

**Documentation in Support of The Candidacy  
For Promotion to Full Professor**

Teaching, Scholarship, and Service  
Fall 2012 – Fall 2017

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# Executive Summary

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I have been an associate professor since September 2012. During these years, I have continued to pursue my goals of excellence, just like I had before being granted tenure. I continued to embrace UTEP's mission, Access and Excellence, pursuing a research agenda of quality, as demonstrated by publications and funding level, and engaging students in research and in community building to enhance recruitment and retention in our computer science program.

Specifically, I have developed and deepened a research program focused on optimization and uncertainty quantification (research funded by ARL through the Army High-Performance Computing Research Center at Stanford since April 2013 – \$1,184,000). I have also contributed to my research community by organizing and chairing several international events (including the Annual International Meeting of the North American Fuzzy Information Processing Society – 2011 and 2016). I have developed my activities aimed to enhance recruitment and retention of students in our computer science department, for instance by creating an ACM-W chapter at UTEP, by leading the NCWIT AiC El Paso affiliate, by designing computer science summer camps, and by hosting high-school students as research interns in summer. I have also been involved in projects that aim at understanding the challenges faced by latin@s in engineering (NSF Research on Gender – \$524,900), and enhancing the retention of our majority-minority students in computer science (NSF IUSE/PFE RED – \$4,992,592).

## □ Teaching

Since 2012, I have taught a number of classes: mostly undergraduate-level courses because of the need to cover a list of required courses and to give way to junior colleagues to teach graduate courses. Most of my teaching has consisted of the following two undergraduate courses: Introduction to Computer Science (a.k.a. CS1, taught every semester since Spring 2015) and Automata, but I also created two new courses on Problem-Solving (one 3-credit-hour course cross-listed for undergrad and graduate students, one 1-credit-hour course only for undergrads). The 1-credit-hour course development is a project in collaboration with Google. The idea is the result of working with the CS department's curriculum committee within our NSF IUSE/PFE RED project to offer more options to CS students as early as when they are in their first semester to enhance their motivation in the program while strengthening their essential problem-solving skills. These two new problem-solving courses emerged from an extra-curricular initiative I offered to students taking our intro to computer science course: a 1-hour weekly problem-solving club, which proved to be very effective in developing our students' awareness of their already existing abilities and equip them with more problem-solving techniques.

Mentoring is also a key part of my teaching activities. I consistently have at least 5 undergraduate students conducting research with me (CR2G, see: [cr2g.constraintsolving.com](http://cr2g.constraintsolving.com)). I regularly give

independent study projects as another way to mentor students closely. I advise the ACM-W chapter at UTEP. I advise several groups of high-school students in town and I regularly give talks to the community about computer science to better inform them about the field.

## □ Research

My passion is to design approaches to solving problems with uncertainty in such a way that, despite the challenge of having uncertainty, guaranteed decisions can be made. And one area that I like particularly is that of predictions: Can we figure out how a phenomenon is going to unfold? Can we predict how experts would rate a particular system? The core of the research I have conducted over the past five years has been in optimization and uncertainty quantification: for this, I have used many different techniques, from interval computations to fuzzy computing, constraint solving, stochastic approaches, etc. The target classes of problems I have attacked are multi-expert multi-criteria decision making problems and dynamic systems, all of which with uncertainty.

My work has been funded through three main sources: NSF (a CAREER grant project whose half lifetime was executed during the last 5 years – about \$560K), AAAS (for my international collaboration with Perugia in Italy – about \$19K), and ARL (for my work on dynamic systems via the Army High-Performance Computing Research Center at Stanford – about \$1M). In addition, I have made efforts to acquire funding, submitting 20 proposals in total over these 5 years, 8 of which were funded, 6 with researchers from outside UTEP, 3 of which for international projects. Publishing my work has been a priority: I have published in peer-reviewed conference proceedings (19), in books as chapters (17), and in journals (12); I also participated and contributed abstracts and/or short papers in workshops. I have been invited to give a plenary talk in an international conference on guaranteed computing SCAN'16 in Uppsala, Sweden) and to give a seminar talk at the University of Paris Pierre and Marie Curie (in September 2017). I was a visiting professor in Perugia, Italy, working with Dr. S. Bistarelli 4 times during the last 5 years (for a total of about 1.5 month). I indeed value collaboration above all. Internationally, my work with the University of Perugia has resulted in an MOU between UTEP and Perugia, allowing for more exchanges, including of students, and we are working on finalizing a curriculum exchange program. Locally also, 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 always involved students in my work to catch any opportunity to train them and to teach them team-working first hand.

## □ Service

While at UTEP (the last 14 years), I have consistently served on committees, ranging from departmental to university-level committees. My involvement as chair of the the Women's Advisory Council to the President (WAC until 2016) followed by my participation in the Executive Council of the Faculty Senate (and a few of its committees) gave me a better idea of the university governance and the opportunities for impact. In addition, my involvement in my research community has been at many varied levels: 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. 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, over the last few years, I have strengthened my leadership in activities that contribute to better informing and providing opportunities for female and URM students to participate in Computer Science activities. In addition to a number of events in high-schools, at career fairs, science fairs, formal presentations, I have led the El Paso NCWIT Aspirations in Computing program (growing its participation twofold), I created UTEP's ACM-W chapter (guiding them through their success-

ful submission of grant proposals to NCWIT and Google twice), I designed a computer science summer camp that started in summer 2015 and is still in use (allowing to reach out to more than 200 students each summer). Since 2010, I have invited high-school students to intern in my lab in summer and I have to date welcome about 20 of them, mostly young women.

Overall, over the past 5 years, I have confirmed the potential of my research by establishing a well-funded and published agenda, allowing me to contribute to my research community, but also to train many students, at all levels but most of them undergraduates. I have contributed to major redesigns in the curriculum of UTEP's computer science department as well as to changes in the pedagogy of one of its core courses (the introduction to computer science). I have also paid close attention to significantly serving my communities (UTEP, my research community, and the local El Paso community).

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## Section 1

# Curriculum Vitae

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### □ Chronology of Education

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

Dissertation title: “Contributions to numerical under and over-constrained CSPs: Symbolic Tools and Flexible Constraints”

Advisors: Frédéric Benhamou and Laurent Granvilliers

**D.E.A.** 1999, *Department of Computer Science, University of Nantes, France*

(D.E.A.: Diplôme d’Études Approfondies)

**M.S.** 1997, *Department of Mathematics, University of Nantes, France*

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

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### □ Chronology of Employment

September 2012 – Present<sup>1</sup>

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

August 2004 – August 2012

**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)

★ Probationary 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 and Research Assistant**, *Computer Science Department, University of Nantes, France*

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<sup>1</sup>Blue data indicates activities that have been accomplished since I obtained tenure, in 2012.

## □ Honors and Awards

- Invited Plenary Speaker at the 17th International Symposium on Scientific Computing, Computer Arithmetics and Verified Numerics, September 2016
- Faculty Co-author of Outstanding Paper Award. Joint Annual Conference of the North American Fuzzy Information processing Society NAFIPS'2015 and 5th World Conference on Soft Computing, August 2015
- 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

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## □ Publications / Creative Activity (Published or Accepted)

### □ Chapters in Scholarly Books and Monographs

- Ch22 Stefano Bistarelli, Martine Ceberio, Joel Henderson, Francisco Santini, Luciana Garbayo, “Abstract Argumentation Frameworks to Promote Fairness and Rationality in Multi-Experts Multi-Criteria Decision Making”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, pp. 7–20, 2017.
- Ch21 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Optimizing  $\text{pred}(25)$  Is NP-Hard”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch20 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Constraint Approach to Multi-Objective Optimization”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch19 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “From Global to Local Constraints: A Constructive Version of Bloch’s Principle”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch18 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Range Estimation under Constraints is Computable Unless There Is a Discontinuity”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch17 Juan Carlos Figueroa Garcia, Martine Ceberio, and Vladik Kreinovich, “Algebraic Product is the Only t-Norm for Which Optimization Under Fuzzy Constraints is Scale-Invariant”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.

- Ch16 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Towards a Physically Meaningful Definition of Computable Discontinuous and Multi-Valued Functions (Constraints)”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch15 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Peak-End Rule: A Utility-Based Explanation”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch14 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Simplicity Is Worse Than Theft: A Constraint-Based Explanation of a Seemingly Counter-Intuitive Russian Saying”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 9-14.
- Ch13 Martine Ceberio and Vladik Kreinovich, “Continuous If-Then Statements Are Computable”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 15-18.
- Ch12 Aline Jaimes, Craig Tweedie, 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 and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 61-66.
- Ch11 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Why Tensors?”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 75-78.
- Ch10 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Adding Constraints – A (Seemingly Counterintuitive but) Useful Heuristic in Solving Difficult Problems”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 79-84.
- Ch9 Vladik Kreinovich, Juan Ferret, and Martine Ceberio, “Constraint-Related Reinterpretation of Fundamental Physical Equations Can Serve as a Built-In Regularization” In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 91-96.
- Ch8 Paden Portillo, Martine Ceberio, and Vladik Kreinovich, “Towards an Efficient Bisection of Ellipsoids”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 137-142.
- Ch7 Uram Anibal Sosa Aguirre, Martine Ceberio, and Vladik Kreinovich, “Why Curvature in L-Curve: Combining Soft Constraints”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 175-180.
- Ch6 Christian Servin, Martine Ceberio, Aline Jaimes, Craig Tweedie, and Vladik Kreinovich, “How to Describe and Propagate Uncertainty When Processing Time Series: Meteorological and Computational Challenges, with Potential Applications to Environmental Studies”, In: Shyi-Ming Chen and Witold Pedrycz (eds.), **Time Series Analysis, Modeling and Applications: A Computational Intelligence Perspective**, Springer Verlag, 2013, pp. 279-299.

- Ch5 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.
- Ch4 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.
- Ch2 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.
- Ch1 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**

- J27 Martine Ceberio and Vladik Kreinovich, “Constraint Problems: Computability Is Equivalent to Continuity”, **International Journal of Intelligent Technologies and Applied Statistics (IJITAS)**, 2017, Vol.10, No.2, pp.21-40.
- J26 Martine Ceberio and Vladik Kreinovich, “A Modification of Backpropagation Enables Neural Networks to Learn Preferences”, **Journal of Uncertain Systems**, to appear.
- J25 Leobardo Valera and Martine Ceberio, “Model-Order Reduction Using Interval Constraint Solving Techniques”, **Journal of Uncertain Systems**, 2017, Vol. 11, No. 2, pp. 84–103.
- J24 Anthony Welte, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Avoiding Fake Boundaries in Set Interval Computing”, **Journal of Uncertain Systems**, 2017, Vol. 11, No. 2, pp. 137-148.
- J23 Anthony Welte, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Computability of the Avoidance Set and of the Set-Valued Identification Problem”, **Journal of Uncertain Systems**, 2017, Vol. 11, No. 2, pp. 129-136.
- J22 Vladik Kreinovich, Martine Ceberio, and Quentin Brefort, “In category of sets and relations, it is possible to describe functions in purely category terms”, **Eurasian Mathematical Journal**, 2015, Vol. 6, No. 2, pp. 90-94.

- J21 Quentin Brefort, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Towards Fast and Reliable Localization of an Underwater Object: An Interval Approach”, **Journal of Uncertain Systems**, 2015, Vol. 9, No. 2, pp. 95-102.
- J20 Karen Villaverde, Olga Kosheleva, Martine Ceberio, “Computations under Time Constraints: Algorithms Developed for Fuzzy Computations can Help”. **Journal of Uncertain Systems**, 26(2), 138-145, 2013.
- J19 Olga Kosheleva, Martine Ceberio, “How Accurately Should We Write on the Board? When Marking Comments on Student Papers?”. **Journal of Uncertain Systems**, 6(2), 89-91, 2013.
- J18 Xiaojing Wang, Martine Ceberio, Shamsnaz Virani, Angel Garcia, and Jeremy Cummins. “A Hybrid Algorithm to Extract Fuzzy Measures for Software Quality Assessment”. **Journal of Uncertain Systems**, 2013.
- J17 Vladik Kreinovich, Christelle Jacob, Didier Dubois, Janette Cardoso, Martine Ceberio (2012). “Failure Analysis of a Complex System Based on Partial Information about Subsystems, with Potential Applications to Aircraft Maintenance”. **Journal of Applied and Computational Mathematics**, 11(2), 165-179.
- J16 Aline Jaimes, Craig Tweedie, Vladik Kreinovich, and Martine Ceberio, “Scale-Invariant Approach to Multi-Criterion Optimization under Uncertainty, with Applications to Optimal Sensor Placement, in Particular, to Sensor Placement in Environmental Research”, **International Journal of Reliability and Safety**, 2012, Vol. 6, No. 1-3, pp. 188-203.
- J15 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.
- J14 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.
- J13 Martine Ceberio and Vladik Kreinovich, “Diagonalization is also practically useful: a geometric idea”, **Geombinatorics**, 2010, Vol. 20, No. 1, pp. 15-20.
- J12 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.
- J11 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.
- J10 Daniel Berleant, Martine Ceberio, Gang Xiang, Vladik Kreinovich, “Towards Adding Probabilities and Correlations to Interval Computations”, **International Journal of Approximate Reasoning**, 2007.
- J9 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.

- J7 Martine Ceberio, Vladik Kreinovich, Sanjeev Chopra, Luc Longpré, 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.
- J6 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.
- J5 Frédéric Benhamou, Martine Ceberio, Philippe Codognot, 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.
- J4 Chandra S. Pdamallu, Linet Ozdamar, Martine Ceberio, “Efficient Interval Partitioning – Local Search Collaboration for Constraint Satisfaction”, **Journal on Computers and Operations Research**, 2006.
- J3 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.
- J2 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.
- J1 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)**

- C53 Leobardo Valera, Angel Garcia, Afshin Gholamy, and Martine Ceberio, “Towards Predictions of Large Dynamic Systems’ Behavior using Reduced-Order Modeling and Interval Computations”, to be published in the proceedings of the **IEEE International Conference on Systems, Man, and Cybernetics (IEEE SMC 2017)**.
- C52 Leobardo Valera, Angel Garcia, and Martine Ceberio, “On-the-Fly Parameter Identification for Dynamic Systems Control, Using Interval Computations and Reduced-Order Modeling”. To be published in the proceedings of the **North American Fuzzy Information Processing Society Annual Conference 2017 (NAFIPS 2017)**.
- C51 Anthony Welte, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Robust Data Processing in the Presence of Uncertainty and Outliers: Case of Localization Problems”, In the Proceedings of the **IEEE Series of Symposia in Computational Intelligence SSCI’2016**, Athens, Greece, December 6-9, 2016.
- C50 Leobardo Valera, Martine Ceberio, “Using Interval Constraint Solving Techniques to Better Understand and Predict Future Behaviors of Dynamic Problems”. In the proceedings of the **North American Fuzzy Information Processing Society Annual Conference**, NAFIPS’2016.
- C49 Angel F. Garcia Contreras, Martine ceberio, “Comparison of Strategies for Solving Global Optimization Problems Using Speculation and Interval Computations”. In the proceedings of the **North American Fuzzy Information Processing Society Annual Conference**, NAFIPS’2016.

- C48 Horacio Florez and Martine Ceberio (2016). “A Novel Mesh Generation Algorithm for Field-Level Coupled Flow and Geomechanics Simulations”. In the Proceedings of **ARMA 16-305, 50th US Rock Mechanics / Geomechanics** Symposium held in Houston, TX.
- C47 Stefano Bistarelli, Martine Ceberio, Joel Henderson, Franceco Santini, “Using Argumentation Frameworks to promote Fairness and Rationality in Multi-Experts Multi-Criteria Decision Making”, in the Proceedings of the **2015 Italian Conference in Theoretical Computer Science**, 2015.
- C46 Esquinca, A., Villa, E. Y., Hampton, E. M., Ceberio, M. C., Wandermurem, L. S., (2015). “Latinas’ resilience and persistence in computer science and engineering: Preliminary findings of a qualitative study examining identity and agency.” Proceedings of the 2015 **Frontiers in Education**.
- C45 Martine Ceberio, Vladik Kreinovich, Hung T. Nguyen, Songsak Sriboonchitta, and Rujira Ouncharoen, “What is the Right Context for an Engineering Problem: Finding Such a Context is NP-Hard”, Proceedings of the **IEEE Symposium Series on Computational Intelligence**, Cape Town, South Africa, December 7-10, 2015, pp. 1615-1620.
- C44 Salem Benferhat, Karim Tabia, Sylvain Lagrue, Vladik Kreinovich, and Martine Ceberio, “On the Normalization of Interval-Based Possibility Distributions”, Proceedings of the **Twenty-Eighth International Florida Artificial Intelligence Research Society Conference FLAIRS’28**, Hollywood, Florida, May 18-20, 2015, pp. 20-25.
- C43 Quentin Brefort, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “If We Take Into Account that Constraints Are Soft, Then Processing Constraints Becomes Algorithmically Solvable”, Proceedings of the **IEEE Symposium on Computational Intelligence for Engineering Solutions CIES’2014**, Orlando, Florida, December 9-12, 2014, pp. 1-10.
- C42 Martine Ceberio, Leobardo Valera, Olga Kosheleva, and Rodrigo Romero. “Model Reduction: Why It Is Possible and How It Can Potentially Help to Control Swarms of Unmanned Aerial Vehicles”. In the Proceedings of the **North American Fuzzy Information Processing Society Annual Conference**, NAFIPS’2015.
- C41 Brefort, Q., Jaulin, L., Ceberio, M. C., Kreinovich, V. Y., (2014). “If We Take Into Account that Constraints Are Soft, Then Processing Constraints Becomes Algorithmically Solvable”. (pp. 1-10). Proceedings of the **IEEE Symposium on Computational Intelligence for Engineering Solutions**, Orlando, Florida SSCI’2014, December 9-12, 2014.
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- C38 X. Wang, M. Ceberio, A. Garcia. “Towards Fuzzy Method for Estimating Prediction Accuracy for Discrete Inputs, with Application to Predicting At-Risk Students”. Proceedings of the **Annual Conference of North American Fuzzy Information Processing Society (NAFIPS’2013)**, Alberta, Canada, June 2013.

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- C36 X. Wang, A. F. Garcia Contreras, M. Ceberio, C. Del Hoyo, L. C. Gutierrez, and S. Virani. “Interval-based algorithms to extract fuzzy measures for software quality assessment”. Proceedings of the **Annual Conference of North American Fuzzy Information Processing Society (NAFIPS’2012)**, Berkeley, CA, August 2012.
- C35 Xiaojing Wang, Angel Garcia Contreras, Martine Ceberio, Christian Del Hoyo, Luis Gutierrez, “A Speculative Algorithm to Extract Fuzzy Measures from Sample Data”, Proceedings of the **2012 annual international conference of Fuzz-IEEE (Fuzz-IEEE’12)**.
- C34 Vladik Kreinovich, Christelle Jacob, Didier Dubois, Janette Cardoso, Martine Ceberio, and Ildar Batyrshin, “Estimating Probability of Failure of a Complex System Based on Inexact Information about Subsystems and Components, with Potential Applications to Aircraft Maintenance”, In: I. Batyrshin and G. Sidorov (eds.), Proceedings of the **10th Mexican International Conference on Artificial Intelligence MICAI’2011**, Puebla, Mexico, November 26 - December 4, 2011, Springer Lecture Notes in Artificial Intelligence, Vol. 7905, pp. 70-81.
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- C31 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.
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- C25 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.
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- C15 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.
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- C11 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.
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- C8 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.
- C7 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.
- C6 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.
- C5 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.
- C4 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.

- C3 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.
- C2 Martine Ceberio, Laurent Granvilliers, “Solving Nonlinear Equations by Abstraction, Gaussian Elimination, and Interval Methods”, in the proceedings of **FroCos 2002**, pp 117-131, 2002.
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□ **Refereed Workshop Proceedings (peer reviewed)**

- W10 [Leobardo Valera, Martine Ceberio, “Model-Order Reduction Using Interval Constraint Solving Techniques.” Proceedings of the 7th International Workshop on Reliable Engineering Computing \(REC2016\). June 15-17, 2016, Ruhr University Bochum, Germany.](#)
- W9 [Luis Gutierrez, Martine Ceberio, Vladik Kreinovich, Rebekah L. Gruver, Marianna Pena, Matthew J. Rister, Abraham Saldana, John Vasquez, Janelle Ybarra, and Salem Benferhat, “From Interval-Valued Probabilities to Interval-Valued Possibilities: Case Studies of Interval Computation under Constraints”, Proceedings of the 6th International Workshop on Reliable Engineering Computing REC’2014, Chicago, Illinois, May 25-28, 2014.](#)
- W8 Christelle Jacob, Didier Dubois, Janette Cardoso, Martine Ceberio, and Vladik Kreinovich, “Estimating Probability of Failure of a Complex System Based on Partial Information about Subsystems and Components, with Potential Applications to Aircraft Maintenance”, Proceedings of the **International Workshop on Soft Computing Applications and Knowledge Discovery SCAKD’2011**, Moscow, Russia, June 25, 2011, pp. 30-41.
- W7 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.
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□ **Conference / Workshop Abstracts (peer-reviewed)**

A39 Angel F. Garcia Contreras, Martine Ceberio, and Vladik Kreinovich, “Plans Are Worthless but Planning Is Everything: A Theoretical Explanation of Eisenhower’s Observation”, in the Proceedings of the **10th International Workshop on Constraint Programming and Decision Making CoProd’2017**, El Paso, Texas, November 3, 2017, to appear.

A38 Angel F. Garcia Contreras, Martine Ceberio, and Vladik Kreinovich, “Why Convex Optimization Is Ubiquitous and Why Pessimism Is Widely Spread”, Proceedings of the **10th International Workshop on Constraint Programming and Decision Making CoProd’2017**, El Paso, Texas, November 3, 2017, to appear.

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A36 Leobardo Valera, Martine Ceberio, “Introduction to Pairwise Testing. Definition and Examples”. **47th Southeastern International Conference on Combinatorics, Graph Theory Computing** (2016).

A35 Leobardo Valera, Martine Ceberio, “Interval Constraint Solving Techniques and Model-Order Reduction to Enhance the Solution of Dynamic Systems”. **2016 INFORMS Annual Meeting**.

A34 Chitta Baral, Martine Ceberio, and Vladik Kreinovich, “How Neural Networks (NN) Can (Hopefully) Learn Faster by Taking Into Account Known Constraints”, Proceedings of the Ninth International **Workshop on Constraints Programming and Decision Making CoProd’2016**, Uppsala, Sweden, September 25, 2016.

A33 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “When We Know the Number of Local Maxima, Then We Can Compute All of Them”, Proceedings of the **Ninth International Workshop on Constraints Programming and Decision Making CoProd’2016**, Uppsala, Sweden, September 25, 2016.

A32 Martine Ceberio, Vladik Kreinovich, (2016). Preface to the special issue on uncertainty. (vol. 10). *Journal of Uncertain Systems*.

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- A29 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Constraint Approach to Multi-Objective Optimization”, Proceedings of the **Eighth International Workshop on Constraints Programming and Decision Making** CoProd’2015, El Paso, Texas, November 6, 2015.
- A28 Leobardo Valera, Martine Ceberio, “Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction”. 8th International **Workshop on Constraint Programming and Decision Making**, El Paso, Nov. 2015.
- A27 Martine Ceberio, Miguel Argaez, Luis Gutierrez, Leobardo Valera. “Using Interval Constraint Solving Techniques to Solve Dynamical Systems”. **CORS/INFORMS 2015 Meeting**, Montreal, June 2015.
- A26 Miguel Argaez, Martine Ceberio, Leobardo Valera. “A Model Order Reduction for Solving Large-Scale Square Nonlinear Systems of Equations”. **CORS/INFORMS 2015 Meeting**, Montreal, June 2015.
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- A22 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “From Global to Local Constraints: A Constructive Version of Bloch’s Principle”, Proceedings of the of the **Seventh International Workshop on Constraints Programming and Decision Making, CoProd’2014**, Wuerzburg, Germany, September 21, 2014.
- A21 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Range Estimation under Constraints is Computable Unless There Is a Discontinuity”, Proceedings of the of the **Seventh International Workshop on Constraints Programming and Decision Making, CoProd’2014**, Wuerzburg, Germany, September 21, 2014.
- A20 Juan Carlos Figueroa Garcia, Martine Ceberio, and Vladik Kreinovich, “Algebraic Product is the Only t-Norm for Which Optimization Under Fuzzy Constraints is Scale-Invariant”, Proceedings of the **Sixth International Workshop on Constraints Programming and Decision Making CoProd’2013**, El Paso, Texas, November 1, 2013, pp. 8-11.
- A19 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Towards a Physically Meaningful Definition of Computable Discontinuous and Multi-Valued Functions (Constraints)”, Proceedings of the **Sixth International Workshop on Constraints Programming and Decision Making CoProd’2013**, El Paso, Texas, November 1, 2013, pp. 22-26.
- A18 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Peak-End Rule: A Utility-Based Explanation”, Proceedings of the **Sixth International Workshop on Constraints Programming and Decision Making CoProd’2013**, El Paso, Texas, November 1, 2013, pp. 12-16.

- A17 Paula Gonzalez-Parra, Martine Ceberio, and Carlos Castillo Chavez. “Interior-Point Methods for a Multi-Group Discrete-Time Influenza Model”. Presented at the **Mathematical Congress of the Americas 2013**, August 2013.
- A16 Joel Henderson, Stefano Bistarelli, Martine Ceberio (2013). “Multi-Experts Multi-Criteria Decision Making”, In the Proceedings of **Numerical Computations: Theory and Algorithms International Conference**, Italy, June 2013.
- A15 Martine Ceberio, Vladik Kreinovich, (2012). “Preface to the special issue”. (vol. 6, pp. 83). **Journal of Uncertain Systems**.
- A14 Ali Jalal-Kamali, Martine Ceberio, Vladik Kreinovich, (2012). “Constraint Optimization: From Efficient Computation of What Can Be Achieved to Efficient Computation of a Way to Achieve the Corresponding Optimum”. Proceedings of the **Fifth International Workshop on Constraint Programming and Decision Making CoProD’12**, Novosibirsk, Russia, September 23, 2012.
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- A12 Uram Anibal Sosa Aguirre, Martine Ceberio, and Vladik Kreinovich, “Why Curvature in L-Curve: Combining Soft Constraints”, Proceedings of the **Fourth International Workshop on Constraint Programming and Decision Making CoProD’11**, El Paso, 2011.
- A11 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Adding Constraints: A (Seemingly Counterintuitive but) Useful Heuristic in Solving Difficult Problems”, Proceedings of the **Fourth International Workshop on Constraint Programming and Decision Making CoProD’11**, El Paso, 2011.
- A10 Shubhra Datta, Martine Ceberio, Mario Bencomo, and George Moreno, “On the Practicality of Constraint-Based Program Verification”, in the proceedings of **SCAN’10**, 2010.
- A9 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.
- A8 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.
- A7 Paden Portillo, Martine Ceberio, Vladik Kreinovich, “Towards an Efficient Bisection of Ellipsoids”, in the book of abstracts of **CoProD’10**, 2010.
- A6 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.
- A5 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.
- A4 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.

- A3 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.
- A2 Luc Longpré, Vladik Kreinovich, Eric Freudenthal, Martine Ceberio, Francois Modave, Neelabh Bajjal, 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.
- A1 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.

□ **Edited Research Books**

- B2 [Martine Ceberio and Vladik Kreinovich \(eds.\), Constraint Programming and Decision Making: Theory and Applications, Springer Verlag, Berlin, Heidelberg, to appear.](#)
- B1 [Martine Ceberio and Vladik Kreinovich \(eds.\), Constraint Programming and Decision Making, Springer Verlag, Berlin, Heidelberg, 2014.](#)

□ **Grants and Contracts**

□ **Total Grants and Contracts**

Since 2012: Total is \$7,123,457 (**\$1,384,905** as PI).

