



ADVANCES IN

NEURAL
INFORMATION
PROCESSING
SYSTEMS 19

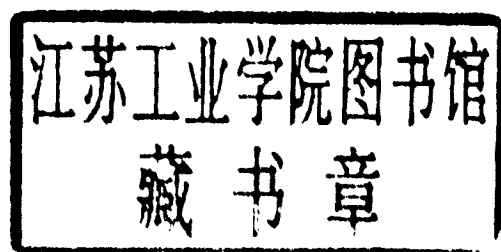
EDITED BY
BERNHARD SCHÖLKOPF,
JOHN PLATT,
THOMAS HOFMANN,

**ADVANCES IN NEURAL INFORMATION
PROCESSING SYSTEMS 19**

Proceedings of the 2006 Conference

edited by

Bernhard Schölkopf, John C. Platt, and Thomas Hofmann



A Bradford Book
The MIT Press
Cambridge, Massachusetts
London, England

© 2007 Massachusetts Institute of Technology

All rights reserved. No part of this book may be reproduced in any form by any electronic or mechanical means (including photocopying, recording, or information storage and retrieval) without permission in writing from the publisher.

MIT Press books may be purchased at special quantity discounts for business or sales promotional use. For information, please email special_sales@mitpress.mit.edu or write to Special Sales Department, The MIT Press, 55 Hayward Street, Cambridge, MA 02142.

This book was printed and bound in the United States of America.

ISSN: 1049-5258

ISBN-13: 978-0-262-19568-3

ISBN-10: 0-262-19568-2

**ADVANCES IN NEURAL INFORMATION
PROCESSING SYSTEMS 19**

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS

PUBLISHED BY MORGAN-KAUFMANN

NIPS-1

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 1: PROCEEDINGS OF THE 1988 CONFERENCE,
DAVID S. TOURETZKY, ED., 1989.

NIPS-2

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 2: PROCEEDINGS OF THE 1989 CONFERENCE,
DAVID S. TOURETZKY, ED., 1990.

NIPS-3

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 3: PROCEEDINGS OF THE 1990 CONFERENCE,
RICHARD LIPPMANN, JOHN E. MOODY AND DAVID S. TOURETZKY, EDs., 1991.

NIPS-4

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 4: PROCEEDINGS OF THE 1991 CONFERENCE,
JOHN E. MOODY, STEPHEN J. HANSON AND RICHARD P. LIPPMANN, EDs., 1992.

NIPS-5

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 5: PROCEEDINGS OF THE 1992 CONFERENCE,
STEPHEN J. HANSON, JACK D. COWAN AND C. LEE GILES, EDs., 1993.

NIPS-6

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 6: PROCEEDINGS OF THE 1993 CONFERENCE,
JACK D. COWAN, GERALD TESAURO AND JOSHUA ALSPECTOR, EDs., 1994.

PUBLISHED BY THE MIT PRESS

NIPS-7

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 7: PROCEEDINGS OF THE 1994 CONFERENCE,
GERALD TESAURO, DAVID S. TOURETZKY AND TODD K. LEEN, EDs., 1995.

NIPS-8

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 8: PROCEEDINGS OF THE 1995 CONFERENCE,
DAVID S. TOURETZKY, MICHAEL C. MOZER AND MICHAEL E. HASSELMO, EDs., 1996.

NIPS-9

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 9: PROCEEDINGS OF THE 1996 CONFERENCE,
MICHAEL C. MOZER, MICHAEL I. JORDAN AND THOMAS PETSCHKE, EDs., 1997.

NIPS-10

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 10: PROCEEDINGS OF THE 1997 CONFERENCE,
MICHAEL I. JORDAN, MICHAEL J. KEARNS AND SARA A. SOLLA, EDs., 1998.

NIPS-11

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 11: PROCEEDINGS OF THE 1998 CONFERENCE,
MICHAEL S. KEARNS, SARA A. SOLLA AND DAVID A. COHN, EDs., 1999.

NIPS-12

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 12: PROCEEDINGS OF THE 1999 CONFERENCE,
SARA A. SOLLA, TODD K. LEEN AND KLAUS-ROBERT MÜLLER, EDs., 2000.

NIPS-13

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 13: PROCEEDINGS OF THE 2000 CONFERENCE,
TODD K. LEEN, THOMAS G. DIETTERICH AND VOLKER TRESP, EDs., 2001.

NIPS-14

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 14: PROCEEDINGS OF THE 2001 CONFERENCE,
THOMAS G. DIETTERICH, SUZANNA BECKER AND ZOUBIN GHAHRAMANI, EDs., 2002.

NIPS-15

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 15: PROCEEDINGS OF THE 2002 CONFERENCE,
SUZANNA BECKER, SEBASTIAN THRUN AND KLAUS OBERMAYER, EDs., 2003.

NIPS-16

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 16: PROCEEDINGS OF THE 2003 CONFERENCE,
SEBASTIAN THRUN, LAWRENCE K. SAUL AND BERNHARD SCHÖLKOPF, EDs., 2004.

