Collaboration for Constraint Satisfaction", **Journal on Computers and Operations Research**, 2006.

J13 Martine Ceberio and Vladik Kreinovich, "Fast Multiplication of Interval Matrices (Interval Version of Strassen's Algorithm)", **Reliable Computing**, Vol. 10, No. 3, pp. 241-243, April 2004.

J14 Martine Ceberio and Vladik Kreinovich, "Greedy Algorithms for Optimizing Multivariate Horner Schemes", in **ACM-SIGSAM Bulletin**, Vol. 38, No. 1 (147), pp. 8-15, March 2004.

J15 Martine Ceberio, Laurent Granvilliers, "Horner's Rule for Interval Evaluation Revisited", **Computing**, Vol. 69, No 1, pp. 51–81, 2002.

3.1.5 List of articles in conference proceedings

C1 Paden Portillo*, Martine Ceberio, and Vladik Kreinovich, "Towards an Efficient Bisection of Ellipsoids", Proceedings of the ITEA Live-Virtual-Constructive Conference "Test

and Evaluation", El Paso, Texas, January 24-27, 2011.

C2 Karen Villaverde, Olga Kosheleva, and Martine Ceberio, "Computations under Time Constraints: Algorithms Developed for Fuzzy Computations Can Help", Proceedings of **NAFIPS 2011, the North American Fuzzy Information Processing Society**, 2011.

C3 Xiaojing Wang*, Jeremy Cummins*, and Martine Ceberio, "The Bees Algorithm to Extract Fuzzy Measures from Sample Data", *best student paper award*, Proceedings of **NAFIPS 2011, the North American Fuzzy Information Processing Society**, 2011. Best Student Paper Award (first place).

C4 Aline Jaimes, Craig Tweedie, Tanja Magoc*, Vladik Kreinovich, and Martine Ceberio, "Multi-Objective Optimization under Positivity Constraints, with a Meteorological Example", Proceedings of the **IEEE World Congress on Computational Intelligence WCCI'2010**, Barcelona, Spain, July 18-23, 2010, pp. 2355-2361.

C5 Carlos Acosta* and Martine Ceberio, "A Constraint-Based Approach to Verification of Programs with Floating-Point Numbers", in the Proceedings of **SERP'08 - the 2008 International Conference on Software Engineering Research and Practice**, 2008.

C6 Martine Ceberio and Christian Servin*, "Cascade Vulnerability Problem Simulator Tool", in the Proceedings of **the 2008 International Conference on Modeling, Simulation and Visualization Methods, MSV'08**, pp. 227–231, 2008.

C7 Yoonsik Cheon, Antonio Cortes*, Martine Ceberio, and Gary T. Leavens, "Integrating Random Testing with Constraints for Improved Efficiency and Diversity", in **the 20th International Conference on Software Engineering and Knowledge Engineering, SEKE'08**, San Francisco Bay, California, USA, July 1–3, 2008.

C8 Roberto Araiza*, Martine Ceberio, Naga Suman Kanagala*, Vladik Kreinovich, and Gang Xiang*, "Applications of 1-D Versions of Image Referencing Techniques to Hydrology and to Patient Rehabilitation", in the proceedings of **NAFIPS 2008, the North American Fuzzy Information Processing Society**, 2008.

C9 Tanja Magoč*, Martine Ceberio, and François Modave, "Interval-based Multi-Criteria Decision Making: Strategies to Order Intervals", in the proceedings of **NAFIPS 2008, the North American Fuzzy Information Processing Society**, 2008.

C10 Naga Suman Kanagala*, Martine Ceberio, Thompson Sarkodie-Gyan, Vladik Kreinovich, and Roberto Araiza*, "Identification of Human Gait in Neuro-Rehabilitation: Towards Efficient Algorithms", in the Proceedings of the **24th Southern Biomedical Engineering Conference**, Eds. H. Nazeran, M. Goldman, and R. Schoephoerster, Medical and Engineering Publishers, pp. 153–156, 2008.

C11 Richard D. Brower, Martine Ceberio, Patricia Nava, Thompson Sarkodie-Gyan, Huiying Yu*, "Identification of Human Gait using Fuzzy Inferential Reasoning", in the Proceedings of **ICORR'07, the 10th International Conference On Rehabilitation Robotics**, Netherlands, 2007.

C12 Richard Brower, Martine Ceberio, Chad MacDonald*, Thompson Sarkodie-Gyan, "Determination of Human Gait Phase Using Fuzzy Inference", in the Proceedings of **ICORR'07, the 10th International Conference On Rehabilitation Robotics**, Netherlands, 2007.

C13 Martine Ceberio, Vladik Kreinovich, Andrzej Pownuk, and Barnabas Bede, "From Interval Computations to Constraint-Related Set Computations: Towards Faster Estimation of Statistics and ODEs under Interval, p-Box, and Fuzzy Uncertainty", in the proceedings of **IFSA'07 World Congress, the International Fuzzy Systems Association** (Main theme: Theory and Applications of Fuzzy Logic and Soft Computing), 2007.

C14 Stefano Bistarelli, Martine Ceberio, Eric Freudenthal, and Christian Servin*, "An Optimization Approach to the Cascade Vulnerability Problem using Soft Constraints", in the proceedings of **NAFIPS 2007, the North American Fuzzy Information Processing Society**.

C15 Michael Orshansky, Wei-Shen Wang, Martine Ceberio, Gang Xiang*, "Interval-based Robust Statistical Techniques for Non-negative Convex Functions, with Application to Timing Analysis of Computer Chips", in the proceedings of **the 21st International Symposium on Applied Computing, SAC'06**, 2006.

C16 Martine Ceberio, Richard Coy*, François Modave, "Multi-criteria Decision Making for Assisted Design", in the proceedings of **IPMU'06, Information Processing and Management of Uncertainty in Knowledge-based Systems**, pp. 1567–1574, 2006.

C17 Evgeny Dantsin, Alexander Wolpert, Martine Ceberio, Gang Xiang*, and Vladik Kreinovich, "Detecting Outliers under Interval Uncertainty: A New Algorithm Based on Constraint Satisfaction", in the proceedings of **IPMU 2006, Information Processing and Management of Uncertainty in Knowledge-based Systems**, 2006.

C18 Olga Kosheleva and Martine Ceberio, "Processing Educational Data: From Traditional Statistical Techniques to an Appropriate Combination of Probabilistic, Interval, and Fuzzy Approaches", in the Proceedings of the **International Conference FNG'05, , Information Processing and Management of Uncertainty in Knowledge-based Systems**, 2005.

C19 Martine Ceberio, G. Randy Keller, Olga Kosheleva, Vladik Kreinovich, Roberto Araiza*, M. Averill*, and Gang Xiang*, "Data Processing in the Presence of Interval Uncertainty and Erroneous Measurements: Practical Problems, Results, Challenges", in the Proceedings of the **Second Scandinavian Workshop on Interval Methods And Their Applications**, 2005.

C20 Martine Ceberio and Vladik Kreinovich, "Towards an Optimal Approach to Soft Constraint Problems", in the Proceedings of the **17th IMACS World Congress Scientific Computation, Applied Mathematics and Simulation (IMACS)**, 2005.

C21 Martine Ceberio, Vladik Kreinovich, Sanjeev Chopra*, Bertrand Ludaescher, and Emad Saad*, "Taylor Model-type Techniques for Hanlding Uncertainty in Expert Systems, with Potential Applications to Geoinformatics", in the Proceedings of the **17th IMACS World Congress Scientific Computation, Applied Mathematics and Simulation (IMACS'05)**, 2005.

C22 Martine Ceberio, Ken Satoh, and Hiroshi Hosobe, "Speculative Constraint Processing with Iterative Revision for Disjunctive Answers", in the proceedings of **CLIMA IV, Computational Logic in Multi-agent Systems**, pp.119–134, 2005.

C23 Martine Ceberio and Richard Coy*, "Enhancement of Parameter Estimation using Flexible Constraints: an Application to Shock-response Study", in the Proceedings of **"Algorithmic Mathematics and Computer Science" (AMCS'05)**, 2005.

C24 François Modave, Martine Ceberio, Xiaojing Wang*, Olga Garay*, R. Ramirez*, and R. Tejada*, "Comparison of Computer Attacks: an Application of Interval-based Fuzzy

Integration", in the Proceedings of **NAFIPS'05, the North American Fuzzy Information Processing Society**, 2005.

C25 Martine Ceberio, François Modave, and Xiaojing Wang*, "Comparing Attacks: an Approach Based on Interval Computations and Fuzzy Integration", in the Proceedings of **FuzzIEEE'05, the IEEE International Conference on Fuzzy Systems**, 2005.