- **Federal funding:** **\$385,905** as PI and \$5,517,552 for projects in which I am co-PI
- **Army funding:** **\$999,000** as PI and \$190,000 for projects in which I am co-PI
- **Industry funding:** \$41,000 from Raytheon, of which I received **\$5,000** as PI
- **University funds:** **\$25,000** from URI and two IDRs (IDR1 & IDR2)

From 2003 to 2012: Total is \$936,719 (**\$241,567** as PI)

- **Federal funding:** \$227,667 as PI and \$680,152 as co-PI
- **European funding:** €20,000, of which 5,000 euros as PI
- **University funds:** \$8,900 from URI and two IDRs (IDR1 & IDR2)

□ **Federal**

1. **NSF IUUSE/PFE RED – Co-PI IUUSE/PFE:RED: Toward a Model of Change for Preparing a New Generation for Professional Practice in Computer Science.** July 2016 – June 2021. Amount: \$4,992,592.00.
2. **NSF Research on Gender – Co-PI Latinas in Computer Science and Engineering: A Qualitative.** September 15, 2012 – September 14, 2016 extended. Amount: \$524,960.00.
3. **American Association for the Advancement of Science WIRC MSIs – PI Predicting Experts’ Decisions and Disagreements using Argumentation Networks and Soft Constraints.** November 2012 – October 2013. Amount: \$19,472.00.
4. **NSF CCF 0953339 – PI CAREER: Symbolic-Numeric Constraint-Based Solutions for Real-World Scientific Problems,** 01/2010 to 12/2016. Amount: \$564,650 + additional \$32,000 REU supplement (2010, 2011, 2012).
5. **NSF CCF 0839052 – PI Constraint Programming and Decision Making Workshop, Co-ProD’08,** 08/2008 – 07/2010. Amount: \$7,441.
6. **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. **ARMY RESEARCH LABORATORY through STANFORD UNIVERSITY Army High Performance Computing Research Center– PI** *HPC Modeling and Simulation of Underbody Blast Parameter Estimation Problems*, start: January 1, 2014, end: December 31, 2017. Amount: \$994,000.
  2. **STEM Accelerator Fund: CS1 Course Redesign**. Amount: \$8,500, Fall 2016.
  3. **Google CS Engagement Award:** Ceberio, Martine (PI). *Revamping CS1 to increase retention*. Amount: \$5,000. (January 2015 – December 2015).
  4. **ARMY RESEARCH LABORATORY through STANFORD UNIVERSITY Army High Performance Computing Research Center– Co-PI** *HPC Modeling and Simulation of Underbody Blast Parameter Estimation Problems*, start: April 1, 2013, end: December 31, 2013. Amount: \$190,000.
  5. **Raytheon – Co-PI** *Virtual Geocaching – STEM Student Software Application* Fall 2012 – Spring 2013. Amount: \$36,000.00.
  6. **UTEP Inter-Disciplinary Research fund – Co-PI** *Research on Identity and Participation in Science, Technology, Engineering, & Science (STEM)-IDR*, The University of Texas at El Paso, February 1, 2012 - January 31, 2013. Amount: \$20,000.00.
  7. **UTEP Inter-Disciplinary Research fund – Co-PI** *IDR1: Interdisciplinary Research Group on Decision Making and Judgment*, The University of Texas at El Paso, Spring 2012 – Spring 2013. Amount: \$5,000.00.
  8. **UTEP University Research Incentive grant – PI** *A Hybrid Robust Solver for Problems with Uncertainty: HyRS*, Jan. 2009 to Dec. 2009. Amount: \$5,400.
  9. **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.
  10. **UTEP University Research Incentive grant – PI:** *Next Steps towards Flexibility in Problem-Solving*. Jan-Dec. 2005. Amount: \$3,500.
  11. **GRA Advance (Research assistantship)** awarded in December 2004: support for 4.5 months of assistantship.
  12. **Grant of the French Ministry of Research – PI:** to help expatriates establish collaborations between French researchers working abroad and French institutions. Sept. 2004 to Aug. 2006. Amount: €5,000.
  13. **PAI Egide Sakura:** external collaborator, French-Japanese project. Jan. 2004 to Dec. 2006. Amount: €15,000.
-

## □ Service / Outreach

### □ National / International Outreach

- Vice-President of **NAFIPS**, January 2017 – December 2019 (NAFIPS is the North American Fuzzy Information Processing Society)
- Member of **NAFIPS’ board of directors**, since March 2011
- Member of **IEEE Technical Committee on Soft Computing**, since March 2016
- Member of the Springer Soft Computing Journal Editorial Board (November 2011 – January 2013).
- Webmaster of the **community website** <http://www.constraintsolving.com>.
- **Conference organization and chairing of program committees**
  - \* Co-chair and co-program chair of **NAFIPS’2016** ([nafips.cs.utep.edu](http://nafips.cs.utep.edu))
  - \* Program and general co-chair of the **CoProD workshop series since 2008** (<http://coprod.constraintsolving.com>), with Vladik Kreinovich (UTEP)
  - \* Co-chair of the **ACM SAC (Symposium on Applied Computing) Knowledge Representation and Reasoning (KRR) 2016, 2017, 2018**
  - \* Co-program chair of **NAFIPS’2012** and **NAFIPS’2014**
  - \* Co-general chair and co-program chair of **NAFIPS’2011**, Co-general chair of **SCAN’08**, the 13th GAMM - IMACS International Symposium on Scientific Computing, Computer Arithmetic and Validated Numerics ([scan2008.com](http://scan2008.com))
  - \* Co-organizer and member of the program committee of **CPAIOR’09 workshop on Bound Reduction Techniques for Constraint Programming and Mixed-Integer Nonlinear Programming** ([www.cs.utep.edu/mceberio/Research/br-cpaior09/](http://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 Program Committees**
  - \* RCRA 2017 (Rappresentazione della Conoscenza e Ragionamento Automatico)
  - \* IAE/AIE 2017 (International Conference on Industrial Engineering, Other Applications of Applied Intelligent Systems)
  - \* FLAIRS-29 (the Florida AI Research Society)
  - \* IJCAI’15, ’13 (International Joint Conference in Artificial Intelligence).
  - \* MICAI’13 (Mexican Conference in Artificial Intelligence).
  - \* WSCS’13 (World Conference on Soft Computing).
  - \* WEA’12 (Workshop on Engineering Applications).
  - \* M-PREF’12, ’13, ’14, ’15 (international workshop at ECAI’12 & ’13– European Conference on Artificial Intelligence) & ’15 at IJCAI 2015
  - \* NAFIPS’15 special session on Interval Computations.
  - \* Workshop on Intelligent Personalization (IP) — Joint Workshop on Constraints and Preferences for Configuration and Recommendation (CPCR) and Intelligent Techniques for Web Personalization (ITWP) at IJCAI 2015

- \* CSP track at SAC since 2005 until 2014
  - \* Virtual Concept 2005, international conference
  - \* AMCS'05 (Algorithmic Mathematics and Computer Science)
  - \* Grace Hopper Celebration 2012 New Investigator Subcommittee Member (Fall 2011 – Summer 2012)
- **Reviewer for... (a selection of recent review assignments only)**
- \* 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), Mexican International Conference on Artificial Intelligence (MICA I) 2011, 2012, 2013, PPAM 2013, 2015, Workshop on Engineering Applications (WEA), 2012, FLAIRS 2016, FuzzIEEE 2016, ICTCS 2014 (the Italian Conference on Theoretical Computer Science), AI\*IA 2016 (the XV International Conference of the Italian Association for Artificial Intelligence), IFSA-NAFIPS 2013, FuzzIEEE 2017.
  - \* Journals: including Computing, ANOR, Reliable Computing, IJAR (International Journal of Approximate Reasoning), INFORMS Journal on Computing, Information Sciences , Journal of Experimental and Theoretical Artificial Intelligence, the Annals of Mathematics and Artificial Intelligence, Artificial Intelligence, Special Issues of Soft Computing, Journal of Logical and Algebraic Methods in Programming, Transactions on Mathematical Software, AAAS-Science.
  - \* Books: Applied Interval Analysis, by Luc Jaulin, 2001; Java for Everyone (class text) by Horstmann at Wiley, 2009; Data Structures: Abstraction and Design Using Java, by Koffman and Wolfgang at Wiley, 2009, Hybrid Computing & Intelligence: Research and Applications, Morgan Kauffman (publishers) .
  - \* Proposals: Member of NSF panels in Maths/Physics (2008), CISE (2008, 2011, 2012, 2013, 2014, 2015, 2017), DUE (2010, 2011).
  - \* Others:
    - Grace Hopper Conference: reviewer of 2014 scholarship applications
    - DoD 2014 Star Award reviewer
    - NCWIT Collegiate Award reviewer 2015, 2016
    - NCWIT Educator Award reviewer 2015
- **Students**
- \* External reviewer of a PhD dissertation for the Computer Science program at the University of Paris 6, France, 2017.

- \* Co-Supervisor of 2 graduate student from ENSTA France (advisor: Luc Jaulin), interning in the TRACS lab at UTEP for five months from April 2014 to August 2014, and for three months in summer 2016 (TRACS is the lab on Theoretical Research driven by Applications in CS, which includes my research group CR2G: [cr2g.constraintsolving.com](http://cr2g.constraintsolving.com))
- \* External reviewer of a PhD dissertation for the Executive Board of the Italian Association for Logic Programming (GULP), 2012.
- \* External reviewer for the dissertation of a PhD candidate from the Indian Institute of Technology of Bombay, India (2009)
- \* Supervisor of an undergraduate students from France for a project during a year at UTEP (2006).

## □ Department Committees

### • Current assignments

- **Academic advisor to undergraduate students** – between 40 and 50 per semester
- Member of the **Faculty Evaluation Committee** – February 2015 – **present**.
- Member of the **CS Undergraduate Curriculum Committee** – August 2013 – **present**.
- **Chair** of the Undergraduate Fundamentals course sequence Committee – May 2015 – **present**.
- In charge of the **Computer Science Department's course schedule** – 2007 to Spring 2010 and August 2012 – **January 2017**.
- Founder and **advisor of the ACM-W chapter at UTEP** – June. 2012 to **present**  
As the ACM-W advisor, I have guided and supervised the ACM-W students in the following projects that were funded by NCWIT or Google:
  - \* NCWIT Seed Fund: in spring 2014 to develop a still existing mentoring program for CS UG students
  - \* Google IgniteCS program: in spring 2016, ACM-W was awarded its first Google IgniteCS project to put in place formal and informal program to teach computer science to young students at a middle school of El Paso. In spring 2017, they received their second award for a similar program at a high-school of El Paso.
  - \* In fall 2017, they are very active in helping with the NCWIT Aspirations in Computing program and they are working on developing and submitting a Google First project.
- Member of the **Computer Science Advancement of Women in Computing** committee – August 2015 – **present**

### • Previous assignments

- Chair of the Programming Languages course Committee – August 2013 – May 2015.
- **Webmaster** of the Computer Science website – August 2011 – August 2014.
- Part of the **CS ABET preparation Committee** – September 2012 – Fall 2013
- **Chair of the 2013 CS Faculty Search Committee** – August 2012 May 2013
- **CS Faculty Search Committee** – December 2011 – Spring 2012

- **Minute-taker at the faculty meetings** of the Computer Science Department – August 2011 – July 2012.
- **Chair of the CS Colloquium committee** – Sept. 2010 to Sept. 2011
- **Advisor of the ACM chapter at UTEP** – Sept. 2005 to Sept. 2011
- 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** – Sept. 2005 to Sept. 2011
- Member of the **CS Information Assurance committee** – Sept. 2007 to Sept. 2011

#### □ College Committees

##### ● Current assignments

- Member of the **Task force on Faculty Success**. March 2013 – **present**.
- Member of the **WEST, Women in Engineering Support Team**. Fall 2012 – **present**.

##### ● Previous assignments

- Member of a team part of the **NCWIT Extension Services** (along with Ann Gates, Miguel Velez-Reyes, Pat Nava, Gabby Gandara) who worked on **increasing the number of female students in Computing**. Fall 2012 – Summer 2014.
- Member of the **Facilitation Team For Information and Security**. September 2011 – November 2012.
- 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

##### ● Current Assignments

- Member of **COURI's Board of Advisors**: COURI is the Campus Office for Undergraduate Research Initiatives at UTEP – March 2015 – **present**.
- Member of **UTEP's Mama PhD** group – September 2010 – **present**.

##### ● Previous Assignments

- Member of the **Executive Council of the Faculty Senate** as representative of UTEP's College of Engineering – September 2015 – August 2017

- **Vice-President of the Faculty Senate.** September 2014 – August 2015.
- Member of the **Executive Council of the Faculty Senate** – as **Secretary** (September 2012 – August 2014) as such:
  - \* Representative of this council on the IT standing committee of the Faculty Senate (2013-2014)
  - \* Representative of this council on the UGCC and Student Grievance Committee standing committee of the Faculty Senate (2014-2015)
- Member of the **Executive committee of the Computational Sciences Program** – September 2008 – June 2015.
- Member of the **Board of the Women’s Resource Center** (now Student Resource Center) – September 2011 – August 2014.
- Member of **UTEP’s Undergraduate Curriculum Committee** (standing committee of the Faculty Senate) – September 2011 – August 2014
- **Member of the Computational Sciences Faculty Search.** September 2013 – April 2014.
- **Faculty Senate** member. September 2010 – August 2012.
- **Chair of the Women’s Advisory Council to the President.** Sept. 2010 – December 2012
- Member of the **Women’s Advisory Council to the President, as past chair.** Jan. 2013 – Dec. 2013
- Chair of the **Women’s Advisory Council to the President.** Sept. 2010 – Dec. 2012
- Member of the **Women’s Advisory Council to the President.** Sept. 2006 – Dec. 2013
- Member of the **UTEP Catalog and Calendar Committee for the Senate.** Sept. 2006 - Sept. 2008

□ **Other: Professional Societies Membership**

- Member of ACM (Association for Computing Machinery)
- Member of ACM-W (ACM’s committee on Women)
- Member of INFORMS
- Member of IEEE
- Member of AAAS (American Association for the Advancement of Science)
- Member of the CPNA (Constraint Programming Society in North America)
- Member of the ACP (Association for Constraint Programming)
- Member of ProfessHers
- Member of Empowering Leadership

## □ **Local / State Outreach**

*Note: most of the following outreach activities contribute to my goal of increasing the participation of women in computing fields.*

### ● **Advisory Boards' membership**

- Board of advisors of Bel-Air's T-STEM Academy (since 2017)
- Board of advisors of Parkland's T-STEM Academy (since 2015)
- Board of advisors of Harmony Science Academy of El Paso (since 2012)
- Board of advisors of Eastlake High School CSE program (2015)
- Board of advisors of Saint Patrick's Elementary and Middle School – 2013 to 2017

### ● **Faculty advisor** for summer research projects for high-school students (2010, 2011, 2012, 2014, 2015, 2016, 2017)

- Nexus program at UTEP:  
*Notably: an unprecedented high-number of interns participated in summers 2014 and 2016: 7 female high-school students)*
- Advisor and mentor for Early College High-School students at El Paso Community College working on research projects over summer (2010, 2011).

### ● **NCWIT Aspirations in Computing Regional Affiliate Competition Coordinator**

- Coordinator of the El Paso affiliate since fall 2015
- Coordinator of the El Paso/Las Cruces affiliate from 2011 to spring 2014  
*15 schools of El Paso/Las Cruces and the wider area have participated in the competition, and over 50 young women have been honored.*
- 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 (Fall 2009, 2010).
- Keynote speaker at the awards ceremony in Spring 2011 at UTEP.

### ● **Presentations about computer science** I regularly give presentations about computer science, at UTEP or at various schools of the El Paso area. In particular, in fall 2016, I gave talks to high-school young women every day of our e-Week, reaching out to about 100 women in one week. In addition, some of my past talks include the following:

- Presentation to the Girls-Who-Code group from Harmony Science Middle School of El Paso – UTEP, May 2017
- Contributed presentation at the Teacher Networking Technology Conference in November 2015 in El Paso about “Computational Thinking in the Classroom”. Audience: about 35 teachers from all disciplines, from K-12.
- Presentation to an all-girls summer camp at Fab Lab El Paso – June 2016
- Presentation to doctorate students about being a professor in computer science, May 2015
- Presentation at Harmony Science Academy of El Paso about computer science and careers (December 2014)

- Contributed presentation at the Teacher Networking Technology Conference in October 2014 in El Paso about “Coding your way through school”. Audience: about 50 teachers from all disciplines, from K-12.
  - Presentation to the Clint Independent School District about Computer Science, May 2014
  - Invited speaker for a Webinar for all teachers of Ysleta School District about how they can bring computer science in their classroom and what they can do if they are CS / math teachers, March 2014
  - Invited speaker at the New Mexico Celebration of Women in Computing, Las Cruces, NM (November 2012).
  - Presentation about career choices and computer science at the Young Women in Computing at New Mexico State University, Las Cruces (April 2011).
  - Presentation about career choices to **Early College High School Students** at El Paso Community College (April 2010).
  - Presentation at the **Extend Your Horizons** conference at UTEP (May 2008).
  - Presentation about Artificial Intelligence and Games at **Wiggs Middle School**, El Paso (May 2007).
  - Invited speaker for a lecture series organized by the association Proyecto Abel in **Ciudad Juarez, Mexico**: 2-hour lecture in Spanish on “from Artificial Intelligence to Constraint Programming” to about twenty high-school students (May 2006).
- **Career Fairs/Days presenter:**
    - Girls Powered Event presenter at Eastwood High School in El Paso (October 2016)
    - Ibero Academy: Presentation about Computer Science to Kindergartners, 1st graders, and 2nd graders (May 2014)
    - Loretto Academy of El Paso – all-girls middle and high school (April 2011, April 2012, April 2014)
    - **Career Expo** at Mitzi Bond Elementary School, El Paso (March 2007, 2008, 2010, 2011).
- **UTEP tours and open house events**
    - Hosted a day of Computer Science for Bel-Air High School in June 2017 (about 50 students)
    - Hosted a day of Computer Science and Engineering for Saint Patrick’s Elementary School – 3rd to 5th grade – in May 2017 (about 60 students)
    - Hosted a day of Computer Science and Engineering for Saint Patrick’s Middle School in December 2016 (about 80 students)
    - Hosted a day of Computer Science for Bel-Air High School in May 2016 (about 50 students)
    - Participates in UTEP’s Orange and Blue Days, and other events such as Open houses annually
    - Regularly prepare presentation material and train my research team students to give overviews of CS to visiting students.



- **High-school classroom innovation:**

- [Computer Science and Language Learning, Loretto Academy of El Paso \(Fall 2013\)](#).
- [Computer Science and Language Learning, Loretto Academy of El Paso \(Fall 2011\)](#).

- **Judge:**

- [Science Fair judge at Harmony Science Academy Middle School, El Paso, February 2017](#).
- [Science Fair judge at St Patrick’s Elementary and Middle School, El Paso, February 2016 and 2017](#).
- [Chapin High-School \*\*Senior Project Symposium\*\* \(April 2011\)](#).
- [Science Fair of Harmony Science Academy \(for elementary and middle schools\), El Paso \(Fall 2009\)](#).

- **Other**

- [Hour of Code at St. Patrick’s Elementary and Middle School \(December 2016\)](#)
- [Mentornet mentor in 2012 and 2013](#)
- [Faculty advisor of the Harmony Science Academy Alumni Association at UTEP since 2015](#)

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- **Teaching**

- **Overview**

During the 14 years I have spent at UTEP, I have taught one or two courses each semester. In addition, I have regularly taught independent studies, on top of my regular course load.

I have taught courses at the undergraduate level: including introductory courses (CS1, 2, & 3), theoretical (CS3350 Automata), practical (CS3360: Programming Languages), Artificial Intelligence, a few special topics in Constraint solving, Game development, as well as graduate courses: including core courses (e.g., Logical Foundations of Computer Science, Advanced Algorithms) and a few special topics in Intelligent Computing.

I have redesigned the Introduction to Computer Science course (CS1401, now CS1301/1101) in my department. I have created a Problem-solving Club that welcomes undergraduate students once a week to practice problem solving and (when relevant) programming. I have designed a new course on Problem Solving, which I piloted in summer 2016 and reworked with the help and support of Google in spring and summer 2017.

My teaching evaluations have consistently been between 4 and 5 out of 5.

- **Teaching innovation**

Always seeking innovation in the classroom to increase student success, break the barrier of usual intimidation, engage all students, I have tried several approaches over the years, from using the old hotmail messenger back in the days to answer my students’ questions in real time, to being an early adopter of piazza (piazza.com) to engage students through active participation and to still allow one to one mentoring, to online textbooks and labs (zybooks.com including zylabs) and online quizzes and online quick feedback system Socrative (socrative.com).

I have also regularly sought professional development (see below) and integrated what I learned in my classes: cooperative learning and problem-based teaching, flipped classroom, competency-based assessment and motivation-based teaching.

#### □ **Professional Development**

- Workshop on Teaching, by Olin College instructors, organized by UTEP STEM-Accelerator Project team, June 2016
  - Participation at this workshop led to my application to funds to help me redesign CS1. I did that in spring 2017.
- Participated in the “Networking Technology & Content Conference”, El Paso, TX. (Nov. 2014 and 2015)
- Continuing Education Program, “Flipped Learning Brown Bag discussion,” Center for Research in Engineering and Technology Education (CREaTE), University of Texas at El Paso. May 15, 2014.
- Affinity Research Group training: in summers 2011 and 2012
- Problem-Based Learning workshops: in May 2012, May 2013, May 2014

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#### □ **Other Professional Development**

The following are meetings I have attended in the recent years that contributed to my professional development (these include either training or informative meetings about grant programs).

- CRA-W Career Mentoring Working: Washington DC, November 2016.
- Conference Attendance, “CE21 Community Meeting,” NSF. January 2014.
- Workshop, “Problem-Based Learning.” 2013, 2014.
- Gender Summit: November 2013
- NCWIT Summer: May 2013
- Leadership Development Institute at UTEP: 2012-2013
- NSF CE21 Community Meeting: 2011, 2012, 2014
- CRA Career: Washington DC, 2012
- CRA-W: Atlanta, 2012

## Part I

# 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. Now, these goals being stated, my approach to teaching has evolved over the years, slowly morphing into what it is right now. I want to hope that it is still in flux because teaching should always evolve. Over the last few years, my teaching and the activities I provide outside the classroom have been guided by the realization that I may have forgotten to acknowledge our students' abilities.

My point of view has changed: I do not come to class anymore only to “teach” students content I bring. Instead, I come to class planning to make them realize how much they know already. A large part of my work then consists in building their confidence in skills they have but are not aware of. Once this is done, I can then work with them to take them a few steps further. What that means is that I do not position myself as their “fixer”, someone who will fix the problems of our “unprepared” students: instead, I acknowledge their background and however “unprepared” one might think they are, I believe and share with them repeatedly that they already know a lot, that they can do the work, and I demonstrate that to them. I find that, all the more in our institution where students come with a wide range of demonstrated skills, it would be contradictory to our mission of access to accept them in the classroom only to remind them and make them feel unfit, unprepared, while, when looking closely, they are not at all unfit, they just come with a possibly non-traditional set of skills, but still with skills. This attitude is now a central part of my philosophy.

For instance, in CS1, the intro to computer science course (a.k.a., CS1401 or CS1301/1101), the goal is for the students to become proficient at solving problems, and along the way, to learn how to implement their solution to problems in some programming language (so far, it is mostly focused on Java, but it could be anything). I insist with my students on the fact that they already know most of what I am going to teach them: they solve problems everyday, they use conditionals, they use loops, and even recursion, methods. We spend quite a while “excavating” these daily habits via hands-on activities so that students realize that, indeed, they do all that already. Then strong on their new confidence in the subject matter, I help them structure their approach, challenge the way they present their solutions (namely, algorithms), etc. We are on our way to progressing a few steps further together. This is how I see acknowledging my students' prior skills and abilities.

In addition to building on my students' existing abilities, my teaching style has also evolved in regards to assessing my students' work and final grade. First of all, let me start by stating that I believe that students should be able to compute their current grade throughout the semester to have an indication of their performance: it is really important for them, all the more for entering students, whom I have taught primarily over the last 3 years. As a result, I share with them the relative weight of every type of grade they will get during the semester (this is what is in the syllabus). However, I share with them that the grade they can compute will only be a lower bound of their actual final grade. The reason is that I also share with them that I am not interested in grading their speed of learning but rather what they become, whether they will be ready for the next course in sequence or not. In doing this, I set the atmosphere in the class to be one where failing is ok, where taking time to learn is ok, because not understanding something only means that a student does not understand it yet, not that he or she will not understand it. As a result, my way of assessing students is very much based on competencies rather than semester-long performance. I

find this way of doing to be much truer to my belief that students come with different backgrounds and learning styles and should not be penalized for starting from farther or taking longer to learn a concept, as long as it is acquired by the end of the semester. A turning point in my attitude towards grading and students' learning was when I attended a presentation of Dr. Carol Dweck, from Stanford University, at the NCWIT Summit in 2014.

In what follows, I provide details about the courses I taught since 2012, material I have developed, technology I use or have used in the classroom, and the students I have advised.

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

#### Overview

Since fall 2012, I have taught the following courses:

- at the **undergraduate** level:
  - CS1190: Topics in Computer Science – Problem-Solving and Algorithms (once)
  - CS1401, later CS1301/1101: Introduction to Computer Science (6 times)
  - CS2401: Elementary data Structures (once)
  - CS3350: Automata (4 times)
  - CS3360: Concepts and Implementation of Programming Languages (3 times)
- at the **graduate** level:
  - CS5303: Logical Foundations of Computer Science (once)
  - CS5350: Advanced Algorithms (once)
- **cross-listed** courses (UG and G):
  - CS4365 / CS5354: Topics in Intelligent/Soft Computing – Problem-Solving and Algorithms (once)

*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 2012, I have offered 3 independent studies at the undergraduate level (CS4371) and 3 at the graduate level (CS5391), including one at the doctoral level (CS6391).

During this time, I have also supervised a number of students, as illustrated by the number of graduate research and dissertation “courses” I was in charge of:

- Computer Science Research: CS 5399 (Master’s thesis, spring 2013 – 3 students, fall 2014 – 2 students, spring 2015, summer 2015), CS 6394 (doctoral research, spring 2017, fall 2017), CS 6694 (doctoral research, spring 2017, fall 2017), CS 6399 (dissertation, fall 2012, spring 2013),
- Computational Sciences Research: CPS 5396 (Graduate Interdisciplinary Research, fall 2013), CPS 5397 (graduate research, summer 2014, fall 2017), CPS 5398 (Graduate Thesis, fall 2014), CPS 5399 (Graduate thesis, spring 2015, summer 2015, fall 2015), CPS 6396 (graduate research, fall 2012, spring 2016, fall 2016), CPS 6397 (doctoral project, fall 2012, summer 2016, fall 2016), CPS 6398 (dissertation, fall 2016), CPS 6399 (dissertation, fall 2012, spring 2017)

## Lectures

My teaching load since Fall 2012 in terms of lectures is reported in Table 2.1.

| Term        | Subject | Course Title   | Enroll. |
|-------------|---------|--|---------|
| Fall 2012   | CS 3360 | Concepts and Implementation of Programming Languages | 29      |
|             | CS 5350 | Advanced Algorithms                                  | 17      |
| Spring 2013 | CS 3360 | Concepts and Implementation of Programming Languages | 29      |
|             | CS 5303 | Logical Foundations of Computer Science              | 11      |
| Fall 2013   | CS 3350 | Automata   | 40      |
|             | CS 3360 | Concepts and Implementation of Programming Languages | 42      |
| Spring 2014 | CS 2401 | Elementary Data Structures                           | 24      |
|             | CS 3350 | Automata   | 36      |
| Fall 2014   | CS 3350 | Automata   | 47      |
| Spring 2015 | CS 1401 | Introduction to Computer Science                     | 42      |
|             | CS 3350 | Automata   | 48      |
| Fall 2015   | CS 1401 | Introduction to Computer Science                     | 39      |
| Spring 2016 | CS 1401 | Introduction to Computer Science                     | 47      |
| Summer 2016 | CS 4365 | Topics in Soft Computing                             | 10      |
|             | CS5354  | Topics in Intelligent Computing                      | 5       |
| Fall 2016   | CS 1401 | Introduction to Computer Science                     | 45      |
| Spring 2017 | CS 1301 | Introduction to Computer Science                     | 45      |
| Fall 2017   | CS 1301 | Introduction to Computer Science                     | 51      |
|             | CS 1190 | Topics in Computing: Problem Solving                 | 10      |
|             | CS 1190 | Topics in Computing: Problem Solving                 | N/A     |

Table 2.1: List of lectures from fall 2012 to fall 2017

**Teaching Load Information:** Usually faculty in my department teach 2 courses a semester (or 6 credit hours). My teaching load was lower in fall 2014, fall 2015, spring 2016, fall 2016, spring

2017, and fall 2017 as I was released from one of my two courses. Also, despite my course release, I have always had a reasonably high number of students, average about 47 students per semester on semesters with a course release, and about 64 on regular semesters (excluding summer when enrollment is typically lower).

