The ICSI GAZETTE

featured research:
spokenlanguageunderstanding

The information age has led to an information overload; there is so much within easy access, but sorting through it all can be terribly unwieldy. A Google search of "How many bombings happened in Iraq this week?" brought up over 2.5 million highly redundant search results, but no direct answer. As increasing amounts of data become accessible, the need to sift through it quickly and intelligently will become all the more urgent. Within ICSI's large and diverse Speech Group, Dr. Dilek Hakkani-Tür leads a team of researchers that is training computers to answer questions, as well as distill information and summarize multiple information streams; essentially, to help computers understand language independent of the source – text, speech, or translation – and genre.

INFORMATION DISTILLATION

Information distillation – the retrieval of specific information in response to a query – is, on its surface, a straightforward task of combining information retrieval and topic-focused summarization: dig through the various data sources you have at your disposal, and return the information that responds to the original query. Consider a basic query such as "LIST FACTS ABOUT [US Secretary of Defense Rumsfeld's visit to China]." It is possible to search through several documents and identify a number of sentences that contain Rumsfeld's name or title along with a mention of China. It requires a significantly more robust system to be able to handle more complex queries such as "DESCRIBE THE ARRESTS OF PERSONS FROM [Al-Qaeda in Iraq] AND GIVE THEIR ROLE IN THE ORGANIZATION," which is more indicative of the types of queries that ICSI has worked with as part of the DARPA-funded multi-site GALE project. This query asks for more detailed information: names, affiliations, locations, and functions within a group. Since these pieces of information won't all occur explicitly in a given sentence, it requires the system to resolve pronouns, and understand the correlation between different named entities. For example, the distillation system has to understand that arrests of persons from Al-Qaeda in cities of Iraq like Basra and Baghdad should be included in its answer to this query. As queries and question-answering systems grow, their methods for returning relevant and non-redundant information must become more nuanced.

The GALE program – Global Autonomous Language Exploitation – presents some challenging goals. Distillation systems must handle complex queries and return results from a number of different sources such as print news, broadcast news, broadcast conversations, and blogs in different languages, namely English and Chinese. There are, naturally, some difficulties in realizing this goal. The distillation systems are being developed and evaluated with training data provided by DARPA; to deploy this kind of distillation system over real-world data presents new difficulties. Distilling information from spoken data requires accurate automatic speech recognition (ASR). Dr. Sibel Yaman points out that if an ASR system makes an error on a word or name it hasn't encountered before – like the name Sibel Yaman or, at one time, even the company-name-turned-verb "Google" – the ASR system is likely to also botch the word boundaries around the name and render the entire sentence unusable.

Even when ASR systems work, there is no method of verifying data or accounting for any inconsistencies. It's not hard to imagine events that might be described very differently by an official news source and a blog; a distillation system in this setting could return potentially conflicting statements. It's still up to the user to make judgment calls in these situations.

as i see it by Nelson Morgan, Director

Age is a question of mind over matter. If you don't mind, it doesn't matter.
- *Satchel Paige*

Today, I had lunch with a favorite uncle. He turned 96 recently, and is starting to appear a bit frail, though this is new for him – two years ago he seemed perfectly fit. His mind is still fine, and he retains much of the inner fire that he had as a young man. In those earlier times, he was an actor, a playwright, and a union organizer (in the electrical union). He also was blacklisted for a quarter century after an appearance before the House Un-American Activities Committee (HUAC). In that episode, he refused to testify (rather than taking refuge in the 5th Amendment), and challenged HUAC's right to hold such "witch hunt" hearings. This was during the Red Scare in post-WWII America, and the Committee used these hearings to intimidate and harass anyone who had dared to join or even associate with left-wing organizations. Uncle Manny essentially dared them to press charges, but instead, they blocked his ability to act, stage plays, or work for any American firm; this was standard fare for the blacklisting scenario of that time.

For me, Uncle Manny was (and is) a "working class hero." But he is something more – he represents an uncompromising embrace of life. At 96, while certainly delighting in telling stories of earlier days, he primarily looks forward – he is still considering what to do next. In recent years he has continued to write, perform (for instance in a one-man play that he wrote), and teach. He frankly recognizes his new physical limitations, but still aims his mind forward to new creative acts. And he has also continued to be active politically, serving as an advisor to organized labor, and writing op-ed pieces critical of government actions (and inaction).

I'm probably all the more intrigued by his story because I recently turned 60. In our base-10 culture, each of these decade transitions seems to have special meaning. Becoming 60 often reminds people of the typical retirement age, coming up in a few years. But my uncle only had his career rejuvenated in the last 30 years or so. Working with so many brilliant and creative young people at ICSI and in Berkeley in general is invigorating in some ways; but sometimes being with someone much older who still is creative and ambitious is also a great reminder that we can still contribute for a long time. It also doesn't hurt my sense of being young just to be with someone who is almost 4 decades older....

In many ways, ours is a youth-oriented culture. And yet, we also have an aging population, with increased longevity and baby boom demographics. Increasingly, there are many people past the typical retirement age who are looking for things to do and ways to be relevant. In our own professions, those of computer science and engineering, we have many examples of researchers who have continued to inspire and create long after the standard retirement age. And ICSI (and the Berkeley campus overall) has creative people with a wide range of ages.

All of these creative people, including my uncle, inspire me to look forward. Uncle Manny is also inspiring in a completely different way: his uncompromising drive to improve society. Even his art was focused on improving the lives of working people, though he also always revealed the human side of his cause: his fight with HUAC caused many conflicts within his family, creating problems that he revealed freely in his writings. It's not so easy to live up to his example. But we can try – looking where we can for research directions that: (1) present creative challenges; (2) offer some opportunity to satisfy a societal need, and (3) pay the bills. There are often conflicts between these goals, but we do our best.

One of the ICSI groups working to reconcile these goals is the Speech Group, featured in this issue of the Gazette. ICSI has worked on different aspects of speech processing for 20 years, and it's fair to say that we've made some significant contributions. Behind these efforts lies a notion of improving the accessibility of information for a wider range of humanity. As computers have spread throughout every aspect of our lives, we have run the risk of creating an environment that was more hospitable to machines than to people. Computers are ubiquitous, most notably the computers in our cell phones. And as access to information has become so much broader, the human interface for that access has often become more difficult, particularly for the wider population. Speech processing is not the whole answer to this, but it's part of it. It's part of the broader goal to make machines more human-friendly, rather than making people more machine-like; part of being able to ask for what you need in human terms: "call Hynek Hermansky" rather than having to use 10-digit codes for each person we want to contact. Of course, the ICSI Speech Group has moved significantly beyond the speech recognition task, as you will see in the rest of this issue. Enjoy.

news briefs

BFOIT, the Berkeley Foundation for Opportunities in Information Technology, hosted its 10th Anniversary Reception on Friday, August 14th, at the Sibley Auditorium in the Stephen D. Bechtel Building at UC Berkeley. BFOIT has also received a generous donation for $5,000 from Paula Hawthorn and Michael Ubell of the Agape Foundation. BFOIT is an ICSI program that supports historically underrepresented ethnic minorities and women in science and engineering.