C26 P. Jaksurat, Eric Freudenthal, Martine Ceberio, and Vladik Kreinovich, "Probabilistic Approach to Trust: Ideas, Algorithms, and Simulations", in the Proceedings of the **5th International Conference on Intelligent Technologies (InTech'04)**, 2004.

C27 Martine Ceberio and François Modave, "An Interval-valued, 2-additive Choquet Integral for Multicriteria Decision Making", in the proceedings of **IPMU 2004, Information Processing and Management of Uncertainty in Knowledge-based Systems**, 2004.

C28 Martine Ceberio and François Modave, "Interval-Based Multicriteria Decision Making", in the Proceedings of **AI+MATH'04, the International Symposium on Artificial Intelligence and Mathematics**, 2004.

C29 Martine Ceberio, Laurent Granvilliers, "Solving Nonlinear Equations by Abstraction, Gaussian Elimination, and Interval Methods", in the proceedings of **FroCos 2002**, pp 117-131, 2002.

C30 Martine Ceberio, Laurent Granvilliers, "Solving Nonlinear Systems by Constraint Inversion and Interval Arithmetic", in the proceedings of **AISC 2000**, pp 127-141, 2000.

3.1.6 Chapters in Scholarly Books and Monographs

Ch1 Martine Ceberio, Vladik Kreinovich, Andrzej Pownuk, and Barnabas Bede, "From Interval Computations to Constraint-Related Set Computations: Towards Faster Estimation of Statistics and ODEs Under Interval, P-Box, and Fuzzy Uncertainty", In: JingTao Yao (ed.), **Novel Developments in Granular Computing: Applications for Advanced Human Reasoning and Soft Computation**, IGI Global Publisher, pp. 131-147, 2010.

Ch2 Tanja Magoč*, François Modave, Vladik Kreinovich, and Martine Ceberio, "Risk Management in Investment Portfolios: The Use Of Fuzzy Measures, Fuzzy Integrals and Constraint Programming", Aboul-Ella Hassanien and Ajith Abraham (Eds), Foundations on Computational Intelligence, in **Studies in Computational Intelligence**, Springer Verlag, Vol. 202/2009, pp 133-173, 2009.

Ch3 Hung T. Nguyen, Vladik Kreinovich, Francois Modave, and Martine Ceberio, "Fuzzy Without Fuzzy: Why Fuzzy-Related Aggregation Techniques Are Often Better Even in Situations Without True Fuzziness", Aboul-Ella Hassanien and Ajith Abraham (Eds), Foundations of Computational Intelligence, Springer-Verlag, 2009, Vol. 2, pp. 27-51.

Ch4 Martine Ceberio and François Modave, "Interval-based Multicriteria Decision Making", in **Modern Information Processing: From Theory to Applications**, edited by B. Bouchon-Meunier, G. Coletti, R. R. Yager (Eds), Elsevier Mathematics, pp. 281–294, 2006.

Ch5 Martine Ceberio, Ken Satoh, and Hiroshi Hosobe, "Speculative Constraint Processing with Multi-Agent Belief Revision", in Francesca Toni and Paolo Torroni (Eds.), **Computational Logic in Multi-Agent Systems** – CLIMA VI (Post-Proceedings of the

6th International Workshop on Computational Logic in Multi-Agent Systems), Lecture Notes in Artificial Intelligence, Vol. 3900, pp. 340–357, Springer-Verlag, 2006.

3.1.7   List of articles in refereed Workshop Proceedings (W) and abstracts (A)

W1 Aline Jaimes, Craig Tweedie, Tanja Magoc*, Vladik Kreinovich, and Martine Ceberio, "Optimal Sensor Placement in Environmental Research: Designing a Sensor Network under Uncertainty", In: Michael Beer, Rafi L. Muhanna, and Robert L. Mullen (Eds.), Proceedings of the **4th International Workshop on Reliable Engineering Computing REC'2010**, Singapore, March 3-5, 2010, pp. 255-267.

W2 Martine Ceberio, Vladik Kreinovich, Andrzej Pownuk, "Constraint-Related Set Computations: A New FEM-Motivated Approach to Propagating Uncertainty", in the proceedings of **FEMTEC'09**.

W3 Paulo Pinheiro Da Silva, Martine Ceberio, Christian Servin*, Vladik Kreinovich, "Propagation and Provenance of Probabilistic and Interval Uncertainty in Cyberinfrastructure-Related Data Processing", in the proceedings of **the NSF Workshop on Reliable Engineering Computing, REC'08**.

W4 Martine Ceberio, Scott Ferson, Vladik Kreinovich, Sanjeev Chopra*, Gang Xiang*, "How to Take into Account Dependence Between the Inputs: From Interval Computations to Constraint-Related Set Computations, With Potential Applications to Nuclear Safety, Bio- and Geosciences", in the proceedings of **the NSF Workshop on Reliable Engineering Computing, REC'06**, 2006.

W5 Martine Ceberio, Vladik Kreinovich, and Lev Ginzburg, "On the Use of Intervals in Scientific Computing: What is the Best Transition from Linear to Quadratic Approximation?", in the Proceedings of the **Second Scandinavian Workshop on Interval Methods And Their Applications**, 2005.

W6 Scott Starks, Vladik Kreinovich, Luc Longpré, Martine Ceberio, Gang Xiang*, Roberto Araiza*, Jan Beck*, Rathi Kandathi, A. Nayak, and Roberto Torres*, "Towards Combining Probabilistic and Interval Uncertainty in Engineering Calculations", in the proceedings of the **NSF Workshop on Reliable Engineering Computing**, pp. 193–213, 2004.

W7 Martine Ceberio, Vladik Kreinovich and Lev Ginzburg, "Towards Joint Use of Probabilities and Intervals in Scientific Computing: What is the Best Transition from Linear to Quadratic Approximation?", in the Proceedings of the **Workshop on State-of-the-Art in Scientific Computing (PARA'04)**, 2004.

A1 Uram Anibal Sosa Aguirre*, Martine Ceberio, and Vladik Kreinovich, "Why Curvature in L-Curve: Combining Soft Constraints", in the book of abstracts of **CoProD'11**, 2011.

A2 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, "Adding Constraints: A (Seemingly Counterintuitive but) Useful Heuristic in Solving Difficult Problems", in the book of abstracts of **CoProD'11**, 2011.

A3 Shubhra Datta*, Martine Ceberio, Mario Bencomo*, and George Moreno*, "On the Practicality of Constraint-Based Program Verification", in the proceedings of **SCAN'10**, 2010.

A4 Karen Villaverde, Olga Kosheleva, and Martine Ceberio, "Why Ellipsoid Constraints, Ellipsoid Clusters, and Riemannian Space-Time: Dvoretzky's Theorem Revisited", in the book of abstracts of **CoProD'10**, 2010.

A5 Vladik Kreinovich, Juan Ferret, and Martine Ceberio, "Constraint-Related Reinterpretation of Fundamental Physical Equations Can Serve as a Built-In Regularization", in the book of abstracts of **CoProD'10**, 2010.

A6 Paden Portillo*, Martine Ceberio, Vladik Kreinovich, "Towards an Efficient Bisection of Ellipsoids", in the book of abstracts of **CoProD'10**, 2010.

A7 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, "Why Tensors?", in: Martine Ceberio (ed.), Abstracts of the **Second Workshop on Constraint Programming and Decision Making CoProD'09**, El Paso, Texas, November 9-10, 2009, pp. 20-23.

A8 Martine Ceberio and Vladik Kreinovich, "Continuous If-Then Statements Are Computable". In: Martine Ceberio (ed.), Abstracts of the **Second Workshop on Constraint Programming and Decision Making CoProD'09**, El Paso, Texas, November 9-10, 2009, pp. 11-14.

A9 Aline Jaimes, Craig Tweedy, Tanja Magoc*, Vladik Kreinovich, and Martine Ceberio, "Selecting the Best Location for a Meteorological Tower: A Case Study of Multi-Objective Constraint Optimization". In: Martine Ceberio (ed.), Abstracts of the **Second Workshop on Constraint Programming and Decision Making CoProD'09**, El Paso, Texas, November 9-10, 2009, pp. 56-60.

A10 Martine Ceberio, Vladik Kreinovich, Scott Ferson, Cliff Joslyn, "Adding Constraints to Situations when, in addition to Intervals, we also have Partial Information about Probabilities", in the proceedings of **SCAN'06** + published in the **post-proceedings of SCAN'06**, the GAMM - IMACS International Symposium on Scientific Computing, Computer Arithmetic and Verified Numerical Computations.

A11 Luc Longpré, Vladik Kreinovich, Eric Freudenthal, Martine Ceberio, Francois Modave, Neelabh Baijal*, Wei Chen, Vinod Chirayath, Gan Xiang*, and J. Ivan Vargas*, "Privacy, Protecting, Processing, and Measuring Loss", presented at the **South Central Information Security Symposium**, 2005.

