



BRÅKET



*Information om seminarier och högre undervisning
i matematiska ämnen i Stockholmsområdet*

NR 36

FREDAGEN DEN 9 NOVEMBER 2007

BRÅKET

Veckobladet från
Institutionen för matematik
vid Kungl Tekniska Högskolan
och Matematiska institutionen
vid Stockholms universitet

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KTH
100 44 Stockholm

Sista manustid för nästa nummer:
Torsdagen den 15 november
kl. 13.00.

Disputation i numerisk analys

Alexei Loubenets disputerar på
avhandlingen *An Immersed Finite
Element Method and its Applica-
tion to Multiphase Problems* mån-
dagen den 12 november kl. 13.00 i
sal F3, KTH, Lindstedtsvägen 26,
b.v. Se Bråket nr 35 sidan 5.

Money, jobs: Se sidorna 13–14.

SEMINARIER

Fr 11–09 kl. 11.00–12.00. **Optimization and Systems
Theory Seminar.** Maben Rabi, Reglerteknik,
Skolan för elektro- och systemteknik, KTH:
Level-triggered control. Seminarierum 3721, Insti-
tutionen för matematik, KTH, Lindstedtsvägen
25, plan 7. Se Bråket nr 35 sidan 6.

Fr 11–09 kl. 11.00. **Mittag-Leffler (Post)Graduate
Seminar.** Thomas Cass: *Title to be announced*.
Institut Mittag-Leffler, Auravägen 17, Djursholm.

Fr 11–09 kl. 13.15–14.15. **Graduate Student Seminar.**
Martin Blomgren, Matematik, KTH: *Title to be
announced*. Seminarierum 3721, Institutionen för
matematik, KTH, Lindstedtsvägen 25, plan 7.

Fr 11–09 kl. 15.00. **Small Talk Seminar.** Martin Gul-
brandsen: *Derived equivalent abelian varieties
and semihomogeneous bundles*. Seminarierum
3721, Institutionen för matematik, KTH, Lind-
stedtsvägen 25, plan 7. Se Bråket nr 35 sidan 9.

Må 11–12 kl. 10.00. **Seminarium i numerisk analys.**
(Observera dagen, tiden och lokalen!) Mike
Shelley, Courant Institute, New York University:
Dynamics and transport of complex fluids. Rum
304, KTH, Teknikringen 14. Se sidan 5.

Fortsättning på nästa sida.

Workshops vid Institut Mittag-Leffler

Under hösten 2007 anordnas två sådana. Den andra av dessa
skall äga rum den 19–23 november. Se sidan 9.

Disputation i data- och systemvetenskap

Anna-Maria Kessler disputerar vid SU på avhandlingen
A Systemic Approach Framework for Operational Risk:
– SAFOR – fredagen den 23 november kl. 13.00. Se sidorna
7–8.

Seminarier (fortsättning)

- Må 11–12 kl. 13.15. Informellt doktorandseminarium i teoretisk datalogi. Johan Håstad**, Teorigruppen, KTH CSC: *On the approximation resistance of a random predicate*. Rum 1537, KTH CSC, Lindstedtsvägen 3, plan 5. Se Bråket nr 35 sidan 8.
- Må 11–12 kl. 14.15. Öppen föreläsning: CSC — Forskning och framtid. Joakim Gustafson**, KTH CSC, Tal, musik och hörsel: *Mot mer reaktiva talbaserade dialogsystem*. Fantum, KTH, Lindstedtsvägen 24, översta våningen. Se sidan 6.
- Ti 11–13 kl. 10.15. Plurikomplexa seminariet. Stefan Borell**, Bern: *Holomorphic discs in C^n* . Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 8.
- Ti 11–13 kl. 13.15–14.15. Seminarium i analys och dynamiska system. (Observera dagen!)** **Pekka Koskela**, Jyväskylä: *Dimension distortion under mappings of exponentially integrable distortion*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.
- Ti 11–13 kl. 14.00–15.00. Mittag-Leffler Seminar. Terry Lyons**, Oxford, UK: *On signed probability measures and some old results of Krylov*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 6.
- Ti 11–13 kl. 14.15. Seminarium i numerisk analys. (Observera dagen och tiden!)** **Vladimir G. Danilov**, Moscow Technical University of Communication and Informatics: *Some problems of solitary nonlinear waves interaction. Weak asymptotics approach*. Rum 4523, KTH CSC, Lindstedtsvägen 5, plan 5. Se sidan 4.
- Ti 11–13 kl. 15.30–16.30. Mittag-Leffler Seminar. Esko Valkeila**, Helsinki University of Technology, Finland: *A Lévy-type of characterization theorem for fractional Brownian motion*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 8.
- On 11–14 kl. 9.30–11.15. Logikseminariet Stockholm-Uppsala. (Observera tiden: seminariet börjar en halvtimme tidigare än vanligt.) Per Martin-Löf: Categories of expressions, meanings or objects?** Sal 16, hus 5, Matematiska institutionen, SU, Kräftriket.
- On 11–14 kl. 10.15–12.00. Kombinatorikseminarium. Anders Björner: Random walks on complex hyperplane arrangements.** Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 35 sidan 10.
- On 11–14 kl. 11.00–12.00. Common SU KoF/KTH Theoretical Physics Seminar. Jon Magne Leinaas**, Oslo: *Geometry of separable and entangled quantum states*. Sal FA31, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 9.
- On 11–14 kl. 13.00–14.45. Algebra and Geometry Seminar. Roy Skjelnes: The space of generically étale families.** Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 11.
- On 11–14 kl. 13.15–14.15. Seminarium i analys och dynamiska system. Mildred Hager**, Lund: *Eigenvalue asymptotics for randomly perturbed non-selfadjoint operators*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

