COMPUTERBYTES

2013

NMSU COMPUTER SCIENCE

The home of NMSU Computer Science: Science Hall

TABLE OF CONTENTS

Dr. Zachary O. Dugas Toups

Researching Games, Interfaces, and Mixed Reality

We are proud to announce the newest addition to our department - Dr. Zachary O. Dugas Toups!

Zach earned his bachelor's degree from Southwestern University in Computer Science in 2003, where his involvement in the ACM SIGGRAPH conference led him to pursue graduate studies in games. After teaching in Japan for a year, he joined Texas A&M University, where he earned his Ph.D. in Computer Science in 2010. His graduate work developed a **zero-fidelity simulation game** for educating firefighters in disaster communications. As a counterpoint to the drive toward high-fidelity simulations, zero-fidelity simulations have been shown to educate effectively by abstracting out the real world and developing a digital reality that focuses on human-human and human-information interactions.

In the years prior to joining NMSU, he worked with Texas Task Force 1, an elite urban search and rescue team, to deploy his game designs and investigate the use of mobile devices by disaster responders. He joined the Texas A&M Center for Applied Technology in 2012, where he assisted in developing information dashboard interfaces that integrated NASA's World Wind 3D mapping software for use by the USDA and US Army.

Zach's research further develops the concept of zero-fidelity simulation. His research develops **user interface design integrated with game design**, and uses both traditional mouse-and-keyboard computer interaction, as well as sensor-based mixed realities that weave together the real and digital worlds through wearable computer systems. Using a mixed method approach, Zach incorporates a deep understanding of human practice through qualitative, ethnographic inquiry, with instrumented quantitative experiments using hardware/software systems.

Zach is an active member of the ACM Special Interest Group for Computer-Human Interaction, publishing in several of SIGCHI's conferences and serving as an Associate Chair for the Conference on Human Factors in Computing Systems.

Dr. Zachary O. Dugas Toups with his wearable computer showing the zero-fidelity simulation team coordination game.

Jay Misra Receives NSF INSPIRE Grant

Towards Ubiquitous Adoption of Wireless Sensor Networks in Experimental Biology Research

By Audrey Olmsted

New Mexico State University celebrated a Research Rally today for an assistant professor who has received funding from the National Science Foundation he plans to use to make a significant impact on wireless sensor networks in experimental biology research.

Satyajayant Misra, with the College of Arts & Sciences' Department of Computer Science, is one of only 11 people to receive the CREATIV (Creative Research Awards for Transformative Interdisciplinary Ventures) award through the Integrated NSF Support Promoting Inter-disciplinary Research and Education (INSPIRE) initiative. With the $800,000 award, Dr. Misra and his colleagues will be developing small, high-quality wireless sensors that will not only be allow continuous monitoring of aquatic and terrestrial animals with discomfiting them, but will also be inexpensive.

Research in WSNs has attracted much attention since it started two decades ago. The vision has been that the application of WSNs would be commonplace in sciences, industries, the military and in everyday life. However, widespread use of WSNs has not been realized, even in a domain such as experimental biology, Misra said. Monitoring and manipulation of biological subjects are still performed manually, significantly limiting data reproducibility, documentation, reliability and overall research productivity.

The lack of adoption of WSNs can be attributed to three main barriers: current sensor nodes are expensive and fragile, hard to customize for specific scientific inquiry, and hard for non-experts to program.

"When we were writing the proposal, the goal was to create a major societal impact. When someone looks back 20 years from now, they are going to say, 'Really? People didn't use wireless sensor networks, because they're all over the place now!"

Jay Misra

Misra was inspired to pursue this research by watching one of his colleagues in biology, Professor Graciela Unguez, monitor and stimulate electric fish in an aquarium. Unguez's students take the fishes out of the water and attach electrodes to them to perform these tasks.

"However, the problem is that when you take the fish out of the water, they may become scared or disoriented, so the data received from them is probably not accurate," Misra said. "This phenomenon may be generalized to almost all closely monitored animal subjects in research."