NIPS-17

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 17: PROCEEDINGS OF THE 2004 CONFERENCE,
LAWRENCE K. SAUL, YAIR WEISS AND LÉON BOTTU, EDs., 2005.

NIPS-18

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 18: PROCEEDINGS OF THE 2005 CONFERENCE,
YAIR WEISS, BERNHARD SCHÖLKOPF AND JOHN C. PLATT, EDs., 2006.

NIPS-19

ADVANCES IN NEURAL INFORMATION PROCESSING SYSTEMS 19: PROCEEDINGS OF THE 2006 CONFERENCE,
BERNHARD SCHÖLKOPF, JOHN C. PLATT AND THOMAS HOFMANN, EDs., 2007.

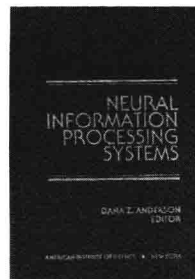
Preface

Welcome to the proceedings of the 20th Conference on Advances in Neural Information Processing Systems (NIPS), which took place in Vancouver, British Columbia, Canada, on December 4–7, 2006. The conference was preceded by a day of tutorials. Post-conference workshops were held on December 7–9 at Whistler, British Columbia.

The NIPS conference is a premier interdisciplinary conference that covers and combines machine learning, neuroscience, cognitive science, and mathematics. The proceedings represent some of the best work in these fields that was created in 2005–6. NIPS has steadily grown over the last decade and in 2006 over 900 unique individuals participated in the main conference and workshop.

Note that the proceedings are titled “Advances in Neural Information Processing Systems, Volume 19,” which appears to be an error at first glance. However, Volume 1 was the proceedings of the second annual conference in 1988. The proceedings of the first annual Neural Information Processing Systems Conference from 1987 didn’t have “Advances” in the title (cover shown right). It is colloquially known as NIPS 0.

The first 6 volumes of “Advances in Neural Information Processing” were published by Morgan Kaufmann Publishers. This volume, the 13th published by the MIT Press, will be the final printed version; the next volume will only be available online, along with all previous volumes, at <http://books.nips.cc/>. The online volumes are searchable and can be downloaded. We thank Morgan Kaufmann Publishers and MIT Press for supporting the dissemination of papers from NIPS over the last 19 years.



Browsing the table of contents for this volume shows that NIPS continues to cover a wide range of topics: from learning theory, through a variety of algorithms, to a plethora of applications. NIPS also connects machine learning to the natural intelligent system of the brain, by covering neuroscience, cognitive science, and biological perception.

NIPS is a rigorously reviewed conference: out of 833 submissions, only 204 papers were accepted. Each paper was double-blind reviewed by at least three researchers in the field. An author response to the reviews was permitted, and a discussion amongst the reviewers and the program committee made the final decision.

Best Student Papers

As in previous years, the NIPS program committee has selected a set of best student papers for awards. A paper is eligible when the majority of the work was done by a student, and the student presented the paper at the conference.

The committee selected 3 best papers and 4 honorable mentions. We encourage you to read these papers. The best student papers are:

- **Analysis of Contour Motions**
 - Ce Liu, William T. Freeman, Edward H. Adelson
- **Large Margin Hidden Markov Models for Automatic Speech Recognition**
 - Fei Sha, Lawrence K. Saul
- **Analysis of Empirical Bayesian Methods for Neuroelectromagnetic Source Localization**
 - David Wipf, Rey Ramírez, Jason Palmer, Scott Makeig, Bhaskar Rao

The honorable mentions are:

- **Combining Causal and Similarity-Based Reasoning**
 - Charles Kemp, Patrick Shafto, Allison Berke, Joshua B. Tenenbaum
- **Real-time Adaptive Information-Theoretic Optimization of Neurobiological Experiments**
 - Jeremy Lewi, Robert Butera, Liam Paninski
- **Bayesian Detection of Infrequent Differences in Sets of Time Series with Shared Structure**
 - Jennifer Listgarten, Radford M. Neal, Sam T. Roweis, Rachel Puckrin, Sean Cutler

- **Inferring Network Structure from Co-Occurrences**
 - Michael G. Rabbat, Mário A.T. Figueiredo, Robert D. Nowak

Invited Speakers

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. The speakers were:

- **Dan Ariely** (Massachusetts Institute of Technology)
 - Free Lunches: Insights from Behavioral Economics
- **David Baker** (University of Washington)
 - Global Optimization Challenges in High Resolution Protein Structure Prediction
- **James Bennett** (Netflix)
 - The Netflix Prize
- **James Clark** (Duke University)
 - Emerging Capacity to Synthesize Data and Process: Application to the Biodiversity Paradox
- **Daniel Margoliash** (University of Chicago)
 - Neural Mechanisms of Auditory Pattern Processing and Pattern Learning in Songbirds
- **George Ojemann** (University of Washington)
 - Examining the Human Brain Mechanisms for Language, Memory, and Learning During Awake Neurosurgery

Thanks

First, we would like to thank the sponsors of NIPS for their generous contributions. These contributions have helped fund student travel, the demonstration track, and the opening buffet.