Fortsättning på nästa sida.

Seminarier (fortsättning)

- To 11–15 kl. 14.00–15.00. Mittag-Leffler Seminar.** Peter Imkeller, Humboldt University Berlin, Germany. The speaker will give a series of three lectures. Title of the series: *Simple SDE, SPDE, and BSDE models dealing with problems of climate dynamics and related risk*. Title of the first lecture: *Meta-stability in some $S(P)DE$ related to simple climate models*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidorna 9–10.
- To 11–15 kl. 14.00–15.00. Joint CIAM and Optimization and Systems Theory Seminar.** (*Observera dagen och tiden!*) Professor Shankar S. Sastry, University of California at Berkeley: *Generalized Principal Component Analysis: An introduction*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 12.
- To 11–15 kl. 15.15–16.15. AlbaNova and Nordita Colloquium in Physics.** Juni Palmgren, Institutionen för medicinsk epidemiologi och biostatistik, Karolinska Institutet: *Mapping genes for complex traits*. Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum.
- To 11–15 kl. 15.30–16.30. Mittag-Leffler Seminar.** Robert Adler, Technion, Israel: *Random fields on manifolds, kinematic formulae, and integral geometry in Gauss space. The third lecture of a series of three*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se Bråket nr 34 sidan 6.
- Fr 11–16 kl. 15.00. Small Talk Seminar.** Michelle Bucher-Karlsson: *Signature and characteristic classes of surface bundles*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 9.
- Må 11–19 kl. 13.15–15.00. Informellt doktorandseminarium i teoretisk datalogi.** Martin Ekerå och Henrik Ygge: *On recent attacks on hash functions*. Rum 1537, KTH CSC, Lindstedtsvägen 3, plan 5. Se sidorna 12–13.
- Må 11–19 kl. 15.15. Seminarium i finansiell matematik.** Alexander Herbertsson, Institutionen för nationalekonomi med statistik, Handelshögskolan vid Göteborgs universitet: *Pricing portfolio credit derivatives using matrix-analytic methods*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.
- Ti 11–20 kl. 13.15. Presentation av examensarbete i matematik.** Maria Svärdh, Civilingenjör & Lärare, KTH: *Webbaserade matematikuppgifter för grundskolans senare del*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 10.
- On 11–21 kl. 11.00. Common SU KoF/KTH Theoretical Physics Seminar.** David Gómez-Ullate, Madrid: *Chaos and multivaluedness: travelling on Riemann surfaces*. Sal FA31, Roslagstullsbacken 21, AlbaNova universitetscentrum.
- On 11–21 kl. 13.15–14.15. Seminarium i analys och dynamiska system.** Joakim Arnlind, KTH: *Title to be announced*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.
- On 11–21 kl. 14.30–15.30. KCSE (KTH Computational Science and Engineering Centre) Seminar.** Mattias Gärdback, Mekanik, KTH: *Using patches of Finite Elements — instead of just elements*. PDC:s seminarierum, KTH, Teknikringen 14, plan 3.

Fortsättning på nästa sida.

Seminarier (fortsättning)

On 11–21 kl. 16.00. KTH/SU Mathematics Colloquium. John Ockendon, Oxford: *Open problems in dislocation mechanics and cold plasmas.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Kaffe/te serveras kl. 15.30 i pausrummet, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 4. Se sidan 11.

