A Summary of the Twenty-Ninth AAAI Conference on Artificial Intelligence

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Introduction by Sven Koenig

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■ *The Twenty-Ninth AAAI Conference on Artificial Intelligence (AAAI-15) was held in January 2015 in Austin, Texas (USA) The conference program was cochaired by Sven Koenig and Blai Bonet. This report contains reflective summaries of the main conference, the robotics program, the AI and robotics workshop, the Virtual Agent Exhibition, the What's Hot track, the Competition Panel, the senior member track, student and outreach activities, the student abstract and poster program, the doctoral consortium, the women's mentoring event, and the demonstrations program.*

The Twenty-Ninth AAAI Conference on Artificial Intelligence (AAAI-15), the inaugural winter version of the long-standing AAAI conference, was held in January 2015 in Austin, Texas (USA) during pleasant weather while snowstorms hit other parts of the United States. The conference program was cochaired by Sven Koenig and Blai Bonet.

AAAI-15 received 1991 submissions — 40 percent more than AAAI-14, which held the previous record. The 974 program committee members and 89 senior program committee members selected 539 papers that were presented either as 15-minute talks or posters (in three large poster sessions) that included 2-minute advertisements in the talk sessions. AAAI-15 needed to be extended by one day to accommodate this many presentations.

The AAAI-15 organizing committee of about 60 researchers arranged many of the traditional AAAI events, including the Innovative Applications of Artificial Intelligence (IAAI) Conference, tutorials, workshops, the video competition, senior member summary talks (on well-developed bodies of research or important new research areas), and What's Hot talks (on research trends observed in other AI-related conferences and, for the first time, competitions). Innovations of AAAI-15 included software and hardware demonstration programs, a virtual agent exhibition, a computer-game showcase, a funding information session with program directors from different funding agencies, and Blue Sky Idea talks (on visions intended to stimulate new directions in AI research) with awards funded by the CRA Computing Community Consortium. Seven invited talks surveyed AI research in academia and industry and its impact on society. Attendees kept track of the program through a smartphone app as well as social media channels.

The conference featured robotics as thematic focus, in part

The AAAI-15 Shakey Celebration

Featured panelists included (left to right) Edward Feigenbaum, Peter Hart, moderator Ben Kuipers, and Nils Nilsson.

in collaboration with the IEEE Robotics and Automation Society (IEEE RAS), the RoboCup Federation, and the Robotics: Science and Systems Foundation. AAAI-15 also featured events that highlighted social responsibility and the impact of AI on society. For example, an open house educated the general public about AI. The event was complemented with a workshop on AI and Ethics, a tutorial on AI and Technological Unemployment, invited talks on the future of AI, If Machines are Capable of Doing Almost Any Work Humans Can Do, What Will Humans Do? and Data Science for Social Good: Using Your Powers to Make a Social Impact, a debate on autonomous weapons, and a tutorial and topical paper track on computational sustainability.

This first-ever winter AAAI conference significantly extended traditional student activities, such as the AAAI/ACM SIGAI Doctoral Consortium, the student abstract and poster program and the Lunch with an AAAI Fellow program. For example, it included a Women's Mentoring breakfast, a tutorial on How to Be a PhD Student, an easily accessible paper program, and many mentoring and social activities specifically designed for students. Students and recent graduates also had the opportunity to participate in a job market organized in cooperation with the ACM Special Interest Group on AI (ACM SIGAI). New ways of recognizing the achievements of students included

the outstanding student paper award, the best student abstract talk award and certificates for undergraduate student coauthors of accepted AAAI papers.

AAAI-15 also hosted a community meeting in which the AAAI president and the AAAI councilors explained upcoming initiatives to the conference attendees, and the attendees had an opportunity to express their ideas and opinions to both the AAAI leadership and the AAAI community.

The following short summaries give more detailed overviews of some of the events that took place at AAAI-15.

Robotics Program

In an effort to bring the complementary communities of AI and robotics closer together, AAAI-15 greatly expanded the robotics program. This expansion was made possible through funding by the National Science Foundation (NSF) and NSERC Canadian Field Robotics Network. Events at AAAI-15 included a 40-year anniversary celebration of the robot Shakey with a number of participants from the project in attendance, a RoboCup soccer exhibition match, and an enlarged Robotics Exhibition, including a focus on robotics in Texas. Families and other members of the general public enjoyed seeing many of these events at the open house. Along with a new Integrated Systems

track, *robotics* was a high-level keyword for the technical track for the second consecutive year, filling two sessions with excellent research. Several tutorials, workshops, and What's Hot talks focused on robotics topics as well.