ICSI Bioinformatics researchers have made significant contributions to a recently published study in Nature Genetics which links a single gene mutation to follicular lymphoma. The disease, a type of non-Hodgkin's lymphoma, affects approximately 66,000 Americans per year, resulting in 20,000 deaths. Eran Halperin and Lucia Conde of ICSI's Algorithms Group performed the statistical analysis of the genetic data used in the study, which was led by Christine Skibola of UC Berkeley and Kevin M. Brown of TGen (Translational Genomics Research Institute).

UC Berkeley's Linguistics Department and ICSI hosted "FRAMES AND CONSTRUCTIONS: A conference in honor of Charles J. Fillmore" on the occasion of his 80th birthday. The conference, whose theme was Fillmore's contributions to Linguistics for nearly five decades, took place on the UC Berkeley campus from July 31 - August 2, 2009.

New Scientist's May 11 edition (issue 2707) featured botnet infiltration work done by Christian Kreibich and other members of the Networking Group in an article titled "Cyber Espionage Reveals Spammer Strategies." This work was also featured in The Berkeley Science Review in an article by ICSI's own Dan Gillick, a graduate student in the Speech Group.

Tobias Friedrich, a DAAD Fellow in the Algorithms Group, along with co-authors Christian Horoba and Frank Newmann, has won a Best Paper Award in the Evolutionary Multiobjective Optimization category at the 2009 Genetic and Evolutionary Computation Conference (GECCO) for their paper, "Multiplicative Approximatons and the Hypervolume Indicator."

Mouton de Gruyter's "Multilingual FrameNets in Computational Lexicography," edited by ICSI alum Hans C. Boas of the University of Texas, features several articles contributed by ICSI's past and present FrameNet members.

Congratulations to Luke Gottlieb and his wife Emy on the birth of their son Judah Richmond Gottlieb, who was born on July 27th, weighing 9 lbs 1 oz.

Judah Richmond Gottlieb

ICSI's Joke-o-mat was selected as a finalist in the ACM Multimedia Grand Challenge 2009. Created by Gerald Friedland, Luke Gottlieb, and Adam Janin of the Speech Group, Joke-o-mat is designed to parse sitcoms by identifying the main characters, the best jokes (as signaled by the loudest and longest laughs), and scene changes. It was made in response to a challenge from Yahoo! on how to segment video along thematic lines. The winner of the Grand Challenge will be announced in October at the ACM Multimedia Conference.

Paul Kay and co-authors from the University of Hong Kong and the Chinese Academy of Sciences published a paper in the May 4-8 issue of Proceedings of The National Academy of Sciences (PNAS) titled "Language Regions of Brain are Operative in Color Perception." Kay, a linguist working in the AI Group, has been published in PNAS several times for related work on color naming and color perception.

Ulrich Rückert, a DAAD Fellow in the Algorithms Group, has won the Best Paper Award at the recent Siam International Conference on Data Mining (SDM 2009), for a paper titled "Adaptive Concept Drift Detection" that he co-wrote with Anton Dries.

Steve Sinha of the AI group has received an AAAS Science and Technology Policy Fellowship and will be working at the DHS Office of Policy Development. Sinha is among 190 scientists and engineers who will spend a year providing valuable science and technology expertise to the government.

featured research, cont.

The continuing growth of distillation systems implies that solutions to these problems are within reach. Information retrieved by current distillation is parsed in a number of useful ways. The systems can indeed make correlations like Baghdad ~ Iraq; it understands people's titles and group affiliations, filters out redundant information, and can even identify causation. New developments include the ability to sort the information coming back to the user; instead of just regurgitating relevant sentences, the information can be broken down by who, what, where, how, and why, allowing for quick sorting of relevant information.

SUMMARIZATION

If a distillation system can answer specific queries from a pool of data, it seems like a logical next step to develop a system that can go through the data and summarize its contents. The Speech Group is also working on just such a process. Whereas distillation determines if given information is relevant to a specific query, summarization finds the important elements from a source and summarizes them, either independently, or with content ranking by the user.

> People have tried a lot of different techniques, and things have gotten fancier over time. But nobody has ever figured out the simplest thing that works really well.

When a human summarizes a set of documents, he or she will read them, intuitively understand what they are talking about, and generate novel sentences explaining the key points. Robust language generation is still quite difficult for computers, so the current approach to computer summarization differs from human methods. First, the computer must determine what the important concepts are in a set of documents, and then it must present the important concepts back in the summary. ICSI's work in this field was initially fueled by the DARPA-funded CALO project (Cognitive Assistant that Learns and Organizes), led by ICSI's research partner SRI. The Speech Group's portion of CALO work developed ASR tools to summarize meetings by key items discussed. A robust diarization system looks at patterns of who speaks when to determine who the important speakers are, which identifies action items. University of Texas at Dallas visitor Shasha Xie's work incorporates prosodic features to identify salient sentences in meetings.

ICSI grad student Dan Gillick observes that "people have tried a lot of different techniques, and things have gotten fancier over time. But nobody has ever figured out the simplest thing that works really well." Accordingly, ICSI's approach to summarization tries to be as straightforward as possible. ICSI researchers use n-grams (sequences of n words) to identify the most often discussed concepts in the documents. The greater the frequency of a concept, the greater is its value. Taking into account the natural tendency of larger sentences to cover more concepts, a sentence with a greater weight is more likely to be a useful sentence in summarization. The value of a summary is the sum of the values of the unique concepts it contains; the ideal summary contains the most important concepts within the size constraint.

Now working with a pool of sentences that are both important and minimally redundant, the system condenses the data into a small summary, on the order of about 100 words. The search for the greatest number of important concepts in a limited space is an optimization problem. This particular NP-hard combinatorial problem is a variation of the knapsack problem, and is similar to one addressed by ICSI Professor Richard M. Karp in his landmark 1972 paper "Reducibility Among Combinatorial Problems." The Speech Group's form of extractive summarization is proving itself very successful in creating summaries that contain large amounts of information; the group was among the leaders at the 2008 Text Analysis Conference evaluation.