Fr 11–23 kl. 13.15–14.15. Graduate Student Seminar. Andreas Strömbergsson, Matematik, KTH: *The Boltzmann-Grad limit of the periodic Lorentz gas.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 11.

SEMINARIUM I NUMERISK ANALYS**Vladimir G. Danilov:****Some problems of solitary nonlinear waves interaction.****Weak asymptotics approach**

Abstract: One of the most important properties of linear problems is the existence of the linear superposition principle. It is used in different ways and is a foundation of all linear theories. In the case of linear problems the superposition principle is in fact the basis of global in time approximating (asymptotic) solutions constructions — these are the classical Maslov canonical operator and the Fourier integral operators introduced by L. Hörmander. These constructions have discovered the deep connection between symplectic geometry objects and PDE's.

Another situation is for nonlinear problems. For these problems a superposition principle is known only for particular cases (linearization using Baklund transformation, equations integrated by inverse scattering problem method). The problem of the nonlinear waves interaction decryption in the general case seems now as unsolvable. But for the particular case of nonlinear solitary waves (solitons, kinks), the situation looks more optimistically. Here one can construct an approximating superposition description based on the algebraic nature of the weak (in D' sense) asymptotics of these solutions. Firstly, it was noted by V. Maslov at the beginning of the 1970's. This approach was developed by V. Shelkovich, G. Omelyanov and the speaker. In the framework of this approach the following problems were solved:

- The scenario of solitons interaction in nonintegrable KdV type equations.
- The problem of free boundaries confluence in the phase field model.
- The problem of kinks interaction in nonintegrable Sine-Gordon type models.

Besides, the problems of shock and singular (delta) shock waves generation were also solved. The last ones are directly connected with geometry: the reason of their appearance is the characteristics intersection (singularity of projection mapping) just like in linear theory. All said above relates to the special (constructive) approach to NPDE's investigations that is based on explicit (in a sense) formulas construction. This approach can give information about very fine solution properties. Here there is a very interesting interaction with numerical investigations. From one hand side one can try to explain some effects discovered numerically and from the other hand side it is possible to try to determine quantitative values of the phenomena observed by theoretical investigations. In the talk we plan to give a review of the topics mentioned above.

Tid och plats: Tisdagen den 13 november kl. 14.15 i rum 4523, KTH CSC, Lindstedtsvägen 5, plan 5.

SEMINARIUM I NUMERISK ANALYS

Mike Shelley:

Dynamics and transport of complex fluids

Abstract: Fluids with suspended micro-structure — complex fluids — arise commonly in micro- and bio-fluidics and can have fascinating and novel dynamical behaviours. I will give an overview of some interesting problems in complex fluid dynamics at low Reynolds number. This includes how visco-elasticity in a fluid can drive fluid mixing, and how elasticity of the micro-structure can yield random-walk transport across simple closed-streamline flows. I will also discuss recent work on “active suspensions”, such as bacterial baths, where the suspended particles are motile and their hydrodynamically mediated interactions lead to large-scale instability, coherent structures, and mixing.

Tid och plats: Måndagen den 12 november kl. 10.00 i rum 304, KTH, Teknikringen 14.

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Pekka Koskela:

Dimension distortion

under mappings of exponentially integrable distortion

Abstract: It is well-known that a planar quasiconformal (or more generally quasiregular) mapping sends sets of Hausdorff-dimension strictly less than two to similar sets. By results of Astala on the higher regularity of quasiconformal mappings, one actually has a sharp formula for the dimension distortion. We discuss generalized dimension distortion under mappings of exponentially integrable distortion, especially in connection with higher regularity.

Tid och plats: Tisdagen den 13 november kl. 13.15–14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I FINANSIELL MATEMATIK

Alexander Herbertsson:

Pricing portfolio credit derivatives using matrix-analytic methods

Abstract: We discuss modelling and valuation of portfolio credit derivatives. A short summary of instruments such as credit default swaps, k -th-to default swaps, and synthetic CDO tranches, are given. Next, we introduce the underlying model used for pricing these derivatives. It is split in two different submodels, one for inhomogeneous portfolios, and one for homogeneous ones. The latter framework allows us to work with much bigger portfolios than the former. In both models the default dependence is introduced by letting individual default intensities jump when other defaults occur, but be constant between defaults. The models are translated into Markov jump processes which represent the default status in the credit portfolio. This makes it possible to use matrix-analytic methods to find convenient closed-form expressions for the portfolio credit derivatives that we want to study, as well as other quantities needed in dynamic credit portfolio management. The models are calibrated against market-data on credit derivatives. We then price exotic credit derivatives and study several implied portfolio quantities, such as multivariate default distributions.