### 2.1.3 New courses and/or major course revisions

Since fall 2012, and specifically since fall 2014, I redesigned our department's introduction to computer science course several times (2 iterations with major revisions), I created two new courses: one cross-listed 3-credit-hour topic course on problem-solving and algorithms, and a new one-credit-hour course on problem-solving and algorithms for undergraduate students only.

#### Redesigns of Introduction to Computer Science (CS1401, later CS1301 and CS1101)

**Redesign No. 1.** This redesign brought to the course a few new elements: a somehow flipped classroom instruction, an online textbook with automatic grading of embedded exercises, a synchronized instruction (across the 3 sections of CS1), and a few new topics introduced in the class.

In fall 2014, David Novick, Monika Akbar, and myself (who were scheduled to each teach one section of CS1401 in spring 2015) were tasked to revisit the way CS1401 was taught. Together we moved this course to a **flipped course**. Flipped courses are courses where most of the content is delivered outside of the classroom, freeing time in class for hands-on activities, practice, and deeper discussions. In fact, using textbooks, which is a very traditional way of teaching, was already a way to prepare students before they come to class. However, the realization that students were not necessarily doing that gave way to the flipped classroom “novel” idea. In fact, most of what there is with that idea is that videos, rather than or in addition to textbooks, are provided for students to watch outside of the classroom, and which explain topics to be covered in class. We design videos, starring David Novick with the goal that students would watch them before class and come prepared so that we could focus on activities and discussion in class. In fact, I observed that students were still not coming to class very prepared (for many reasons including the lack of time due to many outside personal constraints). As a result, I ended up not teaching a fully flipped class but one where, while still giving more space to hands-on activities, I lecture a little bit: usually more at the start of the semester and less as we progress through the semester and students have already reviewed enough material (for midterm exams and/or lab) and can now focus on activities in class.

We changed the textbook and adopted an **online textbook** (zybook: Programming in Java – see appendix). After review of this book, it had appeared to us that it covered most of what we wanted the students to read for the class. This textbook (which we are still using) has a few very practical features, including: 1/ you can modify it (move the sections around, remove some, set some as optional, etc.), 2/ it has embedded activities – participation and challenge activities, 3/ we can keep track of the progress of each of our students of these activities. This last feature allowed us to be more aware of our students' struggles or study problems: as soon as we see students not completing their homework, we can contact them or talk to them in class to figure out how to put them back on track. That is an essential element of our pedagogy: making sure that we know our students, that they know we look at their performance individually, and that we are there to help them.

What we also did in this first redesign was to **synchronize our teaching** (not our teaching style)

so as to ensure that all students, across all 3 sections, would get the same set of outcomes met and relatively at the same time because we share students across 6 lab sections. As a result, we were also able to provide the lecture plan as well as deadlines of labs and homework (see appendix) to students much ahead of said deadlines so that they could better organize their time (a lot of our students work out of campus, some full time, so it is important that we provide time for them to plan their work).

Finally, we **revisited the outcomes** of the course (see appendix). We kept all the outcomes of the previous version of this course and we added a few more: namely, multi-D arrays, recursion, and linked-lists. The rationale behind these additions was that we wanted to expose the students to some key topics of CS2 (a.k.a., CS2401: Elementary Data Structures) at a level 1, because I had observed, while teaching CS2, how students would be frightened by the novelty of these topics when these topics were in fact not hard, but just had to be introduced in context in CS1 to provide students with the big picture of storage for instance or repetition. So instead of giving them the impression that “we are only going to do repetitions through loops and then, you’ll see something more complicated called recursion”, we introduced both concepts at the same time. Instead of telling them that “they could only store data in 1D arrays”, we introduced the concept of multiD arrays right away, while providing more practice on 1D and some on 2D. The result of this was that students showed less fear when covering these topics in CS2 and performed better.

**Redesign No. 2.** In spring 2016, I received funding from Google to further the changes effected in CS1. This second redesign was not major but **focused on providing more tailored service to students**. Namely, I started using an online quizzing system, Socrative.com, to be able to assess my students more often. I started Saturday sessions with my students who wanted to catch up or go further than what we were studying in class. I used Google EngageCS resources (labs reviewed by educators) and I also worked on labs that I could contribute to Google EngageCS.

**Redesign No. 3.** This last redesign came at the time when we also splitted CS1401 into CS1301 and CS1101. This split was motivated by the fact that students often fail the course because of poor performance in labs and we wanted to allow them to retake only the lab part (CS1101). This is to acknowledge that our students face unique constraints and challenges outside the classroom, having to work full time or supporting a family, their parents. Because of this, we often observed that students were struggling to meet the deadlines for labs, or even to complete the labs, making them fail both the lecture and the lab part of CS1401. By splitting it into a lecture and a lab, we offered more flexibility to our students. Aside from this note, the changes brought by this last redesign, sponsored by UTEP’s STEM-Accelerator program, consisted of: a **new sequence of topics** and a grading style focused on **competencies**.

Overall, the topics I covered in CS1 remained the same<sup>2</sup> What I did, however, was that I designed a **“layered” plan of instruction** where I first teach all topics (except objects) at a high level, trying to make them connect their daily experiences to all the topics covered in CS1 (there are very natural examples of that), and then I came back to these topics more in depth. My semester is therefore now organized in 4 phases (see appendix): Phase 1 – general coverage of all topics. This phase is crucial to their realization that they already know most of what we are going to cover during the semester. For instance, I put a lot of emphasis in connecting all I present to situations in their daily lives. Phase 2 – tinkering: we start using memory, conditionals, repetitions, methods,

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<sup>2</sup>We did have to somehow modify the outcomes of the course because of the split into CS1301 and CS1101. However, overall, the outcomes remained the same when looking at the two courses together.



but mostly from given code and algorithms. Phase 3: doing – the students can now implement their own solutions to problems, we also dig deeper into repetitions with recursion. Phase 4: creating – while still using all we’ve learned so far, we go over objects and conclude with some implementation and the use of linked-lists. This “layered” approach allows me to go over concepts several times during the semester. It allows students to have more time to acquire skills.

This brings me to my other change: I now focus on **competencies**. As our students come with varied levels of what is usually understood as academic preparedness, and since I feel very strongly about our mission of access, I believe that penalizing students for the level they come at (which might be reflected in lower grades at the start of the semester) is counterproductive and only contributes to “confirming” to them that computer science or even higher education is not for them. On the contrary, I believe that our students come with a lot of potential and experiences that we can leverage to make them successful (this is a big part of my Phase 1 – see above). I want them to realize that 1/ they bring a lot to their success and 2/ they can grow even further. I try my best to apply the advice of Dr. Carol Dweck (from Stanford University) about the growth mindset. As a result, in the classroom, I share with students my philosophy about their potential, my belief that they can and will grow, and my intentions to work with them to make this happen. To be truthful to that, I also emphasize that I value failure, that it is part of the learning process, and that I am mostly interested, when it comes to assessment, about what they will be like when they leave my class to move on to the next one. Quizzes and exams are no longer potential penalizing instruments, but assessment instruments that inform us (the students and myself) about what we should do next, individually, to meet the goals of this course.

## **Problem-Solving for CS Students**

A few semesters ago, as I was teaching CS1, I realized that our students struggled particularly with solving problems. This was surprising to me because I trust that they are able to solve the simple problems I had given them. I wanted them to realize that they were skilled problem solvers and up their confidence in this respect because I really believed that they were able to solve the problems at hand, just were experiencing anxiety and lack of confidence.

As a result, I started an informal problem-solving club for my CS1 students, later on extended to the CS2 students as well. Each week, for an hour, I met with students to “play” with problems, be challenged, and realize that we were able to address problems. It is important to note that most of the time, we did not use programming to solve these problems. The aim of this club was to boost my students confidence in understanding, attacking, and solving problems. I stopped holding this club in spring 2017 because of other commitments, but in the meantime, problem-solving has morphed into regular courses that I have created, as described below.

- **Cross-listed 3CH Course on Problem-Solving and Algorithms (CS4365/CS5354)**

Based on the problem-solving club I was holding mostly for CS1 students, I wanted to extend this opportunity to more students. As a result, I proposed to offer a summer course on Problem-Solving and Algorithms (see syllabus as one the appendix documents). It was a cross-listed course offered in summer 2016 and attended by 15 students (10 undergraduate students and 5 graduate students). Offering this course allowed me to think about problem solving in a more structure way, to identify material and outcomes relevant and valuable to the students. This course received good evaluations and was the basis for my next contribution (see below).

- **New 1CH Course on Problem-Solving and Algorithms (CS1190)**

As our CS department has embarked in our NSF RED project, our faculty have brainstormed about how to provide an even better experience for our students. Among many potential aspects of this problem, one that I am familiar with as a CS1 instructor, is attrition in early semesters and lack of confidence in problem-solving skills. Attrition in early semesters is often linked with our students' lack of sense of purpose, of understanding of CS' "big picture". This is reinforced by the fact that in their first three semesters in CS, our students typically<sup>3</sup> only have one computer science course available to take each semester (namely: CS1, CS2, and then CS3). As a department, we proposed to offer 1-credit-hour courses available for our CS students to take in parallel of their "thin" sequence CS1-CS2-CS3. One of the courses we proposed to offer is a 1CH course on Problem-Solving.

In spring 2017, our department, led by Ann Gates, started working with Google Engineers, Lorne Needle and Mike Gainer, on the creation of problem-solving courses, in collaboration with CAHSI institutions, New Mexico State University and University of California Dominguez Hills. In this collaboration, we came up with the idea of three 1CH courses on problem-solving, from intro to advanced level. I was in charge of creating the intro course, which I taught as a topics in computing CS1190 over 6 weeks (2.5 hours per week) in early fall 2017 and am set to teach again in late fall 2017. In late summer 2017, while finishes the preparation of the pilot of this CS1190 course, Johannes Strobel (from University of Missouri) joined the team

My problem-solving course focuses on developing the students' ability to attack a problem, any, even outside of the students' area of expertise. I provide a problem-solving framework so that they have a structured approach and are aware of important steps in problem solving. A lot of what I do in this course is helping the students realize how skilled they are and helping them reflect on their problem-solving approaches so that we can understand them and refine them. When I taught it as a 6-week course in early fall 2017, with 10 students, students were exposed to a variety of problems, from short riddles to larger problems, some proposed by Google engineer Mike Gainer, and one by Craig Tweedie, an environmental scientist, professor at UTEP. The culmination of this course was a project presentation to Google engineer Lorne Needle. So far, feedback has been very positive. The course was observed and videorecorded throughout the 6 weeks. Interviews are being conducted by the education researchers who were observing the course and we expect to receive more constructive feedback within a few weeks. I have debriefed with Lorne Needle, Ann Gates, Christina Convertino, and Johannes Strobel and am working on a refined version of the course to be taught in the second half of the fall 2017 semester.

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

##### **Changes in CS1401: Introduction to Computer Science**

All information provided below is supported by evidence available as appendix to this document<sup>4</sup>.

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<sup>3</sup>Under some conditions, students taking CS3 can also take a few upper-division CS courses at the same time. However, that still leaves them with two semesters with one CS course per semester, and not all of our students are eligible to take additional CS courses while taking CS3.

<sup>4</sup>Supporting documents are listed in the appendix of this document and available on the webpage I created for this dossier.

□ **Modification of the lecture plan and synchronized teaching.** Each semester I provide a plan for my students. I am providing, as evidence of changes, such a plan from spring 2015 and from fall 2017.

□ **New outcomes.** In spring 2015, we modified the outcomes of CS1401. In fall 2017, we modified them again to account for the split into CS1301 and CS1101.

□ **Online textbook.** We use Zybook Programming in Java. I modify the book each semester to best fit my teaching style, content, and sequence.

□ **Online quizzing system.** I have designed many quizzes for CS1401/CS1301. They are available on piazza, as I make them available to the students for practice. They are also shown as a list as appendix.

□ **Course material.** Every semester, I work on improving my lecture notes (and slides) and I work at reinventing lab topics. Therefore, over the six times I taught CS1401/CS1301, I have, in collaboration with our instruction team (other instructors, TAs), significantly contributed to the material that can be used for teaching this course.

### **CS4365/CS5354: Topics in (Soft/Intelligent) Computing – Problem Solving and Algorithms**

I created this course from my experience holding a problem-solving club. I created a syllabus, outcomes, lecture notes, activities material, exams, and projects for this course. I provide as evidence the syllabus and exam for this course.

### **CS1190: Topics in Computing – Problem Solving**

I created this course based on my prior experience with the problem-solving club and CS4365/5354 on problem-solving. Creating this course required writing a new syllabus, preparing a repository of possible activities, a day-to-day plan of activities, homework, and exams. I provide as evidence the syllabus, repository of activities, and exams.

### **Other efforts**

In addition to the above efforts, I have developed some material integrating my research in teaching, which I have used in courses such as Artificial Intelligence when I was guest lecturing. I developed lecture slides and labs for my CS1 course. I developed labs and projects for my CS3360 and CS3350 courses, and projects for my CS5350 course.

### **Evidence of teaching style evolution**

As mentioned in my teaching philosophy and in my statement of teaching goals and professional reflection, making my teaching style evolve is part of my philosophy. Now, more specifically, over the past few years, my main teaching style changes can be summarized in the following list:

- **I share with students my growth mindset.** A consequence of that is that I now focus on **acquisition of competencies/skills**, rather than possibly penalizing students for slow

beginnings or slower learning pace.

- **Use of online activity resources:** over the years, and in the aim to both better serve our students and to address a growing enrollment, I have turned to systems that automatically grade my students' work (hence, they get feedback faster) and hence allow me to assess them more often (so I know their struggles better and can better help them). I now use Zybook (an online textbook) when relevant and Socrative.com to conduct quizzes regularly.
- **Enforcing student engagement in CS1 as part of the grade:** 5 points in the CS1 overall grade acknowledge students' engagement in the computing community. They can participate in outreach activities, attend seminars, join a research group, etc. (see list on my CS1 syllabi, in appendix). I believe, and that was a joint decision of the CS1 instructional team, that enforcing such practices further contributes to engaging students in their major and to building their identity as CS students.

### 2.1.5 Evidence of use of technology to complement instruction

I always look for ways to improve our students' experience. Over the years, as mentioned earlier, I have polished my style as an instructor and I tried technology tools with varied success rates. In what follows, I describe the tools I use to support my teaching.

#### Online Forum and Wiki: Piazza

Piazza can be seen as an alternative to BlackBoard. I have used it since 2010 and I have stayed with it as I find it intuitive and light. I create one piazza "site" for each course I teach and I enroll on it all students enrolled in my course as well as the TAs and other assistants and possible peer leaders. It is a combination of a forum (students can interact with each other, ask questions, answer them, ask questions to the instructors, instructors can answer any students' questions, etc. – it is very flexible) and a wiki (I post all information and material pertaining to the course on its piazza "site").

Piazza can be integrated with BlackBoard to allow linkage with students' IDs and grade books. However, the link is not yet implemented at UTEP. That is currently a drawback of my use of piazza, but one that does not counterweigh its advantages. The links to my

#### Online Quizzing System: Socrative

Since fall 2015, I have regularly used Socrative.com. Socrative is an online quizzing system. It allows me to create quizzes for my students and have these quizzes automatically graded. It also allows me to conduct short questions during lectures as I see fit. I also use the "short question" functionality to leave a stream of questions open during the lecture so that students who may be shy to ask questions in person can ask them directly on Socrative. When I see that questions are being asked, I then address them to the whole class.

I now use the pro version of Socrative in which I can use several quizzing "rooms" (so that I can have several quizzes open at the same time: for instance, one open for a take-home quiz, and one in lab at the same time). It also allows me to identify my students by ID (which I design and give them at the start of the semester), which helps me process grades faster and identify faster who was

not present for an in-class quiz for instance. I also use Socrative once at the start of the semester and once at mid-term to survey my students: at the start of the semester, I use it to learn more about my students. At mid-term, I use it to check their satisfaction and/or struggles so far in the semester, so that I get a better understanding of my class dynamic.

### **Online Textbook: Zybook**

Since spring 2015, I have used an online textbook for CS1. Our instructional team at the time (myself with David Novick and Monika Akbar) decided to use the Zybook Programming in Java online textbook. It covers all the content we need the students to read about. Of course, it is focused on Java, while our CS1 course aims to be a course in which we teach problem-solving with computers rather than a specific language. However, in practice, this course has always been taught with a focus on one language (and exposure to a few more). Currently our department has Java as its first language, so we thought that Zybook Programming in Java, although with a strong focus on programming, was a suitable textbook.

We find this online book convenient as it lets us modify the book as we see fit for our class: in particular, we can change the order of chapters, we can create new chapters out of sections of existing chapters, we can remove content, make some content optional, etc. In addition, participation and challenge activities are embedded in the book, allowing the students to practice. Now, such features are usually common among online textbooks. What decided us on this online textbook rather than another one, and frankly, on an online textbook altogether, was the fact that we can follow our students' progress on their assigned embedded activities. As a result, we have immediate feedback on the students' diligence to complete homework and/or struggles to do so. Whatever the reason may be, we are immediately aware that something is not right and we can contact students to figure out how to help them catch up.

So far, I have used this online textbook only for CS1 since I have not taught another course for which they have an online textbook. Also, I have met with representative of other publishers and tried other online textbooks. Some look very good and their number of exercises is very appealing. However, I have not yet found one that has a good balance of exercises and allows to track the students' progress.

*Note:* I used an extra feature of Zybook during Fall 2016 called Zylab. It is a lab, embedded as extra sections in the chapters of the existing Zybook. We, as instructors, design our own labs and they are added to the book. They come with automatic grading. They allow students to test their work as many times as they want before submission and we can decide whether to allow one or multiple submissions. In this regard, this tool was very practical. However, I ran into some problems when using it: 1/ I was not able to assign I/O labs to my students as there was no way to read or write files. The work to be done by students had to consist of one file and terminal execution only. 2/ It did not support multi-D arrays well. 3/ for the same reason as what prevented me from assigning I/O labs, I could not assign work with objects sine only one file could be handled per lab. As a result, for these labs, I had to revert to traditional labs, not within Zylab and I opted out of this option the following semester as I did not want students to have to pay extra for an option that was not fully functional.

## Online Programming Resources: CodingBat.com

In addition to the online textbook I use for CS1, I also make use of other programming resources as pointers for the students to practice more. In particular, one that I like for the variety of its problems and rigor in their description is codingbat.com. I have used it for several semesters in CS1.

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

Always seeking innovation in the classroom to increase student success, break the barrier of usual intimidation, engage all students, I have tried several approaches over the years, from using the old hotmail messenger back in the days to answer my students' questions in real time, to being an early adopter of piazza (piazza.com) to engage students through active participation and to still allow one to one mentoring, to online textbooks and labs (zybooks.com including zylabs) and online quizzes and online quick feedback system Socrative (socrative.com).

I have also regularly sought professional development (see below) and integrated what I learned in my classes: cooperative learning and problem-based teaching, flipped classroom, competency-based assessment and motivation-based teaching.

- **Workshop on Teaching, by Olin College instructors**, organized by UTEP STEM-Accelerator Project team, June 2016.
  - Participation at this workshop led to my application to funds to help me redesign CS1. I did that in spring 2017.
- Presented a **webinar on Computational Thinking in the Classroom**, in April 2014, for all teachers of the Ysleta Independent District, El Paso.
- Presented **4 talks at the “Networking Technology & Content Conference”**, El Paso, TX. (Nov. 2014 and 2015), a regional teachers' conference: about integrating computational thinking in K-12 classrooms, and not only in math and science.
- **Continuing Education Program**, “Flipped Learning Brown Bag discussion,” Center for Research in Engineering and Technology Education (CREaTE), University of Texas at El Paso. May 15, 2014.
- **Affinity Research Group training**: in summers 2011 and 2012.
- **Problem-Based Learning workshops**: in May 2012, May 2013, May 2014.

In addition, through the following events that I attended, I was able to glean some nuggets and tips about teaching:

- CRA-W Career Mentoring Working: Washington DC, November 2016.
- CE21 Community Meeting, NSF. January 2014.
- Workshop on Problem-Based Learning. 2013, 2014.

- Gender Summit: November 2013
- NCWIT Summer: May 2013
- Yearlong training: Leadership Development Institute at UTEP: 2012-2013
- NSF CE21 Community Meeting: 2011, 2012, 2014
- CRA Career: Washington DC, 2012
- CRA-W: Atlanta, 2012

## 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 – not Fall 2017). All ratings are on a scale from 0 to 5.

| Term        | Subject | Course Title   | Enroll. | Instructor | Course |
|-------------|---------|--|---------|------------|--------|
| Fall 2012   | CS 3360 | Concepts and Implementation of Programming Languages | 29      | 4.44       | 4.08   |
|             | CS 5350 | Advanced Algorithms                                  | 17      | 4.17       | 3.85   |
| Spring 2013 | CS 3360 | Concepts and Implementation of Programming Languages | 29      | 4.55       | 4.59   |
|             | CS 5303 | Logical Foundations of Computer Science              | 11      | 4.1        | 3.9    |
| Fall 2013   | CS 3350 | Automata   | 40      | 4.37       | 4.04   |
|             | CS 3360 | Concepts and Implementation of Programming Languages | 42      |            |        |
| Spring 2014 | CS 2401 | Elementary Data Structures                           | 24      | 4.78       | 4.67   |
|             | CS 3350 | Automata   | 36      | 4.63       | 4.34   |
| Fall 2014   | CS 3350 | Automata   | 47      | 3.86       | 3.73   |
| Spring 2015 | CS 1401 | Introduction to Computer Science                     | 42      | 4.55       | 4.82   |
|             | CS 3350 | Automata   | 48      | 4.0        | 4.0    |
| Fall 2015   | CS 1401 | Introduction to Computer Science                     | 39      | 3.4        | 3.6    |
| Spring 2016 | CS 1401 | Introduction to Computer Science                     | 47      | 4.12       | 4.06   |
| Summer 2016 | CS 4365 | Topics in Soft Computing                             | 10      | 4.5        | 4.33   |
|             | CS5354  | Topics in Intelligent Computing                      | 5       | 4.5        | 4.33   |
| Fall 2016   | CS 1401 | Introduction to Computer Science                     | 45      | 5.0        | 5.0    |
| Spring 2017 | CS 1301 | Introduction to Computer Science                     | 45      | 4.44       | 4.44   |

★ Students' evaluations and comments are available in appendix, Section 2.3. Note that the enrollment specified in the table does not correspond to the number of students who took the evaluation. Often, very few students did complete the evaluations.

## 2.2.2 Theses and dissertations supervised

### Supervision of PhD students

1. **Paula Gonzalez Parra:** defended her Ph.D. in Computational Sciences in fall 2012. She worked on estimating best decisions to slow down and stop epidemics. She is now a professor of Mathematics at the University of Cali, Colombia.
2. **Xiaojing Wang:** fall 2009 to spring 2013. Xiaojing worked on Multi-Criteria Decision Making using fuzzy measures. She supported herself with her job on campus, which she still holds, as a research associate at our Center for Institutional Evaluation, Research, and Planning (CIERP). She graduated in spring 2013 and obtained a Ph.D. in Computer Science.
3. **Luis Gutierrez:** fall 2013 to fall 2015 – supported by **NSF CAREER grant**.

Luis was a long-term student in my research group, who started as an undergraduate when he was only taking the Introduction to Computer Science course. Due to medical issues, he had to drop out of the PhD program in the fall 2015. His contributions while a PhD student in my group are as follows:

#### Presentations:

- El Paso, Texas, UTEP Graduate Research Expo, November 7 2013: “A constraint-based model for generating t-wise test suites”.
- El Paso, Texas, 14th Joint UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, November 2 2013, Interval-Valued Probabilities to Interval-Valued Possibilities: Case Studies of Interval Computations under Constraints.
- San Antonio, Texas, SACNAS, October 3 - 6 2013, Constraint based model to generate t-wise test suites.
- El Paso, Texas, COURI Symposium, April 20 2013, Generating minimal t-wise constrained test suites.
- El Paso, Texas, 16th UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, November 3, 2014: Validated Solutions of ordinary differential equations and prediction of behavior (poster).
- SIAM Seminar on Bash Scripting, February 2014.
- El Paso, Texas, Bio-Informatics Symposium: “Interval-Valued Probabilities to Interval-Valued Possibilities: Case Studies of Interval Computation under Constraints”. Luis C. Gutierrez, Salem Benferhat, Martine Ceberio, Vladik Kreinovich, Rebekah Gruver, Marianna Pena, Matthew J. Rister, Abraham Saldana, John Vasquez, and Janelle Ybarra (poster). April 2014.
- El Paso, Texas, Bio-Informatics Symposium: INCaS a new constraint solving toolbox. Luis C. Gutierrez, John Vasquez, Martine Ceberio (poster). April 2014.

#### Articles in which he was a major author:

- Gutierrez, Luis, Salem Benferhat, Martine Ceberio, Vladik Kreinovich, Rebekah Gruver, Marianna Pena, Matthew J. Rister, Abraham Saldana, John Vasquez, and Janelle Ybarra. “Interval-Valued Probabilities to Interval-Valued Possibilities: Case Studies of Interval Computation under Constraints”, 14th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences (2013).
- Gutierrez, Luis C., Carlos Nieto, Francisco Zapata, and Martine Ceberio. “Constraint-based model to Generate wise Test Suites”, 2013 SACNAS National Conference (2013).
- Gutierrez, Luis C., Francisco Zapata, and Martine Ceberio. “Generating Minimal t-wise Constrained Test Suites”, COURI Symposium Abstracts Spring 2013 (2013).