Second, we wish to thank everyone who contributed their time and efforts for making NIPS a great conference. The organizing committee and the program committee are listed on the following pages: they have done a tremendous amount of work to run the conference and select the papers that you will read. We also want to thank the tutorial speakers for their great courses:

- Nir Friedman (Hebrew University)
- Dan Klein (University of California, Berkeley)
- Yann LeCun (New York University)
- Carl Edward Rasmussen (Max Planck Institute for Biological Cybernetics)
- Maya Schuldiner (University of California, San Francisco)
- Joshua Tenenbaum (Massachusetts Institute of Technology)
- Brian Wandell (Stanford University)

Further, we would like to thank Rosemary Miller (of the Salk Institute) for her work as conference manager and executive director of the NIPS Foundation.

We would also like to thank Kelli McGee (Microsoft), Kumar Chellapilla (Microsoft), Kristen Michener (UCSD), Lee Campbell (Salk Institute), Chris Adams (Salk Institute), Chris Hiestand (Salk Institute), and Elisa Bellini (Google) for all of the help in putting the conference together.

Finally, we would like to thank all 451 reviewers and 1694 authors of submitted papers. NIPS is a reflection of its community: the hard research work of submitting authors and the careful checking of the reviewers is the source of the high quality of NIPS.

We hope to see you at future NIPS conferences!

- John C. Platt, Program Chair
- Bernhard Schölkopf, General Chair

Donors

NIPS gratefully acknowledges the generosity of those individuals and organizations who have provided financial support for the NIPS*2006 conference. The financial support enabled us to sponsor student travel and participation, the outstanding student paper awards, the demonstration track and the opening buffet.

GOOGLE	IBM RESEARCH
IGUANA ROBOTICS	INTEL
MICROSOFT RESEARCH	NICTA
NOKIA	PASCAL
SPRINGER MACHINE LEARNING JOURNAL	YAHOO! RESEARCH

NIPS Foundation Officers and Board Members

President	TERRENCE SEJNOWSKI, The Salk Institute
Vice President for Development	SEBASTIAN THRUN, Stanford University
Treasurer	ROBERT JACOBS, University of Rochester
Secretary	MICHAEL MOZER, University of Colorado, Boulder
Executive Board	SUE BECKER, McMaster University, Ontario, Canada
	THOMAS G. DIETTERICH, Oregon State University
	TODD K. LEEN, Oregon Graduate Institute
	LAWRENCE SAUL, University of Pennsylvania
	SARA A. SOLLA, Northwestern University Medical School
	PHIL SOTEL, Pasadena, CA
	YAIR WEISS, Hebrew University of Jerusalem
Advisory Board	GARY BLASDEL, Harvard Medical School
	JACK COWAN, University of Chicago
	STEPHEN HANSON, Rutgers University
	MICHAEL I. JORDAN, University of California, Berkeley
	MICHAEL KEARNS, University of Pennsylvania
	SCOTT KIRKPATRICK, Hebrew University, Jerusalem
	RICHARD LIPPMANN, Massachusetts Institute of Technology
	BARTLETT MEL, University of Southern California
	JOHN MOODY, International Computer Science Institute, Berkeley and Portland
	GERALD TESAURO, IBM Watson Labs
	DAVE TOURETZKY, Carnegie Mellon University
Emeritus Members	T. L. FINE, Cornell University
	EVE MARDER, Brandeis University
2006 General Chair	BERNHARD SCHÖLKOPF, Max Planck Institute for Biological Cybernetics

Organizing Committee

General Chair	BERNHARD SCHÖLKOPF, Max Planck Institute for Biological Cybernetics
Program Chair	JOHN PLATT, Microsoft Research
Tutorial Chair	DAPHNE KOLLER, Stanford University
Workshop Co-Chairs	CHARLES ISBELL, Georgia Tech
	RAJESH RAO, University of Washington
Demonstration Co-Chairs	ALAN STOCKER, New York University
	GIACOMO INDIVERI, INI ETH Zurich
Publications Chair	THOMAS HOFMANN, Google
Publicity Chair	MATTHIAS FRANZ, Max Planck Institute for Biological Cybernetics
Online Proceedings Chair	ANDREW MCCALLUM, University of Massachusetts, Amherst
Volunteers Chair	FERNANDO PÉREZ CRUZ, University Carlos III, Madrid

Program Committee

Program Chair	JOHN PLATT, Microsoft Research
Program Co-Chairs	SAMY BENGIO, IDIAP
	CORINNA CORTES, Google
	DENNIS DECOSTE, Microsoft Live Labs
	SHIMON EDELMAN, Cornell University
	DAN ELLIS, Columbia University
	DIETER FOX, University of Washington
	THOMAS GRIFFITHS, University of California, Berkeley
	DAN HAMMERSTROM, Portland State University
	JOHN LANGFORD, Yahoo! Research
	NEIL LAWRENCE, University of Sheffield
	KEVIN MURPHY, University of British Columbia
	KAMAL NIGAM, Google
	DAN PELLEG, IBM
	HUBERT PREISSEL, University of Tübingen
	MANEESH SAHANI, University College London
	CORDELIA SCHMID, INRIA
	SATINDER SINGH, University of Michigan
	KOJI TSUDA, Max Planck Institute for Biological Cybernetics
	BOB WILLIAMSON, National ICT Australia