Tid och plats: Måndagen den 19 november kl. 15.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

ÖPPEN FÖRELÄSNING: CSC — FORSKNING OCH FRAMTID

Joakim Gustafson:

Mot mer reaktiva talbaserade dialogsystem

KTH CSC – Datavetenskap och kommunikation — inbjuder alla intresserade till en serie öppna föreläsningar, där unga forskare berättar om sina vetenskapsområden och tillämpningar.

Joakim Gustafson har forskat på utveckling av multimodala dialogsystem under 14 år, först 7 år på KTH och sedan 7 år på Telias forskningsavdelning. Han är sedan sommaren 2007 åter på KTH som biträdande lektor på avdelningen för Tal, musik och hörsel.

Sammanfattning: Dagens kommersiella talbaserade dialogsystem är byggda för att göra informations- och bokningssystem tillgängliga i situationer där det är opraktiskt att använda tangentbord och mus. De har designats på ett sätt som förenklar uppgiften för datorn, ofta på bekostnad av användarnas bekvämlighet och spontanitet. På TMH/CTT arbetar vi bland annat för att ta fram mer intuitiva talgränssnitt som kan hantera ett mera spontant och människolikt sätt att tala med datorer. För tillfället fokuserar vi på att få systemen att kännas mer reaktiva och närvarande. Människor använder både ansiktsuttryck och ljudliga hummanden för att visa att de lyssnar och i vilken grad de hänger med. Vi har experimenterat med att bygga ett dialogsystem som förutom dessa människolika signaler även använder grafisk återkoppling för att visa vad det har förstått.

Föreläsningen ger exempel på hur vi i våra forskningssystem har försökt göra system som är reaktiva. Talaren kommer även att berätta om ett experiment på mer naturlig interaktion i ett kommersiellt system (90200) som han utförde med sina kolleger på Telias forskningsavdelning.

Tid och plats: Måndagen den 12 november kl. 14.15 i Fantum, KTH, Lindstedtsvägen 24, översta våningen.

MITTAG-LEFFLER SEMINAR

Terry Lyons:

On signed probability measures and some old results of Krylov

Abstract: It is an interesting exercise to compute the iterated integrals of Brownian Motion and to calculate the expectations (of polynomial functions of these integrals).

Recent work on constructing discrete measures on path space, which give the same value as Wiener measure to certain of these expectations, have resulted in promising new numerical algorithms for solving second order parabolic PDE's in moderate dimensions. It is a critical step in the work of Kusuoka, alone, and with Ninomiya, and then Victoir and Litterer (& Lyons) in their development of high order particle methods for the numerical solution of the PDE's that arise in mathematical finance.

Old work of Krylov associated finitely additive signed measures to certain constant coefficient PDE's of higher order. Recent work with Levin allows us to identify the relevant expectations of iterated integrals in this case, leaving many interesting open questions and suggesting possible numerical algorithms for solving high-dimensional elliptic PDE's.

Tid och plats: Tisdagen den 13 november kl. 14.00–15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

DISPUTATION I DATA- OCH SYSTEMVETENSKAP

Anna-Maria Kessler

disputerar vid SU på avhandlingen

A Systemic Approach Framework for Operational Risk
– SAFOR –

fredagen den 23 november 2007 kl. 13.00 i sal C, Forum, Isafjordsgatan 39, Kista. Till opponent har utsetts *Associate Professor Tara Baidya*, Pontifícia Universidade Católica do Rio de Janeiro, Brasilien.

Abstract of the thesis

This thesis attempts to describe the essential systems features of a complex real-world domain of operational risk (OR) in banking, by employing general systems theory (GST) as the guiding method. An implementational framework (SAFOR) is presented for operational risk management (ORM), the target of which is to manage and mitigate the risk-around-loss causes. Since reasoning about OR is often scenario based, the framework also includes methods for decision making in addition to Value at Risk (VaR) and Conditional Value at Risk (CVaR). Other computational models that yield prediction intervals are discussed as well. Because the banking industry is one of the most mature sectors when it comes to OR, and contains the most data points, the discussion in this thesis evolves around such institutions. The present state-of-the-art in OR management for banking is surveyed using a systemic-holistic approach, and the model framework is presented against this discussion. Tools and concepts from systems theory and systems thinking are employed for assessing systems properties and gaining insights into the interaction of various components. This brings about a number of advantages. This is not in disagreement with current suggestions such as those of the Basle Committee (Basel II), which is doing an excellent job in proving the state-of-the-art in best practice for banking institutions. Rather, this thesis offers a complementary perspective, looking at essentially the same problems but in a broader context and with a differing view.