A summary may contain a lot of information, but that doesn't mean that it is going to be easy to read or even sensible. Some of the same problems that make it hard for a computer to create well-formed and reader-friendly language also make it hard for a computer to determine if its summary is easily readable. An additional layer of constraints encourages the summary to include sentences that will work well together. The sentences which are more independent – those without relative
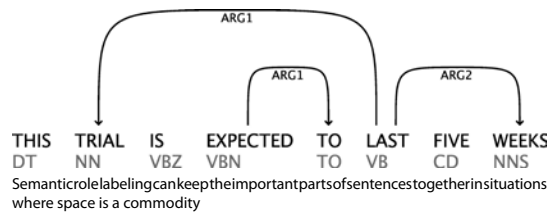
dates or unresolved pronouns, for example – will work better when concatenated. It may seem natural that the closer a sentence is to the beginning of a document, the more useful it will be in summarizing the document's contents; however, this is only partly true. Weighting all sentences based on their location in a document doesn't actually increase the quality of the summary. ICSI has recently experimented with a baseline system that uses only the very first sentence of documents, and it turns out that this system produces summaries that score as highly as any other systems currently in use. Other than the first sentence, it's not the case that earlier sentences are more useful than later ones. ICSI Postdoc Benoit Favre points out that it's easier for these systems to achieve satisfactory results, because returning complete sentences has little risk for error. A more robust, semantically derived system would construct more intelligent results, but runs a greater risk of making errors in evaluations.

Semantic role labeling can keep the important parts of sentences together in situations where space is a commodity

In order to keep the summaries compact, the Speech Group is developing methods of condensing the data within sentences. Sentence compression based solely on syntactic roles can leave sentences syntactically well-formed, but nonsensical. ICSI is exploring the use of semantic role labeling to enhance sentence compression. If a sentence has been annotated, the computer will be able to isolate the important parts of a sentence. Different annotation systems offer different benefits. PropBank, the annotation system currently in use, is a practical choice because of the large amount of annotated data within the corpus, but PropBank's annotation only extends deep enough to syntactically connect verbs with their prepositions, e.g. X gave Y to Z. A more robust annotation system, such as ICSI's own FrameNet, would greatly serve the summarization work being done in the Speech Group. FrameNet's robustness is not only its greatest strength, but is also a major obstacle in applying it to other technologies. FrameNet's annotation process is very rich, and thus takes more time (and funding) to develop into a comparatively comprehensive corpus. As FrameNet grows in size, it will prove to be another invaluable collaborative tool that ICSI researchers can leverage by simply walking down the hall.

What's in store?

In addition to the more established research directions discussed above, Dr. Hakkani-Tür is actively exploring other fields where ASR-fueled information extraction can be helpful.

NSF has funded some recent ICSI work introducing distillation to the field of emergency response. In times of emergencies and disasters, emergency response dispatchers can get absolutely swamped with calls, with some callers having to wait upwards of 10 minutes to speak with a dispatcher. A large number of these calls can be in regards to the same incident, e.g. a broken levee or a car accident. Dr. Hakkani-Tür is training a system to distill information from callers on hold to determine the content of their calls. An additional level of information is extracted from the prosody (voice quality) of the speaker. These data work together to prioritize calls, so that someone with an urgent health need won't be stuck waiting behind a dozen calls about a single car accident.

SRI has also funded some exploratory work on using ASR in elderly care centers. Health care decisions in situations like this can be very subjective; moreover, questions upon which these decisions are made can be uncomfortable for some. Dr. Hakkani-Tür's group has been studying to what extent automation of these conversations can yield improvements in service. ASR can facilitate these conversations happening more frequently, more privately, and more objectively.

Finally, Speech Group researchers focusing on language processing have collaborated with ICSI Networking researchers to explore how information distillation can be used to track black market activity on the internet. Conversational language recognition technology is useful in filtering out advertisements from chat logs to locate illegal solicitations in multiple languages. These tools can combine to identify the locations and content of various illicit activities that occur online, and trace the locations and behaviors of people trading stolen credit card information, social security numbers, and other exploitable personal information.

new study: protecting privacy in dna research

In the last few years, genome association studies have led to breakthrough medical discoveries. However, due to privacy concerns that the identity of individuals could be determined through DNA data, health institutes in the US and abroad have removed public access to the genetic data coming from these association studies. Such association studies have been shown to shed light on diseases such as cancer or Alzheimer's disease, and sharing the raw data from these studies with other scientists can aid tremendously with further discoveries. For this reason, Dr. Eran Halperin of the International Computer Science Institute and Tel Aviv University, and colleagues at the University of California, Berkeley have developed "a mathematical formula and a software solution that ensures that malicious eyes will have very low chances to identify individuals in any study," says Dr. Halperin.

Eran Halperin

The team found a mathematical formula to determine which SNPs -- small molecules of DNA that differ from individual to individual in the human population -- can be publicly accessed without compromising information about the participation of specific individuals in the study. Using software designed with this formula, NIH and other institutes can distribute important research data and make it available to scientists without compromising anyone's privacy.

"We've been able to determine how much of the DNA information one can reveal, without compromising a person's privacy," says Dr. Halperin. "This means the substantial effort invested in collecting this data will not have been in vain. Making this data publicly available again could speed up research and allow people to make new discoveries, more quickly."

Genome association studies compare data from many individuals to identify specific positions in the genome that may be associated with an increased risk of disease, such as cancer. For instance, Dr. Halperin was recently involved in a study that found a link between a specific genetic mutation and risk of a type of non-Hodgkin's lymphoma. By allowing access to genetic information from such studies to the scientific community, other scientists can leverage these studies to find more connections between genetics and diseases.

> Dr. Halperin has developed a solution to ensure that malicious eyes will have very low chances to identify individuals in any way.

The authors of the study plan to provide access to their software to NIH, and hope that scientists will use it, thereby providing public access to their now secure collected data.

A complete list of authors: Sriram Sankararaman and Michael Jordan of UC Berkeley. Guillaume Obozinski from Willow, a joint research team between INRIA Rocquencourt, École Normale Supérieure de Paris and Centre National de la Recherche Scientifique. Eran Halperin of ICSI and Tel Aviv University.

visiting scholars

Since its inception, ICSI has had a strong international program consisting primarily of ties with specific countries. Current formal agreements exist with China, the European Union, Finland, Germany, Spain, and Switzerland.

CHINA
Bo Xu (Networking)
Youquan Zheng (Networking)

FINLAND
Yoshia Hirase (Industrial)
Joakim Koskela (Networking)
Kimmo Kuusilinna (Industrial)
Tommi Lampikoski (Campus Affiliation)
Tiina Lindh-Knuutila (AI)
Annukka Näyhä
Jarno Rajahalme (Networking)
Jouni Similä (Campus Affiliation)

SPAIN
Oscar Ferrandez (AI)
Eduardo Lopez (Speech)
Carlos Subirats (AI-FrameNet)
Enrique Torres (Architecture)

GERMANY
Jan Baumbach (Algorithms)
Gerald Friedland (Speech)
Tobias Friedrich (Algorithms)
Martin Gairing (Algorithms)
Oliver Guenther (Industrial)
Ulrich Rückert (Algorithms)
Thomas Sauerwald (Algorithms)
Guido Schryen (Networking)
Holger Ziekow

EUROPEAN UNION (AMIDA)
Carl Henrik Ek (Vision)
Shasha Xie (Speech)
Carolin Mende (Speech)

SWITZERLAND (IM2)
Nikhil Garg (Speech)
David Imseng (Speech)

In addition, we often have visitors associated with specific research and projects.