A12 Martine Ceberio, Vladik Kreinovich, Luc Longpré, Emad Saad, Bertrand Ludäscher, Chitta Baral, and Hung T. Nguyen, "Affine Arithmetic-Type Techniques for Handling Uncertainty in Expert Systems, with Applications to Geoinformatics and Computer Security", in the Proceedings of the **11th GAMM-IMACS International Symposium on Scientific Computing, Computer Arithmetic, and Validated Numerics (SCAN'04)**, 2004.

3.2 Evidence of Success in Securing Extramural Funding

As documented below, I have consistently made efforts in acquiring external funding. My role in proposed projects has been a balance of PI, Co-PI, supporting faculty / external collaborator. Since September 2003, I have been able to secure from external funding agencies:

- $ 1,276,243 in federal funding, of which $ 596,091 as PI;

- 20,000 euros from European funding, of which 5,000 euros as PI.

3.2.1   Awarded Grants

1. **PI** (NSF CCF 0953339) CAREER: Symbolic-Numeric Constraint-Based Solutions for Real-World Scientific Problems. Duration: 01/01/2010 to 12/31/2014. Amount: $564,650.
   The goal of this on-going project is to make Numerical Constraint Solving (NCS) techniques better adapted to real-world needs while making it more accessible. In order to achieve the goal, this project will concentrate on theory and algorithms at the crux of the efficiency, adaptability, and distributivity aspects of problem-solving techniques. I have started and will continue pursuing the following objectives: (1) to open NCS to novel techniques, improving scalability; (2) to assist users facing over-constrained problems; and (3) to extend the distributed use of NCS to reflect the emerging networked social structure. The results of the research objectives feed into the work carried out to pursue my education objectives: to enhance the problem-solving skills and interest in advanced studies for middle-school to undergraduate students; and to enhance the participation of women and Hispanics in computing. The work carried out under this project has already resulted in several publications (C1, C3, A3, A6), one of them won the best student paper award at NAFIPS'11.

2. **PI** (NSF CCF 0839052) Constraint Programming and Decision Making Workshop, Co-ProD'08. Duration: 08/15/2008 to 07/31/2010. Amount: $5,941.
   The goal of this series of workshops, CoProD'08 – 11, is to bring together NCS researchers and to address the gap between the great capacity of the NCS techniques and their limited use. Each of the 3 CoProD workshops brought together about 30 researchers, from the areas of decision making as well as practitioners. They generated fruitful discussions and enabled some new contacts/collaborations. CoProD's on-going activities consist in developing a website that will engage discussions between decision-making researchers and practitioners and organizing CoProD'12, to take place in 09/12 in Novosibirsk, Russia.

3. **Co-PI** (NSF OCI 0506429) SCI: Collaborative Research: DAPLDS - a Dynamically Adaptive Protein-Ligand Docking System based on Multi-Scale Modeling. Duration: 09/01/2005 to 01/01/2008. Amount: $680,152.
   The goal of this project was to explore the multi-scale nature of algorithmic adaptations in protein-ligand docking and develop computational methods and models that efficiently accommodate these adaptations by means of the immense computing power that can be harnessed through the Internet using public-resource computing.

4. **PI** (French Ministry of Research) Development of Collaborations on the Topic of Flexible Constraints and Symbolic Algorithms: Grant for expatriates to help establish collaborations between French researchers working abroad and French institutes. Duration: 2004 - 2006. Amount: 5,000 euros.

5. **External collaborator** (Egide - Europe) PAI Egide Sakura: French-Japanese project on Soft and Continuous Constraints Programming (SCooP-Sakura). Duration: 01/2004 to 12/2006. Amount: 15,000 euros.
   The goal of this project was to integrate all projects related to soft and / or continuous constraints between NII[7] and LINA[8]. The collaboration generated new projects, such as my joint work on speculative constraint solving, and resulted in another journal publication (J11).

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[7]NII: National Institute of Informatics, Tokyo, Japan.
[8]LINA: Laboratoire d'Informatique de Nantes Atlantique, Nantes, France.

And supplements:

6. **PI** (NSF CCF 1138173) CAREER: Symbolic-Numeric Constraint-Based Solutions for Real-World Scientific Problems. Supplement for REU students in 2011. Amount: $8,000.

7. **PI** (NSF CCF 1026257) CAREER: Symbolic-Numeric Constraint-Based Solutions for Real-World Scientific Problems. Supplement for REU students in 2010. Amount: $16,000.

8. **PI** (NSF CCF 0951526) Constraint Programming and Decision Making Workshop, Co-ProD'08.Amount: $1,500.

3.2.2 Pending Grants

1. **UTEP PI** (NSF CNS 1138493) Collaborative Research: CE21, Type I: Attracting Students to Computing via Contextual Project-Based Learning. Duration: 01/01/2012 to 12/31/2014. Amount: $318,365.

3.2.3 Declined Grants

1. **Supporting faculty** (Italian Ministry of Research) Application for significant bilateral projects within the Joint Declaration following the 10th Review Conference on Scientific and Technological Cooperation between Italy and the United States. Duration: 2011 - 2013.

2. **UTEP PI** (NSF CNS 1042383) Collaborative Research: BPC-DP: Real Projects for Real Clients Courses in High Schools. Duration: 2011 - 2013. Amount: $184,960.

3. **PI** (NSF CCF 1026258) Constraint Programming and Decision Making Workshop, Co-ProD'08: REU supplement for 2010. Amount: $14,105.

4. **Co-PI** (NSF CCF 1018526) AF: RI: Small: Real-Time Automated Investment Algorithms. Duration: 2011 - 2013. Amount: $469,372.

5. **Supporting faculty** (NSF IGERT 1037451) IGERT Multiphysics Training and Education Program (μTEP). Duration: 2010-2015.

6. **Co-PI** (NSF CNS 0940510) BPC-LSA: Collaborative Research: RAMP-UP Recruitment And Motivational Program for Underrepresented Populations. Duration: 2011 - 2013. Amount: $416,792.

7. **UTEP PI** (NSF CNS 0940431) BPC-A: Collaborative Research: Real Projects for Real Clients Courses in High Schools. Duration: 2010 - 2012. Amount: $223,341.

8. **PI** (NSF CCF 0845359) CAREER: A Constraint-Based Real-World-Oriented Problem-Solving Tool. Duration: 2009 - 2013. Amount: $461,078.

9. **Co-PI** (NSF DUE 0837814) Collaborative Research CCLI Phase 1: Refining and Evaluating a Rigorous Problem-Driven Algorithms Course Designed to Foster Engagement and Understanding. Duration: 2009 - 2010. Amount: $74,003.

10. **Co-PI** (NSF IIS 0757600) Pilot: Collaborative Proposal: Refining and Evaluating a Creatively Engaging and Rigorous Problem-Driven Algorithms Course. Duration: 2008 - 2009. Amount: $94,995.

11. **Co-PI** (NSF CNS 0739273) BPC - DP: Under-Represented Minority Role Models: Participation of Women and Hispanics in Computing Academic Careers. Duration: 2008 - 2010. Amount: $426,562.

12. **Co-PI** (Army Research Laboratories) Decision Making and Constraint Pro- gramming for Information Operations Vulnerability and Survivability Assessment. Duration: 2007 - 2009. Amount: $366,000.

13. **Co-PI** (NSF-DoD) Interactive Risk Management Framework for Security Response to Nuclear Threats in Border Urban Areas. Duration: 2007 - 2009.

14. **Co-PI** (BAA-ONR) Model-Based Human Activity Recognition using Gait as the Biometric. Duration: 2007 - 2009. Amount: $500,000.

15. **Co-PI** (NIH-RO) Automated Diagnosis and Therapy in Human Gait Using the Methods of Computational Intelligence. Duration: 2006 - 2011. Amount: $2.5M.

16. **Co-PI** (NSF CNS 0634521) BPC-DP - Under-represented Minority Role Models: Participation of Women and Hispanics in Computational Biology Academic Careers. Duration: 2007 - 2009. Amount: $494,891.

17. **PI** (NSF IIS 0546817) CAREER: A Real-world-oriented and Constraint-based Tool for Problem-Solving. Duration: 2006 - 2010. Amount: $415,386.

18. **Co-PI** (NSF CCF 0515233) Decision making: a new approach bridging the gap between theory and practice. Duration: 2006 - 2008. Amount: $349,304.

19. **Co-PI** (NSF IIS 0412879) A Real-World Decision-Aid System: Foundations and Applications. Duration: 2005 - 2007. Amount: $393,005.