WSNs can help transform experimental biology research by providing previously unavailable, automatic and frequent monitoring and manipulation of the subjects in natural and experimental environments without human intervention.

Misra and his team, including Hong Huang, with electrical and computer engineering, have created a prototype they are now working to miniaturize. They are addressing the major barriers to wireless sensor networks by building a framework that consists of low cost, rugged customizable sensor hardware and easy-to-use software and firmware.

Misra and his team envision branching out from biological research to allow the public to individualize the wireless sensors for their needs, whether that means using the devise to monitor crops or the weather, or even creating a customized home security system.

"This project is not only going to enable experimental researchers in the lab and in the field to stimulate and monitor animals or specimens in real time without human intervention," said NMSU President Barbara Couture, "it will also bring us one step closer to making WSNs that do this kind of data retrieval commonplace in our daily lives."

For the time being, the NMSU researchers are looking at the longevity and durability of the sensors as well as harvesting different sources of energy to operate the devices, such as solar energy.

"We are all very excited to receive this award,' Misra said. "When we were writing the proposal, the goal was to create a major societal impact. When someone looks back 20 years from now, they are going to say, 'Really? People didn't use wireless sensor networks, because they're all over the place now!'"

Wisdom of Crowds for Robust Gene Network Inference

Publication in *Nature Methods*

NMSU Computer Science Professor Joe Song and his students, Yang Zhang, Zhengyu Ouyang, and Haizhou Wang, co-authored a paper titled "Wisdom of Crowds for Robust Gene Network Inference" in the Nature Methods, a high impact journal that publishes chemical and computational methods for biological sciences.

Abstract: "Reconstructing gene regulatory networks from high- throughput data is a long-standing challenge. Through the Dialogue on Reverse Engineering Assessment and Methods (DREAM) project, the authors performed a comprehensive blind assessment of over 30 network inference methods on Escherichia coli, staphylococcus aureus, Saccharomyces cerevisiae and in silico microarray data. They characterize the performance, data requirements and inherent biases of different inference approaches, and provide guidelines for algorithm application and development. They observed that no single inference method performs optimally across all data sets. In contrast, integration of predictions from multiple inference methods shows robust and high performance across diverse data sets. They thereby constructed high-confidence networks for E. coli and S. aureus, each comprising ~1,700 transcriptional interactions at a precision of ~50%. They experimentally tested 53 previously unobserved regulatory interaction in E. coli, of which 23 (43%) were supported. Their results establish community-based methods as a powerful and robust tool for the inference of transcriptional gene regulatory networks."