Reviewers

PIETER ABBEEL
SAMER ABDALLAH
NAOKI ABE
JACOB ABERNETHY
DIMITRIS ACHLIOPTAS
FELIX AGAKOV
ANKUR AGARWAL
SHIVANI AGARWAL
CHARLES ANDERSON
STUART ANDREWS
MARTIN ANTHONY
CHRIS ATKESON
HAGAI ATTIAS
JEAN-JULIEN AUCOUTURIER
PETER AUER
FRANCIS BACH
DREW BAGNELL
CHRIS BAKER
GOEKHAN BAKIR
PIERRE BALDI
ARINDAM BANERJEE
AHARON BAR HILLEL
DAVID BARBER
KOBUS BARNARD
SUGATO BASU
SUMIT BASU
MATTHEW BEAL
ELIZABETH BEHRMAN
RON BEKKERMAN
MIKHAIL BELKIN
SERGE BELONGIE
ASA BEN HUR
SHAI BEN-DAVID
SAM Y BENGIO
YOSHUA BENGIO
MATTHIAS BETHGE
ALINA BEYGEZIMER
CHIRU BHATTACHARYA
DANIEL BIKEL
MIKHAIL BILENKO
JEFF BILMES
NIELS BIRBAUMER
MICHAEL BLACK
BENJAMIN BLANKERTZ
DAVID BLEI
AVRIM BLUM
KWABENA BOAHEN
LEON BOTTOU
OLIVIER BOUSQUET
MICHAEL BOWLING
CHRISTOPH BRAUN
JOACHIM BUHMANN
CHRISTOPHER BURGES
MICHAEL BURL
STEPHANE CANU
MATTEO CARANDINI

PETER CARBONETTO
MIGUEL CARREIRA-PERPINAN
RICH CARUANA
GERT CAUWENBERGHS
NICOLÒ CESA-BIANCHI
OZGUR CETIN
OLIVIER CHAPELLE
GAL CHECHIK
MAX CHICKERING
DMITRI CHKLOVSKII
WEI CHU
KENNETH CHURCH
MICHAEL COLLINS
RONAN COLLOBERT
DORIN COMANICIU
ADRIAN CORDUNEANU
CORINNA CORTES
ERIC COSATTO
GARY COTTRELL
JAMES COUGHLAN
AARON COURVILLE
KOB Y CRAMMER
NELLO CRISTIANNI
LEHEL CSATO
ARON CULOTTA
FLORENCE D'ALCHE-BUC
DAVID DANKS
SANJOY DASGUPTA
DENVER DASH
HAL DAUME III
NATHANIEL DAW
PETER DAYAN
NANDO DE FREITAS
DENNIS DECOSTE
TOBI DELBRUCK
LI DENG
FRANCOIS DENIS
SIMON DENNIS
RACHID DERICHE
MICHAEL DEWEESE
INDERJIT DHILLON
ARNAUD DOUCET
KENJI DOYA
GERARD DREYFUS
DANIEL EATON
DOUGLAS ECK
SHIMON EDELMAN
GAL ELIDAN
ANDRE ELISSEEFF
DANIEL ELLIS
YAAKOV ENGEL
BARBARA ENGELHARDT
MICHAEL ERB
JACOB FELDMAN
PEDRO FELZENSWALB
ROB FERGUS

VITTORIO FERRARI
 JOZSEF FISER
 DAVID FLEET
 FRANCOIS FLEURET
 DAVID FORSYTH
 DEAN FOSTER
 DIETER FOX
 MATTHIAS FRANZ
 MICHAEL FREEDMAN
 WILLIAM FREEMAN
 BRENDAN FREY
 KARL FRISTON
 KENJI FUKUMIZU
 GLENN FUNG
 THOMAS GAERTNER
 CHRISTOPHE GARCIA
 CLAUDIO GENTILE
 WULFRAM GERSTNER
 ZOUBIN GHAHRAMANI
 RAYID GHANI
 MOHAMMAD GHAVAMZADEH
 RAN GILAD-BACHRACH
 DANIEL GILDEA
 MARK GIROLAMI
 JIM GLASS
 PAUL GOLDBERG
 JONATHAN GOLDSTEIN
 MOISES GOLDSZMIDT
 SHARON GOLDWATER
 DAVID GONDEK
 JOSHUA GOODMAN
 NOAH GOODMAN
 GEOFFREY GORDON
 PETER GORNIAC
 THORE GRAEPEL
 JOHN GRANACKI
 YVES GRANDVALET
 DAVID GRANGIER
 ALEXANDER GRAY
 RUSSELL GREINER
 ARTHUR GRETTON
 THOMAS GRIFFITHS
 KALANIT GRILL-SPECTOR
 MARKO GROBELNIK
 GREG GRUDIC
 PETER GRUNWALD
 CUNTAI GUAN
 CARLOS GUESTRIN
 CARNEIRO GUSTAVO
 DAVID GUTIÉRREZ
 ISABELLE GUYON
 PATRICK HAFFNER
 GREG HAMERLY
 LARS KAI HANSEN
 JOHN HARRIS
 MARK HASEGAWA-JOHNSON
 WILLIAM HEADDEN
 MARTIAL HEBERT
 DAVID HECKERMAN