AI
Alberto Amengual
Terry Regier

ALGORITHMS
Dorothea Emig
Richard Röttger
Ron Shamir
Roded Sharan
Tandy Warnow
Tobias Wittkop
Noah Zaitlen

EXTREME ARCHITECTURE
Chris Batten
Rose Liu

FRAMENET
Kyoko Ohara
Hiroaki Sato

VISION
Kiyohiro Sogen

NETWORKING
Po-Ching Lin
Jamon Liu

NETWORKING INTERNS
Tom Callahan
Brendan Cully
Lisa Fowler
Albert Kim
James McCauley
Prateek Mittal
Chitra Muthukrishnan
Matthew Sargent
Kyriakos Zarifis

SPEECH
Oded Ghitza
Carlos Vaquero

OTHER
Angès Voisard

Agnès Voisard

Jan Baumbach

Tiina Lindh-Knuutila

publicationslisting

M. Allman. Comments on Selecting Ephemeral Ports. ACM SIGCOMM Computer Communication Review, Vol. 39, Issue 2, pp. 13-19, April 2009.

Z. Al-Qudah, H. Alzoubi, M. Allman, M. Rabinovich, and V. Liberatore. Efficient Application Placement in a Dynamic Hosting Platform. Proceedings of the 18th International World Wide Web Conference (WWW 2009), Madrid, Spain, pp. 281-290, April 2009.

A. Amengual. A Computational Model of Attachment Secure Responses in the Strange Situation. ICSI Technical Report TR-09-002, March 2009.

A. Amengual. A Specification of a Hybrid Petri Net Semantics for the HISim Simulator. ICSI Technical Report TR-09-003, March 2009.

J. Baker, L. Deng, J. Glass, S. Khudanpur, C.-H. Lee, N. Morgan, and D. O'Shaughnessy. Research Developments and Directions in Speech Recognition and Understanding, Part 1. IEEE Signal Processing Magazine, Vol. 26, No. 3, pp. 75-80, May 2009.

J. Baker, L. Deng, J. Glass, S. Khudanpur, C.-H. Lee, N. Morgan, and D. O'Shaughnessy. Research Developments and Directions in Speech Recognition and Understanding, Part 2. IEEE Signal Processing Magazine, Vol. 26, No. 4, pp. 78-85, July 2009.

C. Batten, A. Joshi, J. Orcutt, A. Khilo, B. Moss, C. Holzwarth, M. Popovic, H. Li, H. Smith, J. Hoyt, F. Kärtner, R. Ram, V. Stojanovic, and K. Asanovic. Building Many-Core Processor-to-DRAM Networks with Monolithic CMOS Silicon Photonics. IEEE Micro, Vol. 29, Issue 4, July-August 2009.

J. Baumbach, T. Wittkop, C. K. Kleindt, and A. Tauch. Integrated Analysis and Reconstruction of Microbial Transcriptional Gene Regulatory Networks Using CoryneRegNet. Nature Protocols, Vol. 4, Issue 6, pp. 992-1005, June 2009.

S. Beamer, K. Asanovic, C. Batten, A. Joshi, and V. Stojanovic. Designing Multi-Socket Systems Using Silicon Photonics. Proceedings of the 23rd International Conference on Supercomputing (ICS-09), Yorktown Heights, New York, pp. 521-522, June 2009.

P. Berenbrink and T. Sauerwald. The Weighted Coupon Collector's Problem and Applications. Proceedings of the 15th International Computing and Combinatorics Conference (COCOON 2009), Niagra Falls, New York, pp. 449-458, July 2009.

T. Bocklet and E. Shriberg. Speaker Recognition Using Syllable-Based Constraints for Cepstral Frame Selection. Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Taipei, Taiwan, pp. 4525-4528, April 2009.

B. Bohnet. Efficient Parsing of Syntactic and Semantic Dependency Structures. Presented at the 13th Conference on Computational Natural Language Learning (CoNLL-2009), Boulder, Colorado, June 2009.

B. Bohnet. Synchronous Parsing of Syntactic and Semantic Structures. Proceedings of the Quatrième Conférence Internationale Sur La Théorie Sens-Texte (Fourth International Conference on Meaning-Text Theory, MTT'09), Montreal, Canada, June 2009.

K. Bringmann and T. Friedrich. Approximating the Least Hypervolume Contributor: NP-Hard in General, but Fast in Practice. Proceedings of the Fifth International Conference on Evolutionary Muilti-Criterion Optimization (EMO 2009), Nantes, France, pp. 6-20, April 2009.

D. Brockhoff, T. Friedrich, N. Hebbinghaus, C. Klein, F. Neumann, and E. Zitzler. On the Effects of Adding Objectives to Plateau Functions. IEEE Transactions on Evolutionary Computation, Vol. 13, Issue 3, pp. 591-603, June 2009.

N. Chang. From Motion Frames to Grammar: A Usage-Based Model of a Construction Learning. Presented at Frames and Constructions, Berkeley, California, July 2009.

C. M. Christoudias, R. Urtasun, A. Kapoor, and T. Darrell. Co-Training with Noisy Perceptual Observations. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Miami, Florida, pp. 2844-2851, June 2009. Also presented at the Learning Workshop (Snowbird), Clearwater, Florida, April 2009.

J. DeNero, M. Bansal, A. Pauls, and D. Klein. Efficient Parsing for Transducer Grammar. Proceedings of North American Chapter of the Association for Computational Linguistics Human Language Technologies Conference (NAACL HLT 2009), Boulder, Colorado, pp. 227-235, May 2009.

J. DeNero, D. Chiang, and K. Knight. Fast Consensus Decoding over Translation Forests. Proceedings of the Joint Conference of the 47th Annual Meeting of the Association for Computational Linguistics and the Fourth International Joint Conference on Natural Lanaguage Processing of the Asian Federation of Natural Language Processing (ACL-IJCNLP 2009), Singapore, August 2009.

J. DeNero, A. Pauls, and D. Klein. Asynchronous Binarization for Synchronous Grammars. Proceedings of the Joint Conference of the 47th Annual Meeting of the Association for Computational Linguistics and the Fourth International Joint Conference on Natural Language Processing of the Asian Federation of Natural Language Processing (ACL-IJCNLP 2009), Singapore, August 2009.

B. Doerr and T. Friedrich. Deterministic Random Walks on the Two-Dimensional Grid. Combinatorics, Probability and Computing, Vol. 18, Nos. 1-2, pp. 123-144, March 2009.