3.3 Evidence of Community, Regional, National, or International Research

As mentioned in my statement of philosophy, collaboration is very important for me: at the local level (with colleagues and students), national, and international levels. This trend of my philosophy shows in my list of publications, with a long list of co-authors (as detailed below), as well as on the list of grant proposals I have been involved in over the last 8 years. I yearn for collaborations as often as possible, as an opportunity to mentor (students), be mentored (by more senior colleagues), and seek innovation.

3.3.1 Co-authored Publications

All my publications were co-authored. *To help differentiate publications that were co-authored with colleagues, I am listing below, in Subsection 3.4.3, the publications in which the co-authors are only the student(s) mentored, myself and possibly another direct advisor of my students.*

I co-authored articles with 11 international colleagues from 8 different institutions and countries, with 13 colleagues at the regional and national levels from 12 different institutions, and with 12 colleagues at UTEP from 6 different departments (3 colleges).

Below is the list of all non-students co-authors along with their affiliation and the number of publications co-authored.

Co-author	Affiliation	# Publ.
International		
Frederic Benhamou	LINA, University of Nantes, France	1
Stefano Bistarelli	Dep. of Mathematics and Computer Science	2
	University of Perugia, Italy	
Philippe Codognet	University Pierre et Marie Curie (Paris 6)	1
	co-director, Japanese-French Laboratory for Infomatics (JFLI)	
	Information Technology Center, University of Tokyo	
Laurent Granvilliers	LINA, University of Nantes, France	3
Hiroshi Hosobe	National Institute of Informatics, Tokyo, Japan	3
Christophe Jermann	LINA, University of Nantes, France	1
Bertram Ludaescher	Universität Freiburg, Germany	3
Gunter Mayer	Numerische Mathematik, Institut für Mathematik	1
	Universität Rostock, Germany	
Linet Ozdamar	Izmir University of Economics, Turkey	1
Ken Satoh	National Institute of Informatics, Tokyo, Japan	3
Kasunori Ueda	Waseda University, Tokyo, Japan	1
National		
Scott Ferson	Applied Biomathematics, Setauket, New York	3
Daniel Berleant	University of Arkansas at Little Rock	1
Evgeny Dantsin	Department of Computer Science, Roosevelt University, Chicago, Michigan	1
Gary T. Leavens	Dept. of Electrical Engineering and Computer Science	1
	University of Central Florida, Orlando	
Richard D. Brower	Department of Medical Education and Department of Neurology	2
	Paul L. Foster School of Medicine	
	Texas Tech University Health Sciences Center	
Barnabas Bede	Department of Mathematics, The University of Texas-Pan American	2
Lev Ginzburg	Stony Brook University	2
Pattama Jaksurat	Department of Computer Science. Chiang Mai University, Thailand	1
Michael Orshansky	Department of Electrical and Computer Engineering	1
	The University of Texas at Austin	
Alexander Wolpert	Department of Computer Science, Roosevelt University, Illinois	1
Regional		
Cliff Joslyn	Los Alamos National Laboratory, New Mexico	1
Hung T Nguyen	Department of Mathematics, New Mexico State University	3
Karen Villaverde	Computer Science Department, New Mexico State University	2

UTEP		# Publ.
Yoonsik Cheon	Computer Science Department	1
Eric Freudenthal	Computer Science Department	3
Randy Keller	Department of Geological Sciences	1
Olga Kosheleva	Department of Teacher Education	7
Vladik Kreinovich	Computer Science Department	42
Luc Longpre	Computer Science Department	1
Francois Modave	(formerly) Computer Science Department	10
	(now) Paul L. Foster School of Medicine	
	Texas Tech University Health Sciences Center	
Paulo Pinheiro Da Silva	Computer Science Department	1
Andrzej Pownuk	Department of Mathematics	3
Thompson Sarkodie-Gyan	Department of Electrical and Computer Engineering	3
Scott Starks	Department of Electrical and Computer Engineering	2
Craig Tweedie	Department of Biological Sciences	4

3.3.2 Joint Grant Proposals

I have also collaborated on 19 joint proposals or projects, as Co-PI, external collaborator, or supporting faculty. Below is the list of proposal collaborators (PIs only), along with their institution, and the number of proposals written together.

Declined or pending		
Stefano Bistarelli	Dep. of Mathematics and Computer Science	1
	University of Perugia, Italy	
Eric Freudenthal	Computer Science Department at UTEP	2
David Klappholz	Stevens Institute of Technology in New Jersey	3
Tanja Magoc	(then) Computer Science Department at UTEP	1
	(now) University of Maryland	
Francois Modave	(then) Computer Science Department at UTEP	4
	(now) Paul L. Foster School of Medicine	
	Texas Tech University Health Sciences Center	
Steve Roach	Computer Science Department at UTEP	1
Thompson Sarkodie-Gyan	Department of Electrical and Computer Engineering at UTEP	3
Leticia Velazquez		2
Funded		
Frederic Benhamou	LINA, University of Nantes, France	1
Ken Satoh	NII, Tokyo, Japan	1
Michela Taufer	(then) Computer Science Department at UTEP	1
	(now) University of Delaware	

3.4 Evidence of Involving Students

3.4.1 Number of students supported from extramural funding

Through the federal funding I received, I was able to support a number of students:

- **PhD students:**

  - Luis David Lopez whom I mentored within the DAPLDS project in 2004-2005: he only stayed a year and then left to follow his wife to the University of Delaware.
  - Aziza Aouhassi whom I mentored within my CAREER project during spring 2011: she only stayed a semester and went back to her country to get married.

- **Graduate students:**

  - Paden Portillo, fall 2010 / spring 2011: Paden is a graduate student in the Master's program of Software Engineering. I was able to support him during fall 2010 and spring 2011. He worked with me on circular interval arithmetic for constraint solvers. Paden has now decided to suspend his involvement in CR2G because of family reasons.
  - Mario Bencomo, 2011: I supported him most of his last year before graduation. He worked mostly on symbolic-numeric algorithms, on techniques to delete redundancies in linear systems of inequalities, and on global constraints. He joined Rice's PhD program in Computational Sciences and Applied Maths in Summer 2011.
  - Christian Del Hoyo, since spring 2011: I have supported him since spring 2011. He has been working with me on a flexible constraint solver. He is expected to graduate in summer 2012.

- **Under-graduate students:**

  - Luis Carlos Gutierrez, since spring 2010.
  - Marisol Chacon, fall 2010.
  - Mario Bencomo, 2010.
  - George Moreno, spring 2010.
  - Paden Portillo, spring 2010.

3.4.2 Number of students involved in research but not supported from extramural funding

Besides the research students I have supported from extramural funding, I have also consistently involved students in my research, working in CR2G, my research group. I have a record of involving students at all levels: PhD students, Master's students, undergraduate students, and high-school students. Over the years, I have involved a total of 4 PhD students, 10 Master's students, about 20 undergraduate students, and 15 high-school students.

3.4.3 Articles co-authored with students

Most of my articles are co-authored with students. Below, I am only citing articles co-authored with students of mine, or with students that I was also mentoring closely.

J12 Chandra S. Pedamallu*, Linet Ozdamar, Martine Ceberio, "Efficient Interval Partitioning – Local Search Collaboration for Constraint Satisfaction", **Journal on Computers and Operations Research**, 2006.

Ch2 Tanja Magoč*, François Modave, Vladik Kreinovich, and Martine Ceberio, "Risk Management in Investment Portfolios: The Use Of Fuzzy Measures, Fuzzy Integrals and Constraint Programming", Aboul-Ella Hassanien and Ajith Abraham (Eds), Foundations on Computational Intelligence, in **Studies in Computational Intelligence**, Springer Verlag, Vol. 202/2009, pp 133-173, 2009.

C1 Paden Portillo*, Martine Ceberio, and Vladik Kreinovich, "Towards an Efficient Bisection of Ellipsoids", Proceedings of the ITEA Live-Virtual-Constructive Conference "Test and Evaluation", El Paso, Texas, January 24-27, 2011.

C3 Xiaojing Wang*, Jeremy Cummins*, and Martine Ceberio, "The Bees Algorithm to Extract Fuzzy Measures from Sample Data", *best student paper award*, Proceedings of **NAFIPS 2011, the North American Fuzzy Information Processing Society**, 2011. Best Student Paper Award (first place).

C5 Carlos Acosta* and Martine Ceberio, "A Constraint-Based Approach to Verification of Programs with Floating-Point Numbers", in the Proceedings of **SERP'08 - the 2008 International Conference on Software Engineering Research and Practice**, 2008.

C6 Martine Ceberio and Christian Servin*, "Cascade Vulnerability Problem Simulator Tool", in the Proceedings of **the 2008 International Conference on Modeling, Simulation and Visualization Methods, MSV'08**, pp. 227–231, 2008.