MATTHIAS HEIN
 KATHERINE HELLER
 RALF HERBRICH
 PERFECTO HERRERA
 TOMER HERTZ
 AARON HERTZMANN
 TOM HESKES
 JEREMY HILL
 THOMAS HOFMANN
 DEREK HOIEM
 ERIC HORVITZ
 PATRIK HOYER
 DIRK HUSMEIER
 QUENTIN HUYS
 AAPO HYVARINEN
 ALEXANDER IHLER
 SHIRO IKEDA
 GIACOMO INDIVERI
 NATHAN INTRATOR
 SHIN ISHII
 TOMMI JAAKKOLA
 JEFF JACKSON
 ROBERT JACOBS
 LARSEN JAN
 THORSTEN JOACHIMS
 MATTI KAARIAINEN
 SHAM KAKADE
 ADAM KALAI
 ASHISH KAPOOR
 BERT KAPPEN
 KUNIO KASHINO
 ROB KASS
 SATHIYA KEERTHI
 BALAZS KEGL
 ALONZO KELLY
 CHARLES KEMP
 JOSEPH KESHET
 SIMON KING
 JYRKI KIVINEN
 ANSSI KLAURI
 RISI KONDOR
 KONRAD KORDING
 BALAJI KRISHNAPURAM
 JOHN KRUSCHKE
 JEREMY KUBICA
 BRIAN KULIS
 JAMES KWOK
 JOHN LAFFERTY
 MICHAIL LAGODAKIS
 JOHN LANGFORD
 PETER LATHAM
 FRANCOIS LAVIOLETTE
 NEIL LAWRENCE
 SVETLANA LAZEBNIK
 JOHN LAZZARO
 ERIK LEARNED-MILLER
 GUY LEBANON
 DANIEL LEE
 MICHAEL LEE

TAI-SING LEE
 MÁTÉ LENGYEL
 JURE LESKOVEC
 CHRISTINA LESLIE
 MICHAEL LEWICKI
 HANG LI
 KONSTANTIN LIKHAREV
 CHIH-JEN LIN
 DEKANG LIN
 BERNABE LINARES-BARRANCO
 RICHARD LIPPMANN
 MICHAEL LITTMAN
 SHIH-CHIH LIU
 TING LIU
 KAREN LIVESCU
 HANS-ANDREA LOELIGER
 PHIL LONG
 DANIEL LOWD
 JORG LUCKE
 WERNER LUTZENBERGER
 JOHN LYNCH
 CHRISTIAN MACHENS
 WILLIAM MACREADY
 DYRHOLM MADS
 SRIDHAR MAHADEVAN
 DANILO MANDIC
 VIKASH MANSINGHKA
 YISHAY MANSOUR
 MARIO MARCHAND
 LLUIS MARQUEZ
 JIRI MATAS
 KLAUS MATHIAK
 STAN MATWIN
 JON MCAULIFFE
 ANDREW MCCALLUM
 FRANK MCSHERRY
 CHRIS MEEK
 CARSTEN MEHRING
 JUERGEN MELLINGER
 ROLAND MEMISEVIC
 VIBHU MITTAL
 DUNJA MLADENIC
 MEHRYAR MOHRI
 GIANLUIGI MONGILLO
 QUAID MORRIS
 KLAUS-ROBERT MUELLER
 VIKTOR MÜLLER
 REMI MUNOS
 KEVIN MURPHY
 ALAN MURRAY
 IAIN MURRAY
 RODERICK MURRAY-SMITH
 ION MUSLEA
 SRIKANTAN NAGARAJAN
 DAN NAVARRO
 MARTIN NAWROT
 ARYE NEHORAI
 DANIEL NEILL
 ANDREW NG

