

Machine Learning Summer Schools



*Gunnar Rätsch
Bernhard Schölkopf*

PASCAL meeting, Bled

History



MLSS 2007
Machine Learning Summer School
Tübingen

9th Machine Learning Summer School

August 20-31, 2007
Max Planck Campus Tübingen, Germany

The summer school is intended for students, postdoctoral researchers, and IT-professionals alike. It will feature introductory lectures and advanced courses on a wide variety of modern approaches to machine learning. The lectures are paired with practical courses, to provide hands-on experience. Evening talks by scientists in other fields will showcase the application of machine learning to a broad range of real-life problems.

Lecture courses:

Andrew Blake (Microsoft Research)
Nicolò Cesa-Bianchi (University of Milano)
Zoubin Ghahramani (Cambridge)
Gunnar Rätsch (FML)
Bernhard Schölkopf (MPI)
Lieven Vandenbergh (UCLA)

Olivier Bousquet (Google)
Arnaud Doucet (U. of British Columbia)
Gene Golub (Stanford)
Carl Edward Rasmussen (Cambridge / MPI)
Alex Smola (NICTA)

Practical courses:

Joaquin Quiñero Candela (Microsoft Research)
Matthias Hein (MPI)
Matthias Seeger (MPI)

Mamuel Davy (LAGIS)
Ulrike von Luxburg (MPI)
Yee Whye Teh (Gatsby Unit)

Evening talks:

Andreas Dengel (DFKI)
Oliver Kohlbacher (University Tübingen)

Uwe Hanebeck (University Karlsruhe)
Joachim Weickert (Saarland University)

Organized by Arthur Gretton, Gunnar Rätsch, Bernhard Schölkopf, and Florian Steinke at the Max Planck Institute for Biological Cybernetics (MPI), Tübingen, and the Friedrich Miescher Laboratory (FML), Tübingen.

For further information about the MLSS contact mlss07@tuebingen.mpg.de or visit

<http://www.mlss.cc/tuebingen07>



...

Machine Learning Summer School

September 12-25, 2004
Berder Island, France

Lectures and Practical Sessions

- **C. Bishop** (Microsoft Research) Graphical Models and Variational Methods
- **A. Blake** (Microsoft Research) Computer Vision
- **O. Bousquet** (MPI Tübingen) Advanced Statistical Learning
- **S. Canu** (INSA Rouen) Regularization
- **O. Chapelle** (MPI Tübingen) Semi-supervised Learning
- **M. Davy** (IRCCyN Nantes) Simulation Methods
- **A. Gretton** (MPI Tübingen) Independent Component Analysis
- **T. Hofmann** (Brown University) Information Theory
- **J. Moore** (ANU Canberra) Control Systems
- **G. Rätsch** (MPI Tübingen and Fraunhofer) Kernel Methods
- **B. Schölkopf** (MPI Tübingen) Kernel Methods
- **J. Shawe-Taylor** (Southampton) Statistical Learning Theory
- **A. Smola** (ANU Canberra) Kernel Methods
- **V. Vapnik** (NEC Research) Empirical Inference

Machine Learning Summer School

August 4-16, 2003
Max Planck Institute for Biological Cybernetics, Tübingen, Germany

Machine Learning Summer School

February 2-15, 2003

Machine Learning Summer School

February 11-22, 2002
The Australian National University
Machine Learning Group (RSISE/CSL)

Courses:

- **Reinforcement Learning**
Peter Bartlett, Biowulf Technologies, Berkeley
- **Boosting**
Ron Meir, Department of Electrical Engineering, Technion
- **Statistical Learning Theory and Empirical Processes**
Shahar Mendelson, The Australian National University
- **Online Learning and Bregmann Divergences**
Gunnar Rätsch, The Australian National University
- **Support Vector Machines and Kernels**
Bernhard Schölkopf, Biowulf Technologies and MPI for Biological Cybernetics
- **Bayesian Kernel Methods**
Alex Smola, The Australian National University
- **Special Talks**
Markus Hegland (ANU), **Jyrki Kivinen** (ANU), **John Lloyd** (ANU), **Arun Sharma** (UNSW), **Chris Wallace** (Monash), and **Robert Williamson** (ANU)

<http://mlg.anu.edu.au/summer2002>

Organized by Shahar Mendelson and Alex Smola.
For further information send e-mail to ml2002@csml.anu.edu.au.