C8 Roberto Araiza*, Martine Ceberio, Naga Suman Kanagala*, Vladik Kreinovich, and Gang Xiang*, "Applications of 1-D Versions of Image Referencing Techniques to Hydrology and to Patient Rehabilitation", in the proceedings of **NAFIPS 2008, the North American Fuzzy Information Processing Society**, 2008.

C9 Tanja Magoč*, Martine Ceberio, and François Modave, "Interval-based Multi-Criteria Decision Making: Strategies to Order Intervals", in the proceedings of **NAFIPS 2008, the North American Fuzzy Information Processing Society**, 2008.

C10 Naga Suman Kanagala*, Martine Ceberio, Thompson Sarkodie-Gyan, Vladik Kreinovich, and Roberto Araiza*, "Identification of Human Gait in Neuro-Rehabilitation: Towards Efficient Algorithms", in the Proceedings of the **24th Southern Biomedical Engineering Conference**, Eds. H. Nazeran, M. Goldman, and R. Schoephoerster, Medical and Engineering Publishers, pp. 153–156, 2008.

C14 Stefano Bistarelli, Martine Ceberio, Eric Freudenthal, and Christian Servin*, "An Optimization Approach to the Cascade Vulnerability Problem using Soft Constraints", in the proceedings of **NAFIPS 2007, the North American Fuzzy Information Processing Society**.

C16 Martine Ceberio, Richard Coy*, François Modave, "Multi-criteria Decision Making for Assisted Design", in the proceedings of **IPMU'06, Information Processing and Management of Uncertainty in Knowledge-based Systems**, pp. 1567–1574, 2006.

C23 Martine Ceberio and Richard Coy*, "Enhancement of Parameter Estimation using Flexible Constraints: an Application to Shock-response Study", in the Proceedings of **"Algorithmic Mathematics and Computer Science" (AMCS'05)**, 2005.

C24 François Modave, Martine Ceberio, Xiaojing Wang*, Olga Garay*, R. Ramirez*, and R. Tejada*, "Comparison of Computer Attacks: an Application of Interval-based Fuzzy Integration", in the Proceedings of **NAFIPS'05, the North American Fuzzy Information Processing Society**, 2005.

C25 Martine Ceberio, François Modave, and Xiaojing Wang*, "Comparing Attacks: an Approach Based on Interval Computations and Fuzzy Integration", in the Proceedings of **FuzzIEEE'05, the IEEE International Conference on Fuzzy Systems**, 2005.

W3 Paulo Pinheiro Da Silva, Martine Ceberio, Christian Servin*, Vladik Kreinovich, "Propagation and Provenance of Probabilistic and Interval Uncertainty in Cyberinfrastructure-Related Data Processing", in the proceedings of **the NSF Workshop on Reliable Engineering Computing, REC'08**.

A3 Shubhra Datta*, Martine Ceberio, Mario Bencomo*, and George Moreno*, "On the Practicality of Constraint-Based Program Verification", in the proceedings of **SCAN'10**, 2010.

A6 Paden Portillo*, Martine Ceberio, Vladik Kreinovich, "Towards an Efficient Bisection of Ellipsoids", in the book of abstracts of **CoProD'10**, 2010.

3.4.4 Presentations by students involved in research in national and international conferences

Of the articles listed in Subsection 3.4.3, the following were presented at conferences by one of the student authors: C3, C5, C6, C8, C9, C14, C23.

Besides the presentation of the articles listed above, I catch every opportunity to put my students in the situation of presenting their work. For instance, I have my students present their work as often as practical at the regional UTEP-NMSU workshop. I also expose them to the national and international research by having them write reviews of articles and by involving them in the logistics of the conferences I organize: for instance, 4 of my students were helpers at NAFIPS'2011, and one of my PhD student represented me as an organizer for a workshop at CP-AI-OR'09 when I was on maternity leave.

3.5 Appendix: List of Supporting Documents

3.5.1 Articles

- **Journal articles**

  J2 Martine Ceberio and Vladik Kreinovich, "Computing with Tensors: Potential Applications of Physics-Motivated Mathematics to Computer Science", Journal of Uncertain Systems, 2010, Vol. 4, No. 3.

  J11 Frederic Benhamou, Martine Ceberio, Philippe Codognet, Hiroshi Hosobe, Christophe Jermann, Ken Satoh, Kasunori Ueda, "Franco-Japanese Research Collaboration in Constraint Programming, R&D Project Report", in Progress in Informatics, no 3, pp. 59-65, 2006.

  J12 Chandra S. Pedamallu, Linet Ozdamar, Martine Ceberio, "Efficient Interval Partitioning – Local Search Collaboration for Constraint Satisfaction", in the Journal on Computers and Operations Research, 2006.

- **Book chapters**

  Ch2 Martine Ceberio, Tanja Magoc, Vladik Kreinovich, and Francì§ois Modave, "Risk Management in Investment Portfolios: The Use Of Fuzzy Measures, Fuzzy Integrals and Constraint Programming", Aboul-Ella Hassanien and Ajith Abraham (Eds), Foundations on Computational Intelligence, in Studies in Computational Intelligence, Springer Verlag, Vol. 202/2009, pp 133-173, 2009.

  Ch4 Martine Ceberio and Francois Modave, "Interval-based Multicriteria Decision Making", in Modern Information Processing: From Theory to Applications, edited by B. Bouchon-Meunier, G. Coletti, R. R. Yager (Eds), Elsevier Mathematics, pp. 281–294, 2006.

- **Articles in conference proceedings**

  C3 Xiaojing Wang, Jeremy Cummins, and Martine Ceberio, "The Bees Algorithm to Extract Fuzzy Measures from Sample Data", best student paper award, Proceedings of NAFIPS 2011, the North American Fuzzy Information Processing Society, 2011. Best Student Paper Award (first place).

  C9 Tanja Magoc, Martine Ceberio, and Francì§ois Modave, "Interval-based Multi-Criteria Decision Making: Strategies to Order Intervals", in the proceedings of NAFIPS 2008, the North American Fuzzy Information Processing Society, 2008.

  C14 Stefano Bistarelli, Martine Ceberio, Eric Freudenthal, and Christian Servin, "An Optimization Approach to the Cascade Vulnerability Problem using Soft Constraints", in the proceedings of NAFIPS 2007, the North American Fuzzy Information Processing Society.

  C22 Martine Ceberio, Ken Satoh, and Hiroshi Hosobe, "Speculative Constraint Processing with Multi-Agent Belief Revision", in the proceedings of CLIMA IV, Computational Logic in Multi-agent Systems, 2005.

  C27 Martine Ceberio and Francì§ois Modave, "An Interval-valued, 2-additive Choquet Integral for Multicriteria Decision Making", in the proceedings of IPMU 2004, Information Processing and Management of Uncertainty in Knowledge-based Systems, 2004.

3.5.2 Proposals

- **Funded**

  1. **PI** (NSF CCF 0953339) CAREER: Symbolic-Numeric Constraint-Based Solutions for Real-World Scientific Problems. Duration: 01/01/2010 to 12/31/2014. Amount: $564,650.
  2. **PI** (NSF CCF 0839052) Constraint Programming and Decision Making Workshop, Co-ProD'08. Duration: 08/15/2008 to 07/31/2010. Amount: $5,941.

- **Rejected**

  1. **Co-PI** (NIH-RO) Automated Diagnosis and Therapy in Human Gait Using the Methods of Computational Intelligence. Duration: 2006 - 2011. Amount: $2.5M.

3.5.3 Other supporting documents

- Email from Siemens regarding their geometric solvers to include on constraintsolving.com

- Website: http://www.constraintsolving.com.

- Website of CoProD: http://coprod.constraintsolving.com.

Part IV

Service

4.1   Overview

As mentioned in my statement of philosophy, I see service as an essential component of being a professional. I see it as a catalyst of integration of teaching and research, as well as a way of implementing my philosophy. I therefore dedicate to it a significant portion of my time. As I try to integrate my activities of research, teaching, and service, I find for instance that service offers other ways to bring together research and teaching. However, my service is not limited to ways that allow me the integration of my activities: I also seek to implement the access and excellence mission of UTEP through a range of activities as detailed below.

Over the course of my probation period, I have had the opportunity of being involved in a number of service activities. I have been active at UTEP through committees at all levels (department, college, university), in my research community (e.g., journal reviewer, panel member, conference chair), as well as in the local community (e.g., outreach). As much as I like variety, I have nevertheless tried to find service activities aligned with my philosophy: e.g., enhancing the participation of women, contributing to enhancing the visibility of computer science while improving its image, seeking excellence through active participation in my research community, and community building. I have also sought leadership positions or generated leadership opportunities that would allow me to have more impact and better chance to achieve my goals.