OR data have been hard to come by in banking. Confidentiality and difficulties in quantifying OR as well as the short time data have been gathered in a consistent way are some of the reasons for this. Moreover, OR is often not clearly discernible from market or credit risks and is not diversifiable. Therefore, no case study has been done. Instead, we have chosen to look into a published bank application of an advanced OR model. The application shows that the technique holds as validation of the SAFOR modules, but contrary to SAFOR the application has no discriminating interval method for decision making, nor does it say much about how to find and control correct data.

Furthermore, the term risk is a very important concept in the literature on economic, political, social and technological issues. In this thesis we mainly concentrate on OR's and OR measures. The thesis research strategy is both explanatory and descriptive. It is explanatory since it rests mainly on literature surveys of the latest and most important research that we have found with significance for building our SAFOR model. But, the strategy is also descriptive, since the model describes a systemic approach. The concept *system* is here seen as an epistemological device to describe systems as wholes. Therefore, the systemic approach is viewed as an epistemology or *a meta-science used for communication between sciences, and which at the same time states criteria for control.*

(Continued on the next page.)

In general, by meta-science is meant a formalized (simplified) linguistic model whose mechanism is the hierarchical system of concepts. Meta-science constructed in a formalized manner can go beyond general statements. It can create the natural metasystem transition, where the objects of the study formalize languages as a whole — for their syntax, their semantics and their applications to description of the reality. A metasystem transition can be used even if the exact structure of the systems involved is not known. For instance, a system of any kind can be copied with some variations, and as a result of consecutive metasystem transitions a multilevel structure of positive and negative feedback mechanisms arises. These feedbacks create understanding for the needed balance between development and control, which are the two main functions involved in the survival of a system.

Moreover, this systemic approach asks for interdisciplinary competence. For example, it is important that the project leader, the senior management and the board of directors understand the relation between the different areas, such as Information Technology (IT), security, risk transfer and finance, and how they integrate. But, it is not easy to find or educate people for such a broad competence.

PLURIKOMPLEXA SEMINARIET

Stefan Borell:
Holomorphic discs in \mathbf{C}^n

Abstract: Franc Forstnerič and Josip Globevnik proved that there exist proper holomorphic discs in \mathbf{C}^2 which avoid the coordinate axes, and they asked whether it is possible to avoid a finite set of complex lines. The question was answered by Barbara Drinovec-Drnovšek who showed that there exist proper holomorphic discs in the complement of closed complete pluripolar sets in any Stein manifold of at least dimension two (in fact, the centre and the tangential direction at the centre can be prescribed). In this talk we discuss the methods used for constructing properly *embedded* discs in the complement of any closed complete pluripolar subset of \mathbf{C}^n , $n > 1$.

Tid och plats: Tisdagen den 13 november kl. 10.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

MITTAG-LEFFLER SEMINAR

Esko Valkeila:
**A Lévy-type of characterization theorem
 for fractional Brownian motion**

Abstract: Let X be a continuous square integrable centred process. A classical theorem by Paul Lévy says that X is a Brownian motion if and only if X is a square integrable martingale with bracket equal to t . We extend this result to fractional Brownian motions. The characterization is based on the finite interval representation of Brownian motion in terms of fractional Brownian motion and on weighted quadratic variation.

The talk is based on joint work with Yulia Mishura (Kiev).

Tid och plats: Tisdagen den 13 november kl. 15.30–16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

COMMON SU KOF/KTH THEORETICAL PHYSICS SEMINAR

Jon Magne Leinaas:

Geometry of separable and entangled quantum states

Abstract: To distinguish entangled from non-entangled states is in general a difficult problem. I give an introduction to how this distinction can be understood in geometric terms, and discuss some recent numerical methods to examine the geometry of the set of entangled states for a bipartite system.

Tid och plats: Onsdagen den 14 november kl. 11.00–12.00 i sal FA31, Roslagstullsbacken 21, AlbaNova universitetscentrum.

SMALL TALK SEMINAR

Michelle Bucher-Karlsson:

Signature and characteristic classes of surface bundles

Abstract: It is a well-known fact that the Euler characteristic is multiplicative in fiber bundles. Atiyah and Kodaira showed, independently, that this was not the case for the signature by exhibiting surface bundles over surfaces with nonzero signature. I will describe such examples and discuss Morita's characteristic classes of surface bundles. Also, as it is interesting to understand what is the worst possible signature for a surface bundle over a surface with given fiber and base space, I will establish an upper bound of Kotschick for the absolute value of the signature of such bundles in terms of the Euler characteristic.