B. Doerr, T. Friedrich, and T. Sauerwald. Quasirandom Rumor Spreading: Expanders, Push vs. Pull, and Robustness. Proceedings of the 36th International Colloquium on Automata, Languages, and Programming (ICALP 2009), Rhodes, Greece, pp. 366-377, July 2009.

A. Dries and U. Rückert. Adaptive Concept Drift Detection. Best paper, proceedings of the 9th SIAM International Conference on Data Mining, Sparks, Nevada, pp. 235-246, April 2009.

R. Elsässer and T. Sauerwald. On the Runtime and Robustness of Randomized Broadcasting. Theoretical Computer Science, Vol. 410, Issue 36, pp. 3414-3427, August 2009.

R. Elsässer and T. Sauerwald. Tight Bounds for the Cover Time of Multiple Random Walks. Proceedings of the 36th International Colloquium on Automata, Languages, and Programming (ICALP 2009), Rhodes, Greece, pp. 415-426, July 2009.

B. Fabian and O. Günther. Security Challenges of the EPC Network. Communications of the ACM, Vol. 52, Issue 7, pp. 121-125, July 2009.

B. Favre and B. Bohnet. ICSI-CRF: The Generation of References to the Main Subject and Named Entities Using Conditional Random Fields. Presented at the Joint Conference of the 47th Annual Meeting of the Association for Computational Linguistics and the Fourth International Joint Conference on Natural Language Processing of the Asian Federation of Natural Language Processing (ACL-IJCNLP 2009), Singapore, August 2009.

B. Favre, D. Hakkani-Tür, and E. Shriberg. Syntactically Informed Models for Comma Prediction. Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Taipei, Taiwan, pp. 4697-4700, April 2009.

J. Feldman, E. Dodge, and J. Bryant. A Neural Theory of Language and Embodied Construction Grammar. In The Oxford Handbook of Linguistic Analysis, B. Heine and H. Narrog, eds., Oxford University Press, 2009.

M. Félegyházi, M. Cagalj, and J.-P. Hubaux. Efficient MAC in Cognitive Radio Networks: A Game-Theoretic Approach. Transactions on Wireless Communications, Vol. 8, No. 4, April 2009.

C. J. Fillmore. Frames and Constructions: Putting Them Together. Presented at Frames and Constructions, Berkeley, California, July 2009.

C. J. Fillmore and C. F. Baker. A Frame Approach to Semantic Description. In The Oxford Handbook of Linguistic Analysis, B. Heine and H. Narrog, eds., Oxford University Press, 2009.

S. Floyd and E. Kohler. RFC 5622: Profile for DCCP Congestion Control ID 4: TCP-Friendly Rate Control for Small Packets (TFRC-SP). Request for Comments 5622, Experimental, August 2009.

S. Foraker, T. Regier, N. Khetarpal, A. Perfors, and J. Tenenbaum. Indirect Evidence and the Poverty of the Stimulus: The Case of Anaphoric One. Cognitive Science, Vol. 33, No. 2, pp. 287-300, March-April 2009.

A. Fossati, M. Salzmann, and P. Fua. Observable Subspaces for 3D Human Motion Recovery. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Miami, Florida, pp. 1137-1144, June 2009.

M. Frampton, R. Fernández, P. Ehlen, C. M. Christoudias, T. Darrell, and S. Peters. Who is "You"? Combining Linguistic and Gaze Features to Resolve Second-Person References in Dialogue. Proceedings of the 12th Conference of the European Chapter of the Association for Computational Linguistics (EACL 2009), Athens, Greece, pp. 273-281, March 2009.

G. Friedland. Analytics for Experts. ACM SIGMM Records, April 2009.

G. Friedland. Review of P. Dev and W. Heinrichs, "Learning Medicine Through Collaboration and Action: Collaborative, Experimental, Networked Learning Environments." ACM Computing Reviews, June 2009.

G. Friedland. Review of E. Villalon, "High-Dimensionality Data Reduction in Java." ACM Computing Reviews, March 2009.

G. Friedland, H. Hung, and C. Yeo. Multi-Modal Speaker Diarization of Real-World Meeting Using Compressed-Domain Video Features. Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Taipei, Taiwan, pp. 4069-4072, April 2009.

G. Friedland and S. C. Shen, eds. Best Papers from the 10th IEEE International Symposium on Multimedia. International Journal on Semantic Computing, Vol. 3, Issue 1, June 2009.

G. Friedland, O. Vinyals, Y. Huang, and C. Müller. Fusion of Short-Term and Long-Term Features for Improved Speaker Diarization. Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Taipei, Taiwan, pp. 4077-4080, April 2009.

G. Friedland, O. Vinyals, Y. Huang, and C. Müller. Prosodic and Other Long-Term Features for Speaker Diarization. IEEE Transactions on Audio, Speech, and Language Processing, Vol. 17, No. 5, pp. 985-993, July 2009.

T. Friedrich, J. He, N. Hebbinghaus, F. Neumann, and C. Witt. Analyses of Simple Hybrid Algorithms for the Vertex Cover Problem. Evolutionary Computation, Vol. 1, No. 1, pp. 3-19, Spring 2009.

T. Friedrich, N. Hebbinghaus, and F. Neumann. Comparison of Simple Diversity Mechanisms on Plateau Functions. Theoretical Computer Science, Vol. 410, Issue 26, pp. 2453-2536, June 2009.

T. Friedrich, C. Horoba, and F. Neumann. Multiplicative Approximations and the Hypervolume Indicator. Proceedings of the Genetic and Evolutionary Computation Conference (GECCO 2009), Montreal, Canada, July 2009.

T. Friedrich and T. Sauerwald. Near-Perfect Load Balancing by Randomized Rounding. Proceedings of the 41st ACM Symposium on Theory of Computing (STOC 2009), Bethesda, Maryland, pp. 121-130, May 2009.

T. Friedrich, T. Sauerwald, and D. Vilenchik. Smoothed Analysis of Balancing Networks. Proceedings of the 36th International Colloquium on Automata, Languages, and Programming (ICALP 2009), Rhodes, Greece, pp. 472-483, July 2009.

M. Fritz and B. Schiele. Towards Integration of Different Paradigms in Modeling, Representation, and Learning of Visual Categories. In Object Categorization: Computer and Human Vision Perspectives, S. Dickinson, A. Leonardis, B. Schiele, and M. Tarr, eds., Cambridge University Press, 2009.

A. Geiger, R. Urtasun, and T. Darrell. Rank Priors for Continuous Non-Linear Dimensionality Reduction. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Miami, Florida, pp. 880-887, June 2009.

D. Gillick. Sentence Boundary Detection and the Problem with the U.S. Proceedings of the North American Chapter of the Association for Computational Linguistics Human Language Technologies Conference (NAACL HLT 2009): Short Papers, Boulder, Colorado, pp. 241-244, June 2009.