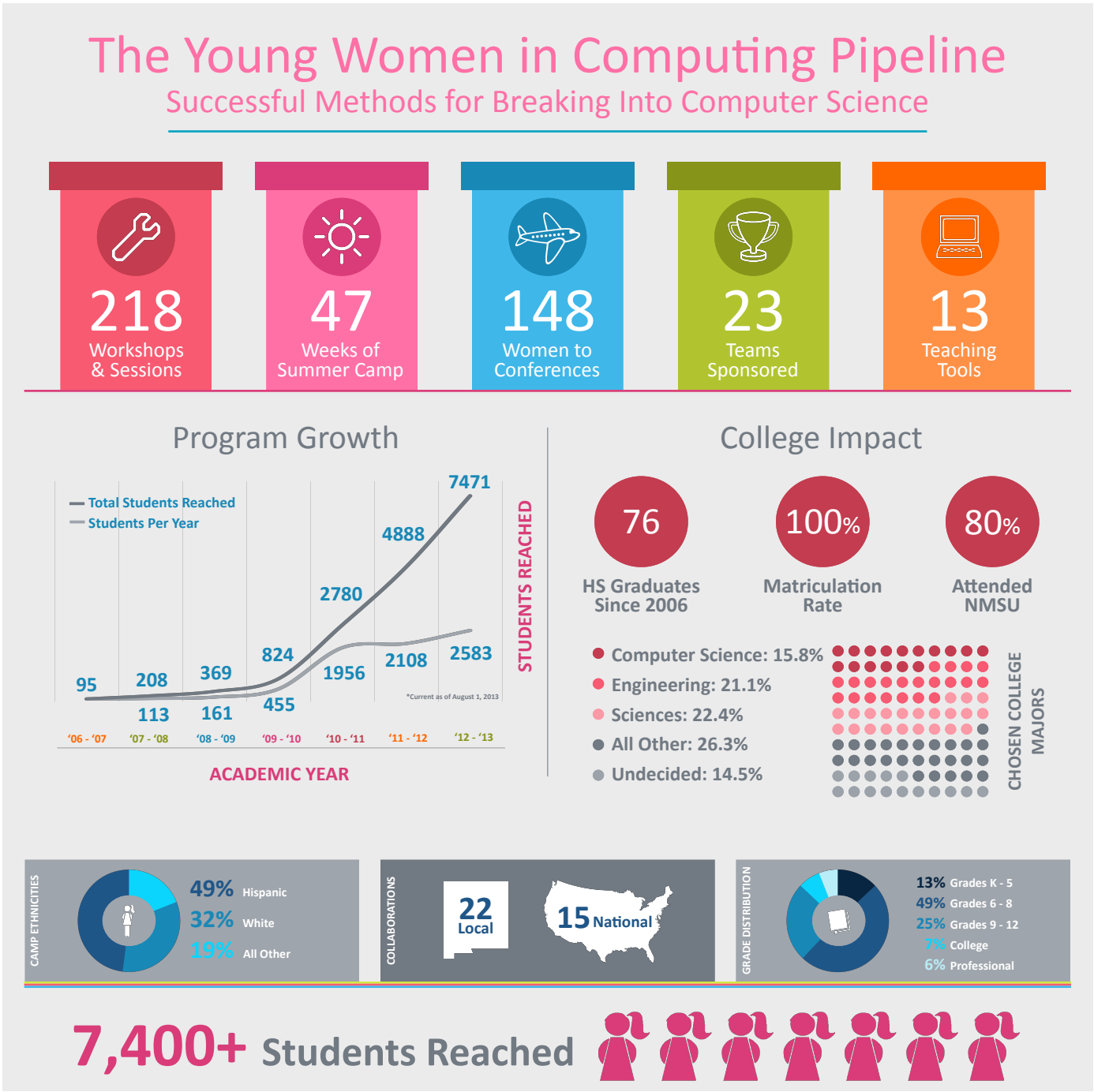
"My long-term research goal is to develop statistically effective and computationally efficient algorithmic framework to detect, represent, and manipulate functional, temporal, and statistical associations among random variables, to account for causal interactions in dynamic biological networks."

Joe Song

The goal of the DREAM project is to catalyze the interaction between experiment and theory in the area of cellular network inference and quantitative model building in systems biology.

For additional information about this project visit Joe's website at www.cs.nmsu.edu/~joemsong.

Dr. Mingzhou (Joe) Song



Young Women in Computing (YWiC)

YWiC! Say What!

By Rebecca Galves

The 2012-2013 outreach year was another incredible collection of successes for YWiC. A record breaking 2,550 participants joined YWiC in workshops, conferences, roadshows, forums, and more! The summer camp sessions hosted 76 middle and high-school young women, over 6 weeks in June and July, teaching 13 different technology and software platforms.

To date, YWiC Summer Camp alumnae are recording a 100% high school graduation rate, 100% matriculation rate into college from high school, with 60.5% majoring in STEM fields. YWiC alum are attending NMSU (80%), UNM (7%), NM Tech, Amherst, Columbia, Duke, MIT, Princeton, Texas Tech, Trinity, and the Univ. of Rochester. This is awesome!

The YWiC Team has established the Women and Minorities in Computing (WaMiC) Student Organization, which has become a vibrant and dynamic group within the Department of Computer Science. WaMiC undergrads are energetic and passionate about CS, host bi-monthly meetings, participate in community service throughout the Las Cruces and campus communities, plus work to provide a support system and structure to help aid all CS students in retention and graduation success! Fantastic work!