4. **Leobardo Valera:** fall 2014 to present – **supported by ARL AHPCRC grant and NSF CAREER grant.**

Leobardo has worked with me on integrating and quantifying uncertainty in our work on reduced-order modeling. He is set to defend his PhD dissertation in fall 2017. Below are some of his contributions:

Presentations, including posters:

- El Paso, Texas, 16th UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, Reduced-Order Modeling
- November 3, 2014: AHPCRC BootCamp, “Using Wavelet Transformations for Reduced-Order Modeling”, DoD, Santa Cruz, California.
- Leobardo Valera and Martine Ceberio. How to use Constraint Solving Techniques (ICST) to Predict Future Behaviors of Dynamic Problems. Army High Performance Computing Research Center (AHPCRC), Annual Technical Review Meeting Stanford University, Santa Cruz, CA USA. March 2016.
- Leobardo Valera and Martine Ceberio. Handling Uncertainty and Large Dimensions in Nonlinear Systems of Equations using Interval Constraint Solving Techniques (ICST). Army High Performance Computing Research Center (AHPCRC), Annual Technical Review Meeting Stanford University, Santa Cruz, CA USA. March 2016.
- Leobardo Valera, Martine Ceberio and Horacio Florez, Handling Uncertainty and Large Dimensions in Nonlinear Systems of Equations using Interval Constraint Solving Techniques. Army High Performance Computing Research Center, Research Management Boarding Meeting, Stanford, CA, January 2016.
- Handling Uncertainty and Large Dimensions in Nonlinear Systems of Equations using Interval Constraint Solving Techniques Army High-Performance Computing Research Center, Research Management Boarding Meeting, Stanford, CA, January 2016.
- Introduction to Pairwise Testing. Definition and Examples, 17th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences The University of Texas, November 2015.
- Validated Solutions of ordinary Differential Equations and Prediction of Behavior. 15th Joint UTEP/NMSU Workshop on Mathematics, Computer Science and Computational Sciences The University of Texas. November 2014.
- Using Wavelet Transformations for Reduced-Order Modeling. Army High Performance Computing Research Center (AHPCRC), Annual Technical Review Meeting Stanford University, Santa Cruz, CA USA. August 2014.
- Leobardo Valera and Martine Ceberio. “Interval Constraint Solving Techniques and Model-Order Reduction to Enhance the Solution of Dynamic Systems”. INFORMS Annual Meeting. Nashville 2016.
- Leobardo Valera, Martine Ceberio. Interval Constraint Solving Techniques and Model-Order Reduction to Enhance the Solution of Dynamic Systems. 19th Joint NMSU/UTEP Workshop on Mathematics, Computer Science, and Computational Sciences. El Paso, TX, November 2016.
- Leobardo Valera and Martine Ceberio. Large Numerical Simulations: Needs, Challenges, Current Solutions How can Interval Computations help? NAFIPS 2016.
- Leobardo Valera, Martine Ceberio. Reduced Interval Newton Method, 18th Joint UTEP/NMSU Workshop on Mathematics, Computer Science and Computational Sciences, New Mexico State University, Las Cruces, New Mexico, March 2016.

□ Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction, Constraint Programming and Decision Making (COPROD 2015), The University of Texas El Paso, November 2015.

Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction, 18th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences The University of Texas, November 2015.

□ Using Regularization to Improve the Rate of Convergence in a Model-Order Reduction (MOR) Problem. Presented at the 22nd International Symposium on Mathematical Programming. Pittsburg, Pennsylvania, ISMP'2015, July 2015.

□ Using Regularization to Improve the Rate of Convergence in a Model-Order Reduction (MOR) Problem. The 17th Joint NMSU/UTEP Workshop on Mathematics, Computer Science, and Computational Sciences. New Mexico State University, Las Cruces, New Mexico, April 11, 2015.

Model-Order Reduction Using Cubic Spline Curve-Fitting. UTEP Graduate Student Expo. The University of Texas at El Paso, November 2014.

□ Model-Order Reduction Using Cubic Spline Curve-Fitting. 15th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences. The University of Texas at El Paso, November 2014.

Honors and Awards:

□ Graduate Award for Academic and Research Excellence in Computational Science. UTEP

□ Banner Bearer at UTEP's Winter 2015 Commencement (No academic, probably it should be deleted)

□ Outstanding Paper Award. Joint Annual Conference of the North American Fuzzy Information processing Society NAFIPS'2015 and 5th World Conference on Soft Computing. For the paper: Martine Ceberio, Leobardo Valera, Olga Kosheleva, and Rodrigo Romero Model reduction: why it is possible and how it can potentially help to control swarms of Unmanned Aerial Vehicles (UAVs), Joint Annual Conference of the North American Fuzzy Information processing Society NAFIPS'2015 and 5th World Conference on Soft Computing, Redmond, Washington, August 17-19, 2015.

□ Outstanding Paper Award. Joint Annual Conference of the North American Fuzzy Information processing Society NAFIPS'2015 and 5th World Conference on Soft Computing. For the paper: Francisco Zapata, Octavio Lerma, Leobardo Valera. How to speed up software migration and modernization, Joint Annual Conference of the North American Fuzzy Information processing Society NAFIPS'2015 and 5th World Conference on Soft Computing, Redmond, Washington, August 17-19, 2015.

17/ Scholarship to attend the ACW conference.

Leo is about to graduate, in fall 2017.

5. **Angel Garcia Contreras:** spring 2015 to present – supported by **NSF CAREER grant & STEM Accelerator program.**

Angel previously worked with me on his Master's thesis (see below). As a PhD student, he is focused on optimization techniques to handle dynamic systems with uncertainty. Below are some of his main contributions:

Presentations:

□ Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction, Constraint Programming and Decision Making (COPROD 2015), The University of Texas El Paso, November 2015.

- Global Optimization via Speculation. Constraint Programming and Decision Making (COPROD 2015), The University of Texas El Paso, November 2015.
  - El Paso, Texas, 18th Joint UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, November 2015, Insights into using continuous constrained optimization methods to solve black box mixed integer problems.
  - Comparison of Strategies for Solving Global Optimization Problems Using Speculation and Interval Computations. NAFIPS 2016.
  - Global Optimization via Speculation. UTEP NMSU Workshop Spring 2016.
  - Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction, Constraint Programming and Decision Making (COPROD 2015), The University of Texas El Paso, November 2015.
  - El Paso, Texas, 18th Joint UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, November 2015, Insights into using continuous constrained optimization methods to solve black box mixed integer problems.
- Additional notable experience:
- Taught a programming course at Stanford’s Army High-Performance Computing Research Center Summer Institute in summer 2015 and summer 2016.

6. **Omeiza Olumoye:** summer to fall 2015 – supported by **NSF CAREER grant**.  
Omeiza is not one of my PhD students. However, I am part of his PhD committee and in 2015, he joined my research team to contribute to our work on optimization and intervals.

Presentation:

- Poster on Interval Newton Methods, 17th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences The University of Texas, November 2015.

7. **Imran Abdullah:** joined my research lab in summer 2017. He is a Computational Sciences Ph.D. student and is currently supported by this program on campus. He is starting to work on predictions for large dynamical systems.

### Supervision of Master’s students

1. **Joel Henderson:** fall 2011 to summer 2014 – **supported by AAAS grant**.  
Joel completed his thesis on the topic of Multi-Criteria Multi-Agents Decision Making using Argumentation Frameworks. During his work with me on this topic, he presented his work at the following international conference: Numerical Computations: Theory and Algorithms International Conference, June 2013, in Italy. He now works at ARL White Sands.
2. **Angel Garcia Contreras:** fall 2011 to fall 2014 – **supported by NSF CAREER grant**.  
Before to enroll in the Ph.D. program, Angel completed his Master’s thesis with me. His work was in optimization using speculations. During his Master’s work, he presented at the following article: Garcia Contreras, A. F., Wang, X., Ceberio M., Bixler R., Gutierrez L., “Interval Optimization to Predict Software Quality Assessment Decisions”, at INFORMS OS’2012. He also presented several times at the UTEP/NMSU workshop. In particular he presented at the 14th Joint UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science (November 2013): “Insights into using continuous constrained optimization methods to solve black box mixed integer problems”. Along with Joel Henderson (Master’s student),

he also presented at SACNAS, October 3-6, 2013. In summer 2013, he worked with Patty Hough at Sandia National Lab in Livermore on thei DAKOTA project. internship at SANDIA Livermore in summer 2013.

3. **Hima Kondepati:** fall 2014 – **supported by NSF CAREER grant.**

Hima joined my lab in fall 2014 as a new student to our program and looking for a topic. She was interested in optimization and I trained her in fall 2014 on this topic and on research methods. By the end of fall 2014, she had decided that she wanted to switch programs to follow more IT-oriented track, without research.

4. **Troy McGarity:** summer 2015 to spring 2016, **Rebekah Gruver:** fall 2015, and **Salah Atiyeh:** fall 2015 – **supported by NSF CAREER grant.**

These three students in the Master's of Software Engineering at UTEP contributed to my work on optimization and constraint solving by building a website (NumConSol) that allows to use the solver developed by my research students, hence allowing for broader dissemination. They also packaged our solver as standalone executables, tailored for Windows and Mac. They all graduated and are now working, respectively at HP, GoDaddy, and Exxon Mobil.

### 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. **Chanel Perez**, fall 2014, in Geology at UTEP, work directed by Aaron Velasco;
2. **Omeiza Olumoye**, since 2015 (expected graduation date: fall 2018), in Electrical and Computer Engineering at UTEP, directed by Thompson Sarkodie-Gyan;
3. **Anastasia Volkova**, since fall 2016, graduated in fall 2017, in Computer Science at the University of Pierre and Marie Curie, France, directed by Christoph Lauter, Thibault Hilaire, and Jean-Claude Bajard;
4. **Leticia Miranda Mojica**, since spring 2017, in Leadership Engineering at UTEP, directed by Meagan Kendall;
5. **Nancy Avila**, since fall 2017, in Electrical and Computer Engineering at UTEP, directed by Homer Nazeran;
6. **Esthela Gallardo**, since spring 2017, defended her proposal in summer 2017 (expected graduation date: Fall 2018), in Computer Science at UTEP, directed by Patricia Teller;
7. **Paden Portillo** and **Oscar Chavez**, graduated in fall 2012, in Software Engineering (Master's).

## 2.2.4 Supervision of undergraduate students

I have coordinated my research group, CR<sup>2</sup>G, Constraint Research and Reading Group, since 2004. Students at all levels, from high-school to PhD students to post-doctoral researchers, have been involved in this group since then. Involving students in research is a very important part of what I do: it increases access and channels students towards excellence in a very active and participative way. In addition to graduate students, I have a large number of undergraduate students whom, I believe, benefit greatly from being involved in research.

In my research group, I value and encourage peer mentoring and follow the Affinity Research Group model<sup>5</sup>.

The undergraduate students in CR<sup>2</sup>G are generally introduced to the research we do during our weekly meetings and the time they spend in the lab in between, shadowing our more senior students (not necessarily seniors in studies, but seniors in my group). They are then quickly involved in an on-going project that they like and my other students and I give the new students nuggets of work to carry out, so that it is not overwhelming. Based on this work, they can start tasting what research is like: in addition to completing their work, they have to present it either formally or not, discuss it, and propose the next steps in our weekly meetings. Like in my classes, I put special emphasis on building my students' sense of mastery and confidence, so that we can then progress several steps further.

The number of undergraduate students in my lab varies from semester to semester. Some have been in my lab for several years while others stay one or two semesters before they move on to something else. This is common as I invite students to my research group very early on (from when they take CS1) and their interest might change as they discover more about computer science. However, I believe that their involvement in research from early on is a great asset for them to be successful in class and in research if they choose this path. The following list of students is the list of students who have been most active in my group since fall 2012.

1. **Luis Gutierrez:** spring 2010 to summer 2013. Luis joined my research team in spring 2010 as he was starting his B.S. degree studies at UTEP. As an undergraduate student, he worked on a variety of problems during his almost 4 years in my team as an undergrad. He attended a summer school on constraint programming and logic at the University of Perugia, Italy, in summer 2013. He presented at many local and regional symposium, as well as at a couple on international venues. He was supported by COURI starting in fall 2011 and until the end of his undergraduate studies.
2. **John Vasquez:** fall 2013 and spring 2014 – **supported by NSF CAREER grant.**
3. **Enrique Martinez:** spring 2014 to fall 2014. As a musician, Enrique worked on constraints and music. He left my group when he graduated.
4. **Jason Holt:** fall 2014 – **supported by NSF CAREER grant.**
5. **Luis Alcantar:** fall 2014 to fall 2015. Luis was supported by COURI in summer 2015. He left my group shortly in spring 2016.

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<sup>5</sup>The Affinity Research Group is a “cooperative learning approach to involving students with diverse backgrounds”, see <https://www.createspace.com/3374426> for more details.

6. **Cristian Ayub:** since spring 2015. In summer 2017, he was supported by CAHSI (Computing Alliance for Hispanic-Serving Institutions). In addition he was supported every semester by either a scholarship of UTEP's Campus Office for Undergraduate Research Initiative (COURI) or by UTEP's Louis Stokes Alliance for Minority Participation (LSAMP – summer 2016). Until summer 2017, he worked on combinatorial testing using constraint programming. While working on this topic, he led a team of undergraduate research students in a NSF-funded COURI program called UTEP Lens of the Market: during this 6-month-long program, he and his peers worked on the marketability of their work on combinatorial testing and its applicability to real-world industry problems, such as transistor design. Since summer 2017, he has been studying quantum mechanics to identify ways to solve them using our team's tools for dynamic systems. Over his years in my team, he has presented several times (at least twice a year: at the COURI annual symposium and at the UTEP/NMSU workshop).
7. **Gabriel Max Felix:** summer 2015 to summer 2017. During his time in my team, Max was a very active student who worked on combinatorial testing. he was part of the team led by Cristian Ayub working on the Lens-of-the-Market project. He stopped attending regularly because of the constraints of his job on campus.
8. **Elsa Gonzalez:** fall 2015 to summer 2016. She was involved in the early work of Cristian Ayub on combinatorial testing.
9. **Raul Mena:** fall 2015 to summer 2016. He was involved in the early work of Cristian Ayub on combinatorial testing. Raul changed majors to Business and left our group in fall 2017.
10. **Miguel Zamudio:** since spring 2016. Miguel was part of the team led by Cristian Ayub working on the Lens-of-the-Market project. He is now moving to doing research on Machine Learning with Olac Fuentes, but is still participating in my lab.
11. **Phillip Hassoun:** since spring 2016. Phillip was selected to participate in Stanford's AH-PCRC Summer Institute for undergraduates in 2016. He has worked on a variety of problems since joining my research team. Lately, he has been instrumental in porting our algorithms to a mobile device to demonstrate their ability to run on limited computational resources.
12. **Enrique Salcido:** since fall 2016. Enrique joined my research group as a member of the Lens-of-the-Market participant, in the team led by Cristian Ayub. He is a Math student and needed a team to participate in this program. After the end of the program, he asked to remain a member of my research group and has contributed to our work on optimization.
13. **Joseph Gutierrez:** since fall 2016. Joseph was originally a Mechanical Engineering student but he later (in spring 2017) changed his major to computer science. He worked in my team on robust optimization and was supported by COURI in summer 2017.
14. **Daniel Villa:** since spring 2017. Daniel was selected to participate in Stanford's AHPCRC Summer Institute for undergraduates in 2017. item **Jorge Quinones:** since fall 2017. Jorge is currently studying our work on dynamical systems.
15. **Jesus Padilla:** since spring 2017. In summer 2017, he was supported by CAHSI (Computing Alliance for Hispanic-Serving Institutions). Jesus has worked on dynamic systems. In summer 2017, he worked on time uncertainty and dynamic systems' behavior prediction. He is now implementing an interval constraint solver from scratch to be used on a mobile device.

16. **Sairy Cohen:** spring 2017. Sairy joined my research group in spring 2017. She was very active in her work on visualization of our numerical results and implementation of optimization techniques. She left in summer 2017 to participate in a summer internship and has been busy since then.
17. **Alexa Cortes:** spring 2017. Alexa is a mechanical engineering student. She joined my group in spring 2017 but is no longer a member as she found it hard to combine with the constraints of her academic schedule.
18. **Stephanie Figueroa:** spring 2017. Stephanie joined my group in spring 2017. She is no longer a member as it was hard for her to combine taking classes, having a job on campus, and attending to research as well.
19. **Samuel Tinevra:** spring 2017. Samuel joined my group in spring 2017. He left in fall 2017 as he got a job off campus and finds it hard to combine his academic and professional constraints.
20. **Ricardo Alvarez Lopez:** since fall 2017. Ricardo is currently studying our work on dynamical systems.
21. **Jorge Quinonez:** since fall 2017. Jorge is currently studying our work on dynamical systems.
22. **Noemi Hernandez:** since fall 2017. Noemi actually is a former NEXUS high-school student intern in my lab. She spent summer 2017 in my lab as a high-school student and decided to join my team in the fall when she started her studies at UTEP. Noemi is currently working very actively with Ricardo and Jorge on our team's efforts on solving dynamic systems.

### Other groups supervised

In addition to the above students, I have more informally advised the following three graduate students.

1. **Francisco Zapata:** was a Ph.D. student of Vladik Kreinovich who joined my lab during a year prior to his graduation. He contributed to our work on pair-wise testing.
2. **Quentin Brefort** (spring and summer 2015) from ENSTA, France, directed by Luc Jaulin; and
3. **Anthony Welte** (summer 2016) from ENSTA, France, directed by Luc Jaulin.

I have also supervised high-school students, whom I invite, every summer, to be interns in my research lab. Such internships are offered through a program called NEXUS (<https://www.utep.edu/-engineering/academic-programs/k12-outreach/nexus.html>) from UTEP's College of Engineering. NEXUS is a shadowing program but, in my research lab, we go much beyond a mere shadowing program. Each summer, I have mentored high-school students who spend the summer as interns in my lab, not only learning how to code but also learning about our research and participating in our research via testing. Each student has to pick two projects, in addition to working in research with us and on their own projects, they have to learn how to pitch a project idea and then to report on it weekly. In total, I have mentored about 20 high-school students in summer since 2010.

### 2.2.5 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. Christina Convertino, an assistant professor of Teacher Education at UTEP, is part of the NSF RED project we have in the department. She and her post-doctoral researcher Angelica Monnarez observed many of my courses since fall 2016. I asked Christina to come to my class once to specifically observe and assess my teaching. Her observations are summarized in the letter available as appendix document.
  - 2.
  - 3.
-



## 2.3 Appendix: List of Supporting Documents

### 2.3.1 Course information and evaluations

- Students evaluations of my teaching (available on webpage at: <http://martineceberio.fr/miscellaneous/dossier>)

### 2.3.2 Teaching improvement efforts

- Evidence from Piazza: A sample of course piazza sites
  - CS3360, fall 2012: [piazza.com/utep/fall2012/cs3360/home](http://piazza.com/utep/fall2012/cs3360/home)
  - CS3350, fall 2013: [piazza.com/utep/fall2013/cs3350/home](http://piazza.com/utep/fall2013/cs3350/home)
  - CS2401, spring 2014: [piazza.com/utep/spring2014/cs2401/home](http://piazza.com/utep/spring2014/cs2401/home)
  - CS1401, spring 2016: [piazza.com/utep/spring2016/cs1401/home](http://piazza.com/utep/spring2016/cs1401/home)
  - CS1301, fall 2017: [piazza.com/utep/fall2017/cs1301/home](http://piazza.com/utep/fall2017/cs1301/home)
  - CS1101, fall 2017: [piazza.com/utep/fall2017/cs1101/home](http://piazza.com/utep/fall2017/cs1101/home)
  - CS1190, fall 2017: [piazza.com/utep/fall2017/cs1190/home](http://piazza.com/utep/fall2017/cs1190/home)
- Documents used in class:
  - Daily survey
  - Informal surveys/questions during the semester
- Socratic quizzes evidence

### 2.3.3 Curriculum development

- New Problem-solving courses:
  1. CS4365/5354: syllabus, exams
  2. CS1190: syllabus, examples of slides, material, exams, students' presentations
- Syllabi
  1. CS2401: spring 2014
  2. CS1401 and CS1301/1101: spring 2015, spring 2016, fall 2017
- Examples of labs developed for CS1401 (zipped files): spring 2015, spring 2016, fall 2017.
- Examples of assignments:
  1. Projects for CS3360
  2. Projects for CS3350

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

1. Dr Christina Convertino, Assistant Professor in Teacher Education.

### 2.3.5 Letters from research students

1. Leobardo Valera, currently a Ph.D. student about to graduate (MS in Computational Sciences in Dec. 2014)
2. Angel Garcia Contreras, Ph.D. student in Computer Science
3. Cristian Ayub, Undergraduate student in Computer Science
4. Phillip Hassoun, Undergraduate student in Computer Science
5. Sairy Cohen, Undergraduate student in Computer Science

## Part II

# Research and Scholarship

## 3.1 Evidence of Success in Research and Publication

### 3.1.1 Research Overview

My passion is to design approaches to solving potentially large problems with uncertainty in such a way that, despite the challenge of facing uncertainty, guaranteed decisions can be made. And one area that I like particularly is that of predictions: Can we figure out how a phenomenon is going to unfold? Can we predict how experts would rate a particular system? The core of the research I have conducted over the past five years has been in optimization and uncertainty quantification: for this, I have used many different techniques, from interval computations to fuzzy computing, constraint solving, stochastic approaches, etc. The target classes of problems I have attacked are multi-expert multi-criteria decision making problems and dynamic systems, all of which with uncertainty.

I seek excellence in what I propose and my priority is to involve students in my research (from early undergraduates – starting in CS1 – and even high-school students as interns in summer) as I believe that it is a fantastic way to help them develop as professionals, to discover their passion in computer science, and to broaden their network and opportunities for their future careers.

I also seek to informally mentor many more students, those who take my classes, those who took it before. In class, I inform students about current research topics. Outside of class, I encourage them to join research groups and seek research opportunities at UTEP and outside. I help them identify what they like and facilitate their connection with colleagues when relevant. I inform them and identify students who would be great candidates for opportunities outside UTEP (summer research and other industry internships).

My work has been funded through three main sources: NSF (a CAREER grant project whose half lifetime was executed during the last 5 years – about \$560K), AAAS (for my international collaboration with Perugia in Italy – about \$19K), and ARL (for my work on dynamic systems via the Army High-Performance Computing Research Center at Stanford – about \$1M). In addition, I have made efforts to acquire funding, submitting 20 proposals in total over these 5 years, 8 of which were funded, 6 with researchers from outside UTEP, 3 of which for international projects. Publishing my work has been a priority: I have published in peer-reviewed conference proceedings (20), in books as chapters (17), and in journals (12); I also participated and contributed abstracts and/or short papers in workshops. I have been invited to give a plenary talk in an international conference on guaranteed computing SCAN'16 in Uppsala, Sweden) and to give a seminar talk at the University of Paris Pierre and Marie Curie (in September 2017). I was a visiting professor in Perugia, Italy, working with Dr. S. Bistarelli 4 times during the last 5 years (for a total of about 1.5 month). I indeed value collaboration above all. Internationally, my work with the University of Perugia has resulted in an MOU between UTEP and Perugia, allowing for more exchanges, including of students, and we are working on finalizing a curriculum exchange program. Locally, 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 always involved students in my work to catch any opportunity to train them and to teach them team-working first hand.

### Some background for my work

Decision making is everywhere and the abundance of data just makes it harder. There are two dimensions of decisions that I tackled over the past 5 years: **1/ decisions with conflicting**

**criteria, and 2/ decisions based on large systems of equations where uncertainty might be present.** Hereafter, I go over some of the rationale for my work in these areas.

1/ Decisions that matter are often based on conflicting criteria; e.g., what defines a good software, what makes a student an at-risk student, what policy is best to address a given situation. Although experts can usually make such decisions, when they are not available, understanding and replicating their decision-making process proves to be hard. Nevertheless, being able to replicate / model experts' decision making process would make expertise widely available and the possibility of making critical difficult decisions ubiquitous. In particular, one can imagine health care decisions could be made in remote locations where experts are a scarce resource. Although there are plenty of techniques to emulate decision making processes based on knowledge of prior decisions of experts; including techniques from soft computing (e.g., using fuzzy measures) and traditional machine learning, none has yet come to a satisfactory level of replication of experts' reasoning process. This is mainly due to the lack of consistency in decision making: a single expert might not always follow the same decision-making path; multiple experts might disagree.

Specifically, the type of decisions I have worked on are known as multi-criteria decisions. In the area of Multi-Criteria Decision Making (MCDM), there exist plenty of techniques to model and process such decisions; ranging from naive weighted sums, to fuzzy measures and integrals such as Choquet and Sugeno, to machine learning. In the case of fuzzy measures and integral, specifically the Choquet integral, as this is our approach, predicting experts' decisions based on the knowledge of prior decisions comes down to solving a non-linear continuous large constrained optimization problem. Although our in-house solver was able to address such problems, the problems themselves are ill-posed as they contain conflicting decisions (among experts) and decisions that do not come from a similar reasoning path (even in the case of a single expert). Such drawbacks were not at that time addressed in the literature and needed to be. On the other hand, in philosophy, the notion of disagreement is very widely developed and studied. In the computation world, there exist frameworks to represent decision-making processes and model conflicts/disagreements. Dr. Bistarelli, my main international collaborator over the last 5 years, had in particular worked on Dung's argumentation framework, which has very rich semantics and is suited to the kind of problems we studied. However, there was no work that addressed the above problems at once.

2/ Following on the type of problems of Point 1, where large optimization problems have to be solved, I looked at how decisions can be made in the case when they rely on data obtained from large and complex systems. This can be the case of dynamic systems with no analytical solutions. In such cases, the setting of the problem itself or the need to get very accurate data (to make equally good decisions), without knowing what aspects of the problem really matter, can result in "inflated" problems, problems whose size may be larger than it should. If this happens, it means that in fact, for such "inflated" problems, there should exist a counterpart "smaller" equivalent problem, which should be much faster to solve. Being able to identify such reductions and act on them has essential applications in many fields, from engineering to defense, to cybersecurity, etc.

The ability to conduct fast and reliable simulations of dynamic systems is indeed of special interest to Army operations for instance. An example is the need to obtain reliable under-body blast simulations to evaluate impacts on vehicles and personnel safety, as well as to study configurations critical in the design and decision-making stages. However, such simulations can be very complex and, to be thorough, involve millions of variables, making it prohibitive in CPU time to run repeatedly on many different configurations. Reduced-order modeling (ROM) methods provide a concrete way to handle such complex simulations using a realistic amount of resources. They constitute a cornerstone to improving predictions and reducing the risk of decisions on Army

applications, such as Underbody Blast vehicle studies.

Uncertainty is an added but practical challenge: it is part of the realities of what we model. However nicely we model some phenomenon, in practice, there will be uncertainty involved. So how can we handle uncertainty in practice? There are many techniques for handling uncertainty, ranging from probabilistic to stochastic approaches, to interval computations and p-box computations. However, not all of these produced **guaranteed results**. In my work I am interested in providing guaranteed results as often as practical.

### **Multi-Criteria Decision Making using Argumentation Framework and Choquet**

This work was a collaboration with Dr. S. Bistarelli from the University of Perugia, started in 2012, and funded by AAAS (see list of funded projects). It also involved one Master's student and two undergraduate students from UTEP. As a team, we sought to integrate our own existing approaches: the fuzzy measure and integral approach (Ceberio) was preconditioned by a control stage in which argumentation networks (Bistarelli, using Dung's argumentation framework) was used to model conflicts. In particular, at this stage, prior data can be modeled using a directed graph where nodes are experts (or arguments) and arrows are conflicting theses versus arguments. The team of Bistarelli already had a tool, based on soft constraints, to approach such problems: this tool is named ConArg. The team worked on extending ConArg to handle multi-criteria decision problems and the specific applications chosen by the team to demonstrate and validate the approach: this application was software evaluation.

Our joint work resulted in a proposed (and published) new model for MEMCDM using argumentation networks. As we were designing the semantics of our new model, the existing solver for argumentation frameworks needed to be adjusted. In doing this, we received a lot of help from Francesco Santini and Fabio Rossi (from the University of Perugia) since both had been involved in ConArg's original implementation.

Although this specific project ended in 2015, Dr. Bistarelli and I have continued to work and to mentor students together. We are still working on Argumentation Frameworks and are starting (as of fall 2017) a joint work on bitcoin and cybersecurity.

### **Addressing Large Nonlinear Systems with Uncertainty**

My work on large nonlinear systems started in spring 2013 and has been on-going since then. It has and still is a funded project of Stanford's Army High-Performance Computing Research Center (funded by ARL). This was a team work that I have led since January 2014. The team includes Dr. Argaez from Math at UTEP, one PhD student, and one post-doctoral researcher (in total we have had two post-doctoral researchers so far). Collaborators from the Army Research Lab have also been instrumental in our successes: Rad Balu from ARL ALC, Luis Bravo, Simon Su, Craig Barker from ARL APG, have allowed us, through our conversations and interactions, to better understand their computational problems and the reality of the practical applications. This work has led to different research directions and contributions as outlined below:

*1/ New Model-Order Reduction methods (MOR):* Our work was driven by two objectives: (a) decreasing the time needed to compute a reduced basis and (b) freeing MOR from the need to pick good snapshots to build a reduced basis. In this aim, we designed a snapshot-free approach based on Wavelets, which has the same numerical properties as the snapshot/SVD (POD) approach.