D. Gillick and B. Favre. A Scalable Global Model for Summarization. Proceedings of the Workshop on Integer Linear Programming for Natural Language Processing at the North American Chapter of the Association for Computational Linguistics Human Language Technologies Conference (NAACL HLT 2009), Boulder, Colorado, pp. 10-18, June 2009.

D. Gillick, K. Riedhammer, B. Favre, and D. Hakkani-Tür. A Global Optimization Framework for Meeting Summarization. Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Taipei, Taiwan, pp. 4069-4072, April 2009.

C. Goebel, C. Tribowski, and O. Günther. Adoption of Cross-Company RFID: An Empirical Analysis of Perceived Influence Factors. Proceedings of the 17th European Conference on Information Systems (ECIS 2009), Verona, Italy, June 2009.

C. Goebel, C. Tribowski, and O. Günther. EPCIS-Based Supply Chain Event Management—A Quantitative Comparison of Candidate System Architectures. Proceedings of International Conference on Complex, Intelligent, and Software Intensive Systems (CISIS-2009), Fukuoka, Japan, pp. 494-499, March 2009.

C. Goebel, C. Tribowski, O. Günther, and R. Tröger. RFID in the Supply Chain: How to Obtain a Positive ROI – The Case of Gerry Weber. Presented at the 11th International Conference on Enterprise Information Systems (ICEIS 2009), Milan, Italy, May 2009.

A. Gomila and A. Amengual. Moral Emotions for Autonomous Agents. In Handbook of Research on Synthetic Emotions and Sociable Robotics: New Applications in Affective Computing and Artificial Intelligence, J. Vallverdu and D. Casacuberta, eds., pp. 166-179, IGI Global, 2009.

O. Günther, L. Ivantysynova, J. Rode, and H. Ziekow. IT Infrastructures in Manufacturing: Insights from Seven Case Studies. Proceedings of the 15th Americas Conference on Information Systems (AMCIS 2009), San Francisco, California, August 2009.

O. Günther, H. Krasnova, D. Riehle, and V. Schöndienst. Modeling Microblogging Adoption in the Enterprise. Proceedings of the 15th Americas Conference on Information Systems (AMCIS 2009), San Francisco, California, August 2009.

U. Guz, B. Favre, D. Hakkani-Tür, and G. Tur. Generative and Discriminative Methods Using Morphological Information for Sentence Segmentation of Turkish. IEEE Transactions on Speech, Audio and Language Processing, Special Issue on Processing Morphologically Rich Languages, Vol. 17, No. 5, pp. 895-903, July 2009.

A. Haghighi, J. Blitzer, J. DeNero, and D. Klein. Better Word Alignments with Supervised ITG Models. Proceedings of the Joint Conference of the 47th Annual Meeting of the Association for Computational Linguistics and the Fourth International Joint Conference on Natural Lanaguage Processing of the Asian Federation of Natural Language Processing (ACL-IJCNLP 2009), Singapore, August 2008.

D. Hakkani-Tür. Towards Automatic Argument Diagramming of Multiparty Meetings. Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Taipei, Taiwan, pp. 4753-4756, April 2009.

E. Halperin and D. A. Stephan. Maximizing Power in Association Studies. Nature Biotechnology, Vol. 27, Issue 3, pp. 255-256, March 2009.

E. Halperin and D. A. Stephan. SNP Imputation in Association Studies. Nature Biotechnology, Vol. 27, Issue 4, pp. 349-351, April 2009.

publications, cont.

Y. Hasegawa, R. Lee-Goldman, and C. J. Fillmore. Framing Causal Events in Japanese and English. Presented at Frames and Constructions, Berkeley, California, July 2009.

A. Hinze and A. Voisard. EVA: An EVent Algebra Supporting Adaptivity and Collaboration in Event-Based Systems. ICSI Technical Report TR-09-006, July 2009.

L. Ivantysynova, M. Klafft, H. Ziekow, O. Günther, and S. Kara. RFID in Manufacturing: The Investment Decision. Proceedings of the 13th Pacific Asia Conference on Information Systems (PACIS 2009), Hyderabad, India, paper 41, July 2009.

A. Joshi, C. Batten, Y.-J. Kwon, S. Beamer, I. Shamim, K. Asanovic, and V. Stojanovic. Silicon-Photonic Clos Networks for Global On-Chip Communication. Proceedings of the Third ACM/IEEE International Symposium on Networks-on-Chip (NOCS 2009), San Diego, California, May 2009.

S. S. Kajarekar, N. Scheffer, M. Graciarena, E. Shriberg, A. Stolcke, L. Ferrer, and T. Bocklet. The SRI NIST 2008 Speaker Recognition Evaluation System. Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Taipei, Taiwan, pp. 4205-4208, April 2009.

P. Kay. If a Canoe Can Be Carved from Every Log Why Can't a Log Be Carved into Every Canoe? Presented at Frames and Constructions, Berkeley, California, July 2009.

P. Kay, T. Regier, A. L. Gilbert, and R. B. Ivry. Lateralized Whorf: Language Influences Perceptual Decision in the Right Visual Field. in Language, Evolution, and the Brain, J. W. Minett and W. S-Y. Wang, eds., City University of Hong Kong Press, 2009.

J. Keilwagen, J. Baumbach, T. Kohl, and I. Grosse. MotifAdjuster: A Tool for Computational Reassessment of Transcription Factor Binding Site Annotations. Genome Biology, Vol. 10, Issue 5, p. R46, May 2009.

N. Khetarpal, A. Majid, and T. Regier. Spatial Terms Reflect Near-Optimal Spatial Categories. Proceedings of the 31st Annual Conference of the Cognitive Science Society (CogSci 2009), Amsterdam, pp. 2396-2401, July 2009.

B. Kirkpatrick, J. Rosa, E. Halperin, and R. M. Karp. Haplotype Inference in Complex Pedigrees. Presented at the 13th Annual International Conference on Research in Computational Molecular Biology (RECOMB 2009), Tucson, Arizona, May 2009.

J. Kolar, Y. Liu, and E. Shriberg. Genre Effects on Automatic Sentence Segmentation of Speech: A Comparison of Broadcast News and Broadcast Conversations. Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Taipei, Taiwan, pp. 4701-4704, April 2009.

T. Kotro, T. Lindh-Knuutila, and E. Hiltunen. How to Analyze Various Consumer Data in the Future? Presented at the 11th International Conference of Finland Futures Research Centre and Finland Futures Academy, Tampere, Finland, May 2009.

H. Krasnova, E. Kolesnikova, and O. Günther. "It Won't Happen To Me!": Self-Disclosure in Online Social Networks. Proceedings of the 15th Americas Conference on Information Systems (AMCIS 2009), San Francisco, California, August 2009.