The Australian National University

Geometry
Amari, RIKEN
d Learning
ghramani, Gatsby Institute
in Inequalities
si, Pompeu Fabra University

si,
: ANU
delson, ANU
ne, ANU
sch, ANU
, ANU
lson, ANU

mlg.anu.edu.au/summer2003

at Institute of Engineering and Information Sciences, ANU

delson, Gunnar Rätsch and Alex Smola.
and e-mail to ml2003@mlg.anu.edu.au.

AN
VERSITY  Max-Planck-Institut
für Biologische Kybernetik

SS03
4377
7
(MPI),
Universit
The Australian
at University

Machine Learning Summer Schools - View Document - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.mlss.cc/ Google

YouTube diba imdb ebay voba kybwiki tv tv agbswww AmexB cafete wetter DB3535 Routenplaner Mondphase Google Docs Mondlauf

Alto ... Lucky Ima... Full width ... Point spre... Semicond... Astralux H... okularseiti... Astrofoto... Sucher Machi...

MLSS Tübingen, Germany, August 20 - August 31, 2007

• **MLSS Taipei, Taiwan, July 24 - August 2, 2006**

• **MLSS Canberra, Australia, February 6-17, 2006**

• **MLSS Chicago, USA, May 16-27, 2005**

• **MLSS Canberra, Australia, January 23 - February 5, 2005**

• **MLSS Berder, France, September 12-25, 2004 (Wiki)**

• **MLSS Tübingen, Germany, August 4-16, 2003**

• **MLSS Canberra, Australia, February 2-14, 2003**

• **MLSS Canberra, Australia, February 11-22, 2002**



Sponsors

- ◆ PASCAL
 - ◆ Nokia
 - ◆ Google
 - ◆ Microsoft Research
 - ◆ Advanced Unibyte
-



- ◆ Max Planck Society
- ◆ NICTA



Application Statistics

- ◆ in total
 - 333 regular applications
 - Many more informal inquiries
- ◆ 107 accepted participants
- ◆ Acceptance rate
 - 32% (70% for PASCAL students)
- ◆ 25 countries, average 4 per country (median 3)

Belgium	4
Canada	6
Chile	1
Denmark	2
Finland	3
France	10
Germany	21
Greece	1
Hong Kong	1
Hungary	2
Israel	4
Italy	4
Japan	2
Malaysia	1
Norway	1
Portugal	2
Slovenia	1
South Africa	3
Spain	3
Switzerland	4
Thailand	2
The Netherlands	3
Turkey	2
United Kingdom	10
USA	9

Application Statistics II

◆ 10 715€ for grants

Undergraduate	10
PhD Student	71
Postdoc	9
Professor	6
Industrial	6

Lecture Courses (4-8h)

- ◆ Andrew Blake: Topics in Image and Video Processing
- ◆ Olivier Bousquet: Statistical Learning Theory
- ◆ Nicolò Cesa-Bianchi: Online Learning
- ◆ Arnaud Doucet: Sequential Monte Carlo Methods
- ◆ Zoubin Ghahramani: Graphical models
- ◆ László Györfi: Machine Learning and Finance
- ◆ Kenji Fukumizu: Kernel Methods for Dependence and Causality
- ◆ Carl E. Rasmussen: Bayesian Inference and Gaussian Processes
- ◆ Gunnar Rätsch: Introduction to Bioinformatics
- ◆ Bernhard Schölkopf & Alex Smola: Introduction to Kernel Methods
- ◆ Lieven Vandenbergh: Convex Optimisation

Practical Courses (2h)

- ◆ Joaquin Quiñonero Candela: Gaussian Processes
- ◆ Manuel Davy: Practical Sampling
- ◆ Matthias Hein & Ulrike von Luxburg: Spectral Clustering and Other Graph Based Algorithms
- ◆ Matthias Seeger: Variational Bayesian Inference
- ◆ Yee Whye Teh: Dirichlet Processes

Evening Speakers (1h)

- ◆ Andreas Dengel: Learning Mental Associations as a Means to Build Organisational Memories
- ◆ Uwe Hanebeck: Stochastic Information Processing in Sensory Networks
- ◆ Oliver Kohlbacher: Lost in Translation -- Solving biological problems with Machine Learning
- ◆ Joachim Weickert: Regularization in Image Analysis

(local Professors which are experts in their field)