Both provide an orthogonal reduced basis, but using wavelets is an “off-the-shelf” approach and does not require computing snapshots. Although much faster, our wavelet approach does not yet match the quality of a traditional POD approach and further inquiry and development is needed. To enhance the performance of our approach, we implemented a hybrid “snapshots & wavelets” approach where SVD is conducted on a portion of snapshots coming from simulations of the full-order model (FOM) and the rest from the wavelets-based fast simulations (this can be seen as data – snapshots – fusion). Our further contribution to MOR consists of an interval version of the POD approach. Instead of obtaining snapshots from multiple simulations of the FOM, we proposed to solve FOM on an interval (or intervals) of parameters’ values, hence allowing us to solve it once and sample the snapshots from the thick surface that constitutes the solution of the one interval FOM simulation we ran. This idea so far has provided results similar to those of the traditional snapshots/SVD approach in quality. We called this approach IPOD for Interval POD. A positive side effect of this contribution is that IPOD also works when there is uncertainty in the definition of FOM.

2/ *Another focus of our work was in improving optimization techniques* for the obtained reduced problems. In this respect, we contributed speed-up ideas such as gappy approximation methods to limit the number of computations involved in the Jacobian. We proposed and studied strategies for regularization to make Newton methods robust to the choice of the starting points. In particular, we proposed a global regularized Gauss-Newton algorithm for a composite function, which guarantees a fast rate of convergence. This algorithm is grounded in the fact that the hybrid reduced-order model we proposed is a composition of two functions: the external function is the representation of the studied model, which satisfies the zero residual property, and the internal function is the linear function whose matrix representation is the reduced basis. This formulation allows us to find a solution to the problem using the interior-point algorithm developed by our team (and used in the past by the Army in the modeling of wings for aerial vehicles) for constrained optimization problems, which have a wide range of applications relevant to the Army. Furthermore, we implemented an interval version of the Newton method (state of the art) for reduced problems (Interval Reduced Newton, which was new) and we also proposed and implemented the use of interval constraint solving techniques to tackle the reduced problems. This allowed us to guarantee convergence, handle uncertainty, and guarantee that the obtained results are correct.

3/ *Uncertainty handling:* Following the design of our IPOD approach and Interval Reduced Newton method for reduced problems, we designed and tested approaches to solve FOM with uncertainty, where uncertainty is modeled as intervals (e.g., intervals enclosing a constant – or constants – that are not known precisely or may vary). We now have a fully functional set of techniques for problems with uncertainty: given a FOM with uncertainty, we are able to design an IROM (Interval ROM), which in turn is used and solved using either Interval Newton or Interval Constraint Solving Techniques (ICST).

4/ *Finally, we were able to model the FOM and ROM problems as constraint solving problems,* which allowed us to design algorithms for predictions of future behavior and for mission control. We developed models and techniques to predict future behavior of given phenomena given observed data (possibly with uncertainty). This is utterly important in Army applications as a reliable understanding of a developing situation can allow to take preventive or palliative action before the situation worsens. We were also able to demonstrate control capabilities: specifically, we designed a technique that is able to re-compute parameters of the dynamical system on the fly to meet new constraints (e.g., boundary conditions, behaviors to be avoided). We foresee that this will be particularly useful for mission control and for adapting missions on the fly. We are still actively

working on this topic.

In short, we have contributed ideas for reduction and solution of the reduced problem, and most notably, we have extended approaches to handle uncertainty and be able to make predictions of future behavior.

### **What's next?**

As a continuation of the work outlined above, I foresee that over the next 3 to 5 years, I will be exploring quantum mechanics applications to further challenge the techniques my team and I have developed for large nonlinear systems with uncertainty. I also have no doubt that I will be studying and integrating machine learning techniques to the reduction techniques I am currently using and developing, and using these for my joint work with Dr. Bistarelli on identifying bitcoin mixnets (or other mixers for other crypto-currencies).

### **3.1.2 Highlights of Research Successes and Impacts**

#### **Major Findings and Successes of the Multi-Criteria Decision Making Project**

In this project, we studied the feasibility of using argumentation frameworks to model Multi-Experts Multi-Criteria Decision Making (ME-MCDM). Although our focus has clearly been to make new decisions consistent with what experts should have made, we realized that using an argumentation framework led us to two model options: one that would allow to make new decisions while following the experts' prior decisions rationales and another more suited to modeling voting systems. We decided to branch out our original research direction to pursuing both directions but kept more focus on the first option. In the aim of making decision, we defined a semantics that allows to remove, from the obtained argumentation network, decisions (potentially even experts) that are unfair or irrational.

Our findings were presented four times in 2013:

- at a research seminar at the University of Perugia in June 2013;
- at Numerical Computations: Theory and Algorithms, NUMTA'13, in Italy in June 2013 (<http://si.deis.unical.it/~yaro/numta2013/>);
- at the 2013 SACNAS National Conference in San Antonio in October 2013 (<http://sacnas.confex.com/sacnas/2013/webprogram/start.html>); and
- at the Graduate School Expo at UTEP in November 2013.

Three of these presentations (all but the seminar) were given by Joel Henderson, graduate student participating in the project. These opportunities helped him make significant progress in presenting skills. He graduated in fall 2015.

Further findings of this project were presented at the Workshop on Argumentation, Rationality and Decision at the Imperial College in London, 18th-19th September 2014, and at the 8th International Workshop on Constraint Programming and Decision Making, CoProD'14, in Wurzburg,



Germany on September 21st, 2014. This work resulted in the subsequent publications: [C47] Stefano Bistarelli, Martine Ceberio, Joel Henderson, Franco Santini, “Using Argumentation Frameworks to promote Fairness and Rationality in Multi-Experts Multi-Criteria Decision Making”, in the Proceedings of the 2015 Italian Conference in Theoretical Computer Science, 2015; and [Ch22] Stefano Bistarelli, Martine Ceberio, Joel Henderson, Francisco Santini, Luciana Garbayo, “Abstract Argumentation Frameworks to Promote Fairness and Rationality in Multi-Experts Multi-Criteria Decision Making”, In: Martine Ceberio and Vladik Kreinovich (eds.), *Constraint Programming and Decision Making: Theory and Applications*, Springer Verlag, Berlin, Heidelberg, 2017.

*Impact.* This collaboration resulted in a strong partnership with Dr. Bistarelli (concretized by 8 visits in 5 years, 1 funded proposals, 3 more submitted) and with the University of Perugia, with whom UTEP signed an MOU recognizing our intention to work closely together. This allows researchers to go back and forth between the institutions to work together, but also students who can go and work on research with a co-advisor of the other institution. We are also currently finalizing the details of a student exchange program so that we can also have students taking part of their curriculum at the partner institution.

## Major Findings and Successes of the Model-Order Reduction Project

The work conducted as a project within Stanford’s Army High-Performance Computing Research Center (AHPCRC) has led to several contributions. We started by proposing Reduced-Order Modeling approaches based on Wavelets, as an attempt to free the process from having to generate snapshots, which we argued would require too much knowledge of the field of interest. This resulted in publications and presentations (C40 and a few presentations at CoProD and posters at AHPCRC).

However, the most noteworthy success from this project comes from the integration of uncertainty in the problems we had to solve, in a way that provided guaranteed results. We started by demonstrating that using uncertainty techniques (namely intervals in our case), we could fix some of the Reduced-Order Modeling we had tried to address with Wavelets: we proposed an interval version of POD, dubbed IPOD. This work was published and presented at several occasions (J25, C42, W10, A35, A28, A27).

We then showed that we could not only model problems with uncertainty, but we also were able to show how uncertainty could still be handled and quantified when solving the problem in its reduced size. This allowed us to propose two new uses of ROM: one to predict future behavior of an unfolding event based on sensed data (C53, C50), and one to estimate the values of a phenomenon’s parameters to enforce (or avoid) specific behaviors (C52).

This work has also been presented as poster at AHPCRC, as well as on numerous local seminars. It was the topic of a plenary talk at the international conference on guaranteed computing SCAN’16 in Uppsala, Sweden, in September 2016, and of a seminar talk at the University of Pierre and Marie Curie in Paris, in September 2017.

*Impact.* The work of Model-Order Reduction has allowed us to explore uncertainty quantification in very challenging and yet practical settings (ROM and highly nonlinear problems). Our progress in this direction has allowed us to define new challenges, namely using ROM for predictions as well as for enforcing / excluding behaviors, all of which coming with guarantees, which is the highlight and main difference of our approach, when compared to non-guaranteed statistical or stochastic approaches. Our work has been recognized as demonstrated by publications and invitation to

present. Its funding has also been renewed every year (4 times) since 2013. Finally, it allowed to train many students: 4 PhD students (one who defended in fall 2013, one to defend in fall 2017, and two still on-going), 2 post-doctoral researchers (one still in the position, and one who moved on to become an assistant professor), and many undergraduate students, 6 of whom spent one summer at Stanford for an REU.

## Applications

My work over the last 5 years was certainly driven by my passion for new approaches to decision problems with uncertainty, but it was greatly enhanced by applications that did need such decision making techniques, forcing me to keep my work practical and relevant.

Specifically, I have worked on problems from the following main areas:

- Software engineering: using Argumentation Frameworks to automatically assess software packages (C35, C36, C37, C38, J18), designing algorithm to create minimal pairwise-covering test suites (A36)
- Misc. Engineering: applications driving our work in reduced-order modeling (A25, W10, C40, C42, C50, C52, C53, J25); interval constraints for underwater robots (C41, C43, C51, J21, J22, J23, J24)
- Biology (A37)
- Medicine: Modeling flu epidemic dynamics (A17, C39)
- Environmental Sciences (J16)

### 3.1.3 Summary of Impact

Over the past 5 years, I have further developed the work I had conducted before that into a strong research agenda with a lot of applications and applicability. The projects I have conducted have constituted a culmination of my prior work on optimization and decision making under uncertainty.

Because of the funding received during this period, my work had a significant impact on **students**, providing projects and funding to many of them, opening opportunities that they would not have been exposed to otherwise. As a result of this work, I was able to mentor two post-doctoral researchers (one still on-going and another one now a faculty in Mathematics at Saint Thomas University in Florida), two students obtained their Ph.D. in Computer Science and Computational Sciences respectively and one more, in Computational Sciences as well is about to defend his, two students obtained their Master's Degree in Computer Science (one of which is now still working with me on his Ph.D.), many undergraduate students were able to complete research experience for undergraduates in my lab (about 12) and/or at Stanford University (for the Army High-Performance Computing Research Center Summer Institute for Undergraduate Research – 6 students). In addition to my own students, I was invited on the committee of a number of Ph.D. students at UTEP but was also asked to review a Ph.D. manuscript for a competition in Italy, and am currently a member of the Ph.D. committee of a student of computer science at the University of Pierre and Marie Curie in Paris, France.

My work on **decision making** has resulted in a strong on-going **collaboration with the University of Perugia**, in particular with Dr. Stefano Bistarelli and his team. Over the past five years, I have visited his lab 5 times for a total of about 1.5 month spent working together there. He also visited UTEP in 2016 and we had two other meetings at the occasion of conferences in 2014 and 2016. An MOU was signed in 2015 between the University of Perugia and UTEP to facilitate research exchanges between our institutions and a student exchange program is being finalized. New advances in **solving large problems with uncertainty** were also achieved, and was published in many venues (journals and conferences). In addition to many presentations locally by myself or my students, I was invited to present my work at the GAMM - IMACS International Symposium on Scientific Computing, Computer Arithmetic and Verified Numerical Computations SCAN'16 in Sweden in 2016 and at the University of Paris 6 in 2017. Additionally, on-going international collaboration took place during that time: one with Luc Jaulin from the **University of Western French Brittany** whose two students came to UTEP for research internships to complete their Master's degrees in 2014 and 2015; one with Salem Benferhat, from the **University of Artois (France)**, who visited Vladik Kreinovich and I at UTEP and with whom we have had since then on-going exchanges and collaboration.

Finally, I have continued my efforts in **organizing the annual International Workshop on Constraint Programming and Decision Making, CoProD**, started in fall 2008 as a satellite event of the 13th GAMM - IMACS International Symposium on Scientific Computing, Computer Arithmetic and Verified Numerical Computations SCAN'08, but this is now a team effort organized jointly by Vladik Kreinovich and myself. Together, we have also organized the **Annual Meeting of the North American Fuzzy Information Processing Society., NAFIPS** in fall 2016 at UTEP (we had already organized it once in 2011).

### 3.1.4 List of articles in refereed scholarly journals since 2012

*Important note: In the lists below, the names of authors who were students at the time we wrote the article are followed by an “\*”. Also, the numbering of the articles is kept as shown in the detailed curriculum vitae to ensure consistency of references*

- J27 Martine Ceberio and Vladik Kreinovich, “Constraint Problems: Computability Is Equivalent to Continuity”, **International Journal of Intelligent Technologies and Applied Statistics (IJITAS)**, 2017, Vol.10, No.2, pp.21-40.
- J26 Martine Ceberio and Vladik Kreinovich, “A Modification of Backpropagation Enables Neural Networks to Learn Preferences”, **Journal of Uncertain Systems**, to appear.
- J25 Leobardo Valera\* and Martine Ceberio, “Model-Order Reduction Using Interval Constraint Solving Techniques”, **Journal of Uncertain Systems**, 2017, Vol. 11, No. 2, pp. 84–103.
- J24 Anthony Welte\*, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Avoiding Fake Boundaries in Set Interval Computing”, **Journal of Uncertain Systems**, 2017, Vol. 11, No. 2, pp. 137-148.
- J23 Anthony Welte\*, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Computability of the Avoidance Set and of the Set-Valued Identification Problem”, **Journal of Uncertain Systems**, 2017, Vol. 11, No. 2, pp. 129-136.

- J22 Vladik Kreinovich, Martine Ceberio, and Quentin Brefort\*, “In category of sets and relations, it is possible to describe functions in purely category terms”, **Eurasian Mathematical Journal**, 2015, Vol. 6, No. 2, pp. 90-94.
- J21 Quentin Brefort\*, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Towards Fast and Reliable Localization of an Underwater Object: An Interval Approach”, **Journal of Uncertain Systems**, 2015, Vol. 9, No. 2, pp. 95-102.
- J20 Karen Villaverde, Olga Kosheleva, Martine Ceberio, “Computations under Time Constraints: Algorithms Developed for Fuzzy Computations can Help”. **Journal of Uncertain Systems**, 26(2), 138-145, 2013.
- J19 Olga Kosheleva, Martine Ceberio, “How Accurately Should We Write on the Board? When Marking Comments on Student Papers?”. **Journal of Uncertain Systems**, 6(2), 89-91, 2013.
- J18 Xiaojing Wang\*, Martine Ceberio, Shamsnaz Virani, Angel Garcia\*, and Jeremy Cummins\*. “A Hybrid Algorithm to Extract Fuzzy Measures for Software Quality Assessment”. **Journal of Uncertain Systems**, 2013.
- J17 Vladik Kreinovich, Christelle Jacob\*, Didier Dubois, Janette Cardoso, Martine Ceberio (2012). “Failure Analysis of a Complex System Based on Partial Information about Subsystems, with Potential Applications to Aircraft Maintenance”. **Journal of Applied and Computational Mathematics**, 11(2), 165-179.
- J16 Aline Jaimes\*, Craig Tweedie, Vladik Kreinovich, and Martine Ceberio, “Scale-Invariant Approach to Multi-Criterion Optimization under Uncertainty, with Applications to Optimal Sensor Placement, in Particular, to Sensor Placement in Environmental Research”, **International Journal of Reliability and Safety**, 2012, Vol. 6, No. 1-3, pp. 188-203.

### 3.1.5 List of articles in conference proceedings since 2012

- C53 Leobardo Valera\*, Angel Garcia\*, Afshin Gholamy\*, and Martine Ceberio, “Towards Predictions of Large Dynamic Systems’ Behavior using Reduced-Order Modeling and Interval Computations”, to be published in the proceedings of the **IEEE International Conference on Systems, Man, and Cybernetics (IEEE SMC 2017)**.
- C52 Leobardo Valera\*, Angel Garcia\*, and Martine Ceberio, “On-the-Fly Parameter Identification for Dynamic Systems Control, Using Interval Computations and Reduced-Order Modeling”. To be published in the proceedings of the **North American Fuzzy Information Processing Society Annual Conference 2017 (NAFIPS 2017)**.
- C51 Anthony Welte\*, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Robust Data Processing in the Presence of Uncertainty and Outliers: Case of Localization Problems”, In the Proceedings of the **IEEE Series of Symposia in Computational Intelligence SSCI’2016**, Athens, Greece, December 6-9, 2016.
- C50 Leobardo Valera\*, Martine Ceberio, “Using Interval Constraint Solving Techniques to Better Understand and Predict Future Behaviors of Dynamic Problems”. In the proceedings of the **North American Fuzzy Information Processing Society Annual Conference, NAFIPS’2016**.

- C49 Angel F. Garcia Contreras\*, Martine ceberio, “Comparison of Strategies for Solving Global Optimization Problems Using Speculation and Interval Computations”. In the proceedings of the **North American Fuzzy Information Processing Society Annual Conference, NAFIPS’2016**.
- C48 Horacio Florez\* and Martine Ceberio (2016). “A Novel Mesh Generation Algorithm for Field-Level Coupled Flow and Geomechanics Simulations”. In the Proceedings of **ARMA 16-305, 50th US Rock Mechanics / Geomechanics** Symposium held in Houston, TX.
- C47 Stefano Bistarelli, Martine Ceberio, Joel Henderson\*, Franco Santini\*, “Using Argumentation Frameworks to promote Fairness and Rationality in Multi-Experts Multi-Criteria Decision Making”, in the Proceedings of the **2015 Italian Conference in Theoretical Computer Science**, 2015.
- C46 Esquinca, A., Villa, E. Y., Hampton, E. M., Ceberio, M. C., Wandermurem, L. S.\*, (2015). “Latinas’ resilience and persistence in computer science and engineering: Preliminary findings of a qualitative study examining identity and agency.” Proceedings of the 2015 **Frontiers in Education**.
- C45 Martine Ceberio, Vladik Kreinovich, Hung T. Nguyen, Songsak Sriboonchitta, and Rujira Ouncharoen, “What is the Right Context for an Engineering Problem: Finding Such a Context is NP-Hard”, Proceedings of the **IEEE Symposium Series on Computational Intelligence**, Cape Town, South Africa, December 7-10, 2015, pp. 1615-1620.
- C44 Salem Benferhat, Karim Tabia, Sylvain Lagrue, Vladik Kreinovich, and Martine Ceberio, “On the Normalization of Interval-Based Possibility Distributions”, Proceedings of the **Twenty-Eighth International Florida Artificial Intelligence Research Society Conference FLAIRS’28**, Hollywood, Florida, May 18-20, 2015, pp. 20-25.
- C43 Quentin Brefort\*, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “If We Take Into Account that Constraints Are Soft, Then Processing Constraints Becomes Algorithmically Solvable”, Proceedings of the **IEEE Symposium on Computational Intelligence for Engineering Solutions CIES’2014**, Orlando, Florida, December 9-12, 2014, pp. 1-10.
- C42 Martine Ceberio, Leobardo Valera\*, Olga Kosheleva, and Rodrigo Romero. “Model Reduction: Why It Is Possible and How It Can Potentially Help to Control Swarms of Unmanned Aerial Vehicles”. In the Proceedings of the **North American Fuzzy Information Processing Society Annual Conference, NAFIPS’2015**.
- C41 Brefort, Q.\*, Jaulin, L., Ceberio, M. C., Kreinovich, V. Y., (2014). “If We Take Into Account that Constraints Are Soft, Then Processing Constraints Becomes Algorithmically Solvable”. (pp. 1-10). Proceedings of the **IEEE Symposium on Computational Intelligence for Engineering Solutions**, Orlando, Florida SSCI’2014, December 9-12, 2014.
- C40 Miguel Argaez, Miguel Hernandez\*, Leticia Velazquez, Martine Ceberio, Reinaldo Sanchez-Arias\*, “Reduced-Order Modeling Using Orthogonal Wavelets”, in the proceedings of **IFORS Barcelona 2014**.
- C39 Paula A. Gonzalez-Parra\*, Martine Ceberio, Sunmi Lee, Carlos Castillo-Chavez. “Optimal Control for a Discrete Time Influenza Model”. In the proceedings of the **Second Colombian Congress of Computational Biology and Bioinformatics (CCBCOL 2013)**.

- C38 X. Wang\*, M. Ceberio, A. Garcia\*. “Towards Fuzzy Method for Estimating Prediction Accuracy for Discrete Inputs, with Application to Predicting At-Risk Students”. Proceedings of the **Annual Conference of North American Fuzzy Information Processing Society (NAFIPS’2013)**, Alberta, Canada, June 2013.
- C37 X. Wang\*, M. Ceberio, S. Virani, C. Del Hoyo\*, and L. Gutierrez\*. “Fuzzy measure extraction for software quality assessment as a multi-criteria decision-making problem”. Proceedings of the **2012 International Conference on Software Engineering Research and Practice**, Las Vegas, NV, July 2012.
- C36 X. Wang\*, A. F. Garcia Contreras\*, M. Ceberio, C. Del Hoyo\*, L. C. Gutierrez\*, and S. Virani. “Interval-based algorithms to extract fuzzy measures for software quality assessment”. Proceedings of the **Annual Conference of North American Fuzzy Information Processing Society (NAFIPS’2012)**, Berkeley, CA, August 2012.
- C35 Xiaojing Wang\*, Angel Garcia Contreras\*, Martine Ceberio, Christian Del Hoyo\*, Luis Gutierrez\*, “A Speculative Algorithm to Extract Fuzzy Measures from Sample Data”, Proceedings of the **2012 annual international conference of Fuzz-IEEE (FuzzIEEE’12)**.

### 3.1.6 Chapters in Scholarly Books and Monographs since 2012

- Ch22 Stefano Bistarelli, Martine Ceberio, Joel Henderson, Francisco Santini, Luciana Garbayo, “Abstract Argumentation Frameworks to Promote Fairness and Rationality in Multi-Experts Multi-Criteria Decision Making”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch21 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Optimizing  $\text{pred}(25)$  Is NP-Hard”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch20 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Constraint Approach to Multi-Objective Optimization”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch19 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “From Global to Local Constraints: A Constructive Version of Bloch’s Principle”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch18 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Range Estimation under Constraints is Computable Unless There Is a Discontinuity”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch17 Juan Carlos Figueroa Garcia, Martine Ceberio, and Vladik Kreinovich, “Algebraic Product is the Only t-Norm for Which Optimization Under Fuzzy Constraints is Scale-Invariant”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.

- Ch16 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Towards a Physically Meaningful Definition of Computable Discontinuous and Multi-Valued Functions (Constraints)”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch15 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Peak-End Rule: A Utility-Based Explanation”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, to appear.
- Ch14 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Simplicity Is Worse Than Theft: A Constraint-Based Explanation of a Seemingly Counter-Intuitive Russian Saying”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 9-14.
- Ch13 Martine Ceberio and Vladik Kreinovich, “Continuous If-Then Statements Are Computable”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 15-18.
- Ch12 Aline Jaimes, Craig Tweedie, 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 and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 61-66.
- Ch11 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Why Tensors?”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 75-78.
- Ch10 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Adding Constraints – A (Seemingly Counterintuitive but) Useful Heuristic in Solving Difficult Problems”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 79-84.
- Ch9 Vladik Kreinovich, Juan Ferret, and Martine Ceberio, “Constraint-Related Reinterpretation of Fundamental Physical Equations Can Serve as a Built-In Regularization” In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 91-96.
- Ch8 Paden Portillo, Martine Ceberio, and Vladik Kreinovich, “Towards an Efficient Bisection of Ellipsoids”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 137-142.
- Ch7 Uram Anibal Sosa Aguirre, Martine Ceberio, and Vladik Kreinovich, “Why Curvature in L-Curve: Combining Soft Constraints”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 175-180.
- Ch6 Christian Servin, Martine Ceberio, Aline Jaimes, Craig Tweedie, and Vladik Kreinovich, “How to Describe and Propagate Uncertainty When Processing Time Series: Metrological and Computational Challenges, with Potential Applications to Environmental Studies”, In: Shyi-Ming Chen and and Witold Pedrycz (eds.), **Time Series Analysis, Modeling and**

**Applications: A Computational Intelligence Perspective**, Springer Verlag, 2013, pp. 279-299.

### 3.1.7 List of articles in refereed Workshop Proceedings (W) and abstracts (A) since 2012

- W10 Leobardo Valera, Martine Ceberio, “Model-Order Reduction Using Interval Constraint Solving Techniques.” Proceedings of the **7th International Workshop on Reliable Engineering Computing (REC2016)**. June 15-17, 2016, Ruhr University Bochum, Germany.
- W9 Luis Gutierrez, Martine Ceberio, Vladik Kreinovich, Rebekah L. Gruver, Marianna Pena, Matthew J. Rister, Abraham Saldana, John Vasquez, Janelle Ybarra, and Salem Benferhat, “From Interval-Valued Probabilities to Interval-Valued Possibilities: Case Studies of Interval Computation under Constraints”, Proceedings of the **6th International Workshop on Reliable Engineering Computing REC’2014**, Chicago, Illinois, May 25-28, 2014.
- A39 Angel F. Garcia Contreras, Martine Ceberio, and Vladik Kreinovich, “Plans Are Worthless but Planning Is Everything: A Theoretical Explanation of Eisenhower’s Observation”, in the Proceedings of the **10th International Workshop on Constraint Programming and Decision Making CoProd’2017**, El Paso, Texas, November 3, 2017, to appear.
- A38 Angel F. Garcia Contreras, Martine Ceberio, and Vladik Kreinovich, “Why Convex Optimization Is Ubiquitous and Why Pessimism Is Widely Spread”, Proceedings of the **10th International Workshop on Constraint Programming and Decision Making CoProd’2017**, El Paso, Texas, November 3, 2017, to appear.
- A37 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Attraction-Repulsion Forces Between Biological Cells: A Theoretical Explanation of Empirical Formulas”, Proceedings of the **10th International Workshop on Constraint Programming and Decision Making CoProd’2017**, El Paso, Texas, November 3, 2017, to appear.
- A36 Leobardo Valera, Martine Ceberio, “Introduction to Pairwise Testing. Definition and Examples”. **47th Southeastern International Conference on Combinatorics, Graph Theory Computing** (2016).
- A35 Leobardo Valera, Martine Ceberio, “Interval Constraint Solving Techniques and Model-Order Reduction to Enhance the Solution of Dynamic Systems”. **2016 INFORMS Annual Meeting**.
- A34 Chitta Baral, Martine Ceberio, and Vladik Kreinovich, “How Neural Networks (NN) Can (Hopefully) Learn Faster by Taking Into Account Known Constraints”, Proceedings of the **Ninth International Workshop on Constraints Programming and Decision Making CoProd’2016**, Uppsala, Sweden, September 25, 2016.
- A33 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “When We Know the Number of Local Maxima, Then We Can Compute All of Them”, Proceedings of the **Ninth International Workshop on Constraints Programming and Decision Making CoProd’2016**, Uppsala, Sweden, September 25, 2016.
- A32 Martine Ceberio, Vladik Kreinovich, (2016). Preface to the special issue on uncertainty. (vol. 10). Journal of Uncertain Systems.