Additionally, AAAI-15 invited and supported the attendance of various members of the robotics community. Drew Bagnell gave an invited AI Robotics Early Career Spotlight keynote talk. Ten papers from Robotics: Science and Systems 2014 were selected for their relevance to the AAAI community and their authors were invited to present at a special session. And 13 graduate students from the robotics community were selected — from more than 60 applicants — to receive AI Robotics Fellowships that funded their conference attendance and allowed them to present their research. Overall, the robotics events formed a coherent theme and an impetus for intercommunity conversations about (re)integrating different aspects of the AI enterprise into intelligent systems.

The robotics program was organized by Brad Knox, George Konidaris, and Nick Hawes.

Research Issues at the Boundary of AI and Robotics Workshop

This full-day NSF-sponsored workshop brought together AI and robotics experts, including senior researchers in both fields. The attendees sought to compile a list of recommendations to funding agencies, professional organizations, and individual researchers for how to push the boundary of AI and robotics, including research areas that stand to benefit most from the collaboration of AI and robotics researchers and activities that bring these researchers together, such as possible challenge problems, the formation of a task force, and activities for the task force. The meeting consisted of short invited talks by invited participants as well as panels and discussion sessions (that involved all participants) to find common ground among the participants. Invitees and participants also prepared position statements that were aggregated and distributed in order to spur discussion and help identify major common threads. The result, currently in preparation, is a roadmap that will be made available to the general public through the world-wide web as well as distributed to funding agencies and within AAAI and IEEE RAS. The position statements and presentation slides are also available for download from the workshop webpage.[1]

The NSF-sponsored workshop was organized by Nancy Amato, Sven Koenig, and Dylan Shell.

Virtual Agent Exhibition

The Virtual Agent Exhibition showcased seven demonstrations illustrating state-of-the art research, some of which had previously been presented at sister conferences (such as AAMAS, AIIDE, or ICAPS).

Each demonstration also appeared as a two-page short paper in the AAAI-15 proceedings, where interested readers can find a full description as well as further references to the underlying research.

This exhibition was an opportunity to introduce an important application area that has been underrepresented at mainstream AI conferences. In addition, the interactive, visual nature of the demonstrators also made them suitable for display to a broader audience as part of the open house, presenting compelling applications of AI techniques.

Overall, the systems can be categorized into embodied conversational agents and interactive narratives, the underpinning AI techniques being multimodal interfaces and planning, respectively. Telecom ParisTech and University of Genoa demonstrated a real-time laughing agent responding to the user's body attitudes captured through a Kinect device. In addition to presenting one of the first comprehensive models of laughter, the system featured a sophisticated network-based control of multimodal expressions.

Attendees were able to interact live with the Sim-Sensei agent from the Institute of Creative Technologies of the University of Southern California, designed to increase people's willingness to disclose personal information in a health-care screening. The system automatically analyzes behavioral cues tied with psychological conditions, such as depression and posttraumatic stress disorder.

Northeastern University showcased a method for automatically generating realistic nonverbal performances for virtual characters to accompany spoken utterances, based on an analysis of the acoustic, syntactic, semantic, and rhetorical properties of the utterance text and audio signal. In the same category, the demonstration of the University of California at Santa Cruz featured socially responsive agents with full-body gestural interactions.

Best Laid Plans of North Carolina State University is an interactive narrative supported by a bespoke planner that supports the explicit management of narrative conflict, combining causal-link-based computational models of narrative with fast heuristic search techniques.

The SCHEHERAZADE-IF system of Georgia Institute of Technology uses AI and crowdsourcing to automatically construct text-based interactive narrative experiences.

Teesside's NetworkING system, which generates virtual medical dramas from the interactive definition of a social network for virtual characters, is based on a mainstream planning technique whose representational power is harnessed in support of narrative control.

The exhibition demonstrated that virtual agents can be AI-intensive applications. Furthermore, they often challenge accepted wisdom in their integration of component technologies (for example, on the role

Edward Feigenbaum, Second President of AAAI at AAAI-15.

of optimality in planning solutions), generating additional research problems for the AAAI community.

The organizer of the Virtual Agent Exhibition was Marc Cavazza.

