

31st Conference on Uncertainty in Artificial Intelligence 2015

**Amsterdam, Netherlands
12-16 July 2015**

Editors:

Marina Meila

Tom Heskes

ISBN: 978-1-5108-1086-0

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2015) by Association For Uncertainty in Artificial Intelligence (AUAI)
All rights reserved.

Printed by Curran Associates, Inc. (2015)

For permission requests, please contact Association For Uncertainty in Artificial Intelligence (AUAI)
at the address below.

Association For Uncertainty in Artificial Intelligence (AUAI)
Department of Computer Science
University of British Columbia
Vancouver BC Canada V6T 1Z4

Phone: (703) 787-8044

Fax: (703) 478-0829

www.auai.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

Contents

Preface	vii
Organizing Committee	ix
Acknowledgments	xi
Sponsors	xix
Best Paper Awards	xxi
1 Proceedings	1
Bayesian Optimal Control of Smoothly Parameterized Systems.	
<i>Yasin Abbasi-Yadkori, Csaba Szepesvári</i>	4
Optimal expert elicitation to reduce interval uncertainty.	
<i>Nadia Ben Abdallah, Sébastien Destercke</i>	12
Stochastic Integration via Error-Correcting Codes.	
<i>Dimitris Achlioptas, Pei Jiang</i>	22
Learning the Structure of Sum-Product Networks via an SVD-based Algorithm.	
<i>Tameem Adel, David Balduzzi, Ali Ghodsi</i>	32
Robust reconstruction of causal graphical models based on conditional 2-point and 3-point information.	
<i>Séverine Affeldt, Hervé Isambert</i>	42
Are You Doing What I Think You Are Doing? Criticising Uncertain Agent Models.	
<i>Stefano V. Albrecht, Subramanian Ramamoorthy</i>	52
Disciplined Convex Stochastic Programming: A New Framework for Stochastic Optimization.	
<i>Alnur Ali, J. Zico Kolter, Steven Diamond, Stephen Boyd</i>	62
Intelligent Affect: Rational Decision Making for Socially Aligned Agents.	
<i>Nabiha Asghar, Jesse Hoey</i>	72
Representation Learning for Clustering: A Statistical Framework.	
<i>Hassan Ashtiani, Shai Ben-David</i>	82
Adversarial Cost-Sensitive Classification.	
<i>Kaiser Asif, Wei Xing, Sima Behpour, Brian D. Ziebart</i>	92
Geometric Network Comparisons.	
<i>Dena Marie Asta, Cosma Rohilla Shalizi</i>	102
Learning and Planning with Timing Information in Markov Decision Processes.	
<i>Pierre-Luc Bacon, Borja Balle, Doina Precup</i>	111
Parameterizing the Distance Distribution of Undirected Networks.	
<i>Christian Bauckhage, Kristian Kersting, Fabian Hadiji</i>	121
New Limits for Knowledge Compilation and Applications to Exact Model Counting.	
<i>Paul Beame, Vincent Liew</i>	131
Hashing-Based Approximate Probabilistic Inference in Hybrid Domains.	
<i>Vaishak Belle, Guy Van den Broeck, Andrea Passerini</i>	141
Bayesian Network Learning with Discrete Case-Control Data.	
<i>Giorgos Borboudakis, Ioannis Tsamardinos</i>	151

