ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 22

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edited by

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Preface

This volume contains the papers presented at the twenty-third[1] annual conference on Neural Information Processing Systems (NIPS), held in British Columbia, Canada from December 7th through 10th, 2009. NIPS is a premier interdisciplinary conference that highlights information processing research from computational, biological, physical, and mathematical perspectives. This synthesis of backgrounds enables unique insights into learning processes, and we are pleased to present the exciting results in this volume.

The papers were accepted to NIPS following a thorough, highly competitive and rigorous review process. We had 1105 submissions of which only 263 were accepted to the conference. NIPS is a very selective and high-quality conference thanks to the outstanding efforts of the group of people who evaluate, select and improve the papers: the program chairs, the program committee, and the reviewers. Every paper was double-blind reviewed, initially by at least three reviewers who were assigned by the program committee. In cases where reviews were contradictory or the reviewers were uncertain, additional reviewers were assigned. After the initial reviews were entered into the system, the authors were given the opportunity to respond to the reviews, and an electronic discussion was initiated in which the reviewers and the program committee member responsible for that paper tried to resolve any differences of opinion regarding the paper. In case major disagreement still existed after the discussion, additional reviewers could be assigned to the paper. Finally, borderline papers were read by additional members of the program committee and the decisions were made based on discussions of the program committee members in August 2009.

As in previous years, the submissions covered a broad range of areas, including: supervised learning, probabilistic models and methods, unsupervised and semi-supervised learning, control and reinforcement learning, learning theory, optimization for learning algorithms, neuroscience, cognitive science, and applications of learning algorithms in vision, robotics, natural language, speech and signal processing, bio-informatics, and brain imaging. Authors were not forced to choose a single area with which to label their submission and, as could be expected from such an interdisciplinary meeting, the majority of submissions chose multiple areas.

These themes can also be seen in the five student-authored papers which received awards. In order to be eligible for an award, a paper had to be nominated by the student's advisor who confirmed that at least fifty percent of the research reported in the paper was performed by one or more student authors. Out of these nominated papers, the program committee generated a short list based on the comments of the paper's reviewers. Finally, a subcommittee read all papers on the short list and chose two papers for an outstanding paper award and three for an honorable mention. The two outstanding student paper awards went to: *An LP View of the M-best MAP problem*, by Menachem Fromer and Amir Globerson; and *Fast*

[1] Using zero-based counting, this is volume 22.

subtree kernels on graphs, by Nino Shervashidze and Karsten Borgwardt. The three student paper honorable mentions went to: *Reading Tea Leaves: How Humans Interpret Topic Models*, by Jonathan Chang, Jordan Boyd-Graber, Sean Gerrish, Chong Wang, and David Blei; *Multi-Label Prediction via Compressed Sensing* by Daniel Hsu, Sham Kakade, John Langford, and Tong Zhang; and *Kernel Choice and Classifiability for RKHS Embeddings of Probability Distributions* by Bharath Sriperumbudur, Kenji Fukumizu, Arthur Gretton, Gert Lanckriet, and Bernhard Schölkopf.

In addition to submitted papers, NIPS had six invited talks at the plenary session. These invited speakers were chosen to highlight research in fields that are related to NIPS. Sergio Verdu of Princeton University talked about "Relative Entropy." Geoffrey Hinton of the University of Toronto talked about the "Deep Learning with Multiplicative Interactions." Mirta Hartmann of Northwestern University talked about "The Rat Vibrissal Array as a Model Sensorimotor System." Yair Weiss of Hebrew University talked about "Learning and Inference in Low-Level Vision." Persi Diaconis of Stanford talked about "Bayesian Analysis of Markov Chains." Karl Deisseroth of Stanford talked about "Optogenetics: Development and Applications." The talks by Geoffrey Hinton and Yair Weiss are part of the Ed Posner Memorial Lecture Series, in honor of the late Ed Posner, the first president of the NIPS Foundation.

As in previous years, the conference was preceded by a day of tutorials and followed by two days of workshops. The tutorials included presenters from a remarkably broad range of subjects. Gunnar Martinsson discussed "Making Very Large-Scale Linear Algebraic Computations Possible Via Randomization." Antonio Torralba discussed "Understanding Visual Scenes." Michael Littman discussed "Model-Based Reinforecement Learning." Francis Bach discussed "Sparse Methods for Machine Learning: Theory and Algorithms." Ronan Collobert and Jason Weston discussed "Deep Learning in Natural Language Processing." Arnaud Doucet and Nando de Freitas discussed "Sequential Monte-Carlo Methods." The workshops focused on more specialized subjects and fostered the lively, informal exchanges for which they are eagerly anticipated each year.

Putting together a conference of this scale is only made possible by the contributions of many people. We gratefully acknowledge our corporate sponsors: Air Force Office of Scientific Research, Artificial Intelligence, Google, Microsoft Research, IBM Research, D.E. Shaw & Co., Yahoo Labs, Alberta Ingenuity Center for Machine Learning, MITACS, Intel, Pascal, Toyota, and Springer. The NIPS board, headed by Terry Sejnowski, provided excellent guidance and continuity within the great tradition of NIPS. Mary Ellen Perry's efforts on all matters having to do with NIPS were crucial in getting things to run smoothly. Our roles would have been impossible without the other members of the NIPS 2009 Organizing Committee: Yann LeCun, Richard Zemel, and Hans Peter Graf. We also wish to thank our workflow master Yucheng Low.

The NIPS 2009 Program Committee included: Jean-Yves Audibert, David Blei, Kwabena Boahen, Michael Bowling, Nicolo Cesa-Bianchi, Aaron Courville, Koby Crammer, Nathaniel Daw, David Dunson, Paolo Frasconi, Nir Friedman, Arthur Gretton, Matthias Hein, Aapo Hyvarinen, Thorsten Joachims, Mark Johnson, Charles Kemp, Wee Sun Lee, Tai Sing Lee, Jon McAuliffe, Yael Niv, Robert Nowak, Pascal Poupart, Carl Rasmussen, Erik Sudderth, Ben Taskar, Antonio Torralba, Bill Triggs, Sethu Vijayakumar, and Andrew Zisserman. It was a privilege to work with such a professional and hardworking group of scientists. We also thank the NIPS 2009 reviewers, listed in the following pages for their tireless efforts in providing objective evaluations of the papers submitted to the conference.

Finally, we wish to thank the people most responsible for this conference — you, the scientists who have shared your latest discoveries with this community. Your dedication to high-caliber scientific research has made organizing this conference a pleasant and educational task.

Yoshua Bengio, University of Montreal
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