As YWiC has blossomed into the far-reaching and highly motivated program found today, the group has been responsible for pursuing private funding from local and national entities. To date, YWiC secured funding from the following groups: DataONE; Intel; Project GUTS and GUTSyGirls; NCWIT/Aspire IT Program; Microsoft; Anita Borg Institute; and the National Girls Collaborative Project. Thank you so much to this inspirational collection of organizations!

Please join us in reaching more and more students throughout New Mexico with a critical donation! We need YOUR help to continue providing Computer Science Outreach, as NM is one of the 39 states in the union that does not require CS as a graduation requirement from high school. As a result, NM students are entering college without knowing that CS is a national and international leader in jobs available, job security, job pay, and job satisfaction!! We need you! Help us to continue spreading the word and showing NM youth how amazing CS is!

Please visit sites.google.com/site/ywicnm for more information on YWiC and sites.google.com/site/wicnmsu for more information on WaMiC.

"We need YOUR help to continue providing Computer Science Outreach. Help us to continue spreading the word and showing NM youth how amazing CS is!"

Rebecca Galves, YWiC Coordinator

Faculty Position Opening

High Performance Computing | Big Data

The **Computer Science** Department at New Mexico State University invites applications for a tenure-track position at the *Assistant Professor* rank, with appointment starting in the Fall 2014 semester. We are seeking strong candidates with research expertise that can effectively complement the research foci of the department; we are particularly interested in expertise in the areas of High Performance Computing (HPC) and/or Big Data. Applications from women, members of traditionally under-represented groups, and other individuals interested in contributing to the diversity and excellence of the academic community are strongly encouraged. Salary and start-up package will be competitive and commensurate with qualifications and experience.

The **minimum qualifications** are a Ph.D. degree in Computer Science, or in a closely-related discipline, by the time of appointment, along with evidence of excellence in research and teaching. We particularly solicit applications from candidates with attitude for collaborative research, with expertise in HPC, supercomputing, big data or data analytics, whose research interests can complement and expand the existing expertise in the department. The successful candidate will be expected to develop an independent research program, collaborate in research projects with other faculty members, and teach graduate and undergraduate courses in Computer Science, with particular emphasis on courses related to the above mentioned disciplines.

The Department has strong research and educational programs, especially in the areas of artificial intelligence, software engineering, computer networks and architectures, bioinformatics, data mining, human-computer interaction, and theoretical computer science. The Department has an extensive computing infrastructure, which includes several parallel and distributed platforms. The Department offers B.S, B.A., M.S., and Ph.D. degrees in Computer Science, M.S. in Bioinformatics, and actively participates in inter-disciplinary research and educational programs.

NMSU is located in southern New Mexico, the *"Land of Enchantment"*, just 50 miles from the El Paso airport. NMSU is a land grant institution, with strong research programs and a tradition in serving a diverse student population (NMSU is a Minority-serving Institution). NMSU has ties to Sandia and Los Alamos National Laboratories, and the White Sands Missile Range. For more information, please visit www.cs.nmsu.edu and www.nmsu.edu.

Applicants should submit a letter of intent, a complete curriculum vitae, a research and teaching statement, and three letters of reference. Candidates selected will be required to provide official transcripts upon hire. Electronic submissions to www.cs.nmsu.edu/~cssearch are requested. For any questions, please contact the CS Faculty Search Chair, at cssearch@cs.nmsu.edu or calling 575-646-6239. Review of applications will start on 10/15/2013 and continue until the position is filled.

New Mexico State University is an EEO/AA Employer. All university positions are contingent upon availability of funding. All offers of employment, oral and written, are contingent on the university's verification of credentials and other information required by federal law, state law, and NMSU policies/procedures, and may include the completion of a criminal history check.

Drs. Vien Tran (left) and Khoi Nguyen (right) recently defended their Ph.D. dissertations, along with Drs. Son To and Hieu Nguyen (not pictured).

Recent Ph.D. Graduates

Please join us in congratulating Drs. Son To, Hieu Nguyen, Khoi Nguyen, and Vien Tran, who successfully defended their Ph.D. dissertations in the previous 2012-2013 academic year. They now join the ranks of CS doctoral graduates from NMSU.