What's Hot Track

The What's Hot track at AAAI-15 aimed to present exciting recent advances and current challenges in various subareas of AI as well as other areas closely related to AI. For this purpose, organizers of a variety of recent specialized AI-related conferences and AI competitions were invited to give an overview of the latest and most innovative methods and techniques as well as current and future challenges in their areas. Speakers also explained the role the conference or competition plays in advancing AI research. All of the presentations in the What's Hot track were accessible to the broad cross section of the general AAAI audience. The six conference talks covered a whole range of areas and events, from robotics (IROS), computer vision and pattern recognition (CVPR), and human-computer interaction (CHI) to knowledge discovery and data mining (KDD), human computation and crowdsourcing (HCOMP), and knowledge representation (KR). These were accompanied, for the first time, by What's Hot talks on AI-related competi-

tions. These covered a wide variety of topical contests, from challenging game competitions, such as Angry Birds and General Game Playing, through contests for automated negotiating agents, planning systems, and SAT and answer set programming solvers to the topical RoboCup@Home competition. A common theme among these presentations was the considerable progress that has been made from one year to the next in the past, the measures organizers take to ensure that the innovativeness of a competition does not stall over time, and how a competition contributes to the advancement of AI in general. Extended abstracts for many of the What's Hot presentations are included in the AAAI-15 proceedings.

The organizers of the What's Hot track were Esra Erdem and Michael Thielscher.

Competition Panel

The Competition Panel generated a lively discussion on how competitions help advance AI research. Contests are known to stimulate our natural competitiveness and motivate especially young researchers; they require us to put theories to practice, help build new communities focused on challenging problems, and — in most instances — provide clear criteria for

The AAAI Debate on Autonomous Weapons
Left to right: Ron Arkin, Thomas G. Dietterich, (moderator), and Stephen Goose.

progress along with benchmarks and data to support empirical evaluations. However, a major criticism is that competitive testing of systems is suitable only for development but not for research. The panel therefore addressed the issues of how competitions can be designed so as to ensure that the research has an impact beyond the competition itself, how we can avoid that the innovativeness stalls after a few years because one approach prevails, and how we can learn more from a competition than just how to win it. Among the core ideas discussed were the requirements that participants release their source code and the necessity to constantly evolve the competition setting itself. The latter requires a systematic way of measuring progress across various dimensions and changing the rules of a competition to make it harder every time a subproblem has been solved. It was also deemed important to design and, if necessary, redesign competitions so as to close loopholes and disable shortcuts that otherwise would allow for oversimplified solutions.

The Competition Panel was organied by Michael Thielscher. Panelists included Michael Bowling (Poker competition), Koen Hindriks (Agents competition), Claude Sammut, and Sven Wachsmuth (RoboCup competitions).

The 2015 Senior Member Track

AAAI-15's senior member presentation track provided an opportunity for established researchers in the AI community to give a broad talk on a well-developed body of research, an important new research area, or a promising new topic. In comparison to the corresponding track at AAAI-14, this year there were two important innovations.

First, there were two subtracks. The first track, called Summary Talks, aimed for broad talks on a well-developed body of research or an important new research area. Participants in the second track, Blue Sky Ideas, presented ideas and visions that could stimulate the research community to pursue new directions, for example, new problems, new application domains, or new methodologies that were likely to stimulate significant new research). Each presentation was accompanied by paper that was published in the AAAI-15 proceedings.

The senior member presentation track received 30 submissions, which were peer reviewed by other senior members of the AI community (mostly by those serving as senior program committe members of the main technical track). Twenty of these submissions were accepted for presentation (7 Summary Talks and 13 Blue Sky talks). In addition, the best 3 Blue Sky submissions (selected before the conference by a specific committee) were given an award, funded by the Computing Community Consortium[2] and had the opportunity to present the work in a plenary session.

The senior member track presentations attracted a large number of attendees and in many cases rooms were more than full, with attendees standing or sitting on the floor. Very important discussions were spawned, some were continued offline after the presentations with quite a few people listening or participating in this discussion.