MAHESAN NIRANJAN
 Yael Niv
 DAVID NOELLE
 KLAUS OBERMAYER
 JEAN-MARC ODOBEZ
 BRUNO OLSHAUSEN
 MANFRED OPPER
 SIMON OSINDERO
 ELIAS PAMPALK
 NAVNEET PANDA
 LIAM PANINSKI
 MARK PASKIN
 HANNA PASULA
 HELENE PAUGAM-MOISY
 BARAK PEARLMUTTER
 DAN PELLEG
 WILL PENNY
 FERNANDO PEREZ-CRUZ
 AMY PERFORS
 ROBERT PETERS
 GERT PFURTSCHELLER
 PETRA PHILIPS
 JONATHAN PILLOW
 JEAN PONCE
 MASSIMILIANO PONTIL
 DOINA PRECUP
 THOMAS PREUSS
 YUAN (ALAN) QI
 JOAQUIN QUIÑONERO CANDELA
 GUNNAR RAETSCH
 ULRICH RAMACHER
 RAJESH RAO
 CHRISTOPHER RAPHAEL
 CARL EDWARD RASMUSSEN
 MAGNUS RATTRAY
 STEVE RENALS
 GAEL RICHARD
 THOMAS RICHARDSON
 MARTIN RIEDMILLER
 MAXIMILIAN RIESENHUBER
 RYAN RIFKIN
 IRINA RISH
 SIMON ROGERS
 KHASHAYAR ROHANIMANESH
 RICHARD ROHWER
 ROMER ROSALES
 MICHAL ROSEN-ZVI
 SAHARON ROSSET
 DAN ROTH
 STEFAN ROTH
 VOLKER ROTH
 STEFAN ROTTER
 JUHO ROUSU
 SAM ROWEIS
 NICHOLAS ROY
 MATTHEW RUDARY
 EYTAN RUPPIN
 MEHRAN SAHAMI
 MANEESH SAHANI

ADAM SANBORN
 GUIDO SANGUINETTI
 CRAIG SAUNDERS
 STEFAN SCHAAL
 TOBIAS SCHEFFER
 MARK SCHMIDT
 JEFF SCHNEIDER
 ANTON SCHWAIGHOFER
 MATTHIAS SEEGER
 FLORENT SEGONNE
 FEI SHA
 AMNON SHASHUA
 JOHN SHAWE-TAYLOR
 CHRISTIAN SHELTON
 JIANBO SHI
 EERO SIMONCELLI
 VIKAS SINDHWANI
 YORAM SINGER
 PARIS SMARAGDIS
 ARNOLD SMEULDERS
 CRISTIAN SMINCHISESCU
 ALEX SMOLA
 EDWARD SNELSON
 STEFANO SOATTO
 KEMAL SONMEZ
 NATHAN SREBRO
 MIRCEA STAN
 INGO STEINWART
 MARK STEYVERS
 AMOS STORKEY
 ERIK SUDDERTH
 ARUN SURENDRAN
 RICHARD SUTTON
 JOHAN SUYKENS
 RICHARD SZELISKI
 CSABA SZEPESVARI
 BENYANG TANG
 YEE WHYI TEH
 JOSHUA TENENBAUM
 AMBUJ TEWARI
 SIMON THORPE
 SEBASTIAN THRUN
 NAFTALI TISHBY
 EMANUEL TODOROV
 ANTONIO TORRALBA
 VOLKER TRESP
 BILL TRIGGS
 KOJI TSUDA
 MICHAEL TURMON
 TINNE TUYTELAARS

NAONORI UEDA
 JOOST VAN DE WEIJER
 MARC VAN HULLE
 JAKOB VERBEEK
 DIMITRA VERGYRI
 JEAN-PHILIPPE VERT
 EMMANUEL VINCENT
 PASCAL VINCENT
 PAUL VIOLA
 S V N VISHWANATHAN
 NIKOS VLASSIS
 JULIA VOGEL
 ULRIKE VON LUXBURG
 JIRI VRBA
 MARTIN WAINWRIGHT
 KILIAN WEINBERGER
 DAPHNA WEINSHALL
 NIKOLAUS WEISKOPF
 YAIR WEISS
 MAX WELLING
 ERIC WIEWIORA
 CHRIS WIGGINS
 CHRIS WILLIAMS
 DAVID WINGATE
 WENG-KEEN WONG
 FRANK WOOD
 GANG WU
 ERIC P. XING
 CHEN YANOVER
 SCOTT WEN-TAU YIH
 ELAD YOM-TOV
 ANGELA YU
 BYRON YU
 KAI YU
 STELLA YU
 ALAN YUILLE
 MOHAMMED J ZAKI
 GREGORY ZELINSKY
 CHENGXIANG ZHAI
 HAO ZHANG
 TONG ZHANG
 YI ZHANG
 ZHIHUA ZHANG
 DENGYONG ZHOU
 ZHI-HUA ZHOU
 XIAOJIN ZHU
 ALEXANDER ZIEN
 MARTIN ZINKEVICH
 ANDREW ZISSERMAN

Contents

Contents	v
Preface	xvii
Donors	xix
NIPS Foundation	xix
Committees	xx
Reviewers	xxi
An Application of Reinforcement Learning to Aerobatic Helicopter Flight , PIETER ABBEEL, ADAM COATES, MORGAN QUIGLEY, ANDREW Y. NG	1
Tighter PAC-Bayes Bounds , AMIRAN AMBROLADZE, EMILIO PARRADO-HERNÁNDEZ, JOHN SHAWE-TAYLOR	9
Online Classification for Complex Problems Using Simultaneous Projections , YONATAN AMIT, SHAI SHALEV-SHWARTZ, YORAM SINGER	17
Learning on Graph with Laplacian Regularization , RIE KUBOTA ANDO, TONG ZHANG	25
Sparse Kernel Orthonormalized PLS for feature extraction in large data sets , JERÓNIMO ARENAS-GARCÍA, KAARE BRANDT PETERSEN, LARS KAI HANSEN	33
Multi-Task Feature Learning , ANDREAS ARGYRIOU, THEODOROS EVGENIOU, MASSIMILIANO PONTIL	41
Logarithmic Online Regret Bounds for Undiscounted Reinforcement Learning , PETER AUER, RONALD ORTNER	49
Efficient Methods for Privacy Preserving Face Detection , SHAI AVIDAN, MOSHE BUTMAN	57
Active learning for misspecified generalized linear models , FRANCIS R. BACH	65
Subordinate class recognition using relational object models , AHARON BAR HILLEL, DAPHNA WEINSHALL	73
Unified Inference for Variational Bayesian Linear Gaussian State-Space Models , DAVID BARBER, SILVIA CHIAPPA	81
A Novel Gaussian Sum Smoother for Approximate Inference in Switching Linear Dynamical Systems , DAVID BARBER, BERTRAND MESOT	89