- A31 Ceberio, M. C., Kreinovich, V. Y., Nguyen, H. T., Sriboonchitta, S., Ouncharoen, R., (2015). “What is the Right Context for an Engineering Problem: Finding Such a Context is NP-Hard”. (pp. 136). Abstracts of the **IEEE Symposium Series on Computational Intelligence**, Cape Town, South Africa, December 7-10, 2015.
- A30 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Optimizing  $\text{pred}(25)$  Is NP-Hard”, Proceedings of the **Eighth International Workshop on Constraints Programming and Decision Making CoProd’2015**, El Paso, Texas, November 6, 2015.
- A29 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Constraint Approach to Multi-Objective Optimization”, Proceedings of the **Eighth International Workshop on Constraints Programming and Decision Making CoProd’2015**, El Paso, Texas, November 6, 2015.
- A28 Leobardo Valera, Martine Ceberio, “Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction”. 8th International **Workshop on Constraint Programming and Decision Making**, El Paso, Nov. 2015.
- A27 Martine Ceberio, Miguel Argaez, Luis Gutierrez, Leobardo Valera. “Using Interval Constraint Solving Techniques to Solve Dynamical Systems”. **CORS/INFORMS 2015 Meeting**, Montreal, June 2015.
- A26 Miguel Argaez, Martine Ceberio, Leobardo Valera. “A Model Order Reduction for Solving Large-Scale Square Nonlinear Systems of Equations”. **CORS/INFORMS 2015 Meeting**, Montreal, June 2015.
- A25 Leobardo Valera, Martine Ceberio. “Using Regularization to Improve the Rate of Convergence in a Model-Order Reduction (MOR) Problem”. **22th International Symposium on Mathematical Programming**. Pittsburg, Pennsylvania, ISMP’2015, July 2015.
- A24 Martine Ceberio, Vladik Kreinovich, (2014). Preface to “Constraint Programming and Decision Making” in Constraint Programming and Decision Making. (pp. v-x). Berlin, Heidelberg: Springer Verlag.
- A23 Martine Ceberio, Vladik Kreinovich, (2014). Preface to the special issue on uncertainty. (3rd ed., vol. 8, pp. 163). Journal of Uncertain Systems.
- A22 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “From Global to Local Constraints: A Constructive Version of Bloch’s Principle”, Proceedings of the of the **Seventh International Workshop on Constraints Programming and Decision Making, Co-Prod’2014**, Wuerzburg, Germany, September 21, 2014.
- A21 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Range Estimation under Constraints is Computable Unless There Is a Discontinuity”, Proceedings of the of the **Seventh International Workshop on Constraints Programming and Decision Making, Co-Prod’2014**, Wuerzburg, Germany, September 21, 2014.
- A20 Juan Carlos Figueroa Garcia, Martine Ceberio, and Vladik Kreinovich, “Algebraic Product is the Only t-Norm for Which Optimization Under Fuzzy Constraints is Scale-Invariant”, Proceedings of the **Sixth International Workshop on Constraints Programming and Decision Making CoProd’2013**, El Paso, Texas, November 1, 2013, pp. 8-11.

- A19 Martine Ceberio, Olga Kosheleva, and Vladik Kreinovich, “Towards a Physically Meaningful Definition of Computable Discontinuous and Multi-Valued Functions (Constraints)”, Proceedings of the **Sixth International Workshop on Constraints Programming and Decision Making CoProd’2013**, El Paso, Texas, November 1, 2013, pp. 22-26.
- A18 Olga Kosheleva, Martine Ceberio, and Vladik Kreinovich, “Peak-End Rule: A Utility-Based Explanation”, Proceedings of the **Sixth International Workshop on Constraints Programming and Decision Making CoProd’2013**, El Paso, Texas, November 1, 2013, pp. 12-16.
- A17 Paula Gonzalez-Parra, Martine Ceberio, and Carlos Castillo Chavez. “Interior-Point Methods for a Multi-Group Discrete-Time Influenza Model”. Presented at the **Mathematical Congress of the Americas 2013**, August 2013.
- A16 Joel Henderson, Stefano Bistarelli, Martine Ceberio (2013). “Multi-Experts Multi-Criteria Decision Making”, In the Proceedings of **Numerical Computations: Theory and Algorithms International Conference**, Italy, June 2013.
- A15 Martine Ceberio, Vladik Kreinovich, (2012). “Preface to the special issue”. (vol. 6, pp. 83). **Journal of Uncertain Systems**.
- A14 Ali Jalal-Kamali, Martine Ceberio, Vladik Kreinovich, (2012). “Constraint Optimization: From Efficient Computation of What Can Be Achieved to Efficient Computation of a Way to Achieve the Corresponding Optimum”. Proceedings of the **Fifth International Workshop on Constraint Programming and Decision Making CoProD’12**, Novosibirsk, Russia, September 23, 2012.
- A13 Martine Ceberio, Olga Kosheleva, Vladik Kreinovich, (2012). “Simplicity Is Worse Than Theft: A Constraint-Based Explanation of a Seemingly Counter-Intuitive Russian Saying”. Proceedings of the **Fifth International Workshop on Constraint Programming and Decision Making CoProD’12**, Novosibirsk, Russia, September 23, 2012.

### 3.1.8 List of Edited Books since 2012

- B2 Martine Ceberio and Vladik Kreinovich (eds.), *Constraint Programming and Decision Making: Theory and Applications*, Springer Verlag, Berlin, Heidelberg, to appear, 2017.
- B1 Martine Ceberio and Vladik Kreinovich (eds.), *Constraint Programming and Decision Making*, Springer Verlag, Berlin, Heidelberg, 2014.

## 3.2 Evidence of Success in Securing Extramural Funding

As documented below, between 2012 and 2017, I have established a successful research agenda, mostly as PI for projects at the core of my research interests, as demonstrated by my funded efforts and the collaborations that took place. In addition to my funded projects, I pursued other ones, which were not funded but are reflected in what follows as evidence of my activities.

### □ Total Grants and Contracts since 2012

Total funding is \$7,408,457 (**\$1,379,905** as PI).

- **Federal funding: \$390,905** as PI and \$5,517,552 for projects in which I am co-PI
- **Army funding: \$999,000** as PI and \$475,000 for projects in which I am co-PI
- **Industry funding: \$36,000** from Raytheon, for projects in which I am co-PI
- **University funds: \$25,000** from URI and two IDRs (IDR1 & IDR2)

### 3.2.1 Awarded Grants and Grants active during the 2012-2017 period

14. **ARMY RESEARCH LABORATORY through Stanford University's Army High Performance Computing Research Center– PI** *HPC Modeling and Simulation of Underbody Blast Parameter Estimation Problems*, start: January 1, 2017, end: December 31, 2017. Amount: \$244,000.
13. **STEM Accelerator Fund: CS1 Course Redesign**. Amount: \$8,500, Fall 2016.
12. **ARMY RESEARCH LABORATORY through Stanford University's Army High Performance Computing Research Center– PI** *HPC Modeling and Simulation of Underbody Blast Parameter Estimation Problems*, start: January 1, 2016, end: December 31, 2016. Amount: \$225,000.
11. **Google CS Engagement Award: Ceberio, Martine (PI)**. *Revamping CS1 to increase retention*. Amount: \$5,000. (January 2015 – December 2015).
10. **ARMY RESEARCH LABORATORY through Stanford University's Army High Performance Computing Research Center– PI** *HPC Modeling and Simulation of Underbody Blast Parameter Estimation Problems*, start: January 1, 2015, end: December 31, 2015. Amount: \$275,000.
9. **ARMY RESEARCH LABORATORY through Stanford University's Army High Performance Computing Research Center– PI** *HPC Modeling and Simulation of Underbody Blast Parameter Estimation Problems*, start: January 1, 2014, end: December 31, 2014. Amount: \$250,000.
8. **NSF IUSE/PFE RED – Co-PI IUSE/PFE:RED: Toward a Model of Change for Preparing a New Generation for Professional Practice in Computer Science**. July 2016 – June 2021. Amount: \$4,992,592.
7. **Raytheon – Co-PI Virtual Geocaching – STEM Student Software Application: Geocaching from Space**. September 1 to August 31, 2013. Amount: \$36,000.00.
6. **ARMY RESEARCH LABORATORY through Stanford University's Army High Performance Computing Research Center– Co-PI** *HPC Modeling and Simulation of Underbody Blast Parameter Estimation Problems*, start: April 1, 2013, end: December 31, 2013. Amount: \$190,000.
5. **NSF Research on Gender – Co-PI Latinas in Computer Science and Engineering: A Qualitative**. September 15, 2012 – September 14, 2016 extended. Amount: \$524,960.00.
4. **American Association for the Advancement of Science WIRC MSIs – PI Predicting Experts' Decisions and Disagreements using Argumentation Networks and Soft Constraints**. November 2012 – October 2013. Amount: \$19,472.00.

3. **UTEP Inter-Disciplinary Research fund – Co-PI** *Research on Identity and Participation in Science, Technology, Engineering, & Science (STEM)-IDR*, The University of Texas at El Paso, February 1, 2012 - January 31, 2013. Amount: \$20,000.00.
2. **UTEP Inter-Disciplinary Research fund – Co-PI** *IDR1: Interdisciplinary Research Group on Decision Making and Judgment*, The University of Texas at El Paso, Spring 2012 – Spring 2013. Amount: \$5,000.00.
1. **NSF CCF 0953339 – PI CAREER: Symbolic-Numeric Constraint-Based Solutions for Real-World Scientific Problems**, 01/2010 to **12/2016**. Amount: \$564,650 + additional \$32,000 REU supplement (2010, 2011, 2012).

### 3.2.2 Pending Grants

2. **Department of Homeland Security – Co-PI**. With Heidi Taboada (PI UTEP). *Center of Excellence for Cross-Border Threat Screening and Supply Chain Defense (CBTS &SCD)*. 2018 – 2023.
1. **ARMY RESERACH LABORATORY – Co-PI**. Radhakrishnan Balu (ARL PI). *ARL Computational & Information Sciences Directorate, Competitive Basic Research Program, Risk analysis (UQ)*. Amount: \$285,000 (October 2017 – September 2018).

### 3.2.3 Declined Grants

11. **European COST Action – Co-PI**. With S. Bistarelli (PI, University of Perugia, Italy). COST Action Proposal OC-2017-1-22146. *Argumentation and Intelligent Decisions in the large<sup>E</sup>*.
10. **NSF MRI Program – Co-PI**. With T. Sarkodie-Gyan (PI UTEP). *MRI-Development: Development of an Intelligent Knowledge-based Condition-Monitoring System in Advanced Manufacturing*, Total amount: \$2,209,239 (September 2017 – August 2021).
9. **European COST Action – Co-PI**. With S. Bistarelli (PI, University of Perugia, Italy). COST Action Proposal OC-2016-2-21464. *Argumentation and Intelligent Decisions in the large<sup>E</sup>*.
8. **NSF IUSE/PFE RED – Co-PI** *IUSE/PFE:RED: Toward a Model of Change for Preparing a New Generation for Professional Practice in Computer Science*. July 2015 – June 2020. Amount: \$4,992,592.00.
7. **Google Innovation Program – PI**. *Generating Minimal Constrained t-wise Covering Test Suites*. Amount: \$94,506.36 (submitted in: 2015).
6. **NSF – Co-PI**. *The Problem- Based Learning in Engineering Network (PBL in EN G Net): Scaffolding Design Problem Solving in Engineering Education to Foster Active Engagement for Enduring Understanding Education*. September 15, 2014 – September 15, 2017.
5. **NCWIT NEXT Award on Recruitment and Retention of Women in CS – Co-PI** (Submitted in: 2014).

4. **NSF Expeditions in Computing – USC Subcontract PI at UTEP.** with S. Sen(PI, USC). *Risk Analytics for a Data-powered Smart Grid*. Amount: \$818,180. (submitted in: 2014).
3. **NSF ERC – U.Michigan Subcontract PI at UTEP.** with A. Cohn (PI, U. Michigan). *Engineering Research Center for Data-Driven Re-Engineering of the Emergency Medicine System (DREEMS)*.(submitted in: 2013).
2. **NSF REE – Co-PI.** With E. Mein (PI UTEP). *Retaining Hispanic Women in Engineering: An Examination of Social Networks, Identity Development, and Academic Success*, (submitted in: 2013).
1. **NSF Big Data Program – Co-PI.** with V. Kreinovich (PI UTEP). *BIGDATA: Mid-Scale: DCM: ESCE: DA: Quantum LEAP: Quantifying and Processing Heterogenous Uncertainty of Big Data: Methods and Algorithms that Enable Privacy* (submitted in: 2012).

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

Collaboration is very important for me: at the local level (with colleagues and students), national, and international levels. I yearn for collaborations as often as possible, as an opportunity to mentor (students), be mentored (by more senior colleagues or by colleagues outside of my discipline), and seek innovation. 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 also have a few strong collaborations on organizations of international workshops and scientific sessions at international conferences. Finally, there are other collaborations that have not yet borne either proposals or publications but that are very active. I am listing all of these in what follows.

#### 3.3.1 Co-authored Publications

All my publications were co-authored. Hereafter, I am listing the colleagues with whom I have co-authored articles. This list does not include students (publications with students will be listed in Subsection 3.4.3).

I co-authored articles with 5 international colleagues from 3 different institutions and countries, with 14 colleagues at the regional and national levels from 6 different institutions, and with 8 colleagues at UTEP from 7 different departments (3 colleges: Engineering, Science, and Education). Below is the list of all main non-students co-authors along with their affiliation and the number of publications co-authored.

| Co-author               | Affiliation   | # Publ. |
|-------------------------|---|---------|
| <b>International</b>    |   |         |
| Salem Benferhat         | University of Artois, France  | 2       |
| Stefano Bistarelli      | Dep. of Mathematics and Computer Science<br>University of Perugia, Italy                | 3       |
| Juan C. Figueroa Garcia | Universidad Distrital Francisco José de Caldas, Colombia                                | 2       |
| Luc Jaulin              | University of Bretagne Ouest, France  | 6       |
| Francesco Santini       | Dep. of Mathematics and Computer Science<br>University of Perugia, Italy                | 2       |
| <b>National</b>         |   |         |
| Carlos Castillo-Chavez  | Arizona State University  | 2       |
| Elaine Hampton          | STEM Educational Consultants  | 1       |
| Hung T. Nguyen          | New Mexico State University   | 2       |
| Christian Servin        | El Paso Community College   | 1       |
| Karen Villaverde        | New Mexico State University   | 1       |
| <b>UTEP</b>             |   |         |
| Miguel Argaez           | Department of Mathematical Sciences   | 3       |
| Alberto Esquinca        | Department of Teacher Education   | 1       |
| Juan Ferret             | Department of Philosophy  | 1       |
| Luciana Garbayo         | Department of Philosophy  | 1       |
| Olga Kosheleva          | Department of Teacher Education   | 21      |
| Vladik Kreinovich       | Computer Science Department   | 32      |
| Rodrigo Romero          | Electrical and Computer Engineering Department  | 1       |
| Craig Tweedie           | Department of Biological Sciences   | 3       |
| Elsa Villa              | Center for Education Research and Policy Studies  | 1       |
| Shamsnaz Virani         | <i>formerly:</i> Systems Engineering<br><i>now at:</i> Worcester Polytechnic University | 3       |

### 3.3.2 Joint Grant Proposals

I have also collaborated with colleagues on 23 of the 27 proposals I have submitted (12 of which were funded and 2 are still pending a decision). Below is the list of proposal collaborators (main PIs and co-PIs), along with their institution, the number of proposals written together that were funded (F), declined (D), or are still pending (P).

| <b>Collaborators</b>   | <b>Institutions</b>   | <b># Prop. and F/D/P</b> |
|------------------------|---|--------------------------|
| Miguel Argaez          | Dep. of Mathematical Sciences, <b>UTEP</b>                                      | 5 F                      |
| Rad Balu               | <b>ARL ALC Adelphi</b> , MD   | 1P                       |
| Stefano Bistarelli     | Dep. of Mathematics and Computer Science<br>University of <b>Perugia, Italy</b> | 2 D, 1 F                 |
| Amy Cohn               | <b>University of Michigan</b>   | 1 D                      |
| Christina Convertino   | Teacher Education Department, <b>UTEP</b>                                       | 1 D, 1 F                 |
| Scott Ferson           | <b>University of Liverpool</b> , UK   | 1D                       |
| Ann Gates              | Computer Science Department, <b>UTEP</b>  | 2 D, 1 F                 |
| Vladik Kreinovich      | Computer Science Department, <b>UTEP</b>  | 1D                       |
| Erika Mein             | Teacher Education Department, <b>UTEP</b>                                       | 1 D                      |
| Thompson Sarkodie-Gyan | Electrical and Computer Engineering Department, <b>UTEP</b>                     | 1 D, 1 P                 |
| Suvrajeet Sen          | <b>University of Southern California</b>  | 1 D                      |
| Heidi Taboada          | Indus., Manuf., and Sys. Engineering Dept., <b>UTEP</b>                         | 1P                       |
| Elsa Villa             | Center for Education Research and Policy Studies, <b>UTEP</b>                   | 2F, 2D                   |

### 3.3.3 Joint Meeting Organization

Since 2012, I have organized a number of scientific sessions, workshops, and conferences. All of these were based on collaborations. The main events I organized since 2012 have been: the Annual Meeting of the North American Fuzzy Information Processing Society (NAFIPS'16), the annual International Workshop on Constraint Programming and Decision Making (CoProD, in Novosibirsk – Russia 2012, at UTEP 2013, in Wurzburg – Germany 2014, at UTEP 2015, in Uppsala – Sweden 2016, and at UTEP 2017). Here is a list of the main efforts I have conducted, along with my main collaborators for these efforts.

| <b>Workshops/Conf./Sessions</b>    | <b>Collaborators</b>                                    | <b>Institutions</b>  |
|------------------------------------|---|--|
| NAFIPS'16                          | Vladik Kreinovich                                       | Computer Science Department, <b>UTEP</b>   |
| CoProD'12, '13, '14, '15, '16, '17 | Vladik Kreinovich                                       | Computer Science Department, <b>UTEP</b>   |
| ACM SAC KRR'17, '18                | Stefano Bistarelli<br>Francesco Santini<br>Eric Monfroy | Dep. of Mathematics and Computer Science<br>University of <b>Perugia, Italy</b><br>University of <b>Nantes, France</b> |

The proceedings of NAFIPS'16 were published and indexed by IEEE (<http://nafips.cs.utep.edu>). The proceedings for SAC KRR are to be published as the proceedings of the general conference ACM-SAC (<http://www.dmi.unipg.it/bista/organizing/KRsac2017/#organi> and <http://www.dmi.unipg.it/bista/organizing/KRRsac2018/>). The proceedings of CoProD are always provided at the meeting to all participants. However, extended versions of the work presented at CoProD have led to publishing two Springer books (see B1 and B2).

### 3.3.4 Other Collaborations

In addition to the above-mentioned collaborations, I have active collaborations with Luis Bravo and Simon Su from the **Army Research Laboratory at Aberdeen Proving Grounds** in Maryland. Our collaboration is concretizing in work that we are planning to present and publish, but it has just not been published yet.

## 3.4 Evidence of Involving Students

### 3.4.1 Students supported from extramural funding

Thanks to the funding I received but also through , I was able to support a number of students, ranging from undergraduate students to post-doctoral researchers. Below, I am highlighting the students I was able to support along with their major achievements in research.

- **Post-doctoral researchers (2):**

- **Reinaldo Sanchez Arias:** spring 2013 to summer 2014 – supported by **ARL AH-PCRC grant**.

Reinaldo contributed to Dr. Argaez and my work on reduced-order modeling using wavelets. In fall 2014, he was offered a position as an assistant professor of Mathematics at Wentworth Institute of Technology, Boston MA, and is now an assistant professor of Mathematics at St. Thomas University in Florida.

- **Horacio Florez:** fall 2015 to present – supported by **ARL AHPCRC grant**.

Horacio joined my research team at UTEP but is located at ARL ALC in Adelphi (MD) where he serves as a liaison with our collaborators from ARL. He works on reduced-order modeling and uncertainty quantification. Notable contributions of Horacio are as follows:

- Florez H.A. and Argaez M., 2016, “Applications and Comparison of Model-Order Reduction Methods based on Wavelets and POD”, in the Proceedings of NAFIPS 2016.

- Argaez M., Ceberio M., Florez H.A. and Mendez O., 2016, “A model reduction for highly non-linear problems using wavelets and Gauss-Newton method”, in the Proceedings of NAFIPS 2016.

- Florez H.A. and Ceberio M., 2016, “A Novel Mesh Generation Algorithm for Field-Level Coupled Flow and Geomechanics Simulations”, ARMA 16-305, 50th US Rock Mechanics / Geomechanics Symposium held in Houston, TX.

- Florez, H. A. and Ceberio, M. “Domain Decomposition Methods in Geomechanics”. 8th International Workshop on Constraint Programming and Decision Making (CoProD’2015), El Paso, Texas, Nov. 2015.

- **Ph.D. students (4):**

- **Luis Gutierrez:** fall 2013 to fall 2015 – supported by **NSF CAREER grant**.

Luis was a long-term student in my research group, who started as an undergraduate when he was only taking the Introduction to Computer Science course. Due to medical



issues, he had to drop out of the PhD program in the fall 2015. His contributions while a PhD student in my group are as follows:

Presentations:

- El Paso, Texas, UTEP Graduate Research Expo, November 7 2013: “A constraint-based model for generating t-wise test suites”.
- El Paso, Texas, 14th Joint UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, November 2 2013, Interval-Valued Probabilities to Interval-Valued Possibilities: Case Studies of Interval Computations under Constraints.
- San Antonio, Texas, SACNAS, October 3 - 6 2013, Constraint based model to generate t-wise test suites.
- El Paso, Texas, COURI Symposium, April 20 2013, Generating minimal t-wise constrained test suites.
- El Paso, Texas, 16th UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, November 3, 2014: Validated Solutions of ordinary differential equations and prediction of behavior (poster).
- SIAM Seminar on Bash Scripting, February 2014.
- El Paso, Texas, Bio-Informatics Symposium: “Interval-Valued Probabilities to Interval-Valued Possibilities: Case Studies of Interval Computation under Constraints”. Luis C. Gutierrez, Salem Benferhat, Martine Ceberio, Vladik Kreinovich, Rebekah Gruver, Marianna Pena, Matthew J. Rister, Abraham Saldana, John Vasquez, and Janelle Ybarra (poster). April 2014.
- El Paso, Texas, Bio-Informatics Symposium: INCaS a new constraint solving toolbox. Luis C. Gutierrez, John Vasquez, Martine Ceberio (poster). April 2014.

Articles in which he was a major author:

- Gutierrez, Luis, Salem Benferhat, Martine Ceberio, Vladik Kreinovich, Rebekah Gruver, Marianna Pena, Matthew J. Rister, Abraham Saldana, John Vasquez, and Janelle Ybarra. “Interval-Valued Probabilities to Interval-Valued Possibilities: Case Studies of Interval Computation under Constraints”, 14th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences (2013).
- Gutierrez, Luis C., Carlos Nieto, Francisco Zapata, and Martine Ceberio. “Constraint-based model to Generate twice Test Suites”, 2013 SACNAS National Conference (2013).
- Gutierrez, Luis C., Francisco Zapata, and Martine Ceberio. “Generating Minimal t-wise Constrained Test Suites”, COURI Symposium Abstracts Spring 2013 (2013).

- **Leobardo Valera:** fall 2014 to present – **supported by ARL AHPCRC grant and NSF CAREER grant.**

Leobardo has worked with me on integrating and quantifying uncertainty in our work on reduced-order modeling. He is set to defend his PhD dissertation in fall 2017. Below are some of his contributions:

Presentations, including posters:

- El Paso, Texas, 16th UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, Reduced-Order Modeling
- November 3, 2014: AHPCRC BootCamp, “Using Wavelet Transformations for Reduced-Order Modeling”, DoD, Santa Cruz, California.
- Leobardo Valera and Martine Ceberio. How to use Constraint Solving Techniques (ICST) to Predict Future Behaviors of Dynamic Problems. Army High Performance Computing Research Center (AHPCRC), Annual Technical Review Meeting Stanford University, Santa Cruz, CA USA. March 2016.

- Leobardo Valera and Martine Ceberio. Handling Uncertainty and Large Dimensions in Nonlinear Systems of Equations using Interval Constraint Solving Techniques (ICST). Army High Performance Computing Research Center (AHPCRC), Annual Technical Review Meeting Stanford University, Santa Cruz, CA USA. March 2016.
- Leobardo Valera, Martine Ceberio and Horacio Florez, Handling Uncertainty and Large Dimensions in Nonlinear Systems of Equations using Interval Constraint Solving Techniques. Army High Performance Computing Research Center, Research Management Boarding Meeting, Stanford, CA, January 2016.
- Handling Uncertainty and Large Dimensions in Nonlinear Systems of Equations using Interval Constraint Solving Techniques Army High-Performance Computing Research Center, Research Management Boarding Meeting, Stanford, CA, January 2016.
- Introduction to Pairwise Testing. Definition and Examples, 17th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences The University of Texas, November 2015.
- Validated Solutions of ordinary Differential Equations and Prediction of Behavior. 15th Joint UTEP/NMSU Workshop on Mathematics, Computer Science and Computational Sciences The University of Texas. November 2014.
- Using Wavelet Transformations for Reduced-Order Modeling. Army High Performance Computing Research Center (AHPCRC), Annual Technical Review Meeting Stanford University, Santa Cruz, CA USA. August 2014.
- Leobardo Valera and Martine Ceberio. “Interval Constraint Solving Techniques and Model-Order Reduction to Enhance the Solution of Dynamic Systems”. INFORMS Annual Meeting. Nashville 2016.
- Leobardo Valera, Martine Ceberio. Interval Constraint Solving Techniques and Model-Order Reduction to Enhance the Solution of Dynamic Systems. 19th Joint NMSU/UTEP Workshop on Mathematics, Computer Science, and Computational Sciences. El Paso, TX, November 2016.
- Leobardo Valera and Martine Ceberio. Large Numerical Simulations: Needs, Challenges, Current Solutions How can Interval Computations help? NAFIPS 2016.
- Leobardo Valera, Martine Ceberio. Reduced Interval Newton Method, 18th Joint UTEP/NMSU Workshop on Mathematics, Computer Science and Computational Sciences, New Mexico State University, Las Cruces, New Mexico, March 2016.
- Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction, Constraint Programming and Decision Making (COPROD 2015), The University of Texas El Paso, November 2015.
- Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction, 18th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences The University of Texas, November 2015.
- Using Regularization to Improve the Rate of Convergence in a Model-Order Reduction (MOR) Problem. Presented at the 22nd International Symposium on Mathematical Programming. Pittsburg, Pennsylvania, ISMP’2015, July 2015.
- Using Regularization to Improve the Rate of Convergence in a Model-Order Reduction (MOR) Problem. The 17th Joint NMSU/UTEP Workshop on Mathematics, Computer Science, and Computational Sciences. New Mexico State University, Las Cruces, New Mexico, April 11, 2015.
- Model-Order Reduction Using Cubic Spline Curve-Fitting. UTEP Graduate Student Expo. The University of Texas at El Paso, November 2014.
- Model-Order Reduction Using Cubic Spline Curve-Fitting. 15th Joint UTEP/NMSU

Workshop on Mathematics, Computer Science, and Computational Sciences. The University of Texas at El Paso, November 2014.

Honors and Awards:

Graduate Award for Academic and Research Excellence in Computational Science. UTEP

Banner Bearer at UTEP's Winter 2015 Commencement (No academic, probably it should be deleted)

Outstanding Paper Award. Joint Annual Conference of the North American Fuzzy Information processing Society NAFIPS'2015 and 5th World Conference on Soft Computing. For the paper: Martine Ceberio, Leobardo Valera, Olga Kosheleva, and Rodrigo Romero Model reduction: why it is possible and how it can potentially help to control swarms of Unmanned Aerial Vehicles (UAVs), Joint Annual Conference of the North American Fuzzy Information processing Society NAFIPS'2015 and 5th World Conference on Soft Computing, Redmond, Washington, August 17-19, 2015.

Outstanding Paper Award. Joint Annual Conference of the North American Fuzzy Information processing Society NAFIPS'2015 and 5th World Conference on Soft Computing. For the paper: Francisco Zapata, Octavio Lerma, Leobardo Valera. How to speed up software migration and modernization, Joint Annual Conference of the North American Fuzzy Information processing Society NAFIPS'2015 and 5th World Conference on Soft Computing, Redmond, Washington, August 17-19, 2015.

17/ Scholarship to attend the ACW conference.

Leo is about to graduate, in fall 2017.