Schedule Week 1

	Sun 19.08	Mon 20.08.	Tue 21.08.	Wed 22.08.	Thrs 23.08.	Fri 24.08.	Sat 25.08.	
9:00-10:45	Arrival	Smola 1	Rasmussen 1	Rasmussen 3	Ghahramani 3	Ghahramani 5		
		Schölkopf 1	Rasmussen 2	Rasmussen 4	Ghahramani 4	Ghahramani 6	Vandenberghe 1	
10:45-11:15		Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	
11:15-13:00		Schölkopf 2	Smola 2	Rätsch5	Fukumizu 1	Fukumizu 3	Vandenberghe 2	
		Schölkopf 3	Smola 3	Rätsch6	Fukumizu 2	Fukumizu 4	Vandenberghe 3	
13:00-14:00		Lunch	Lunch	Lunch	Lunch	Lunch		
14:00-16:45		Registration (16:00-19:00)	Hein, Luxburg or break	Hein, Luxburg or break	Quinonero Candela or break	Quinonero Candela or break	Seeger or break	
16:45-17:15			Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	
17:15-19:00			Rätsch 1	Rätsch 3	Ghahramani 1	Rasmussen 5	Student Pres.	
		Rätsch 2	Rätsch 4	Ghahramani 2	Rasmussen 6	Student Pres.		
19:00-20:00	Welcome Party	Dinner	Dinner	BBQ	Dinner	Dinner		
20:30-21:30			Kohlbacher		Dengel			
late			Bar	Bar		Bar	Bar	

Schedule Week 2

	Sun 26.08.	Mon 27.08.	Tue 28.08.	Wed 29.08.	Thrs 30.08.	Fri 31.08.	Sat 01.09.
9:00-10:45		Bousquet 1 Bousquet 2	Bousquet 3 Bousquet 4	Bousquet 5 Bousquet 6	Cesa-Bianchi 3 Cesa-Bianchi 4	Doucet 5 Doucet 6	Departure
10:45-11:15		Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	
11:15-13:00		Teh 1 Teh 2	Blake 3 Blake 4	Cesa-Bianchi 1 Cesa-Bianchi 2	Doucet 1 Doucet 2	Cesa-Bianchi 5 Cesa-Bianchi 6	
13:00-14:00		Lunch	Lunch	Lunch	Lunch	Lunch	
14:00-16:45		Teh or break	Teh or break	Seeger or break	Davy or break	Davy or break	
16:45-17:15		Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	
17:15-19:00		Blake 1 Blake 2	Fukumizu 5 Fukumizu 6	Györfi 1 Györfi 2	Doucet 3 Doucet 4	Györfi 3 Györfi 4	
19:00-20:00	Conference Dinner	Dinner	Dinner	BBQ	Dinner	Dinner	
20:30-21:30		Weickert			Hanebeck	Final Party	
late		Bar	Bar		Bar		

MLSS Courses Canberra 2002

- ◆ Reinforcement Learning (Peter Bartlett)
- ◆ Boosting (Ron Meir)
- ◆ Statistical Learning Theory and Empirical Processes (Shahar Mendelson)
- ◆ Online Learning and Bregman Divergences (Gunnar Rätsch and Manfred Warmuth)
- ◆ Support Vector Machines and Kernels (Bernhard Schölkopf)
- ◆ Bayesian Kernel Methods (Alex Smola)

plus the following short courses:

- ◆ Learning for Control: Adaptive Control Problems are different (Brian Anderson)
- ◆ Nonparametric Estimation of Component Distributions in a Multivariate Mixture (Peter Hall)
- ◆ Algorithms for Association Rules (Markus Hegland)
- ◆ Online Loss Bounds (Jyrki Kivinen)
- ◆ Learning from Structured Data (John Lloyd)
- ◆ A Unified Approach to Deduction and Induction (Arun Sharma)
- ◆ Inductive Principles (Bob Williamson)

MLSS Courses Canberra 2003

- ◆ Information Geometry (Shun-Ichi Amari)
- ◆ Concentration Inequalities (Gabor Lugosi)
- ◆ Unsupervised Learning (Zoubin Ghahramani)

plus short courses by

- ◆ Eleazar Eskin
- ◆ Peter Hall
- ◆ Markus Hegland
- ◆ John Lloyd
- ◆ Shahar Mendelson
- ◆ Mike Osborne
- ◆ Gunnar Rätsch
- ◆ Alex Smola
- ◆ S.V.N. Vishwanathan
- ◆ Bob Williamson
- ◆ Petra Philips

MLSS Courses Tübingen 2003

Long Courses

- **Statistical Learning Theory** O. Bousquet
- **Independent Component Analysis** J-F. Cardoso
- **Probabilistic Models and Gaussian Processes** C.E. Rasmussen
- **Kernel Algorithms I** B. Schölkopf
- **Kernel Algorithms II** A. Smola
- **Pattern Classification** E. Yom-Tov

