

## Statement of Philosophy

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

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

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

### □ Teaching

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

In practice, I implement *access* by teaching in varied ways to accommodate different learning styles, different backgrounds, and different self images (student’s confidence plays an important role in their being receptive to material or not). I strive to adjust to students’ needs to extents that do not slow the class progress, and I offer extensive support outside of the classroom, through well stated and attended office hours as well as appointments when more time is needed or the stated office hours are not convenient. I also propose varied activities in the classroom: work in teams / individually, to foster essential team-working skills and at the same time enable peer-mentoring useful for weaker students, while still valuing individual achievements. Although flexibility and style accommodation have always been a priority for me, I have polished my teaching style over the years as is reflected in my teaching portfolio. Outside of the classroom, I implement *access* in other ways, by offering independent studies that constitute a way to mentor students more closely and fully adjust to their style, but without any team-work component; and by involving students in my research (at all levels: from high-school to PhD students), which offers an incredible experience to the students who grow more confident and experience team-working outside of the classroom. *Access* is also about populating the pipeline of potential incoming students. Besides the many

outreach activities I have taken part in, I have been involved in developing a project for a new high-school course whose aim is to increase the participation of women and hispanic students in computing by emphasizing and nurturing their organic skills and the impact of computer science on areas that matter to the community (health, non-profit organization, etc.). This effort is aligned with the College on-going effort to increase the participation of women in engineering.

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

## □ **Research**

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

My research goals were to: (1) make non-linear continuous constraint and optimization problems solvers scalable, while remaining reliable (w.r.t. notions such as globality, completeness, robustness); and (2) bridge the gap between the practicality of the solvers and their lack of use by practitioners, by building a community of decision-making researchers and domain scientists. In doing this, I seek to make an impact on the way problems are solved and which problems can be solved. I believe that this is a high payoff area. To achieve these goals, I have balanced my work between fundamental and applied research: part of my work is in exploring new computational models and designing

ways to make more computations faster: I work mainly in the areas of symbolic-numeric algorithms for constraint and optimization solving, multi-criteria decision making, interval computations (e.g., through the use of different paradigms, the use of different interval arithmetic, or combinations of solvers); part is in exploring applications as both a way of getting feedback and (mostly) a creativity boost: network security, bio-medical engineering, software engineering.

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

*Access* also drives part of my research activities. I am a firm believer in open research, sharing experience and information. I also value diversity, of backgrounds, genders, and levels. As a result, I seek collaborations: I have collaborated with a number of researchers within UTEP across departments and colleges, in other US institutions (e.g., Stevens Institute of Technology in New Jersey), and abroad (e.g, Japan, Italy). My interdisciplinary collaborations resulted in joint papers with for instance researchers from departments of mathematics, geological sciences, education. When my work is not to be performed in the framework of a collaboration with colleagues, I always involve students, which results in co-authored-only publications. Integrating students to my research (to research in general) is, as was shown multiple times in education research articles, a way of retaining them and increasing their chances of success. I created a research group, CR2G (Constraint Research and Reading Group, <http://cr2g.constraintsolving.com>), shortly after starting my tenure-track period. Over the years, the group has gathered students at all levels: undergraduate, graduate, PhD levels, and more recently, high-school students during summer internships and projects. A total of four PhD students have been members of CR2G, three of them left UTEP while under my supervision before graduation due to family reasons (in 2007, 2009, 2011), one is expected to graduate by Summer 2012. Nine Master's students have been involved as well, five of which graduated, one is expected to graduate by early fall 2011, one by Spring 2012, and one joined Rice's Computational Sciences PhD program in Summer 2011. Many undergraduate students (over 20) were involved, with different success rates to keep them in the graduate program. Recently, I have put efforts in recruiting high-school students for summer internships. I am now totalling a number of 15 high-school students who have been involved in summer internships or projects with me. I am glad to report that a large majority of them are female: I believe that involving female students will increase the participation of women by creating role models. Finally, as part of my effort to give access to research, I also value universal access through online presence (which also increases the visibility of UTEP). CR2G developed and maintained a research community website, <http://constraintsolving.com>, which attracts a significant amount of web traffic of over 1,000 unique

visitors a month from over 62 countries.

#### □ **Service**

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

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

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