- **Angel Garcia Contreras:** spring 2015 to present – supported by **NSF CAREER grant & STEM Accelerator program.**

Angel previously worked with me on his Master's thesis (see below). As a PhD student, he is focused on optimization techniques to handle dynamic systems with uncertainty. Below are some of his main contributions:

Presentations:

Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction, Constraint Programming and Decision Making (COPROD 2015), The University of Texas El Paso, November 2015.

Global Optimization via Speculation. Constraint Programming and Decision Making (COPROD 2015), The University of Texas El Paso, November 2015.

El Paso, Texas, 18th Joint UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, November 2015, Insights into using continuous constrained optimization methods to solve black box mixed integer problems.

Comparison of Strategies for Solving Global Optimization Problems Using Speculation and Interval Computations. NAFIPS 2016.

Global Optimization via Speculation. UTEP NMSU Workshop Spring 2016.

Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction, Constraint Programming and Decision Making (COPROD 2015), The University of Texas El Paso, November 2015.

El Paso, Texas, 18th Joint UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science, November 2015, Insights into using continuous constrained optimization methods to solve black box mixed integer problems.

Additional notable experience:

Taught a programming course at Stanford's Army High-Performance Computing Re-

search Center Summer Institute in summer 2015 and summer 2016.

- **Omeiza Olumoye:** summer to fall 2015 – supported by **NSF CAREER grant**.  
Omeiza is not one of my PhD students. However, I am part of his PhD committee and in 2015, he joined my research team to contribute to our work on optimization and intervals.

Presentation:

□ Poster on Interval Newton Methods, 17th Joint UTEP/NMSU Workshop on Mathematics, Computer Science, and Computational Sciences The University of Texas, November 2015.

- **Master’s students (6):**

- **Joel Henderson:** fall 2011 to summer 2014 – supported by **AAAS grant**.  
Joel completed his thesis on the topic of Multi-Criteria Multi-Agents Decision Making using Argumentation Frameworks. During his work with me on this topic, he presented his work at the following international conference: Numerical Computations: Theory and Algorithms International Conference, June 2013, in Italy. He now works at ARL White Sands.

- **Angel Garcia Contreras:** fall 2011 to fall 2014 – supported by **NSF CAREER grant**.

Before to enroll in the Ph.D. program, Angel completed his Master’s thesis with me. His work was in optimization using speculations. During his Master’s work, he presented at the following article: Garcia Contreras, A. F., Wang, X., Ceberio M., Bixler R., Gutierrez L., “Interval Optimization to Predict Software Quality Assessment Decisions”, at INFORMS OS’2012. He also presented several times at the UTEP/NMSU workshop. In particular he presented at the 14th Joint UTEP/NMSU Workshop on mathematics Computer Science, and Computational Science (November 2013): “Insights into using continuous constrained optimization methods to solve black box mixed integer problems”. Along with Joel Henderson (Master’s student), he also presented at SACNAS, October 3-6, 2013. In summer 2013, he worked with Patty Hough at Sandia National Lab in Livermore on thei DAKOTA project.  
internship at SANDIA Livermore in summer 2013.

- **Hima Kondepati:** fall 2014 – supported by **NSF CAREER grant**.  
Hima joined my lab in fall 2014 as a new student to our program and looking for a topic. She was interested in optimization and I trained her in fall 2014 on this topic and on research methods. By the end of fall 2014, she had decided that she wanted to switch programs to follow more IT-oriented track, without research.

- **Troy McGarity:** summer 2015 to spring 2016, **Rebekah Gruver:** fall 2015, and **Salah Atiyeh:** fall 2015 – supported by **NSF CAREER grant**.

These three students in the Master’s of Software Engineering at UTEP contributed to my work on optimization and constraint solving by building a website (NumConSol) that allows to use the solver developed by my research students, hence allowing for broader dissemination. They also packaged our solver as standalone executables, tailored for

Windows and Mac. They all graduated and are now working, respectively at HP, Go-Daddy, and Exxon Mobil.

- **Under-graduate students (4):** The following undergraduate students were supported by funds external to UTEP.
  - **Cristian Ayub:** summer 2017 – supported by CAHSI (Computing Alliance for Hispanic-Serving Institutions).
  - **John Vasquez:** fall 2013 and spring 2014 – supported by NSF CAREER grant.
  - **Jesus Padilla:** summer 2017 – supported by CAHSI (Computing Alliance for Hispanic-Serving Institutions).
  - **Jason Holt:** fall 2014 – supported by NSF CAREER grant.

### 3.4.2 Students involved in research but not supported from extramural funding

In addition to the above-mentioned students, who were supported by extramural funding, I worked with the following students, who were either funded by jobs they already had or by scholarships, which they obtained to fund their work with me.

- **Ph.D. students (4):**
  1. **Paula Gonzalez Parra:** defended her Ph.D. in Computational Sciences in fall 2012. She worked on estimating best decisions to slow down and stop epidemics. She is now a professor of Mathematics at the University of Cali, Colombia.
  2. **Xiaojing Wang:** fall 2009 to spring 2013. Xiaojing worked on Multi-Criteria Decision Making using fuzzy measures. She supported herself with her job on campus, which she still holds, as a research associate at our Center for Institutional Evaluation, Research, and Planning (CIERP). She graduated in spring 2013 and obtained a Ph.D. in Computer Science.
  3. **Imran Abdullah:** joined my research lab in summer 2017. He is a Computational Sciences Ph.D. student and is currently supported by this program on campus. He is starting to work on predictions for large dynamical systems.
  4. **Francisco Zapata:** was a Ph.D. student of Vladik Kreinovich who joined my lab during a year prior to his graduation. He contributed to our work on pair-wise testing.
- **Under-graduate students (22):**
  1. **Luis Gutierrez:** spring 2010 to summer 2013. Luis joined my research team in spring 2010 as he was starting his B.S. degree studies at UTEP. As an undergraduate student, he worked on a variety of problems during his almost 4 years in my team as an undergrad. He attended a summer school on constraint programming and logic at the University of Perugia, Italy, in summer 2013. He presented at many local and regional symposium, as well as at a couple on international venues. He was supported by COURI starting in fall 2011 and until the end of his undergraduate studies.
  2. **Enrique Martinez:** spring 2014 to fall 2014. As a musician, Enrique worked on constraints and music. He left my group when he graduated.

3. **Luis Alcantar:** fall 2014 to fall 2015. Luis was supported by COURI in summer 2015. He left my group shortly in spring 2016.
4. **Cristian Ayub:** since spring 2015. In addition to being supported by CAHSI (see above), he was supported every semester by either a scholarship of UTEP's Campus Office for Undergraduate Research Initiative (COURI) or by UTEP's Louis Stokes Alliance for Minority Participation (LSAMP – summer 2016). Until summer 2017, he worked on combinatorial testing using constraint programming. While working on this topic, he led a team of undergraduate research students in a NSF-funded COURI program called UTEP Lens of the Market: during this 6-month-long program, he and his peers worked on the marketability of their work on combinatorial testing and its applicability to real-world industry problems, such as transistor design. Since summer 2017, he has been studying quantum mechanics to identify ways to solve them using our team's tools for dynamic systems. Over his years in my team, he has presented several times (at least twice a year: at the COURI annual symposium and at the UTEP/NMSU workshop).
5. **Gabriel Max Felix:** summer 2015 to summer 2017. During his time in my team, Max was a very active student who worked on combinatorial testing. he was part of the team led by Cristian Ayub working on the Lens-of-the-Market project. He stopped attending regularly because of the constraints of his job on campus.
6. **Elsa Gonzalez:** fall 2015 to summer 2016. She was involved in the early work of Cristian Ayub on combinatorial testing.
7. **Raul Mena:** fall 2015 to summer 2016. He was involved in the early work of Cristian Ayub on combinatorial testing. Raul changed majors to Business and left our group in fall 2017.
8. **Miguel Zamudio:** since spring 2016. Miguel was part of the team led by Cristian Ayub working on the Lens-of-the-Market project. He is now moving to doing research on Machine Learning with Olac Fuentes, but is still participating in my lab.
9. **Phillip Hassoun:** since spring 2016. Phillip was selected to participate in Stanford's AHPCRC Summer Institute for undergraduates in 2016. He has worked on a variety of problems since joining my research team. Lately, he has been instrumental in porting our algorithms to a mobile device to demonstrate their ability to run on limited computational resources.
10. **Enrique Salcido:** since fall 2016. Enrique joined my research group as a member of the Lens-of-the-Market participant, in the team led by Cristian Ayub. He is a Math student and needed a team to participate in this program. After the end of the program, he asked to remain a member of my research group and has contributed to our work on optimization.
11. **Joseph Gutierrez:** since fall 2016. Joseph was originally a Mechanical Engineering student but he later (in spring 2017) changed his major to computer science. He worked in my team on robust optimization and was supported by COURI in summer 2017.
12. **Daniel Villa:** since spring 2017. Daniel was selected to participate in Stanford's AHPCRC Summer Institute for undergraduates in 2017. item **Jorge Quinones:** since fall 2017. Jorge is currently studying our work on dynamical systems.
13. **Jesus Padilla:** since spring 2017. Jesus has worked on dynamic systems. In summer 2017, he worked on time uncertainty and dynamic systems' behavior prediction. He is now implementing an interval constraint solver from scratch to be used on a mobile device.

14. **Sairy Cohen:** spring 2017. Sairy joined my research group in spring 2017. She was very active in her work on visualization of our numerical results and implementation of optimization techniques. She left in summer 2017 to participate in a summer internship and has been busy since then.
15. **Alexa Cortes:** spring 2017. Alexa is a mechanical engineering student. She joined my group in spring 2017 but is no longer a member as she found it hard to combine with the constraints of her academic schedule.
16. **Stephanie Figueroa:** spring 2017. Stephanie joined my group in spring 2017. She is no longer a member as it was hard for her to combine taking classes, having a job on campus, and attending to research as well.
17. **Samuel Tinevra:** spring 2017. Samuel joined my group in spring 2017. He left in fall 2017 as he got a job off campus and finds it hard to combine his academic and professional constraints.
18. **Ricardo Alvarez Lopez:** since fall 2017. Ricardo is currently studying our work on dynamical systems.
19. **Jorge Quinonez:** since fall 2017. Jorge is currently studying our work on dynamical systems.
20. **Noemi Hernandez:** since fall 2017. Noemi actually is a former NEXUS high-school student intern in my lab. She spent summer 2017 in my lab as a high-school student and decided to join my team in the fall when she started her studies at UTEP. Noemi is currently working very actively with Ricardo and Jorge on our team's efforts on solving dynamic systems.

In addition to my "own research students", I also mentored students for whom I served as a committee member. The list of such students for the period starting in 2012 is as follows:

- **Chanel Perez**, fall 2014, in Geology at UTEP, work directed by Aaron Velasco;
- **Omeiza Olumoye**, since 2015 (expected graduation date: fall 2018), in Electrical and Computer Engineering at UTEP, directed by Thompson Sarkodie-Gyan;
- **Anastasia Volkova**, since fall 2016, graduated in fall 2017, in Computer Science at the University of Pierre and Marie Curie, France, directed by Christoph Lauter, Thibault Hilaire, and Jean-Claude Bajard;
- **Leticia Miranda Mojica**, since spring 2017, in Leadership Engineering at UTEP, directed by Meagan Kendall;
- **Nancy Avila**, since fall 2017, in Electrical and Computer Engineering at UTEP, directed by Homer Nazeran;
- **Esthela Gallardo**, since spring 2017, defended her proposal in summer 2017 (expected graduation date: Fall 2018), in Computer Science at UTEP, directed by Patricia Teller;
- **Paden Portillo** and **Oscar Chavez**, graduated in fall 2012, in Software Engineering (Master's).

I have also mentored visiting master's students from France:

- **Quentin Brefort** (spring and summer 2015) from ENSTA, France, directed by Luc Jaulin; and
- **Anthony Welte** (summer 2016) from ENSTA, France, directed by Luc Jaulin.

Finally, each summer, I have mentored high-school students who spent the summer as interns in my lab, not only learning how to code but also learning about our research and participating in our research via testing. In total, I have mentored about 20 high-school students in summer.

So in total, since 2012, I have worked closely with:

- **2 post-doctoral** researchers;
- **13 Ph.D. students:** 6 whom I directly advised, 2 of whom graduated and another one is about to (fall 2017); 1 whom I advised while he had joined my research team but whose actual advisor was Vladik Kreinovich; and another 6 Ph.D. students for whom I served as a committee member;
- **10 Master’s students:** 6 whom I directly advised, 5 of whom graduated; and another 2 whom I advised during their visit at UTEP (international visiting students) and 2 for whom I served as a committee member;
- **22 undergraduate students;** and
- about **20 high-school students.**

### 3.4.3 Articles co-authored with students

Many of my articles are co-authored with students. Below, I am listing the articles I co-authored with students of mine or with students that I was mentoring closely. The numbering is the same as appears on my CV.

- Ch22 Stefano Bistarelli, Martine Ceberio, Joel Henderson, Francisco Santini, Luciana Garbayo, “Abstract Argumentation Frameworks to Promote Fairness and Rationality in Multi-Experts Multi-Criteria Decision Making”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making: Theory and Applications**, Springer Verlag, Berlin, Heidelberg, pp. 7–20, 2017.
- Ch12 Aline Jaimes, Craig Tweedie, 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 and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 61-66.
- Ch8 Paden Portillo, Martine Ceberio, and Vladik Kreinovich, “Towards an Efficient Bisection of Ellipsoids”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 137-142.
- Ch7 Uram Anibal Sosa Aguirre, Martine Ceberio, and Vladik Kreinovich, “Why Curvature in L-Curve: Combining Soft Constraints”, In: Martine Ceberio and Vladik Kreinovich (eds.), **Constraint Programming and Decision Making**, Springer Verlag, Berlin, Heidelberg, 2014, pp. 175-180.



- Ch6 Christian Servin, Martine Ceberio, Aline Jaimes, Craig Tweedie, and Vladik Kreinovich, “How to Describe and Propagate Uncertainty When Processing Time Series: Metrological and Computational Challenges, with Potential Applications to Environmental Studies”, In: Shyi-Ming Chen and and Witold Pedrycz (eds.), **Time Series Analysis, Modeling and Applications: A Computational Intelligence Perspective**, Springer Verlag, 2013, pp. 279-299.
- J25 Leobardo Valera and Martine Ceberio, “Model-Order Reduction Using Interval Constraint Solving Techniques”, **Journal of Uncertain Systems**, 2017, Vol. 11, No. 2, pp. 84–103.
- J24 Anthony Welte, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Avoiding Fake Boundaries in Set Interval Computing”, **Journal of Uncertain Systems**, 2017, Vol. 11, No. 2, pp. 137-148.
- J23 Anthony Welte, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Computability of the Avoidance Set and of the Set-Valued Identification Problem”, **Journal of Uncertain Systems**, 2017, Vol. 11, No. 2, pp. 129-136.
- J22 Vladik Kreinovich, Martine Ceberio, and Quentin Brefort, “In category of sets and relations, it is possible to describe functions in purely category terms”, **Eurasian Mathematical Journal**, 2015, Vol. 6, No. 2, pp. 90-94.
- J21 Quentin Brefort, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Towards Fast and Reliable Localization of an Underwater Object: An Interval Approach”, **Journal of Uncertain Systems**, 2015, Vol. 9, No. 2, pp. 95-102.
- J18 Xiaojing Wang, Martine Ceberio, Shamsnaz Virani, Angel Garcia, and Jeremy Cummins. “A Hybrid Algorithm to Extract Fuzzy Measures for Software Quality Assessment”. **Journal of Uncertain Systems**, 2013.
- J17 Vladik Kreinovich, Christelle Jacob, Didier Dubois, Janette Cardoso, Martine Ceberio (2012). “Failure Analysis of a Complex System Based on Partial Information about Subsystems, with Potential Applications to Aircraft Maintenance”. **Journal of Applied and Computational Mathematics**, 11(2), 165-179.
- J16 Aline Jaimes, Craig Tweedie, Vladik Kreinovich, and Martine Ceberio, “Scale-Invariant Approach to Multi-Criterion Optimization under Uncertainty, with Applications to Optimal Sensor Placement, in Particular, to Sensor Placement in Environmental Research”, **International Journal of Reliability and Safety**, 2012, Vol. 6, No. 1-3, pp. 188-203.
- C53 Leobardo Valera, Angel Garcia, Afshin Gholamy, and Martine Ceberio, “Towards Predictions of Large Dynamic Systems’ Behavior using Reduced-Order Modeling and Interval Computations”, to be published in the proceedings of the **IEEE International Conference on Systems, Man, and Cybernetics (IEEE SMC 2017)**.
- C52 Leobardo Valera, Angel Garcia, and Martine Ceberio, “On-the-Fly Parameter Identification for Dynamic Systems Control, Using Interval Computations and Reduced-Order Modeling”. To be published in the proceedings of the **North American Fuzzy Information Processing Society Annual Conference 2017 (NAFIPS 2017)**.

- C51 Anthony Welte, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “Robust Data Processing in the Presence of Uncertainty and Outliers: Case of Localization Problems”, In the Proceedings of the **IEEE Series of Symposia in Computational Intelligence SSCI’2016**, Athens, Greece, December 6-9, 2016.
- C50 Leobardo Valera, Martine Ceberio, “Using Interval Constraint Solving Techniques to Better Understand and Predict Future Behaviors of Dynamic Problems”. In the proceedings of the **North American Fuzzy Information Processing Society Annual Conference, NAFIPS’2016**.
- C49 Angel F. Garcia Contreras, Martine ceberio, “Comparison of Strategies for Solving Global Optimization Problems Using Speculation and Interval Computations”. In the proceedings of the **North American Fuzzy Information Processing Society Annual Conference, NAFIPS’2016**.
- C48 Horacio Florez and Martine Ceberio (2016). “A Novel Mesh Generation Algorithm for Field-Level Coupled Flow and Geomechanics Simulations”. In the Proceedings of **ARMA 16-305, 50th US Rock Mechanics / Geomechanics** Symposium held in Houston, TX.
- C47 Stefano Bistarelli, Martine Ceberio, Joel Henderson, Franceco Santini, “Using Argumentation Frameworks to promote Fairness and Rationality in Multi-Experts Multi-Criteria Decision Making”, in the Proceedings of the **2015 Italian Conference in Theoretical Computer Science**, 2015.
- C46 Esquinca, A., Villa, E. Y., Hampton, E. M., Ceberio, M. C., Wandermurem, L. S., (2015). “Latinas’ resilience and persistence in computer science and engineering: Preliminary findings of a qualitative study examining identity and agency.” Proceedings of the 2015 **Frontiers in Education**.
- C43 Quentin Brefort, Luc Jaulin, Martine Ceberio, and Vladik Kreinovich, “If We Take Into Account that Constraints Are Soft, Then Processing Constraints Becomes Algorithmically Solvable”, Proceedings of the **IEEE Symposium on Computational Intelligence for Engineering Solutions CIES’2014**, Orlando, Florida, December 9-12, 2014, pp. 1-10.
- C42 Martine Ceberio, Leobardo Valera, Olga Kosheleva, and Rodrigo Romero. “Model Reduction: Why It Is Possible and How It Can Potentially Help to Control Swarms of Unmanned Aerial Vehicles”. In the Proceedings of the **North American Fuzzy Information Processing Society Annual Conference, NAFIPS’2015**.
- C41 Brefort, Q., Jaulin, L., Ceberio, M. C., Kreinovich, V. Y., (2014). “If We Take Into Account that Constraints Are Soft, Then Processing Constraints Becomes Algorithmically Solvable”. (pp. 1-10). Proceedings of the **IEEE Symposium on Computational Intelligence for Engineering Solutions**, Orlando, Florida SSCI’2014, December 9-12, 2014.
- C39 Paula A. Gonzalez-Parra, Martine Ceberio, Sunmi Lee, Carlos Castillo-Chavez. “Optimal Control for a Discrete Time Influenza Model”. In the proceedings of the **Second Colombian Congress of Computational Biology and Bioinformatics (CCBCOL 2013)**.
- C38 X. Wang, M. Ceberio, A. Garcia. “Towards Fuzzy Method for Estimating Prediction Accuracy for Discrete Inputs, with Application to Predicting At-Risk Students”. Proceedings of the **Annual Conference of North American Fuzzy Information Processing Society (NAFIPS’2013)**, Alberta, Canada, June 2013.

- C37 X. Wang, M. Ceberio, S. Virani, C. Del Hoyo, and L. Gutierrez. “Fuzzy measure extraction for software quality assessment as a multi-criteria decision-making problem”. Proceedings of the **2012 International Conference on Software Engineering Research and Practice**, Las Vegas, NV, July 2012.
- C36 X. Wang, A. F. Garcia Contreras, M. Ceberio, C. Del Hoyo, L. C. Gutierrez, and S. Virani. “Interval-based algorithms to extract fuzzy measures for software quality assessment”. Proceedings of the **Annual Conference of North American Fuzzy Information Processing Society (NAFIPS’2012)**, Berkeley, CA, August 2012.
- C35 Xiaojing Wang, Angel Garcia Contreras, Martine Ceberio, Christian Del Hoyo, Luis Gutierrez, “A Speculative Algorithm to Extract Fuzzy Measures from Sample Data”, Proceedings of the **2012 annual international conference of Fuzz-IEEE (FuzzIEEE’12)**.
- W10 Leobardo Valera, Martine Ceberio, “Model-Order Reduction Using Interval Constraint Solving Techniques.” Proceedings of the **7th International Workshop on Reliable Engineering Computing (REC2016)**. June 15-17, 2016, Ruhr University Bochum, Germany.
- W9 Luis Gutierrez, Martine Ceberio, Vladik Kreinovich, Rebekah L. Gruver, Marianna Pena, Matthew J. Rister, Abraham Saldana, John Vasquez, Janelle Ybarra, and Salem Benferhat, “From Interval-Valued Probabilities to Interval-Valued Possibilities: Case Studies of Interval Computation under Constraints”, Proceedings of the **6th International Workshop on Reliable Engineering Computing REC’2014**, Chicago, Illinois, May 25-28, 2014.
- A39 Angel F. Garcia Contreras, Martine Ceberio, and Vladik Kreinovich, “Plans Are Worthless but Planning Is Everything: A Theoretical Explanation of Eisenhower’s Observation”, in the Proceedings of the **10th International Workshop on Constraint Programming and Decision Making CoProd’2017**, El Paso, Texas, November 3, 2017, to appear.
- A38 Angel F. Garcia Contreras, Martine Ceberio, and Vladik Kreinovich, “Why Convex Optimization Is Ubiquitous and Why Pessimism Is Widely Spread”, Proceedings of the **10th International Workshop on Constraint Programming and Decision Making CoProd’2017**, El Paso, Texas, November 3, 2017, to appear.
- A36 Leobardo Valera, Martine Ceberio, “Introduction to Pairwise Testing. Definition and Examples”. **47th Southeastern International Conference on Combinatorics, Graph Theory Computing** (2016).
- A35 Leobardo Valera, Martine Ceberio, “Interval Constraint Solving Techniques and Model-Order Reduction to Enhance the Solution of Dynamic Systems”. **2016 INFORMS Annual Meeting**.
- A28 Leobardo Valera, Martine Ceberio, “Using Interval Constraint Solving Techniques in Dynamic Systems Behavior Prediction”. **8th International Workshop on Constraint Programming and Decision Making**, El Paso, Nov. 2015.
- A27 Martine Ceberio, Miguel Argaez, Luis Gutierrez, Leobardo Valera. “Using Interval Constraint Solving Techniques to Solve Dynamical Systems”. **CORS/INFORMS 2015 Meeting**, Montreal, June 2015.
- A26 Miguel Argaez, Martine Ceberio, Leobardo Valera. “A Model Order Reduction for Solving Large-Scale Square Nonlinear Systems of Equations”. **CORS/INFORMS 2015 Meeting**, Montreal, June 2015.

- A25 Leobardo Valera, Martine Ceberio. “Using Regularization to Improve the Rate of Convergence in a Model-Order Reduction (MOR) Problem”. **22th International Symposium on Mathematical Programming**. Pittsburg, Pennsylvania, ISMP’2015, July 2015.
- A17 Paula Gonzalez-Parra, Martine Ceberio, and Carlos Castillo Chavez. “Interior-Point Methods for a Multi-Group Discrete-Time Influenza Model”. Presented at the **Mathematical Congress of the Americas 2013**, August 2013.
- A16 Joel Henderson, Stefano Bistarelli, Martine Ceberio (2013). “Multi-Experts Multi-Criteria Decision Making”, In the Proceedings of **Numerical Computations: Theory and Algorithms International Conference**, Italy, June 2013.

#### 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: C53, C50, C49, C48, C47, C42, C39, C38, C37, C36, C35, A39, A38, A36, A35, A28, A25.

In addition to 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 (held twice a year either at UTEP or at NMSU – New Mexico State University). 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 major helpers at NAFIPS’2016 and all students in my lab usually help every other year when the workshop CoProD is held at UTEP.

**Part III**

**Service**

## 4.1 Overview

As I mentioned in my statement of philosophy, I see service as a crucial element of my work. I believe that service is necessary to support efforts in teaching and research. Service is also an essential component of being a professional: being an active and responsible citizen of my work place and research community. I seek to serve the university population: faculty and students, as well as researchers in my community, and my local community, as best as I can. I therefore dedicate to it a significant portion of my time and I seek, through my service, to implement the access and excellence mission of UTEP through a range of activities.

Since 2012, I have been active at all of these levels. I have participated in the governance of my institution, from the department's level to the UT system level (through my involvement in the Faculty Senate as Vice-President). In my research community, I have organized a major international conference and annual workshops with my colleague Vladik Kreinovich: NAFIPS'2016, CoProD'12 to '17, and with colleagues in Europe, S. Bistarelli, F. Santini, E. Monfroy, ACM SAC KRR'2018. I am also part of many program committees and I have reviewed for a number of journals, books, NSF panels, and other conferences as described further in this document. I became NAFIPS' president elect in January 2017. In my local community, I have been very active as advisory board member, speaker, open house host, judge, and mentor to high-school students with interest in computing.

At the local level (university and local community), I have put a special emphasis of my service on the recruitment and retention of students in computer science, and in particular, in broadening participation in computer science to under-represented minorities, with a special focus on women. My recruitment efforts are best illustrated by my involvement in outreach activities and programs, such as NCWIT Aspirations in Computing and the design of an Excites Summer Camp at UTEP. My retention efforts include the creation of a problem-solving club for entering CS students, but also my work on redesigning our UG program's introductory course to computer science, sponsored by Google and then by UTEP's STEM Accelerator program. Recently, our department, led by Ann Gates, received an NSF RED grant to reinvent our department into one that is more inclusive and promotes diversity and excellence. Through this project, I have invested a lot of my time and efforts in particular in the design of a new course on problem-solving, in collaboration with Google, based on my previous experience of a problem-solving club for entering students and a summer class on the same topic.

Through all the above activities, I always seek access and excellence: reaching out to as many as possible, impacting as many as possible, contributing to high-impact endeavors, seeking activities that broaden access to excellence for our students and our community, while maintaining a high-quality work and mentoring students to reach excellence.

## 4.2 Highlights of Service Leadership and Impact

Service being for me a pillar of effective teaching and research, in what follow, I illustrate my service on what was my main focus since 2012 on service to teaching and service to research: namely, my outreach efforts to increase the visibility of Computer Science and therefore our enrollment, my efforts on the recruitment and retention of women in Computer Science, and my service to my research community via conference organizations.

### 4.2.1 Broadening the Participation in CS: Recruitment Efforts

Sharing my passion about computer science is almost a hobby. So I am always happy to go out in the community and spread a good word or two about computer science, entice young students to consider activities in computing, and to show teachers how they can embed computational thinking and activities in their subject matter, even in social studies for instance.

As a result, I try to be very active locally, to build relationship with schools. For instance, I am happy to attend local events such as science fairs as it is an opportunity to see what young students are interested in, to talk to them, and to interact with their teachers as well. This makes it easier to then organize presentations and invite these schools to UTEP for a tour of our department including a lot of hands-on activities. In fact, I make it a requirement for any student joining my research group, to be active in outreach activities that the group takes on. Over the past two years only, my group, in collaboration with ACM-W (which I advise) and the College of Engineering's student ambassadors (headed by Gabby Gandara) have successfully hosted 6 day-long schools visits to our department filled with activities such as fun intro to programming, cryptography, robotics, etc. We also held an hour of code event at a local elementary and middle school in December 2016, reaching out to about 200 students.