Sample Complexity of Policy Search with Known Dynamics , PETER L. BARTLETT, AMBUJ TEWARI	97
AdaBoost is Consistent , PETER L. BARTLETT, MIKHAIL TRASKIN	105
A selective attention multi-chip system with dynamic synapses and spiking neurons , CHIARA BARTOLOZZI, GIACOMO INDIVERI	113
Temporal and Cross-Subject Probabilistic Models for fMRI Prediction Tasks , ALEXIS BATTLE, GAL CHECHIK, DAPHNE KOLLER	121
Convergence of Laplacian Eigenmaps , MIKHAIL BELKIN, PARTHA NIYOGI	129
Analysis of Representations for Domain Adaptation , SHAI BEN-DAVID, JOHN BLITZER, KOBY CRAMMER, FERNANDO PEREIRA	137
An Approach to Bounded Rationality , ELI BEN-SASSON, ADAM TAUMAN KALAI, EHUD KALAI	145
Greedy Layer-Wise Training of Deep Networks , YOSHUA BENGIO, PASCAL LAMBLIN, DAN POPOVICI, HUGO LAROCHELLE	153
Dirichlet-Enhanced Spam Filtering based on Biased Samples , STEFFEN BICKEL, TOBIAS SCHEFFER	161
Detecting Humans via Their Pose , ALESSANDRO BISSACCO, MING-HSUAN YANG, STEFANO SOATTO	169
Similarity by Composition , OREN BOIMAN, MICHAL IRANI	177
Denoising and Dimension Reduction in Feature Space , MIKIO L. BRAUN, JOACHIM BUHMANN, KLAUS-ROBERT MÜLLER	185
Learning to Rank with Nonsmooth Cost Functions , CHRISTOPHER J.C. BURGESS, ROBERT RAGNO, QUOC VIET LE	193
Conditional mean field , PETER CARBONETTO, NANDO DE FREITAS	201
Sparse Multinomial Logistic Regression via Bayesian L1 Regularisation , GAVIN C. CAWLEY, NICOLA L.C. TALBOT, MARK GIROLAMI	209
Branch and Bound for Semi-Supervised Support Vector Machines , OLIVIER CHAPELLE, VIKAS SINDHWANI, S. SATHIYA KEERTHI	217
Automated Hierarchy Discovery for Planning in Partially Observable Environments , LAURENT CHARLIN, PASCAL POUPART, ROMY SHIODA	225
Max-margin classification of incomplete data , GAL CHECHIK, GEREMY HEITZ, GAL ELIDAN, PIETER ABBEEL, DAPHNE KOLLER	233
Modeling General and Specific Aspects of Documents with a Probabilistic Topic Model , CHAITANYA CHEMUDUGUNTA, PADHRAIC SMYTH, MARK STEYVERS	241
Implicit Online Learning with Kernels , LI CHENG, S.V.N. VISHWANATHAN, DALE SCHUURMANS, SHAOJUN WANG, TERRY CAELLI	249
Context dependent amplification of both rate and event-correlation in a VLSI network of spiking neurons , ELISABETTA CHICCA, GIACOMO INDIVERI, RODNEY J. DOUGLAS	257
Bayesian Ensemble Learning , HUGH A. CHIPMAN, EDWARD I. GEORGE, ROBERT E. MCCULLOCH	265