Tid och plats: Fredagen den 16 november kl. 15.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

WORKSHOPS AT INSTITUT MITTAG-LEFFLER

The scientific program at Institut Mittag-Leffler during the fall of 2007 is devoted to *Stochastic Partial Differential Equations*.

As part of the activities of the semester, two workshops are organized. They are partially funded by the Centre of Mathematics for Applications (Oslo) and the Generalitat de Catalunya (Catalunya, Spain).

The first workshop had the title *Stochastic Partial Differential Equations*, and it took place during September 10–14, 2007.

The second workshop has the title *Applications of Partial Differential Equations*, and it will take place during November 19–23, 2007.

Detailed information about the scientific program and the workshops can be found at <http://www.mittag-leffler.se/programs/0708f/>.

MITTAG-LEFFLER SEMINAR

Peter Imkeller:

Simple SDE, SPDE, and BSDE models

dealing with problems of climate dynamics and related risk

The speaker will give a series of three lectures, based on joint work with Stefan Ankirchner, Claudia Hein, Michael Högele, Ying Hu, Matthias Müller, Ilya Pavlyukevich, Alexandre Popier, Goncalo Nunes dos Reis, and Torsten Wetzel. The title given above is the title of the series. The first lecture, given on Thursday, November 15, has the following title:

(Continued on the next page.)

Meta-stability in some S(P)DE related to simple climate models

Abstract: Simple models of the earth's energy balance are able to interpret some qualitative aspects of the dynamics of paleo-climatic data. In the 1980's this led to the investigation of periodically forced dynamical systems of the reaction-diffusion type with small Gaussian noise, and a rough explanation of glacial cycles by Gaussian meta-stability. A spectral analysis of Greenland ice time series performed at the end of the 1990's representing average temperatures during the last ice age suggest an α -stable noise component with an $\alpha \sim 1.75$. Based on this observation, papers in the physics literature attempted an interpretation featuring dynamical systems perturbed by small Lévy noise. We study exit and transition between meta-stable states for solutions of stochastic differential equations and stochastic reaction-diffusion equations derived from this prototype. Due to the heavy-tail nature of the α -stable component of the noise, the results for Lévy noise differ strongly from the well-known case of purely Gaussian perturbations. For SPDE, transitions are governed by the modes with the largest jumps.

Tid och plats: Torsdagen den 15 november kl. 14.00–15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Maria Svärdh:

Webbaserade matematikuppgifter för grundskolans senare del

Abstract: This report investigates the utility of websites as recurring features in the teaching of mathematics. In 2003 an evaluation of compulsory education made by The Swedish National Agency for Education showed that many students perceive lessons in mathematics as dull and tedious. With correctly developed computer or Internet applications, a more engaging medium for the teaching of mathematics may be presented to students. This project describes the construction of a website, where mathematical computer games are divided into different levels. For a student to pass a level and move onto the next, he/she must complete all the problems on the level in question. A demonstration version of the website was tested by a small number of students in lower secondary school. In this evaluation of the website the students voiced the opinion that such a website could be used to complement their education within school, but not in their spare time. They also reported that the problems designed as computer games were fun and challenging, and that the division of the problems into different levels meant that some students retried a trickier problem instead of giving up.

De spel som Maria Svärdh har utvecklat kan man ta del av på <http://home.swipnet.se/amts/exjobb/>.

Huvudhandledare har varit **Gunnar Johnsson**, Institutionen för matematik, KTH, och bihandledare har varit **Gunilla Olofsson**, Lärarhögskolan, och **Anna-Karin Högfeldt**, KTH Learning Lab.

Marcus Andersson, Civilingenjör & Lärare, KTH, skall vara opponent vid seminariet.

Tid och plats: Tisdagen den 20 november kl. 13.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

ALGEBRA AND GEOMETRY SEMINAR

Roy Skjelnes:

The space of generically étale families

Abstract: The space of n ordered distinct points on a variety X can be compactified using the Hilbert scheme. This compactification G_X was described in [1]. In a recent work [2] the space of n ordered distinct points is examined more in detail, and there the compactification G_X is obtained without the use of the Hilbert scheme.

References: (See <http://www.math.kth.se/~skjelnes/research.html>).

- [1] T. EKEDAHL & R. SKJELNES, *Recovering the good component of the Hilbert scheme*.
- [2] R. SKJELNES & D. RYDH, *The space of generically étale families*.