C. Kreibich, C. Kanich, K. Levchenko, B. Enright, G. Voelker, V. Paxson, and S. Savage. Spamcraft: An Inside Look At Spam Campaign Orchestration. Proceedings of the Second USENIX Workshop on Large-Scale Exploits and Emergent Threats (LEET '09), Boston, Massachusetts, April 2009.

B. Kulis, S. Sra, and I. Dhillon. Convex Perturbations for Scalable Semidefinite Programming. Proceedings of the 12th International Conference on Artificial Intelligence and Statistics (AISTATS 2009), Clearwater Beach, Florida, pp. 296-303, April 2009.

A. Kuzmanovic, S. Floyd, and K. K. Ramakrishnan. RFC 5562: Adding Explicit Congestion Notification (ECN) Capability to TCP's SYN/ACK Packets. Request for Comments 5562, Experimental, June 2009.

T. Lampikoski. Nintendo Yes Wii Can. UC Berkeley Haas School of Business MBA case study, March 2009.

N. D. Lawrence and R. Urtasun. Non-Linear Matrix Factorization. Presented at the Learning Workshop (Snowbird), Clearwater, Florida, April 2009.

N. D. Lawrence and R. Urtasun. Non-Linear Matrix Factorization with Gaussian Processes. Proceedings of the 26th International Conference on Machine Learning (ICML 2009), Montreal, Canada, pp. 601-608, June 2009.

R. Lee-Goldman and R. Rhodes. Corpus-Based Analysis and Annotation of Constructions. Presented at Frames and Constructions, Berkeley, California, July 2009.

R. Lee-Goldman, J. Ruppenhofer, M. Ellsworth, and C. F. Baker. Pragmatic Factors in Null Instantiation: Beyond Definiteness and Genre. Presented at the 11th International Pragmatics Conference, Melbourne, Australia, July 2009.

H. Lei. Towards Structured Approaches to Arbitrary Data Selection and Performance Prediction for Speaker Recognition. Proceedings of the Third IAPR/IEEE International Conference on Biometrics (ICB 2009), Alghero, Italy, pp. 513-522, June 2009.

Z. Li, A. Goyal, Y. Chen, and V. Paxson. Automating Analysis of Large-Scale Botnet Probing Events. Proceedings of the ACM Symposium on Information, Computer, and Communication Security (ASIACCS 2009), Sydney, Australia, pp. 11-22, March 2009.

B. Lönneker-Rodman and C. F. Baker. The FrameNet Model and Its Applications. Natural Language Engineering, Vol. 15, Issue 3, pp. 415-453, July 2009.

M. Mavronicolas and T. Sauerwald. A Randomized, O(log w)-Depth 2-Smoothing Network. Proceedings of the 21st ACM Symposium on Parallelism in Algorithms and Architectures (SPAA 2009), Calgary, Canada, August 2009.

F. Moreno-Noguer, M. Salzmann, V. Lepetit, and P. Fua. Capturing 3D Stretchable Surfaces from Single Images in Closed Form. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Miami, Florida, pp. 1842-1849, June 2009.

C. Müller and G. Friedland. Multimodal Interfaces for Automotive Applications (MIAA). Proceedings of the ACM International Conference on Intelligent User Interfaces (IUI 2009), Sanibel, Florida, pp. 493-494, February 2009.

K. H. Ohara. Frame-Based Contrastive Lexical Semnatics in Japanese FrameNet: The Case of Risk and Kakeru. In Multilingual FrameNets in Computational Lexicography: Methods and Applications, H. Boas, ed., pp. 163-182, Mouton de Gruyer, 2009.

K. Parton, K. R. McKeown, R. Coyne, M. T. Diab, R. Grishman, D. Hakkani-Tür, M. Harper, H. Ji, W. Y. Ma, A. Meyers, S. Stolbach, A. Sun, G. Tur, W. Xu, and S. Yaman. Who, What, When, Where, Why? Comparing Multiple Approaches to the Cross-Lingual 5W Task. Proceedings of the Joint Conference of the 47th Annual Meeting of the Association for Computational Linguistics and the Fourth International Joint Conference on Natural Lanaguage Processing of the Asian Federation of Natural Language Processing (ACL-IJCNLP 2009), Singapore, August 2009.

B. Pasaniuc, J. Kennedy, and I. I. Mandoiu. Imputation-Based Local Ancestry Inference in Admixed Populations. Proceedings of the Fifth International Symposium on Bioinformatics Research and Applications (ISBRA 2009), Fort Lauderdale, Florida, pp. 221-233, May 2009.

B. Pasaniuc, S. Sankararaman, G. Kimmel, and E. Halperin. Inference of Locus-Specific Ancestry in Closely Related Populations. Proceedings of the 17th Annual International Conference on Intelligent Systems for Molecular Biology (ISMB) and the 8th European Conference on Computational Biology (ECCB), Stockholm, Sweden. in Bioinformatics, Vol. 25, No. 12, pp. 213-221, June 2009.

A. Pauls, J. DeNero, and D. Klein. Consensus Training for Consensus Decoding in Machine Translation. Proceedings of the 2009 Conference on Empirical Methods in Natural Language Processing, Singapore, pp. 1418-1427, August 2009.

V. Paxson. How the Pursuit of Truth Led Me to Selling Viagra. Invited talk at the 18th USENIX Security Symposium, Montreal, Canada, August 2009.

M. Petruck. Typological Considerations in Constructing a Hebrew FrameNet. In Multilingual FrameNets in Computational Lexicography: Methods and Applications, H. Boas, ed., pp. 183-205, Mouton de Gruyer, 2009.

M. Petruck. Why Is This Day Different from All Others? Presented at Frames and Constructions, Berkeley, California, July 2009.

S. Pfennigschmidt and A. Voisard. Handling Temporal Granularity in Situation-Based Services. ICSI Technical Report TR-09-005, July 2009.

D. Pfoser, A. Efentakis, A. Voisard, and C. Wenk. Exploiting Road Network Properties in Efficient Shortest-Path Computation. ICSI Technical Report TR-09-007, July 2009.

A. Raabe and A. Felke. High-Level Reconfiguration Modelling. In Languages for Embedded Systems and Their Applications, M. Radetzki, ed., pp. 227-240, Springer, 2009.

R. Rizk, D. Marx, M. Schrepfer, J. Zimmermann, and O. Günther. Media Coverage of Online Social Network Privacy Issues in Germany - A Thematic Analysis. Proceedings of the 15th Americas Conference on Information Systems (AMCIS 2009), San Francisco, California, August 2009.

M. Salzmann and P. Fua. Reconstructing Sharply Folding Surfaces: A Convex Formulation. Presented at the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Miami, Florida, pp. 1054-1061, June 2009.

R. Sarikaya, K. Kirchhoff, T. Schultz, and D. Hakkani-Tür. Introduction to the Special Issue on Processing Morphologically Rich Languages. IEEE Transactions on Audio, Speech and Language Processing, Vol. 17, No. 5, pp. 861-862, July 2009.

