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Marina Meilă

Research Interests Machine learning and automated inference, focusing on learning graphical probability models from data. Applications of learning in vision, language modeling, information retrieval. Efficient algorithms for learning and structure discovery in high-dimensional domains.

Education

1999 **PhD, Electrical Engineering and Computer Science, MIT**
Thesis Title: *"Learning with Mixtures of Trees"*
Thesis Supervisor: Michael Jordan, MIT
Thesis Committee: Alan Willsky, Paul Viola, MIT

1985 **MS in Automatic Control and Computers, Polytechnic University of Bucharest**
Graduated 1st in 270
Thesis Title: *"Numerical integration of 2D heat transfer equations with mixed boundary conditions"*
Thesis Supervisor: Vlad Ionescu, Polytechnic University of Bucharest

Research Experience

Researcher, CAD Software group, Institute for Computer Technique, Bucharest, Romania (1985 – 1990).
Designed and implemented algorithms for a solid modeling system, for a constraint propagation system incorporated into a graphic editor and for other projects of the group. Managed the solid modeling system project (team of 4) in its final phase.

Visiting scholar, System Modeling and Control group, Daimler Benz Research, Berlin, Germany (August 1995, January 1996).
Designed Markov mixture of experts models as tractable approximations for dynamical linear systems with parameter jumps; implemented them in order to model helicopters in flight.

Intern, Decision Theory and Adaptive Systems group, Microsoft Research (September – December 1997).
Studied experimentally the performance of various clustering and initialization methods for high dimensional data. Designed a linear memory agglomerative clustering algorithm for dis-

crete and continuous data and implemented it as a module in the group's belief networks software package.

Teaching Experience

Assistant Electricité de France Neural Networks Summer School, Le Breau, France (1984)
Organized and taught the neural networks laboratory classes (1 week, 30 students; classes in French).

Assistant Professor, Department of Automatic Control, Polytechnic University of Bucharest, Romania (1990 – 1992).
Lectures and laboratory classes in Introductory Automatic Control, Neural Networks, Modeling and Simulation. Supervised 3 MS theses on neural networks. Research in associative memories and Boltzmann machines.

Awards

1981 3rd place in the **Romanian National Mathematics Competition** for Students in Engineering "Traian Lalescu"

1984 **Merit fellowship** for outstanding academic performance from the Romanian government.

Refereed conferences

Meilă, M. *"An accelerated Chow & Liu algorithm: fitting tree distributions to high-dimensional sparse data"*, accepted at ICML99.

Meilă M., Heckerman D. *"An experimental comparison of several clustering and initialization methods"* presented at the Workshop on Uncertainty in Artificial Intelligence UAI 98 and submitted to the Machine Learning Journal.

Meilă, M., Jordan, M. I. *"Estimating dependency structure as a hidden variable"* in Advances in Neural Information Processing Systems 10, M. I. Jordan, M. Kearns, S. Solla, (eds.), MIT Press, 1998.

Meilă, M., Jordan, M. I. *"An objective function for belief net triangulation"*. Proceedings of the Sixth International Workshop on Artificial Intelligence and Statistics AISTATS 97, Ft. Lauderdale, Florida, 1997.

Meilă, M., Jordan, M. I. *"Triangulation by continuous embedding"*, in Advances in Neural Information Processing Systems 9, M. Mozer, M. I. Jordan, T. Petsche, (eds.), MIT Press, 1997.

Meilă, M., Jordan, M. I. *"Learning fine motion by Markov mixtures of experts"* in Advances in Neural Information Processing Systems 8, D. Touretzky, M. C. Mozer and M. Hasselmo (eds.), MIT Press, 1996.

Meilă, M., Stoica, P. *"A Novel Algorithm for Training a Bidirectional Associative Memory"*. Proceedings of the European Signal Processing Conference, Brussels, Belgium , 1992.

Meilă, M., Mandoiu, M. *"BGeo - Controlling Changes Using Geometric Relations in a Graphic System for Computer Aided Mechanical Design"*. INFOTEC, Bucuresti, Romania, 1988.

Gingu, C., Meilă, M., *"Two-Dimensional Simulation of MOS Capacitors"*. 15th Microelectronic Conference, Beograd, Yugoslavia, 1987.

Meilă, M., Gingu, C. *"Numeric Algorithm for Simulation of Diffusion Processes"*. 14th Microelectronic Conference, Ljubljana, Yugoslavia, 1986.

Meilă, M. *" Heuristic Intuition in Problem Solving."* 1st National Inventics Symposium, Iasi, Romania, 1984.

Book chapters and journal publications

Meilă, M., *"Learning in graphical models"* in J.-G. Ganascia and J.-D. Zucker (eds.) 'Machine Learning', Hermés, in preparation.

Meilă, M., Jordan, M. I. *"Markov Mixtures of Experts"* in R. Murray-Smith and T. A. Johanssen (eds.) 'Multiple Model Approaches to Nonlinear Modelling and Control', Taylor and Francis, 1996.

Tertisco, M., Calin, S.,Meilă, M., Dumitrescu, B. *Introduction to Automatic Control and Computers*, Polytechnic Institute Bucuresti Press, Bucuresti, 1991.

Meilă, M. *"Cross-Sectioning Algorithm for Solid Modeling Systems"*. Computers and Artificial Intelligence, **10** 447-485, 1991.

Meilă, M. *"SIMNON - Simulator for Discrete and Continuous-Time Systems"*. Romanian Journal of Informatics and Automatic Control, Vol. 1, No. 1-4, 1991.

Technical reports

Meilă, M. (with T. Jaakkola and T. Jebara) *"Maximum entropy formulation of discriminative training for tree models"*, in preparation.

Meilă, M., Jordan, M. I. *"A domain partitioning approach to structure learning for graphical models"* in preparation.

Meilă, M., Jordan, M. I. *"Estimating dependency structure as a hidden variable"*, AI Memo 1648, A.I. Laboratory, Massachusetts Institute of Technology, 1997. Revised, extended version, 1998.

Meilă, M. and Murray-Smith, R., *"State and parameter estimation for linear systems with Markov jumps"*, Daimler-Benz Research Technical Report F3/S11, 1997.

Meilă, M. and Jordan, M. I., *"Learning the parameters ofHMMs with auxilliary input"*, MIT Computational Cognitive Science Tech. Report 9401, 1994.

Meilă, M. *"The Simulated Annealing Algorithm and the Boltzmann Machine"* System Control Group TR 3/1992, Bucharest Polytechnic Institute, 1992.

Invited talks and workshop presentations

"Efficient unsupervised learning in high dimensions with mixtures of trees", Microsoft Research, Cambridge, UK, November 1998.

"A top-down approach to hidden variable discovery", European Workshop on Highly Structured Systems, Tirano, Italy, September 1998.

"A top-down method to structure learning in graphical models", NIPS workshop on Learning and Graphical Models, Breckenridge, Colorado, December 1997.

"Triangulation by continuous embedding", NIPS workshop on Optimization Methods, Snowmass, Colorado, December 1996.

Activities

Mountaineering, downhill and XC-skiing, canoeing. Travel.

Co-founder and president (1995-1998) of the Romanian Students' Association at MIT.