Tid och plats: Onsdagen den 14 november kl. 13.00–14.45 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

KTH/SU MATHEMATICS COLLOQUIUM

John Ockendon:

Open problems in dislocation mechanics and cold plasmas

Abstract: This talk will describe two open problems. The first concerns the homogeneous action of discrete dislocation pile-ups in a crystal lattice. The solution of the resulting large system of nonlinear algebraic equations can be approximated in terms of a dislocation density, but this density tends to infinity at the head of the pile-up.

The second concerns a continuum model for ion flow in the vicinity of a dust particle in a plasma. For sufficiently large ion velocity, the ion trajectories intersect each other, but the nature of the reality singularities is unclear.

Tid och plats: Onsdagen den 21 november kl. 16.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Kaffe/te serveras kl. 15.30 i pausrummet, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 4.

GRADUATE STUDENT SEMINAR

Andreas Strömbergsson:

The Boltzmann-Grad limit of the periodic Lorentz gas

Abstract: The periodic Lorentz gas describes a particle moving in a periodic array of spherical scatterers, and is one of the fundamental mathematical models for chaotic diffusion in a periodic set-up. In my lecture I will describe the recent solution of a problem posed by Y. Sinai in the early 1980's, on the nature of the diffusion when the scatterers are very small (the Boltzmann-Grad limit). The main tool in our approach is measure rigidity, a part of ergodic theory which has recently found important applications in several other problems in number theory and mathematical physics.

This lecture is based on joint work with Jens Marklof, Bristol.

Tid och plats: Fredagen den 23 november kl. 13.15–14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

**JOINT CIAM AND
OPTIMIZATION AND SYSTEMS THEORY SEMINAR**

Shankar S. Sastry:

Generalized Principal Component Analysis: An introduction

Abstract: There are a large number of problems in which we encounter the problem of modelling large amounts of data, by what is referred to as a “mixture of models”, that is to say that the data can be segmented into finitely many sub-components, each of which can be separately modelled. In the context of the identification of hybrid systems it is easy to see how this would arise when the input-output behaviour depends on the “discrete state” of the hybrid system. Of course, the applications in computer vision, signal and image processing and indeed more generally in statistics are extremely numerous. This area of work has found a tremendous outpouring of effort and methods in recent years in the signal processing, hybrid systems, statistics and learning systems literature. However, it is our perception that the conceptual and theoretical underpinnings of the bulk of the literature are weak.

In the course of a recent set of papers with Yi Ma of the University of Illinois, Urbana Champaign, and Rene Vidal of Johns Hopkins University and their students, we have developed what we believe to be an interesting new approach to simultaneously segmenting and modelling data from mixtures of models. The heart of our approach lies in what is called “Generalized Principal Component Analysis”. This in turn has many connections with such classical problems as Hilbert’s Nullstellensatz and many unsolved problems in statistics. In my talk I will give a brief overview of the approaches and their applications to date. The work is being incorporated into a monograph to appear in 2008 and a preview of this monograph is available at <http://black.csl.uiuc.edu/~yima/psfile/book-VMS.pdf>.

The website for the code for GPCA is <http://perception.csl.uiuc.edu/gpca/>.

Tid och plats: Torsdagen den 15 november kl. 14.00 – 15.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

**INFORMELLT DOKTORANDSEMINARIUM
I TEORETISK DATALOGI**

Martin Ekerå och Henrik Ygge:

On recent attacks on hash functions

Abstract: Cryptographic hash functions play an important role in information security.

The hash function MD4, introduced by Rivest in 1990, has served as a template for many other hash functions, such as MD5, SHA-0, SHA-1, RIPE-MD, RIPE-MD 160 and HAVAL-128 amongst others.

In 2004, Xiaoyun Wang, Dengguo Feng, Xuejia Lai and Hongbo Yu announced collisions on MD4, MD5, HAVAL-128 and RIPE-MD. These were the first full collisions to be announced on MD5, HAVAL-128 and RIPE-MD.

The fundamental idea behind Wang’s attack is to keep track of how bitwise differences propagate through the internal states of the hash function. Therefore, the attack may be mounted against most iterated hash functions, including more recent functions such as SHA-0 and SHA-1.

No full collision has yet been found on SHA-1, but a theoretical attack with complexity significantly lower than that of a brute force collision attack has been presented.

In the first half of the seminar, we will give a general overview of cryptographic hash functions and Wang’s attack. It will require no prerequisites.

(Continued on the next page.)

In the second part, we will go into details about how differential paths are constructed and how they may be used to find collisions in MD5. This part will get very technical.