Efficient Algorithms for Bayesian Network Parameter Learning from Incomplete Data. <i>Guy Van den Broeck, Karthika Mohan, Arthur Choi, Adnan Darwiche, Judea Pearl</i> . . .	161
Bayes Optimal Feature Selection for Supervised Learning with General Performance Measures. <i>Saneem Ahmed C.G., Harikrishna Narasimhan, Shivani Agarwal</i>	171
Visual Causal Feature Learning. <i>Krzysztof Chalupka, Pietro Perona, Frederick Eberhardt</i>	181
Large-Margin Determinantal Point Processes. <i>Wei-Lun Chao, Boqing Gong, Kristen Grauman, Fei Sha</i>	191
Fast Relative-Error Approximation Algorithm for Ridge Regression. <i>Shouyuan Chen, Yang Liu, Michael R. Lyu, Irwin King, Shengyu Zhang</i>	201
Selective Greedy Equivalence Search: Finding Optimal Bayesian Networks Using a Polynomial Number of Score Evaluations. <i>David Maxwell Chickering, Christopher Meek</i>	211
Stable Spectral Learning Based on Schur Decomposition. <i>Nicolò Colombo, Nikos Vlassis</i>	220
Semi-described and semi-supervised learning with Gaussian processes. <i>Andreas Damianou, Neil D. Lawrence</i>	228
Budget Constraints in Prediction Markets. <i>Nikhil Devanur, Miroslav Dudík, Zhiyi Huang, David Pennock</i>	238
A Probabilistic Logic for Reasoning about Uncertain Temporal Information. <i>Dragan Doder, Zoran Ognjanović</i>	248
Training generative neural networks via Maximum Mean Discrepancy optimization. <i>Gintare Karolina Dziugaite, Daniel M. Roy, Zoubin Ghahramani</i>	258
Incremental Region Selection for Mini-bucket Elimination Bounds. <i>Sholeh Forouzan, Alexander Ihler</i>	268
Estimating Mutual Information by Local Gaussian Approximation. <i>Shuyang Gao, Greg Ver Steeg, Aram Galstyan</i>	278
Psychophysical Detection Testing with Bayesian Active Learning. <i>Jacob R. Gardner, Xinyu Song, Kilian Q. Weinberger, Dennis Barbour, John P. Cunningham</i>	286
Locally Conditioned Belief Propagation. <i>Thomas Geier, Felix Richter, Susanne Biundo</i>	296
Discriminative Switching Linear Dynamical Systems applied to Physiological Condition Monitoring. <i>Konstantinos Georgatzis, Christopher K. I. Williams</i>	306
Revisiting Non-Progressive Influence Models: Scalable Influence Maximization in Social Networks. <i>Golshan Golnari, Amir Asiaee T., Arindam Banerjee, Zhi-Li Zhang</i>	316
Scalable Recommendation with Hierarchical Poisson Factorization. <i>Prem Gopalan, Jake M. Hofman, David M. Blei</i>	326
State Sequence Analysis in Hidden Markov Models. <i>Yuri Grinberg, Theodore J. Perkins</i>	336
Multitasking: Optimal Planning for Bandit Superprocesses. <i>Dylan Hadfield-Menell, Stuart Russell</i>	345
Importance Sampling over Sets: A New Probabilistic Inference Scheme. <i>Stefan Hadjis, Stefano Ermon</i>	355
Progressive Abstraction Refinement for Sparse Sampling. <i>Jesse Hostetler, Alan Fern, Thomas Dietterich</i>	365
Zero-Truncated Poisson Tensor Factorization for Massive Binary Tensors. <i>Changwei Hu, Piyush Rai, Lawrence Carin</i>	375
Computing Optimal Bayesian Decisions for Rank Aggregation via MCMC Sampling. <i>David Hughes, Kevin Hwang, Lirong Xia</i>	385
Do-calculus when the True Graph Is Unknown. <i>Antti Hyttinen, Frederick Eberhardt, Matti Järvisalo</i>	395