The senior member track was cochaired by Ariel Felner and Jérôme Lang.
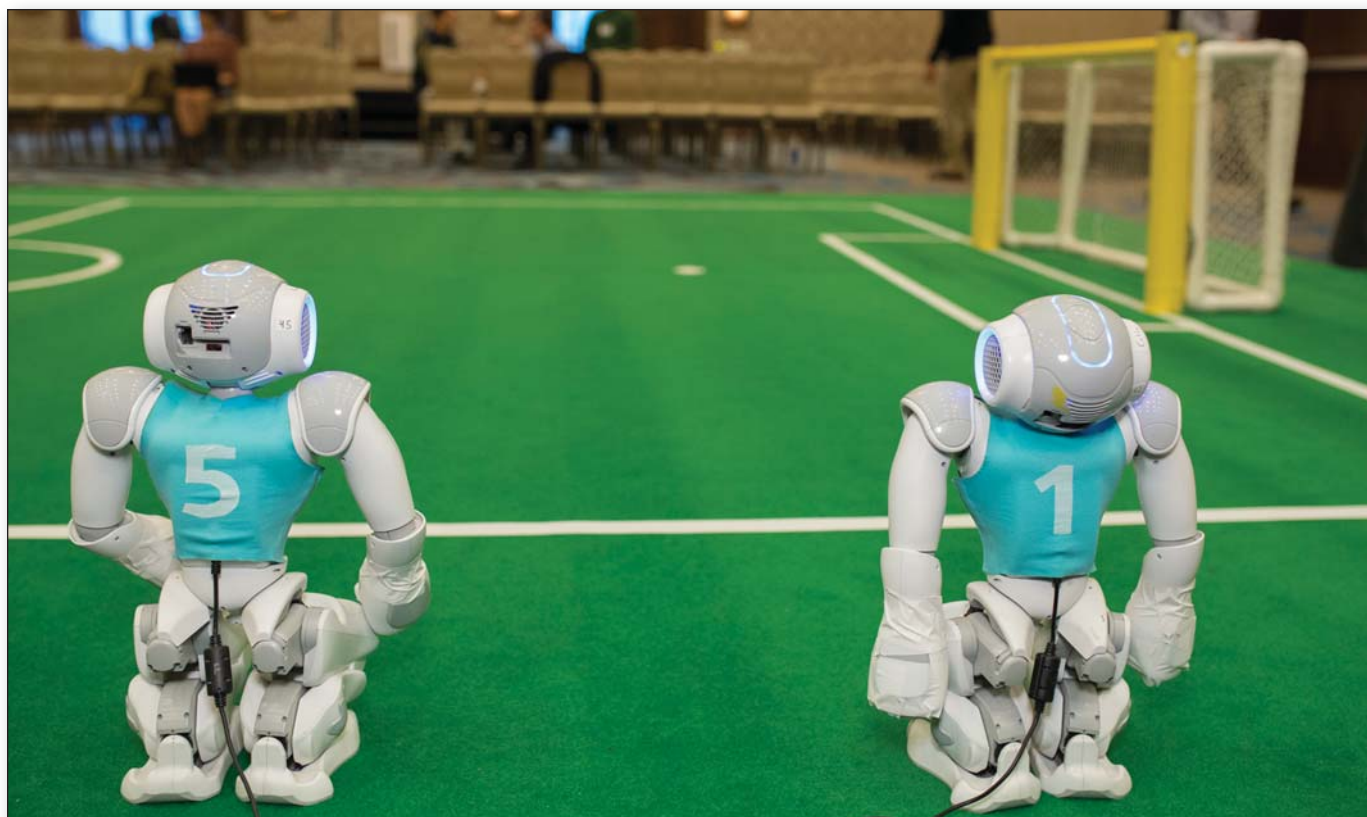
RoboCup at AAAI-15.

Student and Outreach Activities

AAAI-15 organized a broad range of activities targeted towards students and the general public. These included an open house, social events (newcomers lunch, group lunches, research speed dating, and a game night), an Easily-Accessible Paper program, and coordination for students looking to share housing.

The largest task was coordinating the open house, which brought together a range of researchers to demo and talk about their work to the general public. Our efforts to bring in organized school groups were unsuccessful, despite long-term planning and funding. In the future we recommend that a local organizer with strong ties to the school systems be brought in early to recommend the best time to hold the open house to coordinate with student schedules. However, the event did engage a broad spectrum of attendees from the general public, particularly because of the press coverage leading up to the event. The invited talks were well-attended, and the discussions around the future of AI were timely given the recent press coverage of AI.