Making sure that my outreach activities are sustainable is very important: I am lucky to have very enthusiastic students, in addition to my research group, at our local ACM-W chapter (that I advise), who made outreach the main mission of their chapter. They applied to and were granted two Google IgniteCS grants to support their outreach efforts at a local middle school and a local high school. Through these programs alone, they were able to reach out to about 200 young students and expose them to computer science.

I believe that outreach is complete only when you also take teachers into account. If teachers are convinced about the value of computational thinking and computing, and they have ways to integrate these in their classroom, many more things can be achieved than when we, as university faculty, go once in while to talk to students. For this reason, I seized the opportunity to give a webinar to all teachers from a school district of the El Paso area (Ysleta) about ways to integrate computing and computational thinking in their classrooms. This presentation was informed by my prior collaboration with a language teacher. We integrated coding in her classroom, with the help of my research group students: we had the students (several times over a few semesters) implement a video in the scratch programming language, whose audio and written content was in the foreign language taught in this class. With no prior knowledge of programming and with little help from my students, the high-school students were able to put together very nice videos and left the experience with the confidence that computer science was at their reach. I continued my effort with teachers by presenting similar content at an annual regional conference for teachers in 2014 and 2015. I plan to continue similar efforts. My efforts to reach out to teachers is complemented by my involvement in the NCWIT Aspirations in Computing, which is a program not only reaching out to young high-school women but also to their teachers, one of whom is selected as educator of the year locally and nationally.

### 4.2.2 Broadening the Participation of Women in CS

My CS recruitment efforts are doubled by my efforts to broaden the participation in Computer Science to Women. This is another passion of mine: I do not seek to attract all women to computer science, but I regret that computer science is often not offered to women and/or discarded as an

unattainable area for them. The results of this situation are expressed by a low number of women graduating with a degree in computer science (about 15%). I aim to change the conversation about computer science and show young women what it truly is and what they can do, if they were to elect or even just consider this area for a career. However, once women elect Computer Science as a major, keeping them in the major is also a challenge and part of my service efforts are also geared towards their retention. In what follows, I go over my work in the recruitment and retention of women in CS.

## **Recruitment of Women in CS**

The recruiting efforts mentioned above also serve the purpose of informing women about computer science and changing the narrative about what they can, should, or cannot, should not choose as a career. However, in addition to the recruiting activities I mentioned before, I also lead efforts that are specifically (or mainly) targeted to women.

This is the case of the efforts of ACM-W through their Google IgniteCS funding. Although their work is open and addressed to all students of the classes they visit, their effort and the narrative they use is targeted towards women, gearing to addressing common biases and misconceptions. They also started a computing program for girl scouts. In addition, I catch any opportunity to talk to young women to inform them about CS. In fall 2016 (not in fall 2017 because I was out of town), during E-week at UTEP when high-school students were visiting UTEP everyday, I was able to talk to all the young women (and only women) in these groups, once a day during lunch. It was a great opportunity to reach out to about 100 young women in a week. This allowed me, in addition to presenting CS to these students, to promote a program I have led locally for the last 7 years: the NCWIT Aspirations in Computing program (AiC). This program aims to identify and recognize young women in high school who have interest in computing. Research shows that such students, even with interest in computing, are at a high risk of given up on their interest during their high-school years. NCWIT AiC makes sure that 1/ they get “patted in the back” for their interest, 2/ they realize that they are not alone (they meet the other local participant, and national participants if they win at the national level), and 3/ they become part of a select close group of likeminded young women who are or have been participants in the NCWIT AiC program. This outreach effort is very time consuming but I have seen its effects year after year and I cannot give it up. Over the years I have coordinated this program in El Paso, about 10 young women have joined UTEP CS or ECE. A good number of others did the same at our neighbor institution NMSU (New Mexico) and others have joined similar majors but at farther institutions.

In addition to the NCWIT AiC, I also hold summer internships for high-school students in my research lab: I have done that since 2010. Although the invitation is open and we have had young men as interns on occasion, we have mostly had young women interns. This is a result of my emphasis on such recruitment of students but also of the fact that I invite all NCWIT yearly participants to intern in my lab. Few of the NCWIT participants actually take on my offer: this is most of the times because they already have another plan for summer. These young women are very successful in general and know how to navigate the summer internship program maze very well, so they usually do not need the opportunity I offer to them. However, overall, since 2012, I believe that over the 20 high-school students I have had in my lab, at least 15 were women.

Finally, in summer 2015, I designed, with a colleague from Civil Engineering at UTEP, Ivonne Santiago, a week-long summer camp on civil engineering and computer science, for middle and high-school students (but mostly attended by middle-school students), as part of the Excites Summer



Camp program at UTEP. This summer camp was attended by about 250 students that summer and has been used again, but only as a computer science camp, every summer since then. Some of its activities are also used for school campus visits. Notably, this summer camp was originally designed for a girls-only camp. It was in fact used for a girls-only camp but much fewer times than it was for co-ed camps. Still, it was the original goal of it.

## Retention of Women in CS

Attrition in Computer Science is a problem that goes beyond gender. However, the influx of women in our program is so little that any attrition in female CS majors can easily divide the participation of women by 2. Addressing the problem of the leaking pipeline of women in CS is one of the challenges that our department's NSF RED project set to tackle. My involvement in decreasing attrition is at different levels: 1/ through initiatives outside the classroom and 2/ through new courses or redesigned courses.

Outside the classroom, I have founded a local chapter of ACM-W in 2012. Since then, the chapter has been very active with outreach as outlined earlier. It has also put emphasis not only on outreach but also on serving its own constituents at UTEP via mentoring program that benefitted all levels of students (targeted for women originally): senior UG students would mentor entering UG, graduate students would mentor senior UG students, and professional women from the region would mentor graduate students and some senior UG students. This program was jumpstarted by an NCWIT Seed fund that our chapter applied to and received. It has continued beyond the original planned duration. As I value mentoring, I have also taken part in MentorNet. Although not for our own students directly at that time, I believe that any effort to help students go through CS, anywhere, is important.

Additionally, as I was teaching our Introduction to Computer Science course, a.k.a. CS1, I noticed that students needed to be more engaged outside the classroom and needed to up their skills in problem solving. I would often observe them struggling in class with problems that were at their reach: they just did not have enough practice to realize it. So I started a problem-solving club gathering students interested in furthering their skills in problem solving. Another goal of mine was to demonstrate to them that we could have fun with solving problems. It took one full semester to make this club "popular" but starting at the second semester, I started having more students attend. As a result, I decided to create a course on this topic, which was offered in summer 2016. It was successful and students reported learning a lot of skills valuable in their other courses. Subsequently, as part of the work conducted under our NSF RED project, I suggested to build a one-credit-hour course on problem solving. With the additional collaboration of Google Engineers and CAHSI<sup>6</sup> institutions, a new problem-solving course was created, as a special topic (CS1190) of one credit hour, to start with. I taught it successfully the first time over a 6-week period in fall 2017 and I am set to teach it again in the second part of fall 2017, as an opportunity to refine its delivery. This course, although part of my teaching portfolio, also belongs to my service activities as it is taught as service, on top of my regular teaching load.

In addition to these efforts, and in order to tackle attrition as early as possible, to put students on track in our CS program, since spring 2015, the department has been very supportive of what we call the fundamentals courses in Computer Science, which are composed of Introduction to Computer Science (or CS1), Elementary Data Structures (or CS2), and Data Structures (or CS3). Concretely, the number of sections grew to 3 to avoid very large classes, all the more in view of our

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<sup>6</sup>CAHSI is the Computing Alliance for Hispanic Serving Institutions, led by Ann Gates at UTEP.

UG enrollment growth (which almost triple of the last 5 years). The department also made sure to support a large instructional team, composed of professors, UG and G TAs, and UG peer leaders, to ensure that students have many people to help them inside and outside the classroom. On my end, as an instructor of CS1 every semester since spring 2015, I have contributed to changes in pedagogy and content of the course several times.

- In Fall 2014, planning for Spring 2015, I was part of a team, along with David Novick and Monika Akbar (the three of us were going to teach CS1 in spring 2015) who redesigned the course content and delivery modes.
- In Spring 2016, I received funding from Google (\$5,000) to further study the changes in CS1. This funding also helped support an undergraduate student to work with me on putting together uniform labs that we submitted to Google EngageCS platform. It is during that semester that I started working on competency-based assessment.
- Finally, in Spring 2017, I modified the course once more strong of my training on student motivation and funding by UTEP's STEM-Accelerator program.

Although all of these were done as part of my service, I develop the details of these courses and my philosophy about these in my teaching portfolio.

### **Retention of Women Faculty in CS**

The retention of women in CS needs role models in the department. In 2016, a new committee was created in our department: it's our department committee on women, led by Natalia Villanueva-Rosales, which gathers all female faculty and instructors of our department to discuss how to change the departmental culture. This is one of the products of the NSF RED project led by Ann Gates. I am also, like all faculty in engineering, part of the WEST group that aims to be a support team for female faculty and students. WEST is part of WIN led by Patricia Nava.

#### **4.2.3 Service to Research Community: Enhancing UTEP's Visibility**

Serving my research community goes without saying. It is part of being a good citizen. As a result, I regularly review conference and journal articles, books (including textbooks), and grant proposals.

My efforts in this area can also serve my and UTEP's mission of access and excellence. Some activities help increase the visibility of UTEP, hence participating in the reputation of the institution, exposing students to visitors and research they might not have otherwise been exposed to, and eliciting excellence by modeling it. My work in organizing workshops and conferences allowed to expose my students to research done all over the world. This is the case of NAFIPS'16 organized at UTEP in which several of my students were very active helpers. This is again the case of the CoProD workshops that are held at UTEP (half of these are held at UTEP, half on the location of the international conference SCAN). Networking done and relationships built while working on such events, locally or abroad, allow to build collaborations that last. Lately, we invited Mark Stadherr to UTEP: my research students were able to have open sessions with him, asking many questions whose answers can help their own research and Mark Stadherr is going to join one of my PhD students' dissertation committee. Participating in committees such as the IEEE Technical

Committee and being part of the board of directors of NAFIPS (the North American Fuzzy Information Processing Society) and now its President Elect are ways I can further serve my community and learn from to share with my students.

Participating in grant reviewing panels are also very important opportunities for me to better understand the agencies needs and to interact with program directors, hence increasing the possibility to get funding, which students benefit from.

## 4.3 Evidence of Service to the University

### 4.3.1 Departmental Service

1. Member of the **Faculty Evaluation Committee** – February 2015 – **present**. This committee gathers once a year in Spring to evaluate the annual portfolio of all faculty in the department. Our evaluation serves as a recommendation to the chair of our department.
2. Member of the **CS Undergraduate Curriculum Committee** – August 2013 – **present**.
3. **Chair** of the Undergraduate Fundamentals course sequence Committee – May 2015 – **present**. This committee oversees the content and pedagogy of our department’s introductory undergraduate courses, known as CS1, CS2, and CS3, which go from introduction to CS to data structures.
4. Founder and **advisor of the ACM-W chapter at UTEP** – June. 2012 to **present** As the ACM-W advisor, I have guided and supervised the ACM-W students in the following projects that were funded by NCWIT or Google:
  - NCWIT Seed Fund: in spring 2014 to develop a still existing mentoring program for CS UG students
  - Google IgniteCS program: in spring 2016, ACM-W was awarded its first Google IgniteCS project to put in place formal and informal program to teach computer science to young students at a middle school of El Paso. In spring 2017, they received their second award for a similar program at a high-school of El Paso.
  - In fall 2017, they are very active in helping with the NCWIT Aspirations in Computing program and they are working on developing and submitting a Google First project.
5. Member of the **Computer Science Advancement of Women in Computing** committee – August 2015 – **present**
6. **Academic advisor to undergraduate students** – between 40 and 50 per semester (see more on this below)
7. In charge of the **Computer Science Department’s course schedule** – 2007 to Spring 2010 and August 2012 – **January 2017**.
8. **Chair of the Programming Languages course Committee** – August 2013 – May 2015.
9. **Webmaster** of the Computer Science website – August 2011 – August 2014.
10. Part of the **CS ABET preparation Committee** – September 2012 – Fall 2013
11. **Chair of the 2013 CS Faculty Search Committee** – August 2012 May 2013

### 4.3.2 College Service

1. Member of the **WIN Program** in Engineering at UTEP. Since 2012. WIN stands for Women In eNginering. This program aims to serve an overarching group to oversee several of its programs that are specifically dedicated to: all women in the College of Engineering at UTEP (WInginers), female faculty in engineering at UTEP (WEST: see below), and female professionals in engineering careers (WEPP).
  - Member of the **WEST, Women in Engineering Support Team**. Fall 2012 – **present**.
2. Member of a team part of the **NCWIT Extension Services** (along with Ann Gates, Miguel Velez-Reyes, Pat Nava, Gabby Gandara) who worked on **increasing the number of female students in Computing**. Fall 2012 – Summer 2014.
3. Member of the **Task force on Faculty Success**. March 2013 – **present**.
4. Member of the **Facilitation Team For Information and Security**. September 2011 – November 2012.

### 4.3.3 University Service

1. Member of **COURI's Board of Advisors**: COURI is the Campus Office for Undergraduate Research Initiatives at UTEP – March 2015 – **present**. Twice a year, this office on campus offers scholarships to undergraduate students who plan to conduct research. COURI's board is in charge of reviewing the students' applications. In addition, the board is in charge of monitoring the progress of this entity on campus.
2. Member of the **Executive Council of the Faculty Senate** as representative of UTEP's College of Engineering – September 2015 – August 2017
3. **Vice-President of the Faculty Senate**. September 2014 – August 2015.
4. Member of the **Executive Council of the Faculty Senate** – as **Secretary** (September 2012 – August 2014) as such:
  - Representative of this council on the IT standing committee of the Faculty Senate (2013-2014)
  - Representative of this council on the UGCC and Student Grievance Committee standing committee of the Faculty Senate (2014-2015)
5. Member of the **Executive committee of the Computational Sciences Program** – September 2008 – June 2015.
6. Member of the **Board of the Women's Resource Center** (now Student Resource Center) – September 2011 – August 2014.
7. Member of **UTEP's Undergraduate Curriculum Committee** (standing committee of the Faculty Senate) – September 2011 – August 2014
8. **Member of the Computational Sciences Faculty Search**. September 2013 – April 2014.

9. Member of the **Women's Advisory Council to the President, as past chair**. Jan. 2013 – Dec. 2013
10. Member of **UTEP's Mama PhD** group – September 2010 – **present**.

#### 4.3.4 Student Advising

##### Undergraduate advising

In our department at UTEP, all faculty advise undergraduate students once a semester. It is a great opportunity for us to discuss their performance, their goals, and to advise them about their next steps, academically and also professionally. We also encourage students to take advantage of the students organizations in our department to further engage in the life of our department. Finally, I discuss research with all students, encouraging them to seek research opportunities, whether year-round or at least in summer.

Over the years, the number of students we advise each semester has somehow fluctuated. However, it was around 30 students per semester. Recently, with the growth of our undergraduate enrollment, we have observed a growth in the number of students we need to advise each semester. We are currently slightly above 50 students to advise each semester.

Each advising session is supposed to last about 15 to 20 minutes. On occasion it lasts longer if the situation of the student being advised is more complicated. As a result, it can take a while to advise all of these students. However, I find these sessions to be a fantastic way to reach out to students who might not otherwise seek contact with their professors, and as a result, may not get crucial information beyond academics (such as information about internships, research, student organizations, etc.).

##### Research advising

I dedicate a large part of my efforts advising students conducting research under my supervision. As mentioned in my research document, I supervise students in my research group CR2G. Since 2012, I have supervised **2 post-doctoral** researchers: **13 Ph.D. students**: 6 whom I directly advised, 2 of whom graduated and another one is about to (fall 2017); 1 whom I advised while he had joined my research team but whose actual advisor was Vladik Kreinovich; and another 6 Ph.D. students for whom I served as a committee member; **10 Master's students**: 6 whom I directly advised, 5 of whom graduated; and another 2 whom I advised during their visit at UTEP (international visiting students) and 2 for whom I served as a committee member; **22 undergraduate students**; and about **20 high-school students**. Notably, my former post-doctoral researcher is now a faculty member at St. Thomas University in Florida, and one of my former Ph.D. students is now a faculty member at the University of Cali in Colombia. Currently, I supervise 1 post-doctoral researcher, 3 PhD students, and 9 undergraduate students. I hope to recruit a Master's student in the spring.

Besides, each summer since 2010, via a program of our College called NEXUS, I invite and supervise high-school students (mainly young women) who participate in my research lab as interns. We train them to solve problems, program (in Java, Matlab, we teach them how to use the command line); we have them work on two projects of their choice, and we involve them in our research as testers of our algorithms. They also learn how to present their work because as members of my group, they have to present at our weekly meetings. Since 2012, about 20 students have been involved in

my group as interns. I have maintained a mentoring relationship beyond summer with some (even if few) of them.

I am also involved in advising students as part of their thesis or dissertation committees, or as host of summer (or longer) internships. In particular, I have co-advised two students from ENSTA, France (advisor: Luc Jaulin), interning in the TRACS lab at UTEP for five months from April 2014 to August 2014, and three months in summer 2016 (TRACS is the lab on Theoretical Research driven by Applications in CS, which includes my research group CR2G: [cr2g.constraintsolving.com](http://cr2g.constraintsolving.com)). I have also been a committee member for 8 students at UTEP. I have been an external reviewer of a PhD dissertation for the Computer Science program at the University of Pierre and Marie Curie (Paris 6), France, in fall 2017. Finally, I have also been an external reviewer of a PhD dissertation for the Executive Board of the Italian Association for Logic Programming (GULP), 2012.

## 4.4 Evidence of Service to Research Community

### 4.4.1 Editorial, Technical Committees, and Board Memberships

- Vice-President of **NAFIPS**, January 2017 – December 2019 (NAFIPS is the North American Fuzzy Information Processing Society)
- Member of **NAFIPS’ board of directors**, since March 2011
- Member of **IEEE Technical Committee on Soft Computing**, since March 2016
- Member of the Springer **Soft Computing Journal Editorial Board** (November 2011 – January 2013).

### 4.4.2 Editorship

- **Journals’ Special Issues**
  - Co-editor, a special issue of **Journal of Uncertain Systems on Uncertainty, 2016, Vol. 10**; with Vladik Kreinovich
  - Co-editor, a special issue of **Journal of Uncertain Systems on Uncertainty, 2015, Vol. 9**, No. 2; with Vladik Kreinovich
  - Co-editor, a special issue of **Journal of Uncertain Systems on Uncertainty, 2014, Vol. 8**; with Vladik Kreinovich
  - Co-editor, a special issue of **Journal of Uncertain Systems on Uncertainty, 2013, Vol. 7**, No. 3; with Vladik Kreinovich
  - Co-editor, a special issue of **Journal of Uncertain Systems on Uncertainty, 2012, Vol. 6**, No. 2; with Vladik Kreinovich
- **Edited Research Books**
  - Martine Ceberio and Vladik Kreinovich (eds.), “**Constraint Programming and Decision Making: Theory and Applications**”, Springer Verlag, Berlin, Heidelberg, 2017.
  - Martine Ceberio and Vladik Kreinovich (eds.), “**Constraint Programming and Decision Making**”, Springer Verlag, Berlin, Heidelberg, 2014.

### 4.4.3 Program Committee

- **Program chair**

- Co-chair and co-program chair of **NAFIPS’2016** (nafips.cs.utep.edu)
- Program and general co-chair of the **CoProD workshop series since 2008** (<http://coprod.constraintsolving.com>), with Vladik Kreinovich (UTEP)
- Co-chair of the **ACM SAC (Symposium on Applied Computing) Knowledge Representation and Reasoning (KRR) 2016, 2017**
- Co-program chair of **NAFIPS’2012** and **NAFIPS’2014**

- **Member of program committee**

- **RCRA 2017** (Rappresentazione della Conoscenza e Ragionamento Automatico)
- **IAE/AIE 2017** (International Conference on Industrial Engineering, Other Applications of Applied Intelligent Systems))
- **FLAIRS-29** (the Florida AI Research Society)
- **IJCAI’15, ‘13** (International Joint Conference in Artificial Intelligence).
- **MICAI’13** (Mexican Conference in Artificial Intelligence).
- **WSCS’13** (World Conference on Soft Computing).
- **WEA’12** (Workshop on Engineering Applications).
- **M-PREF’12, ‘13, ‘14, ‘15** (international workshop at ECAI’12 & ’13– European Conference on Artificial Intelligence) & ’15 at IJCAI 2015
- **NAFIPS’15** special session on Interval Computations.
- **Workshop on Intelligent Personalization (IP)** — Joint Workshop on Constraints and Preferences for Configuration and Recommendation (CPCR) and Intelligent Techniques for Web Personalization (ITWP) at IJCAI 2015

### 4.4.4 Paper and Book Review

Since 2012, I reviewed articles for **conferences and workshops** including:

- **ACM SAC** (Symposium of Applied Computing) (for the CSP track),
- **NAFIPS** (North American Fuzzy Information Processing Society),
- **ECAI** (the European Conference on Artificial Intelligence),
- **FIE** (the Frontiers In Education conference),
- **IJCAI** (the International Joint Conference in Artificial Intelligence),
- **Workshops at CP**,
- **Mexican International Conference on Artificial Intelligence (MICAI)** 2011, 2012, 2013,
- **PPAM** 2013, 2015,

- **Workshop on Engineering Applications** (WEA), 2012,
- **FLAIRS** 2016,
- **FuzzIEEE** 2016, 2017,
- **ICTCS** 2014 (the Italian Conference on Theoretical Computer Science),
- **AI\*IA** 2016 (the XV International Conference of the Italian Association for Artificial Intelligence),

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

- Journals:
  - Reliable Computing,
  - INFORMS Journal on Computing,
  - Information Science,
  - Journal of Experimental and Theoretical Artificial Intelligence,
  - the Annals of Mathematics and Artificial Intelligence,
  - Artificial Intelligence,
  - Special Issues of Soft Computing,
  - Journal of Logical and Algebraic Methods in Programming,
  - Transactions on Mathematical Software,
  - AAAS-Science.
- Book:
  - Hybrid Computing & Intelligence: Research and Applications, Morgan Kauffman (publishers)

#### 4.4.5 Conference / tracks / workshop chairing and organization

- **International conferences**
  - Co-chair and co-program chair of **NAFIPS’2016** ([nafips.cs.utep.edu](http://nafips.cs.utep.edu))
- **International workshops**
  - Program and general co-chair of the **CoProD workshop series since 2008** (<http://coprod.constraintsolving.com>), with Vladik Kreinovich (UTEP)
- **Tracks at international conferences**
  - Co-chair of the **ACM SAC (Symposium on Applied Computing) Knowledge Representation and Reasoning (KRR) 2016, 2017, 2018**



#### 4.4.6 Grant Proposal Review and Others

I participated in five several NSF panels since 2012:

- Proposal Reviews: Member of NSF panels in 2012, 2013, 2014, 2015, 2017 (CISE).
- Other Reviewing Assignments:
  - Grace Hopper Conference: reviewer of 2014 scholarship applications
  - DoD 2014 Star Award reviewer
  - NCWIT Collegiate Award reviewer 2015, 2016
  - NCWIT Educator Award reviewer 2015

#### 4.4.7 Professional memberships

- Member of ACM (Association for Computing Machinery)
- Member of ACM-W (ACM's committee on Women)
- Member of INFORMS
- Member of IEEE
- Member of AAAS (American Association for the Advancement of Science)
- Member of the **board of directors** of the North American Fuzzy Information Processing Society (NAFIPS) since March 2011

#### 4.4.8 Open Source Software and Other Web Resources

- Designer of <http://numconsol.cs.utep.edu>
- Designer and webmaster of the **community website** <http://www.constraintsolving.com>
- Released the NumConSol solver on constraintsolving.com for multiple platforms

### 4.5 Evidence of Service to Community

#### 4.5.1 Service to the Local Community

- **Advisory Boards' membership**
  - Board of advisors of Bel-Air's T-STEM Academy (since 2017)
  - Board of advisors of Parkland's T-STEM Academy (since 2015)
  - Board of advisors of Harmony Science Academy of El Paso (since 2012)
  - Board of advisors of Eastlake High School CSE program (2015)

- Board of advisors of Saint Patrick’s Elementary and Middle School – 2013 to 2017
- **Faculty advisor** for summer research projects for high-school students (2010, 2011, 2012, 2014, 2015, 2016, 2017)
  - Nexus program at UTEP:  
*Notably: an unprecedented high-number of interns participated in summers 2014 and 2016: 7 female high-school students)*
- **NCWIT Aspirations in Computing Regional Affiliate Competition Coordinator**
  - Coordinator of the El Paso affiliate since fall 2015
  - Coordinator of the El Paso/Las Cruces affiliate from 2011 to spring 2014  
*15 schools of El Paso/Las Cruces and the wider area have participated in the competition, and over 50 young women have been honored.*
- **Presentations about computer science** I regularly give presentations about computer science, at UTEP or at various schools of the El Paso area. In particular, in fall 2016, I gave talks to high-school young women every day of our e-Week, reaching out to about 100 women in one week. In addition, some of my past talks include the following:
  - Presentation to the Girls-Who-Code group from Harmony Science Middle School of El Paso – UTEP, May 2017
  - Contributed presentation at the Teacher Networking Technology Conference in November 2015 in El Paso about “Computational Thinking in the Classroom”. Audience: about 35 teachers from all disciplines, from K-12.
  - Presentation to an all-girls summer camp at Fab Lab El Paso – June 2016
  - Presentation to doctorate students about being a professor in computer science, May 2015
  - Presentation at Harmony Science Academy of El Paso about computer science and careers (December 2014)
  - Contributed presentation at the Teacher Networking Technology Conference in October 2014 in El Paso about “Coding your way through school”. Audience: about 50 teachers from all disciplines, from K-12.
  - Presentation to the Clint Independent School District about Computer Science, May 2014
  - Invited speaker for a Webinar for all teachers of Ysleta School District about how they can bring computer science in their classroom and what they can do if they are CS / math teachers, March 2014
  - Invited speaker at the New Mexico Celebration of Women in Computing, Las Cruces, NM (November 2012).
- **Career Fairs/Days presenter:**
  - Girls Powered Event presenter at Eastwood High School in El Paso (October 2017)
  - Girls Powered Event presenter at Eastwood High School in El Paso (October 2016)
  - Ibero Academy: Presentation about Computer Science to Kindergarteners, 1st graders, and 2nd graders (May 2014)

- Loretto Academy of El Paso – all-girls middle and high school (April 2011, April 2012, April 2014)
- **UTEP tours and open house events**
  - Hosted a day of Computer Science for Bel-Air High School in June 2017 (about 50 students)
  - Hosted a day of Computer Science and Engineering for Saint Patrick’s Elementary School – 3rd to 5th grade – in May 2017 (about 60 students)
  - Hosted a day of Computer Science and Engineering for Saint Patrick’s Middle School in December 2016 (about 80 students)
  - Hosted a day of Computer Science for Bel-Air High School in May 2016 (about 50 students)
  - Participates in UTEP’s Orange and Blue Days, and other events such as Open houses annually
  - Regularly prepare presentation material and train my research team students to give overviews of CS to visiting students.
- **High-school classroom innovation:**
  - Computer Science and Language Learning, Loretto Academy of El Paso (Fall 2013).
- **Judge:**
  - Science Fair judge at Harmony Science Academy Middle School, El Paso, February 2017.
  - Science Fair judge at St Patrick’s Elementary and Middle School, El Paso, February 2016 and 2017.
- **Other**
  - Mentornet mentor in 2012 and 2013
  - Faculty advisor of the Harmony Science Academy Alumni Association at UTEP since 2015