In what follows, I start by highlighting some of my activities that illustrate how I have worked towards achieving my goals: my efforts on women issues (towards a 21st-century-demographics-ready campus, and to increase the participation of women in computing), my efforts to be an active participant of my research community while increasing the visibility of UTEP, and my outreach efforts. I then report in a more exhaustive manner my activities of service for the University, my research community, as well as the local community.

4.2   Highlights of Service Leadership and Impact

What follow are illustrations of service activities I have conducted and that are aligned with my goal of access and excellence. I have worked on women-related issues: how to better take into account women in the academe but also how to open the door to more incoming female students. I have strived to increase the visibility of UTEP by organizing conferences but also taking the lead in building a research community. Finally, I have always been interested and participated in outreach activities: I have over the years tried to establish an efficient model of outreach that aims at increasing access to more students.

4.2.1   Women Related Activities

As mentioned earlier, I have considered two angles on women issues: assessing and possibly improving the condition of female faculty on campus as well as increasing the participation of female students in computing.

Women on Campus: Towards a 21st-Century-Demographics-Ready Campus

In summer 2006, I was lucky to be invited to be a member of the Women's Advisory Council to the President (WAC). Being part of this council helped me clarify my focus on women issues on campus.

After working on several topics over my service in this council (including a recommendation for a staff mentoring program), as a chair of this council since September 2010, I have oriented the efforts of the council to assessing and possibly making recommendations for improving the condition of female faculty on campus.

The council spent the past academic year exploring the possible areas of improvement at UTEP to make our campus family friendly. Part of the room for improvement concerned the implementation of the FMLA: there seemed to be a wide range of possible implementations of it. Our work resulted so far in the recommendation of the design of a compliance training module on this topic, with the emphasis on the family component of it (it does not only apply to pregnant women but more generally to anyone who need to take time off to care for a family member). We also have been in touch with Dr Howard Daudistel at UTEP and with UTEP's Human Resources leadership team to brainstorm about ways to improve faculty and staff's experience of FMLA, as well as to try to establish a clear definition of what a faculty schedule and work load is. Our discussions resulted in our recommending that training be provided to chairs and deans. Within the council, we are currently working on putting together a chair-and-dean toolkit inspired by that used by UC Berkeley as the result of the family initiative of Berkeley Dean Mary Ann Mason.

I have also dedicated a lot of time coordinating the efforts of WAC with those of the Mama PhD group, with the help of Lee Ann Westman and Irasema Coronado. This way, we were able to present an integrated and concerted agenda to President Natalicio at the occasion of meetings with her in spring 2011 to report our activities. I have also started more recently to coordinate WAC's efforts with those of the Women Resource Center at UTEP, with the help of Shannon Osborne.

Besides, in a constant aim to increase women's access to resources on campus, I have designed and created a website for the council: this website is almost ready for release and is available at http://admin.utep.edu/wac.

The current goal of the council is to make recommendations that are relevant to making our campus family friendly as we believe that this is not only necessary for our campus to be ready to the 21st century demographics, but also as it would clearly be an asset to put forth when hiring.

Enhancing Women's Participation in Computing

Although my involvement in the activities described in Subsection 4.2.1 are across disciplines, another women-related issue that I am passionate about is the participation of women in computing. I believe in diversity as it drives innovation and I am therefore concerned about the lack of diversity: women are hardly represented in computer science.

For instance, decision makers and engineers lead the way and decide what is to be solved and how to solve it, what is to be built and how to built it. Lacking in women's angle means that women's needs are not necessarily addressed and women's creativity is not factored in solving techniques and in innovations.

Because of my strong feeling about women's participation, I have actively taken part for instance in giving talks to groups of women students (high-school and university), in participating in career fairs (for instance at all-girl schools), and in involving high-school girls in summer projects with my research group, CR2G. Most importantly, I have been involved in the following two activities / projects:

1. National Center for Women & Information Technology (NCWIT)'s awards in aspirations in

computing: Each year, NCWIT invites high-school girls to participate in a competition that recognizes students showing high motivation / high achievement in computing. The local effort (El Paso - Las Cruces, NM) is led by Steve Roach, CS professor at UTEP. Activities related to this annual event include: recruiting high-school students by giving presentations in their schools about the competition, helping the students prepare their application, judging / reviewing the applications (usually not the local ones), and organizing the local awards ceremony. The ACM local student chapter that I advise takes an active part in these activities as well.

As a result of these efforts, for instance, last year's competition awarded two national winners from the El Paso - Las Cruces region, as well as two national runner-ups.

2. Creating a "Real Project for Real Client" Course in high-schools (project with David Klappholz from Stevens Institute of Technology): the idea from which this project originated is that computer science is often perceived as an inorganic discipline, i.e., involving very little inter-personal skills or communication, and with little or no impact of our society. Our goal, with this project, is to create a new course in high schools that would teach students the organic part of computer science: communication as a mean to elicit specification of a computer-science-related project from a non-for-profit client, hence demonstrating at the same time the use of computer science for and its impact on society.

   Klappholz and I have submitted this project three times to NSF (twice to its Broadening Participation in Computing program in 2009 and 2010 – and received very good reviews –, and once to Computing Eduation for the 21st century program in spring 2011) and we are still hoping to get it fully started. Thanks to Google fund that we received in summer 2010, we were able to organize a teachers' workshop in summer 2010 in New Jersey, to train teachers to teach this new course.

4.2.2   Enhancing UTEP's Visibility

I try to catch every opportunity to enhance UTEP's visibility. To this end, I aim at excellence as it brings visibility: excellence in my research and service to my community. I also sought other ways to achieve this:

For instance, I recently became a member of the board of directors of the North American Fuzzy Information Processing Society. This, I believe, creates presence in the research community and enhances UTEP's influence. However, this is an anecdotal event. More systematically, I have sought activities that bring a large audience to look at UTEP, to even come to UTEP. As detailed below, I have taken part in conference organization and chairing, as well as an active lead in community building.

Conferences organization and chairing

Although I have been involved in several workshops and conferences organization and chairing, the most notable ones are:

- the 30th North American Fuzzy Information Processing Society Annual Conference, NAFIPS 2011, held at UTEP on March 18-20, 2011 (co-general chair, co-program chair, co-organizer with Vladik Kreinovich);

- the 13th GAMM - IMACS International Symposium on Scientific Computing, Computer Arithmetic and Verified Numerical Computations, held at UTEP on September 29 - October 3, 2008 (co-chair and co-organizer, with Vladik Kreinovich).

Both conferences drew a lot of international attention. In particular, NAFIPS'2011 drew the attendance of about 90 people from over 42 institutions around the world.

Community Building

Since fall 2008, I have taken the lead in building a community of researchers interested in decision making and in applications of these. The community annually gathers at the workshop on Constraint Programming and Decision Making (CoProD) that I organize decision-making researchers with domain scientists with decision-making needs.

To make these events happen, I sought and received NSF funding that helped me have a balance of invited speakers and contributed talks. I am now about to edit a special issue of the Springer book series on Advances in Intelligent and Soft Computing that gathers articles from CoProD 2009 to 2011. Submissions have been received and will be treated for potential inclusion in the special issue.

4.2.3 Outreach

Finally, consistent with my goal of access, and more broadly than a single focus on female students, I have put efforts in outreach and invitation of high-school students to my lab.

Over the years, I have developed a network of contacts and collaborations with high-schools of El Paso. Through discussions within actors of this network, it has appeared that offering internships to high-school students was a possibility and that there was demand from the students. I therefore started to invite students to join my lab for summer and encouraged schools to take part in the NEXUS program at UTEP (see http://engineering.utep.edu/plaza/Nexus/index.html for more details). Concurrently, I started collaborating with Maria Alvarez at the El Paso Community College (EPCC) on summer research projects for early-college high-school students. Both experiences started in summer 2010, with 2 students through NEXUS (female students) and 3 through EPCC (2 male / 1 female); and is continuing in summer 2011 with 5 students through NEXUS (4 female / 1 male) and 7 at EPCC (1 female / 6 male).

The projects proposed to the EPCC students are mostly of development nature but we also train them to the research methodology by asking specific deeper questions; for instance, one of the projects this summer is to develop an android app for genetic sequence algorithms. The NEXUS students, on the other hand, get more first-hand exposure to research, both due to their hosting in my lab and to the involvement in my research projects (as helpers for my students: for instance, tester) and in all of our research meetings. However, I am trying to have the EPCC and NEXUS students work together at least part of the week in my lab (and not only at EPCC as the EPCC students do now), to increase the exposure to research and enhance the team-working skill development.

Besides these summer efforts, I also conduct outreach activities throughout the year, in close collaboration with Ms Fernandez, math and AP CS teacher at Loretto Academy of El Paso (an all-girl high-school). The idea is to show the connection of the math content to computing and at the

same time, through examples and more general presentations, to change the image of computing.