The Easily-Accessible Paper program highlighted papers that, in the judgement of the program committee members, were especially accessible to attendees with only a general knowledge of AI. It also provided opportunities for students to meet with the authors of these papers. This innovation was risky because there isn't a guaranteed correlation between a well-written paper and a well-presented talk. Also, reviewers from outside a field are the ones best able to judge whether a paper is accessible or not, but most reviewers of a paper are from within its field. Thus, while the general idea of this track was appreciated, we received mixed feedback and believe that the track should be improved or rethought if it is to be used again in the future. As a research community we carefully evaluate research quality, but do not systematically evaluate presentation quality, something we may want to consider in the future.

Finally, the social activities were well-attended and seemed to be broadly enjoyed and thus served their purpose to intergrate new students and researchers into the AAAI community.

The general student and outreach activities were organized by Nathan R. Sturtevant and William Yeoh.

Student Abstract and Poster Program

The Student Abstract and Poster program at AAAI-15 and ran across two days and was a big success. There were 44 student participants, who presented their work in two poster sessions and in a three-minute presentation "madness" contest. The addition of the three-

minute poster madness for the first time had a positive response from all students, who participated enthusiastically. From their presentations, it was clear that they had practiced presenting their ideas concisely.

The best paper award was decided based on voting by the students and the judgement of two senior members. The best presentation award was given to Maria Cabrera for Touchless Telerobotic Surgery — Is It Possible at All? by Tian Zhou, Maria Eugenia Cabrera, and Juan Pablo Wachs. In addition, two papers were selected for honorable mention: Graphical Representation of Assumption-Based Argumentation by Claudia Schulz and A Sequence Labeling Approach to Deriving Word Variants by Jennifer D'Souza. Each of these students received a certificate from AAAI.

The student abstract and poster program was organized by Daniele Magazzeni, Sriraam Natarajan, and Sebastian Sardina.

AAAI/ACM SIGAI Doctoral Consortium

The two-day AAAI/ACM SIGAI Doctoral Consortium was designed to provide feedback to Ph.D. students on their dissertation topic, presentation styles, and career plans. All AAAI-15 attendees were encouraged to attend and provide feedback to the up-and-coming members of the AAAI community. Each student was also paired with a senior member of the AAAI community in his or her field, who served as a mentor for the student before, during, and after the doctoral consortium. They also received feedback from additional members of the AAAI community as part of their 40-minute presentation during the doctoral consortium and during the main AAAI-15 poster session. A total of 16 students presented on topics across the AI spectrum. The full list of students and presentations can be found on the doctoral consortium webpage.[3]

In addition to individual research talks, the doctoral consortium also included a panel on Launching and Managing your Career, in which the participants heard from Marc G. Bellemare (Google Deep Mind), Eric Eaton (University of Pennsylvania), Stephen Hart (Trac Labs), and Hector Munoz-Avila (National Science Foundation and Lehigh University) on subjects ranging from work-life balance to career goals and postgraduation jobs.

Through generous support of NSF and ACM SIGAI, the students, mentors, and panel members discussed ideas during two lunches and one dinner. By interacting with both junior and established members of the AAAI community, students were able to gain new perspectives for improving their research, got valuable critiques of their presentation styles, and advice on better situating their work within the broader field and on planning for their postgraduation future.

The AAAI/ACM SIGAI Doctoral Consortium was organized by David L. Roberts and Matthew E. Taylor.
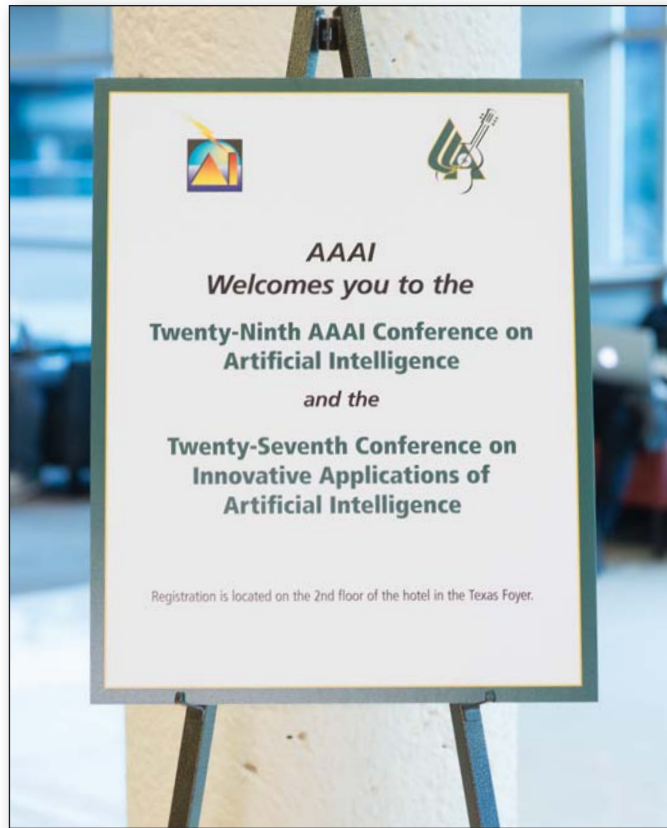
Breakfast with Champions: A Women's Mentoring Event