The seminar is planned to be held in Swedish, but we can switch to English if the audience so desires. All slides will be in English. The intended duration is 2×45 minutes.

Tid och plats: Måndagen den 19 november kl. 13.15–15.00 i rum 1537, KTH CSC, Lindstedtsvägen 3, plan 5.

MONEY, JOBS

Columnist: Johannes Lundqvist, Department of Mathematics, Stockholm University.
E-mail: johannes@math.su.se.

Info = information. This will be given and repeated until obsolete. Rely on other sources as well.

BBKTH = Bulletin Board at the Department of Mathematics, KTH.

BBSU = Bulletin Board at the Department of Mathematics, SU.

The following information, with links, is also available at <http://www.math.su.se/~johannes/mj.html.en>.

Unless stated otherwise, a given date is the last date (e.g. for applications), and the year is 2007. A number without an explanation is a telephone number.

Standard information channels

1. A channel to information from Vetenskapsrådet: <http://www.vr.se/naturteknik/index.asp>.
2. A channel to information from the European Mathematical Society: <http://www.emis.de>.
3. A channel to information from the American Mathematical Society: <http://www.ams.org>.
4. KTH site for information on funds: <http://www.kth.se/aktuellt/stipendier>.
5. Stockholm University site for information on funds: <http://www2.su.se/forskning/stipendier/databas.php3>.
6. Umeå site for information on funds: http://www.umu.se/umu/aktuellt/stipendier_fond_anslag.html.
7. Job announcement site: <http://www.maths.lth.se/nordic/Euro-Math-Job.html>. This is run by the European Mathematical Society.
8. Stiftelsen för internationalisering av högre utbildning och forskning (STINT) site for information on funds: <http://www.stint.se>.
9. Nordisk Forskerutdanningsakademi (NorFA) site for information on funds: <http://www.norfa.no>.
10. Svenska institutet (SI) site for information on funds: <http://www.si.se>.

Old information

Money to apply for

11. Institut Mittag-Leffler utlyser postdoktorala stipendier för verksamhetsåret 2008/09. Ämnesområdet för hösten 2008 är: "Geometry, analysis and general relativity". Ämnesområdet för våren 2009 är: "Discrete probability". Sista ansökningsdag är den 31 januari 2008. Web-info: <http://www.mittag-leffler.se/programs/0809/grants.php>.
12. Stiftelsen Längmanska kulturfonden utlyser bidrag för att främja bl.a. naturvetenskaper. Bidrag ges främst till särskilda ändamål, däremot inte till löpande verksamhet, periodiska skrifter och dylikt. Beviljade belopp är i regel i storleksordningen 15 000 – 40 000 kr. Sista ansökningsdag är den 15 januari 2008. Web-info: <http://www.langmanska.se/>.
13. Stiftelsen P. E. Lindahls fond utlyser två stipendier om vardera 150 000 kronor för vetenskapliga studier eller fortsatt praktisk utbildning i naturvetenskapliga ämnen inom eller utom Sverige. Sökande skall ha avlagt doktorsexamen år 2002 eller senare eller vara behörig att antagas till forskarutbildning och får inte inneha tjänst hos stat eller kommun. Tidigare har prioritering givits till nydisputerade forskare samt seniora forskare som är i behov av bidrag till fortsatt utbildning, exempelvis i form av resa/vistelse vid annat universitet. Sista ansökningsdag är den 17 december. Web-info: http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=15.

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Jobs to apply for

14. Lunds universitet söker en biträdande universitetslektor i matematisk statistik med inriktning mot statistiska metoder inom livsvetenskaper. Sista ansökningsdag är den 14 december. Web-info: http://www.naturvetenskap.lu.se/upload/LUPDF/natvet/Utlysningar/071123_3463.pdf.
 15. Umeå universitet söker en doktorand i matematisk ekologi (ledande till doktorsexamen antingen i tillämpad matematik eller teoretisk ekologi). Sista ansökningsdag är den 15 november. Web-info: <http://www.math.umu.se/Aktuellt/Vacancies/DoktorandMatematiskEkologi2007.pdf>.
 16. Göteborgs universitet söker en doktorand i matematik med inriktning mot algebraiska strukturer i fysiken. Sista ansökningsdag är den 15 november. Web-info: <http://ledig-anstallning.adm.gu.se/#>.
 17. Göteborgs universitet söker en doktorand i matematik med inriktning mot numerisk analys av atomära beräkningar. Sista ansökningsdag är den 15 november. Web-info: <http://ledig-anstallning.adm.gu.se/#>.
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