Kernel-Based Just-In-Time Learning for Passing Expectation Propagation Messages. <i>Wittawat Jitkrittum, Arthur Gretton, Nicolas Heess, S. M. Ali Eslami, Balaji Lakshminarayanan, Dino Sejdinovic, Zoltán Szabó</i>	405
Averaging of Decomposable Graphs by Dynamic Programming and Sampling. <i>Kustaa Kangas, Teppo Niinimäki, Mikko Koivisto</i>	415
Novel Bernstein-like Concentration Inequalities for the Missing Mass. <i>Bahman Yari Saeed Khanloo, Gholamreza Haffari</i>	425
Minimizing Expected Losses in Perturbation Models with Multidimensional Parametric Min-cuts. <i>Adrian Kim, Kyomin Jung, Yongsub Lim, Daniel Tarlow, Pushmeet Kohli</i>	435
Population Empirical Bayes. <i>Alp Kucukelbir, David M. Blei</i>	444
Encoding Markov logic networks in Possibilistic Logic. <i>Ondřej Kuželka, Jesse Davis, Steven Schockaert</i>	454
On the Computability of AIXI. <i>Jan Leike, Marcus Hutter</i>	464
Tracking with ranked signals. <i>Tianyang Li, Harsh Pareek, Pradeep Ravikumar, Dhruv Balwada, Kevin Speer</i>	474
Classification of Sparse and Irregularly Sampled Time Series with Mixtures of Expected Gaussian Kernels and Random Features. <i>Steven Cheng-Xian Li, Benjamin Marlin</i>	484
Complexity of the Exact Solution to the Test Sequencing Problem. <i>Wenhao Liu, Ross D. Shachter</i>	494
Finite-Sample Analysis of Proximal Gradient TD Algorithms. <i>Bo Liu, Ji Liu, Mohammad Ghavamzadeh, Sridhar Mahadevan, Marek Petrik</i>	504
Estimating the Partition Function by Discriminance Sampling. <i>Qiang Liu, Jian Peng, Alexander Ihler, John Fisher III</i>	514
A Finite Population Likelihood Ratio Test of the Sharp Null Hypothesis for Compliers. <i>Wen Wei Loh, Thomas S. Richardson</i>	523
Structure Learning Constrained by Node-Specific Degree Distribution. <i>Jianzhu Ma, Feng Zhao, Jinbo Xu</i>	533
Active Search and Bandits on Graphs using Sigma-Optimality. <i>Yifei Ma, Tzu-Kuo Huang, Jeff Schneider</i>	542
Off-policy learning based on weighted importance sampling with linear computational complexity. <i>A. Rupam Mahmood, Richard S. Sutton</i>	552
Impact of Learning Strategies on the Quality of Bayesian Networks: An Empirical Evaluation. <i>Brandon Malone, Matti Järvisalo, Petri Myllymäki</i>	562
Learning the Structure of Causal Models with Relational and Temporal Dependence. <i>Katerina Marazopoulou, Marc Maier, David Jensen</i>	572
Hamiltonian ABC. <i>Edward Meeds, Robert Leenders, Max Welling</i>	582
(Nearly) Optimal Differentially Private Stochastic Multi-Arm Bandits. <i>Nikita Mishra, Abhradeep Thakurta</i>	592
Equitable Partitions of Concave Free Energies. <i>Martin Mladenov, Kristian Kersting</i>	602
Non-parametric Revenue Optimization for Generalized Second Price auctions.. <i>Mehryar Mohri, Andrés Muñoz Medina</i>	612
Polynomial-time algorithm for learning optimal tree-augmented dynamic Bayesian networks. <i>José L. Monteiro, Susana Vinga, Alexandra M. Carvalho</i>	622
Learning and Inference in Tractable Probabilistic Knowledge Bases. <i>Mathias Niepert, Pedro Domingos</i>	632
Multi-Context Models for Reasoning under Partial Knowledge: Generative Process and Inference Grammar. <i>Ardavan S. Nobandegani, Ioannis N. Psaromiligkos</i>	642
Annealed Gradient Descent for Deep Learning. <i>Hengyue Pan, Hui Jiang</i>	652