Short Courses

- **Monte Carlo Simulation Methods** C. Andrieu
- **Bioinformatics** P. Baldi
- **Stochastic Approximation** L. Bottou
- **Concentration Inequalities** S. Boucheron
- **Mathematical Tools for Machine Learning** C. Burges
- **Minimum Description Length** P. Grünwald
- **Information Retrieval and Language Technology** T. Joachims
- **Foundations of Learning** S. Smale
- **Principles and Practice of Bayesian Learning** M. Tipping

Practical Sessions

- **Simulation Methods** M. Davy
- **Support Vector Machines** A. Elisseeff, A. Gretton, J. Weston
- **Pattern Classification – From Data to Decision** E. Yom-Tov

Evening Talks

- **On Learning Vector-Valued Functions** M. Pontil
- **Empirical Inference** V. Vapnik
- **Analysis of Support Vector Machine Classification** D-X. Zhou

Student Talks

- **Half-day mini-conference, talks and posters**

Some Quotations (Tübingen 2003 & 2007)

2003:

- ◆ “Excellent organization! [...] Also the price for students was very reasonable!- More practical sessions? They were really excellent and for PhD students cannot be recommended highly enough.”
- ◆ “Most of the lecturers at our university could have learned quite a lot from the mostly non-everyday-lecturers at the summer school.”
- ◆ “Excellent, I really enjoyed the opportunity to see famous people and to have the opportunity to contact other students. [...] Please, try to keep the effort as many years as possible because it is worth it.”

2007:

- ◆ “Yes, I liked it a lot. It was a great mixture of study and social activities, being able to learn new things in an area you are interested in, and get to know many interesting people. [...] I liked the practical sessions very much [...].”
- ◆ “I think it would be useful to send out [...] some readings [before the summer school], so that it will be easier to attend some of the lectures [...].”
- ◆ “I very much enjoyed MLSS. The lectures were consistently of a high quality, and the environment was fantastic. I liked the fact that much of the content was accessible to people from outside the field like myself.”

Elements of a Machine Learning Syllabus

Block 1: **Mathematics**

- ◆ analysis *
- ◆ linear algebra *
- ◆ functional analysis *
- ◆ numerical mathematics and mathematical programming *
- ◆ probability theory *
- ◆ statistics *
- ◆ empirical process theory and concentration inequalities
- ◆ approximation theory
- ◆ multivariate analysis
- ◆ nonparametric statistics
- ◆ differential geometry
- ◆ convex analysis

Block 2: **Computer Science and Engineering**

- ◆ computer programming *
- ◆ signal processing *
- ◆ Software development
- ◆ computer vision
- ◆ robotics
- ◆ control theory

Block 3: **Human Sciences**

- ◆ experimental psychology
- ◆ neuroscience
- ◆ linguistics

Block 4: **Philosophy**

- ◆ philosophy of science
- ◆ epistemology

Block 5: **Specialized Courses**

(cf. Machine Learning Summer Schools)

* *undergraduate material*

A “Parallel Distributed” European MSc/PhD in ML?

- group of 10 institutions offering graduate level credits
- credits = courses, lab rotations, etc.
- credits can also be earned in summer schools
- typically, students will spend periods of 6 months in each place, giving sufficient time to complete a course
- different sites offer different specialized courses
- thesis can be written at any participating lab and is reviewed by professors from different sites
- degree is awarded by a PASCAL member university, ideally a prestigious one
- model: "intercollegiate London MSc. in mathematics"

Benefits:

- might foster also scientific collaborations (often collaborations are driven by students)
- will help retain top European students, and attract strong overseas students

MLSS Courses Berder 2004

- ◆ Graphical Models and Variational Methods (C. Bishop)
- ◆ Computer Vision (A. Blake)
- ◆ Advanced Statistical Learning Theory (O. Bousquet)
- ◆ Regularization (S. Canu)
- ◆ Simulation Methods (M. Davy)
- ◆ Information Retrieval and Text Mining (T. Hofman)
- ◆ Control Systems (J. Moore)
- ◆ Boosting (G. Rätsch)
- ◆ Kernel Methods I (B. Schölkopf)
- ◆ Statistical Learning Theory (J. Shawe-Taylor)
- ◆ Kernel Methods II (A. Smola)
- ◆ Empirical Inference (V. Vapnik)
- ◆ Signal Processing (R. Williamson)
- ◆ Machine Learning in Bioinformatics (A. Zien)

Plus practical sessions:

- ◆ Semi-supervised Learning (O. Chapelle)
- ◆ Simulation Methods (M. Davy)
- ◆ Independent Component Analysis (A. Gretton)