My goal is then to analyse the impact of these experience and if successful, to propose these integrated activities as a model for outreach.

4.3 Evidence of Service to the University

4.3.1 Departmental Service

1. **Chair of the CS Colloquium committee** – since Sept. 2010
   The CS colloquium committee is in charge of organizing the schedule of talks in the CS department. This also includes inviting and hosting speakers (managing their schedule of meetings during their stay at UTEP when they come from out of town). Since I have been part of this committee, and chaired it, 15 talks have been held, 9 of which have been from out-of-town speakers. See http://www.cs.utep.edu/DeptCS/seminars/ for more details on the talks of this past year.

2. **Advisor of the ACM chapter at UTEP** – since Sept. 2005
   As an advisor of the ACM chapter at UTEP, I have sought to guide the activities through close interaction with the chapter's officers. The chapter's activities over the years have varied from offering tutorials to high-schools of El Paso on programming (high-schools were usually picked depending on the officer's network), participating in charity events (such as Dia de los Ninos), to actively participating in the NCWIT awards in aspirations in computing (helping "recruit" the students, helping them in their applications, helping organize the awards ceremony).

3. Member of the **CS Faculty search committee** – Sept. 2010 – February 2011

4. Member of the **CS Chair search committee** – Sept. 2008 - May 2009

5. Member of the **CS Graduate committee** – since Sept. 2004
   This committee discusses the applications/admissions of new graduate students, the qualifying exams, the rules and content of the graduate and PhD programs. Over the years, I was involved several times in the writing and in grading the PhD qualifying exam for Data Structures and Algorithms.

6. Member of the **CS Facilities committee** – since Sept. 2005
   This committee meets on a need basis and/or discusses issues via email when appropriate. Discussed issues are usually related to current building needs and material replacement.

7. Member of the **CS Information Assurance committee** – Sept. 2007 – 2010
   Luc Longpre (chair of the committee and lead of the effort), Vladik Kreinovich, and I worked on the mapping of our courses to the outcomes expected to obtain an Information Assurance Certificate. We later worked on the creation of a Center for Information Assurance (CFIA) whose director is Luc Longpre: the center was officially formed in January 2009. See http://www.cs.utep.edu/cfia/ for more detail.

8. In charge of the **department's course schedule**, under the lead of Ann Gates and later on Steve Roach, until spring 2010.

4.3.2 College Service

1. Member of the **Civil Engineering Faculty search committee** – Sept. 2008 - May 2009

2. Member of the working group on UTEP's **Key Strategic Direction** about enhancing students' success – Dec. 2005 - April 2006.
During this period of time, we met every week to brainstorm about how to recruit, retain students, decrease the time to graduation, and improve the preparation of students, and submitted a proposal about how to enhance research at UTEP.

3. Member of the working group on UTEP's **Key Strategic Direction** about research – Jan. 2005 - April 2005.
During this period of time, we met every week, and our work resulted in the submission of a proposal about ways to enhance research at UTEP.

4. Member of **UTEP's Integrated Curriculum group** – 2004.

4.3.3 University Service

1. **Chair of the Women's Advisory Council to the President** – since Sept. 2010
The purpose of the Women's Advisory Council to the President is to serves as a direct communication channel between women faculty, staff, students and the President. The Council fosters wide-ranging dialogue about issue and interest affecting women on campus and meets as needed. Yearly nominations for appointments to the Council are made by current members each summer. If appointed to serve on the Council, each member serves for a two year term. Representation on the Council consists of faculty, staff and students appointed by the President.
While chairing this council, I have led its efforts to family-friendly campus issues, focusing on 21st-century-demographics needs. I also developed a website (almost ready for release) to increase the access of people on campus to information and resources; see http://admin.utep.edu/wac for more details.

2. Member of **UTEP's Senate** for the CS department – since Sept. 2010
UTEP's faculty senate meets monthly to discuss university-wide issues and new policies. My role as a faculty senator is to attend these meetings, participate in the discussion if relevant, and report to the department the important news.

3. Member of the **Executive Committee** of the **Computational Sciences Program** at UTEP – since Sept. 2008
This committee meets on a need basis. The topics discussed within this committee include curriculum, graduation requirements, qualifying exams, students' applications, and other day-to-day issues.

4. Member of the **MamaPhD group** at UTEP – since Sept. 2010
The Mama PhD group was created in 2009. It supports UTEP faculty who are mothers. Its creation was originally inspired by the book "Mama PhD" as well as the corresponding blog. The Mama PhD group gathers faculty from a wide variety of disciplines. The groups meets monthly. In 2010-2011, as a member of both WAS and Mama PhD, I have been very active in coordinating the efforts of the two groups as there is a significant overlap between their respective goals.

5. Member of the **Women's Advisory Council to the President** – since Sept. 2006
   See above for more details.

6. Member of the **UTEP Catalog and Calendar Committee for the Senate** – Sept. 2006 - Sept. 2008
   Our task encompassed both the catalog and the calendar, but our hard work focused on the catalog, that we worked at reformatting, both the online and paper catalog.

4.3.4 Student Advising

Undergraduate advising

Since 2005, I have been assigned a group of about 30 undergraduate students that I meet once a semester for Summer/Fall advising during spring and summer semesters and for Spring advising during fall semester. Each advising session last about 15 minutes (sometimes more as needed) and is dedicated to discussing the set of courses the student should be taking the following semester(s) to ensure a timely graduation while not jeopardizing their GPA, providing career advice as well as advice to maximize their experience as a student in our department (such as doing research, taking part in the ACM chapter, applying for internships). I find such sessions essential as another way to reach out to our own students, some of them not always coming to ask for help or advice otherwise.

Research advising

I dedicate a large part of my efforts advising students conducting research under my supervision. As mentioned in Part II, I supervise research of students in my research group CR2G. To date, I have supervised about 20 undergraduate students. Five Master's students supervised by me have graduated: Richard Coy (Dec. 2005), Geetanjali Mesineni (July 2007), Carlos Acosta, Naga Suman Kanagala (Dec. 2008), Christian Servin (May 2009). Paden Portillo and Mario Bencomo were also Master's students doing research in CR2G but left one for personal reasons, the other to join Rice University's PhD program in Computational Sciences and Applied Maths. I have supervised four PhD students: three of them (Luis David Lopez, Mai Ahn Nguyen, Aziza Aouhassi) left UTEP, respectively in 2007, 2009, and 2011, due to family reasons while under my supervision; the last one (Xiaojing Wang) is expected to graduate in summer 2012.

Currently, I supervise one PhD student as mentioned above, two Master's students: Shubhra Datta (expected to graduate in early Fall 2011) and Christian Del Hoyo (expected to graduate in summer 2012), and one undergraduate student. A new member, Angel Garcia, Master's student, should join shortly and I am conducting efforts to recruit a new PhD student as well.

Besides, I am supervising during summer 2011 a total of 10 high-school students, split between three of them within the NEXUS program at UTEP (two from Da Vinci school of El Paso, one from Loretto Academy of El Paso), and seven within the MSEIP program for early-college high-school students at the El Paso Community College. That brings the total of high-school students I have supervised so far up to 15.

Finally, I have also advised an undergraduate student from France for a one-year-long project at UTEP, and I was in 2009 an external reviewer for the dissertation of a PhD candidate from the Indian Institute of Technology of Bombai, India (2009).

4.4 Evidence of Service to Research Community

4.4.1 Editorship

- **Journals' Special Issues**

  - Co-editor: special issue of Reliable Computing with selected papers from SCAN'2008, 2011, Vol. 15; with Vladik Kreinovich
  - Co-editor: special issue of Journal of Uncertain Systems on Uncertainty, 2011, Vol. 5, No. 2; with Vladik Kreinovich
  - Co-editor: special issue of Journal of Uncertain Systems on Uncertainty, 2010, Vol. 4, No. 4; with Vladik Kreinovich

- **Workshop proceedings**

  - Editor: book of abstracts of CoProD'08, '10, '11

- **Tracks editorials**

  - Martine Ceberio, Vladik Kreinovich, Michel Rueher: *Editorial: track reliable computations and their applications.* SAC 2006: pp. 1633 – 1634.
  - Martine Ceberio, Vladik Kreinovich, Michel Rueher: *Editorial: track reliable computations and their applications.* SAC 2005: pp. 1429 – 1430.
  - Martine Ceberio, Vladik Kreinovich, Michel Rueher: *Reliable Computations and Their Applications (RCA) Track.* In Reliable Computing 11(6): pp. 499 – 503. 2005.

4.4.2 Program Committee

- **Program chair**

  - Co-program chair for NAFIPS'11
  - Program chair for all CoProD workshops
  - Co-program chair for RCA tracks at ACM SAC'05 and '06.