Max-Product Belief Propagation for Linear Programming: Applications to Combinatorial Optimization. <i>Sejun Park, Jinwoo Shin</i>	662
Fast Algorithms for Learning with Long N -grams via Suffix Tree Based Matrix Multiplication. <i>Hristo S. Paskov, John C. Mitchell, Trevor J. Hastie</i>	672
A Complete Generalized Adjustment Criterion. <i>Emilija Perković, Johannes Textor, Markus Kalisch, Marloes H. Maathuis</i>	682
Optimal Threshold Control for Energy Arbitrage with Degradable Battery Storage. <i>Marek Petrik, Xiaojian Wu</i>	692
Mesochronal Structure Learning. <i>Sergey Plis, David Danks, Jianyu Yang</i>	702
Budgeted Online Collective Inference. <i>Jay Pujara, Ben London, Lise Getoor</i>	712
Auxiliary Gibbs Sampling for Inference in Piecewise-Constant Conditional Intensity Models. <i>Zhen Qin, Christian R. Shelton</i>	722
Memory-Efficient Symbolic Online Planning for Factored MDPs. <i>Aswin Raghavan, Roni Khardon, Prasad Tadepalli, Alan Fern</i>	732
The Survival Filter: Joint Survival Analysis with a Latent Time Series. <i>Rajesh Ranganath, Adler Perotte, Noémie Elhadad, David M. Blei</i>	742
Communication Efficient Coresets for Empirical Loss Minimization. <i>Sashank J. Reddi, Barnabás Póczos, Alex Smola</i>	752
Large-scale randomized-coordinate descent methods with non-separable linear constraints. <i>Sashank J. Reddi, Ahmed Hefny, Carlton Downey, Avinava Dubey, Suvrit Sra</i>	762
An Upper Bound on the Global Optimum in Parameter Estimation. <i>Khaled S. Refaat, Adnan Darwiche</i>	772
A Markov Game Model for Valuing Player Actions in Ice Hockey. <i>Kurt Routley, Oliver Schulte</i>	782
Learning Latent Variable Models by Improving Spectral Solutions with Exterior Point Method. <i>Amirreza Shaban, Mehrdad Farajtabar, Bo Xie, Le Song, Byron Boots</i>	792
Missing Data as a Causal and Probabilistic Problem. <i>Ilya Shpitser, Karthika Mohan, Judea Pearl</i>	802
Improved Asymmetric Locality Sensitive Hashing (ALSH) for Maximum Inner Product Search (MIPS). <i>Anshumali Shrivastava, Ping Li</i>	812
Learning Optimal Chain Graphs with Answer Set Programming. <i>Dag Sonntag, Matti Järvisalo, Jose Peña, Antti Hyttinen</i>	822
How matroids occur in the context of learning Bayesian network structure. <i>Milan Studený</i>	832
The Long-Run Behavior of Continuous Time Bayesian Networks. <i>Liessman Sturlaugson, John W. Sheppard</i>	842
Online Bellman Residual Algorithms with Predictive Error Guarantees. <i>Wen Sun, J. Andrew Bagnell</i>	852
On the Error of Random Fourier Features. <i>Dougal J. Sutherland, Jeff Schneider</i>	862
Bayesian Structure Learning for Stationary Time Series. <i>Alex Tank, Nicholas J. Foti, Emily B. Fox</i>	872
Learning from Pairwise Marginal Independencies. <i>Johannes Textor, Alexander Idelberger, Maciej Liśkiewicz</i>	882
Bethe Projections for Non-Local Inference. <i>Luke Vilnis, David Belanger, Daniel Sheldon, Andrew McCallum</i>	892
A Smart-Dumb/Dumb-Smart Algorithm for Efficient Split-Merge MCMC. <i>Wei Wang, Stuart Russell</i>	902
Planning under Uncertainty with Weighted State Scenarios. <i>Erwin Walraven, Matthijs T. J. Spaan</i>	912

Generalization Bounds for Transfer Learning under Model Shift. <i>Xuezhi Wang, Jeff Schneider</i>	922
Clustered Sparse Bayesian Learning. <i>Yu Wang, David Wipf, Jeong Min Yun, Wei Chen, Ian Wassell</i>	932
Bethe and Related Pairwise Entropy Approximations. <i>Adrian Weller</i>	942
Efficient Transition Probability Computation for Continuous-Time Branching Processes via Compressed Sensing. <i>Jason Xu, Vladimir N. Minin</i>	952
Extend Transferable Belief Models with Probabilistic Priors. <i>Chunlai Zhou, Yuan Feng</i>	962
Probabilistic Graphical Models Parameter Learning with Transferred Prior and Constraints. <i>Yun Zhou, Norman Fenton, Timothy M. Hospedales, Martin Neil</i>	972