Implicit Surfaces with Globally Regularised and Compactly Supported Basis Functions , CHRISTIAN WALDER, BERNHARD SCHÖLKOPF, OLIVIER CHAPELLE	273
Map-Reduce for Machine Learning on Multicore , CHENG-TAO CHU, SANG KYUN KIM, YI-AN LIN, YUANYUAN YU, GARY BRADSKI, ANDREW Y. NG, KUNLE OLUKOTUN	281
Relational Learning with Gaussian Processes , WEI CHU, VIKAS SINDHWANI, ZOUBIN GHAHRAMANI, S. SATHIYA KEERTHI	289
Recursive Attribute Factoring , DAVID COHN, DEEPAK VERMA, KARL PFLEGER	297
On Transductive Regression , CORINNA CORTES, MEHRYAR MOHRI	305
Balanced Graph Matching , TIMOTHEE COUR, PRAVEEN SRINIVASAN, JIANBO SHI	313
Learning from Multiple Sources , KOBAYASHI, MICHAEL KEARNS, JENNIFER WORTMAN	321
Kernels on Structured Objects Through Nested Histograms , MARCO CUTURI, KENJI FUKUMIZU	329
Differential Entropic Clustering of Multivariate Gaussians , JASON V. DAVIS, IDERJIT DHILLON	337
Support Vector Machines on a Budget , OFER DEKEL, YORAM SINGER	345
A Theory of Retinal Population Coding , EIZABURO DOI, MICHAEL S. LEWICKI	353
Learning to Traverse Image Manifolds , PIOTR DOLLÁR, VINCENT RABAUD, SERGE BELONGIE	361
Using Combinatorial Optimization within Max-Product Belief Propagation , JOHN DUCHI, DANIEL TARLOW, GAL ELIDAN, DAPHNE KOLLER	369
Optimal Single-Class Classification Strategies , RAN EL-YANIV, MORDECHAI NISENSON	377
A Small World Threshold for Economic Network Formation , EYAL EVEN-DAR, MICHAEL KEARNS	385
PG-means: learning the number of clusters in data , YU FENG, GREG HAMERLY	393
Clustering Under Prior Knowledge with Application to Image Segmentation , MÁRIO A.T. FIGUEIREDO, DONG SEON CHENG, VITTORIO MURINO	401
Multi-dynamic Bayesian Networks , KARIM FILALI, JEFF A. BILMES	409
Image Retrieval and Classification Using Local Distance Functions , ANDREA FROME, YORAM SINGER, JITENDRA MALIK	417
Multiple Instance Learning for Computer Aided Diagnosis , GLENN FUNG, MURAT DUNDAR, BALAJI KRISHNAPURAM, R. BHARAT RAO	425
Distributed Inference in Dynamical Systems , STANISLAV FUNIAK, CARLOS GUESTRIN, MARK PASKIN, RAHUL SUKTHANKAR	433

iLSTD: Eligibility Traces and Convergence Analysis , ALBORZ GERAMIFARD, MICHAEL BOWLING, MARTIN ZINKEVICH, RICHARD S. SUTTON	441
A PAC-Bayes Risk Bound for General Loss Functions , PASCAL GERMAIN, ALEXANDRE LACASSE, FRANÇOIS LAVIOLETTE, MARIO MARCHAND ..	449
Bayesian Policy Gradient Algorithms , MOHAMMAD GHAVAMZADEH, YAAKOV ENGEL	457
Data Integration for Classification Problems Employing Gaussian Process Priors , MARK GIROLAMI, MINGJUN ZHONG	465
Approximate inference using planar graph decomposition , AMIR GLOBERSON, TOMMI S. JAAKKOLA	473
Near-Uniform Sampling of Combinatorial Spaces Using XOR Constraints , CARLA P. GOMES, ASHISH SABHARWAL, BART SELMAN	481
No-regret Algorithms for Online Convex Programs , GEOFFREY J. GORDON	489
Large Margin Multi-channel Analog-to-Digital Conversion with Applications to Neural Prosthesis , AMIT GORE, SHANTANU CHAKRABARTTY	497
Approximate Correspondences in High Dimensions , KRISTEN GRAUMAN, TREVOR DARRELL	505
A Kernel Method for the Two-Sample-Problem , ARTHUR GRETTON, KARSTEN M. BORWARDT, MALTE RASCH, BERNHARD SCHÖLKOPF, ALEXANDER J. SMOLA	513
Learning Nonparametric Models for Probabilistic Imitation , DAVID B. GRIMES, DANIEL R. RASHID, RAJESH P.N. RAO	521
Training Conditional Random Fields for Maximum Labelwise Accuracy , SAMUEL S. GROSS, OLGA RUSSAKOVSKY, CHUONG B. DO, SERAFIM BATZOGLOU	529
Adaptive Spatial Filters with predefined Region of Interest for EEG based Brain-Computer-Interfaces , MORITZ GROSSE-WENTRUP, KLAUS GRAMANN, MARTIN BUSS	537
Graph-Based Visual Saliency , JONATHAN HAREL, CHRISTOF KOCH, PIETRO PERONA	545
Stratification Learning: Detecting Mixed Density and Dimensionality in High Dimensional Point Clouds , GLORIA HARO, GREGORY RANDALL, GUILLERMO SAPIRO	553
Manifold Denoising , MATTHIAS HEIN, MARKUS MAIER	561
TrueSkill™: A Bayesian Skill Rating System , RALF HERBRICH, TOM MINKA, THORE GRAEPEL	569
Prediction on a Graph with a Perceptron , MARK HERBSTER, MASSIMILIANO PONTIL	577
Geometric entropy minimization (GEM) for anomaly detection and localization , ALFRED O. HERO, III	585
Single Channel Speech Separation Using Factorial Dynamics , JOHN R. HERSHEY, TRAUSTI KRISTJANSSON, STEVEN RENNIE, PEDER A. OLSEN ..	593