- **Member of program committee**

  - Member of the scientific committee of the IntCP, CPSec, Verif/Valik workshops at International Conference on the Principles and Practice of Constraint Programming (CP), 2006
  - Member of the scientific committee of the track CSP (Constraint Solving Problems) at SAC since 2006.
  - Member of the scientific committee of Virtual Concept 2005, international conference.
  - Member of the scientific committee of the international conference AMCS'05 (Algorithmic Math- ematics and Computer Science).
  - Member of the program committee of the CPAIOR'09 workshop on Bound Reduction Techniques for Constraint Programming and Mixed-Integer Nonlin- ear Programming
  - Distributed and Speculative Constraint Programming workshop, DSCP'05, at CP'05

4.4.3 Paper and Book Review

I reviewed articles for the following **conferences and workshops**:

- The International Conference on the Principles and Practice of Constraint Programming (CP), since 2004

- ACM Symposium of Applied Computing (SAC) (for the Constraint track), since 2004

- North American Fuzzy Information Processing Society (NAFIPS), 2010, 2011

- The International Conference On Rehabilitation Robotics (ICORR), 2007

- The European Conference on Artificial Intelligence (ECAI), 2008, 2010

- The Frontiers In Education Conference (FIE), 2005, 2006, 2008

- The International Joint Conference in Artificial Intelligence (IJCAI), 2005, 2007, 2009

- Annual Conference of the Association for the Advancement of Artificial Intelligence (AAAI), 2010, 2011

- The Ershov Memorial Conference (PSI), 2011

- The Conference on the State of the Art in Scientific and Parallel Computing (PARA), 2010

- The 24th International Conference on Logic Programming (ICLP), 2008.

- Workshops at The International Conference on the Principles and Practice of Constraint Programming (CP) – e.g., Soft constraints, 2005, 2006, 2007.

I also reviewed articles for the following **journals and books**:

- Journals:

  - Computing, 2009, 2011
  - ANOR, 2004
  - Reliable Computing, since 2005
  - IJAR (International Journal of Approximate Reasoning),
  - INFORMS Jounal on Computing, 2009, 2010
  - Informations Sciences, 2009, 2010, 2011

- Books:

  - Applied Interval Analysis, by Luc Jaulin, 2001;
  - Java for Everyone (class test) by Horstmann at Wiley, 2009;
  - Data Structures: Abstraction and Design Using Java, by Koffman and Wolfgang at Wiley, 2009.

4.4.4 Conference / tracks / workshop chairing and organization

- **International conferences**

  - Co-general chair and co-program chair of the Annual Conference of the North American Fuzzy Information Processing Society, NAFIPS'2011 (nafips.cs.utep.edu), held at UTEP

  - Co-general chair of the 13th GAMM - IMACS International Symposion on Scientific Computing, Computer Arithmetic and Validated Numerics, SCAN'08 (scan2008.com), held at UTEP

- **International workshops**

  - Program and general chair of the workshop series CoProD (CoProD'08,'09,'10,'11): Constraint Programming and Decision Making workshops (coprod.constraintsolving.com), held at UTEP

  - Co-organizer and member of the program committee of the CPAIOR'09 workshop on Bound Reduction Techniques for Constraint Programming and Mixed-Integer Nonlinear Programming (www.cs.utep.edu/mceberio/Research/br-cpaior09/), held at Carnegie Mellon University, Pittsburgh

  - Program chair and organizer of the Distributed and Speculative Constraint Programming workshop, DSCP'05, at CP'05, held in Barcelona, Spain

- **Tracks at international conferences**

  - Co-program chair and co-organizer of the RCA (Reliable Computing and their Applications) track at ACM Symposium on Applied Computing, SAC'05,'06, held respectively in Santa Fe, New Mexico, and in Dijon, France

Note: All of these conferences and workshops' website have been designed and maintained by myself in a constant effort in catch every opportunity to increase UTEP's visibility.

4.4.5 Grant Proposal Review

I participated in five several NSF panels since 2008:

- Maths/Physics (March 2008);

- CISE (March 2008, March 2011);

- DUE (July 2010, July 2011).

4.4.6 Professional memberships

- Member of the **board of directors** of the North American Fuzzy Information Processing Society (NAFIPS) since March 2011

- Member of the Constraint Programming Society in North America (CPNA)

- Member of the Association for Constraint Programming (ACP)

- Member of the Association for Computing Machinery (ACM)

- Member of ProfessHers

- Member of Empowering Leadership

4.4.7 Open Source Software and Other Web Resources

- Designer and webmaster of the **community website http://www.constraintsolving.com** that provides for instance:

  - General information about constraints
  - Tutorials
  - Information about constraint solvers

4.5 Evidence of Service to Community

4.5.1 Service to the Local Community

- Collaboration with high-schools of El Paso:

  - Loretto Academy, an all-girl high school: collaboration with their math and AP CS teacher, Ms Fernandez, to enhance her teaching with activities meant to stimulate problem-solving skills and enhance the image of computer science
  - Harmony Science Academy: e.g., through helping mentor their robotics team, helping find judges for their fairs

- Faculty advisor for high-school students:

  - Summer 2011: **Faculty advisor** for two summer research projects for Early College High-School students at El Paso Community College (7 students).
  - Summer 2011: **Faculty advisor** for four high-school students (3 from Da Vinci high school / 1 from Loretto Academy in El Paso) within the Nexus program at UTEP.
  - Summer 2010: **Faculty advisor** for a summer research project for Early College High-School students at El Paso Community College.
  - Summer 2010: **Faculty advisor** for two high-school girls of Harmony Science Academy of El Paso, within the Nexus program at UTEP.

- Career fair and open house participation:

  - April 2010: College of Engineering **open house**
  - April 2011: **Career Fair** at Loretto Academy of El Paso (all-girls middle and high school).
  - March 2007, 2008, 2010, 2011: **Career Expo** at Mitzi Bond Elementary School, El Paso.

- Invited presentations about computer science and careers:

- April 2011: Presentation about career choices and computer science at the Young Women in Computing at New Mexico State University, Las Cruces.
- April 2010: Presentation about career choices to **Early College High School Students** at El Paso Community College.
- May 2008: Presentation at the **Extend Your Horizons** conference at UTEP.
- May 2007: Presentation about Artificial Intelligence and Games at **Wiggs Middle School**, El Paso.
- I was invited in **May 2006**, by the association Proyecto Abel in **Ciudad Juarez, Mexico**, to give an invited talk to about twenty high-school students. I gave a 2-hour presentation in Spanish on the following topic: from Artificial Intelligence to Constraint Programming.

- Judge at science fairs and senior symposia:

  - April 2011: judge at the Chapin High-School **Senior Project Symposium**.
  - Fall 2009, 2010: part of the **NCWIT local effort** (led by Dr. Steve Roach, UTEP) to engage high-school girls of El Paso to participate in the NCWIT Awards for Aspirations in Computing. NCWIT Reviewer/judge of high-school girls' applications. Keynote speaker at the awards ceremony in Spring 2011 at UTEP.
  - Fall 2009: Judge at the **Science Fair** of Harmony Science Academy (for elementary and middle schools), El Paso

- Other:

  - April 2008: **"Dia de los Niños"**. I helped the ACM chapter at UTEP to organize this event.

4.6   Appendix: List of Supporting Documents

4.6.1   Service to UTEP

- **Letters** from:

  1. Letty Paez, former chair of WAC, and Assistant Dean, College of Health Sciences
  2. the Women's Advisory Council to the President
  3. LeeAnn Westman, founding member of the Mama PhD group at UTEP
  4. Gabby Gandara, director of the Plaza at UTEP

- **Website:**

  1. Website of the Women's Advisory Council to the President (WAC)

4.6.2 Service to research community

- **Websites:**

  1. Website of the workshop on Distributed and Speculative Constraint Programming (DSCP'2006)
  2. Website of the track on Reliable Computations and their Applications (RCA'2006) at ACM SAC
  3. Website of the Annual Conference of the North American Fuzzy Information Processing Society (NAFIPS'11)

- **Emails** related to:

  1. Invitation to be a reviewer for Informations Sciences
  2. Invitation to be a panel member at NSF

- **Professional distinction:**

  1. List of NAFIPS' board members

4.6.3 Service to local community

- **Letters** from:

  1. Enrique Trevino, visiting professor at Strathmore College, co-organizer of the Proyecto Abel in 2006 in Ciudad Juarez
  2. Mary Beth Farkas, Counselor at Mitzi Bond Elementary School of El Paso
  3. Maria Alvarez, Professor of Biology at El Paso Community College
  4. Guvanch Atamyradov, Principal of Harmony Science Academy of El Paso, North East campus

- **Website:**

  1. Website with the pictures from the College of Engineering open house in 2010