Son's dissertation is titled "On Belief State Representation and its Application in Planning with Incomplete Informa-tion, Nondeterministic Actions, and Sensing Actions." He has taken up a post-doctoral position at the CMU Silicon Valley Campus in Palo Alto, CA.

Khoi's dissertation is on "Methodologies for Scaling Up Conformant Planning: Exploitation of Interaction between Possible Worlds." He joined Microsoft in Seattle, WA as a software development engineer.

Vien's dissertation is on "Techniques for Scalability of Conformant Planners." He has accepted a software engineering position at SimQuest in Boston, MA.

Hieu's dissertation is on "Knowledge Based Negotiation Agents: Theory and Implementation." He is now an assistant professor at Vinh University, Vietnam.

All four students were co-advised by Drs. Son Tran and Enrico Pontelli.

Asserting an Online Presence

New Website, Facebook Page, and Twitter Account

We are pleased to announce our new homes on the web. We have redesigned our website (www.cs.nmsu.edu), set up a Twitter feed: @NMSUCS, and posted a Facebook page: facebook.com/NMSUCS! These online sources will be updated regularly with CS news and announcements, enabling students, alumni, and researchers to stay abreast of the happenings in the department through their favorite online source. We invite you to **Like us on Facebook** and **follow us on Twitter**.

Our online outlets are a great source for the latest in research from the department. We are also sharing job opportunities to our students and alumni. If you are looking to hire, please let us know so we can get the word out!

The new NMSU CS online presence: website, Twitter, and Facebook. Use the QR codes in the corners to load the pages on your smartphone or computer, or visit directly:
http://www.cs.nmsu.edu
http://twitter.com/NMSUCS
http://facebook.com/NMSUCS

Support NMSU CS

We Need You!

If you are an alumnus or alumna, current student, or just a friend of the NMSU CS Department, and you would like to support our activities and mission – Thank You! There are many different ways to give back to the department.

The simplest way is to make a donation. Your donation will support the students pursuing their educational dreams, through scholarships, renovation of equipment and acquisition of materials and supplies. You have also the option of supporting our faculty members, enabling them to be more effective in their research and educational efforts. In particular, we are launching a new campaign at creating new opportunities to help young women interested in pursuing studies in Computer Science.

Your donation is tax deductible and even a small contribution will make a big difference! Donations can be made using the online NMSU donations system at fndforms.nmsu.edu/giving.php.

The following are some of the funds that you can contribute to:

- Young Women in Computing
  (*Supporting outreach efforts to attract women to computing*)
- Mark Nesiba Memorial Endowed Scholarship for Women in Computing
  (*Supporting a talented undergraduate woman in Computer Science)*
- Richard H. Stark Scholarship
  (*Supporting outstanding undergraduate CS students*)
- Founders' Endowment Fund
  (*Supporting faculty in the CS department*)
- General Scholarships Fund
  (*Supporting outstanding undergraduate and graduate CS students*)
- Equipment and Maintenance Fund
  (*Supporting the CS department in renovating its infrastructure*)
- Software and Educational Materials Fund
  (*Providing students with funds to acquire software and other educational materials*)
- J. Mack Adams Fund
  (*Supporting the establishment of an endowed professorship in CS*)

DONATION TIERS

< $64	NMSU CS Friend
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$128 – $256	NMSU CS Contributor
$256 – $512	NMSU CS Sustainer
$512 – $1024	NMSU CS Champion
> $1024	NMSU CS Hero

Donors will be acknowledged in the newsletter and on our website.

Recent Publications and Performances

What Your NMSU CS Students And Faculty Members Have Been Up To

J. Barnett, G. Bezhanishvili, **H. Leung**, G. Lodder, D. Pengelley, **I. V. Pivkina**, D. Ranjan, M. Zack. *Primary Historical Sources in the Classroom: Discrete Mathematics and Computer Science*. Loci: Convergence, 2013.

H. Cao, S. Bowers, M. Schildhauer. *Database Support for Enabling Data-Discovery Queries over Semantically-Annotated Observational Data*. Transactions on Large-Scale Data- and Knowledge-Centered Systems, 2012.