AAAI-15 featured Breakfast with Champions, a women's mentoring event that was specifically designed for women students to meet with senior women in AI. Women are very underrepresented in computer science, receiving only 14 percent of bachelor's degrees and 18 percent of Ph.D.s in computer science. The field of AI is no exception to this disparity: an estimated 14 percent of authors of accepted AAAI-15 papers were female. As a result of these skewed statistics, female students and junior faculty members often feel isolated and have few other women to interact with as peers or role models.

The goal of Breakfast with Champions was to create a stronger community for women in the field. It provided an informal setting for female students to meet senior women from academia and industry, with funding provided by *AI Journal* and AAAI, and supported by a nominal charge to participating students. The event was enormously successful and very well received by the 12 mentors and 45 students in attendance. Participants exchanged stories and advice about career planning, conference experiences, managing a career while starting a family, internships, and choosing between industry and academia. The students made valuable connections that will strengthen their ties with the AAAI community, and the mentors also benefited from the new rela-

The AAAI-15 Robotics Exhibition Begins.

two systems that provided assistance with television or home theater (one using planning, the other recommendation strategies), several systems that used AI to improve education or instruction, and two systems that demonstrated the power of graphical visualization using AI. Another system used social media to align power demand with local renewable energy.

The demonstration program was organized by Carlos Linares López.

Notes

1. robotics.cs.tamu.edu/nsfboundaryws.
2. See www.cra.org/ccc/visioning/blue-sky.
3. ciigar.csc.ncsu.edu/aaai2015-dc.

Blai Bonet is a professor of computer science at the Universidad Simón Bolívar.

Marc Cavazza is a professor in the School of Computing at Teesside University.

Marie desJardins is a professor of computer science at the University of Maryland, Baltimore County.

Ariel Felner is an associate professor at Ben Gurion University.

Nick Hawes is a reader in autonomous intelligent robotics at the School of Computer Science, University of Birmingham.

Brad Knox is a postdoctoral researcher at the Massachusetts Institute of Technology.

Sven Koenig is a professor of computer science at the University of Southern California.

George Konidaris is an assistant professor of computer science at Duke University.

Jérôme Lang is a senior scientist at CNRS and Lamsade, Université Paris-Dauphine.

Carlos Linares López is an assistant professor at Universidad Carlos III de Madrid.

Daniele Magazzeni is a lecturer in computer science, King's College London.

Amy McGovern is an associate professor in the School of Computer Science, University of Oklahoma.

Sriraam Natarajan is an assistant professor in the School of Informatics and Computing at Indiana University.

Nathan R. Sturtevant is an assistant professor in the Computer Science Department at the University of Denver.

Michael Thielscher is a professor in the School of Computer Science and Engineering at the University of New South Wales.

William Yeoh is an assistant professor in the Computer Science Department at the University of New Mexico.

Sebastian Sardina is a senior lecturer in the School of Computer Science and Information Technology at RMIT University.

Kiri Wagstaff is a scientist at the Jet Propulsion Laboratory, California Institute of Technology.

tionships and from the opportunity to share their experiences.

The Breakfast with Champtions event was organized by Marie desJardins, Amy McGovern, and Kiri Wagstaff.

The AAAI-15 Demonstration Program

The AAAI-15 Demonstrations Program was intended to foster discussion and exchange of ideas among researchers and practitioners from academe and industry by presenting software and hardware systems and research prototypes of such systems, including their capabilities and workings. Twenty-seven demonstrations were accepted for presentation, encompassing a wide variety of research topics, including agents, classifiers, games, HMI, knowledge representation, machine learning, neural networks, planning, recommendation systems, and visualization techniques.

Many of the hour-long demonstrations were well attended, which reflected the breadth and scope of the many interesting and wide-reaching applications. There were systems on traffic management, a system that used machine learning to correct emails,