P. Schnitzpan, M. Fritz, S. Roth, and B. Schiele. Discriminative Structure Learning of Hierarchical Representations for Object Detection. Proceedings of the IEEE Conference on Computer Vision and Patter Recognition (CVPR), Miami, Florida, pp. 2238-2245, June 2009.

G. Schryen. Security of Open Source and Closed Source Software: An Empirical Comparison of Published Vulnerabilities. Proceedings of the 15th Americas Conference on Information Systems (AMCIS 2009), San Francisco, California, August 2009.

G. Schryen and R. Kadura. Open Source vs. Closed Source Software: Towards Measuring Security. Proceedings of the 24th Annual ACM Symposium on Applied Computing (SAC 2009), Honolulu, Hawaii, pp. 2016-2023, March 2009.

N. Shetty, G. Schwartz. M. Felegyhazi, and J. Walrand. Competitive Cyber-Insurance and Internet Security. Presented at the Workshop on Economics of Information Security (WEIS 2009), London, United Kingdom, June 2009.

E. Shriberg, B. Favre, J. Fung, D. Hakkani-Tür, and S. Cuendet. Prosodic Similarities of Dialog Act Boundaries Across Speaking Styles. In Linguistic Patterns in Spontaneous Speech, S.-C. Tseng, ed., pp. 213-239, Institute of Linguistics, 2009.

W. T. Siok, P. Kay, W. S. Y. Wang, A. H. D. Chan, L. Chen, K.-K. Luke, and L. H. Tan. Language Regions of Brain Are Operative in Color Perception. Proceedings of the National Academy of Sciences of the United States of America, Vol. 106, Issue 20, pp. 8140-8145 , May 2009.

C. F. Skibola, P. M. Bracci, E. Halperin, L. Conde, D. W. Craig, L. Agana, K. Iyadurai, N. Becker, A. Brooks-Wilson, J. D. Curry, et al. Genetic Variants at 6p21.33 Are Associated with Susceptibility to Follicular Lymphoma. Nature Genetics, Vol. 41, No. 8, pp. 873-875, August 2009.

R. Sommer, V. Paxson, and N. Weaver. An Architecture for Exploiting Multi-Core Processors to Parallelize Network Intrusion Prevention. Concurrency and Computation: Practice and Experience, Vol. 21, No. 10, pp. 1255-1279, July 2009.

V. Stojanovic, A. Joshi, C. Batten, Y.-J. Kwon, and K. Asanovic. Manycore Processor Networks with Monolithic Integrated CMOS Photonics. Proceedings of the 29th Conference on Lasers and Electro-Optics (CLEO'09) (invited paper), Baltimore, Maryland, May 2009.

A. Suárez, J. Moody, and M. Saffell. Dynamic Portfolio Management with Transaction Costs. Proceedings of the International Workshop on Advances in Machine Learning for Computational Finance, London, United Kingdom, July 2009.

C. Subirats. La Función del Corpus en FrameNet Español. Proceedings of the First International Conference on Corpus Linguistics (CILC 09), Murcia, Spain, pp. 1148-1155, May 2009.

C. Subirats. Spanish FrameNet: A Frame Semantic Analysis of the Spanish Lexicon. In Multilingual FrameNets in Computational Lexicography: Methods and Applications, H. Boas, ed., pp. 135-162, Mouton de Gruyter, 2009.

C. Subirats, O. Ferrandez, and M. Ortega. Spanish FrameNet in Question Answering. Presented at Frames and Constructions, Berkeley, California, July 2009.

D. Thaw, J. Feldman, and J. Li. CoPE: Democratic CSCW in Support of E-Learning. Proceedings of the IEEE International Conference on Complex, Intelligent and Software Intensive Systems (CISIS 2009), Barcelona, Spain, pp. 481-486, March 2009.

E. Torres, P. Ibáñez, V. Viñals-Yúfera, and J. Maria Llaberia. Store Buffer Design for Multibanked Data Caches. IEEE Transactions on Computers, March 2009.

C. Tribowski, C. Goebel, and O. Günther. RFID Context Data Management: The Missing Link to EPCIS-Based Supply Chain Monitoring. Proceedings of the 13th Pacific Asia Conference on Information Systems (PACIS 2009), Hyderabad, India, paper 2, July 2009.

C. Tribowski, K. Spin, O. Günther, and O. Sielemann. Storing Data on RFID Tags: A Standards-Based Approach. Proceedings of the 17th European Conference on Information Systems (ECIS 2009), Verona, Italy, June 2009.

C. Tribowski, K. Spin, O. Günther, and O. Sielemann. Unternehmensübergreifende RFID-Anwendungen–Eine Fallstudie aus der Möbelindustrie zur RFID-basierten Auftragsabwicklung. Proceedings of the 11th Paderborner Frühjahrstagung (PBFT 2009), Paderborn, Germany, April 2009.

R. Urtasun. Non-Parametric Latent Variable Models for Shape and Motion Analysis. Invited talk at the Third International Conference on Computer Vision/Computer Graphics Collaboration Techniques (MIRAGE 2009), Versailles, France, May 2009.

R. Urtasun, A. Geiger, and T. Darrell. Rank Priors for Continuous Non-Linear Dimensionality Reduction. Presented at the Learning Workshop (Snowbird), Clearwater, Florida, April 2009.

A. Voisard and H. Ziekow. Designing Sensor-Based Event Processing Infrastructures: A Tradeoff Analysis. ICSI Technical Report TR-09-004, June 2009.

R. Weiss and D. Ellis. A Variational EM Algorithm for Learning Eigenvoice Parameters in Mixed Signals. Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), pp. 113-116, Taipei, Taiwan, April 2009.

S. Yaman, G. Tur, D. Vergyri, D. Hakkani-Tür, M. Harper, and W. Wang. Anchored Speech Recognition for Question Answering. Proceedings of North American Chapter of the Association for Computational Linguistics Human Language Technologies Conference (NAACL HLT 2009): Short Papers, Boulder, Colorado, pp. 265-268, May 2009.

T. Yeh, J. J. Lee, and T. Darrell. Fast Concurrent Object Localization and Recognition. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Miami, Florida, pp. 280-287, June 2009.

THE INTERNATIONAL COMPUTER SCIENCE INSTITUTE (ICSI) is the only independent, non-profit US lab solely conducting open, non-proprietary, pre-competitive research in computer science. Affiliated with the University of California campus in Berkeley, ICSI's mission is to further research in computer science through international collaboration, and further international collaboration through research in computer science. ICSI provides a haven for computer scientists to conduct long-term research without commercial limitations and with few faculty pressures. ICSI has significant efforts in four major research areas: Internet research, including Internet architecture, related theoretical questions, and network services and applications; theoretical computer science, including applications to bioinformatics; artificial intelligence, particularly for applications to natural language understanding; and natural speech processing.