K. Cruz-Martinez, A. Rosling, **Y. Zhang**, **M. Song**, G. Andersen, J. Banfield. *Effect of Rainfall-Induced Soil Geochemistry Dynamics on Grassland Soil Microbial Communities*. Applied and Environmental Microbiology, 2012.

M. Elfituri, J. E. Cook, **J. Cook**. *Binary Instrumentation Support for Measuring Performance in OpenMP Programs*. International Workshop on Software Engineering for Computational Science and Engineering, 2013.

X. Fang, **S. Misra**, G. Xue, D. Yang. *Smart Grid–The New and Improved Power Grid: A Survey*. IEEE Communications on Surveys and Tutorials, 2012.

F. Fioretto, **E. Pontelli**. *Constraint Programming in Community-Based Gene Regulatory Network Inference*. Conference on Computational Methods in Systems Biology, 2013.

B. Gao, **Y. Jin**. *Adaptive Packet Resizing By Spatial Locality and Data Sharing for Energy-Efficient NOC*. International Conference on Parallel and Distributed Systems, 2013.

M. Hammad, **J. Cook**. *Compositional Verification of Sensor Software Using Uppaal*. IEEE International Symposium on Software Reliability Engineering, 2012.

J. Han, **H. Cao**. *An Efficient Location Reporting and Indexing Framework for Urban Road Moving Objects*. Distributed and Parallel Databases, to appear.

Y. Jin, T. Pinkston. *PAIS: Parallelism-Aware Interconnect Scheduling in Multicore*. ACM Transactions on Embedded Computing Systems, 2013.

H. Leung. *Regular Languages and Finite Automata*. Loci: Convergence, 2013.

S. Misra, **N. Majd**, H. Huang. *Approximation Algorithms for Constrained Relay Node Placement in Energy Harvesting Wireless Sensor Networks*. IEEE Transactions on Computers, to appear.

I. V. Pivkina. *Adoption of a Three-Part Approach in a Discrete Mathematics Course*. Journal of Computing Sciences in Colleges/Consortium for Computing Sciences in Colleges, 2013.

E. Pontelli, *et al. Phylotastic! Making Tree-of-Life Knowledge Accessible, Reusable and Convenient*. BMC Bioinformatics, 2013.

J. Said, Z. Lin, X. Zhang, **M. Song**, J. Zhang. *A Comprehensive QTL Meta-Analysis for Fiber Quality, Yield, Yield Related and Morphological Traits, Drought Tolerance, and Disease Resistance in Tetraploid Cotton*. BMC Genomics, to appear.

T. C. Son, **E. Pontelli**, **N. Nguyen**, C. Sakama. *Formalizing Negotiations Using Logic Programming.* ACM Transactions on Logic Programming, 2013.

Z. O. Toups, L. Ortiz, L. Lury. *A Free-Air Interactive Digital Painting Art installation for the play* Red *by the American Southwest Theatre Company at NMSU*. On display Sept. 27, 2013–Oct. 13, 2013.

V. Tran, **K. Nguyen**, **T. C. Son**, **E. Pontelli**. *A Conformant Planner based on Approximation: CpA(H)*. ACM Transactions on Intelligent Systems and Technology, 2013.

W. Yeoh, A. Kumar, S. Zilberstein. *Automated Generation of Interaction Graphs for Value-Factored Decentralized POMDPs*. International Joint Conference on Artificial Intelligence, 2013.

Contact Us

If you are an alumnus or alumna of the NMSU CS Department, we want to hear from you! Let us know what you are doing so we can share your successes.

Please join our Facebook page (facebook.com/NMSUCS) and follow us on Twitter (twitter.com/NMSUCS) and help us develop a community of NMSU CS Alumni and Friends. If you are in the neighborhood, please come by and visit! Or simply send us your ideas: your experience is valuable to assist with development, to help our students connect with alumni and potential employers, and to grow into a bigger and stronger department.

Send your contact information, news, and suggestions to:

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