BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 2 **FREDAGEN DEN 16 JANUARI 2009**

BRÅKET

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

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Sista manustid för nästa nummer:
Torsdagen den 22 januari
kl. 13.00.

Disputation i matematik

Johan G. Granström skall disputera på avhandlingen *Reference and Computation in Intuitionistic Type Theory* fredagen den 16 januari kl. 13.15 i Polhemsalen, Ångströmlaboratoriet, Lägerhyddsvägen 1, Uppsala universitet. Se Bråket nr 1 sidan 2.

Money, jobs: Se sidorna 7 – 8.

SEMINARIER

Fr 01–16 kl. 12.15 – 13.00. GRU-seminarium i matematik. Anna-Karin Högfeldt och **Stefan Knutsson,** KTH Learning Lab: *Filmad undervisning.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 1 sidan 4.

Fr 01–16 kl. 13.15 – 14.15. Presentation av examensarbete i matematik. David Goldstein: *A Combinatorial Approach to Green's Hyperplane Restriction Theorem.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 1 sidan 4.

Må 01–19 kl. 15.15 – 17.00. Seminarium i matematisk statistik. Professor Stefan Arnborg, Avdelningen för teoretisk datalogi, Skolan för datavetenskap och kommunikation (CSC), KTH: *The legacy of Ed Jaynes.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 1 sidan 5.

Ti 01–20 kl. 14.00 – 15.00. Institut Mittag-Leffler Seminar. Tom Sanders, Christ's College, Cambridge: *Probabilistic methods in additive combinatorics: sets with random spectrum.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 3.

Ti 01–20 kl. 15.15 – 16.00. Seminarium i finansiell matematik. *(Observera dagen!)* **Jesper Andreasen,** Danske Bank: *On adjusting a general local volatility model for stochastic volatility.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Fortsättning på nästa sida.

Kurs

Mattias Dahl: Differential geometry. Se sidan 5.

Seminarier (fortsättning)

Ti 01–20 kl. 15.30–16.30. Institut Mittag-Leffler Seminar. Ilkka Norros, VTT, Helsinki: *Power-law random graphs and routing problems.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

On 01–21 kl. 11.00–12.00. KTH/Nordita/SU Seminar in Theoretical Physics. *(Observera lokalen!)* **Jonas Larson,** Nordita: *Cold atomic gas in an optical lattice: effects of coupling internal atomic states.* Sal FB55, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 5.

On 01–21 kl. 13.15–14.15. Seminarium i analys och dynamiska system. Ioannis Parissis, KTH: *Effective dimension bounds for the maximal function along a polynomial curve.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

On 01–21 kl. 15.15. Seminarium i matematisk statistik. Priscilla Greenwood, Arizona State University: *The stochastic dynamics of a neuron.* Rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 3.

To 01–22 kl. 10.30. Seminar in Fluid Mechanics. Professor Guido Buresti, Dipartimento di Ingeneria Aerospaziale, Università di Pisa, Italien: *Flow fluctuations and vorticity dynamics in the near wake of triangular prisms in cross-flow.* Seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8. Se Bråket nr 1 sidan 5.

To 01–22 kl. 14.00–15.00. Institut Mittag-Leffler Seminar. Tomasz Luczak, Adam Mickiewicz University, Poznan: *Chasing robbers on random graphs.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 4.

To 01–22 kl. 15.15–16.15. AlbaNova and Nordita Colloquium in Physics. Lars Bergström, Fysikum, SU: *Dark matter: Observational status and theoretical challenges.* Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum.

To 01–22 kl. 15.30–16.30. Institut Mittag-Leffler Seminar. Tatyana Turova, Lunds universitet: *Asymptotics for the size of the largest component scaled to* "$\log n$" *in inhomogeneous random graphs.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 3.

Må 01–26 kl. 15.15. Seminarium i finansiell matematik. Adam Andersson, Chalmers tekniska högskola, Göteborg: *On weak differentiability of quadratic forward-backward SDEs with application to cross hedging.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

Fr 01–30 kl. 11.00. Optimization and Systems Theory Seminar. Angelo Cenedese, University of Padova, Italy: *Shape analysis and deformation control.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 7.

Fr 01–30 kl. 14.00. Seminar at the School of Electrical Engineering, KTH. A. D. Ioannidis, Lunds Tekniska Högskola: *Waveguides in E/M theory: the general linear medium in arbitrary geometry.* Seminarierummet, Teknikringen 33, 1 tr., KTH. Se sidan 4.

INSTITUT MITTAG-LEFFLER SEMINAR

Tom Sanders:
Probabilistic methods in additive combinatorics:
sets with random spectrum

Abstract: A classic problem in additive combinatorics is the following. If A contains a positive proportion of the integers $\{1, \dots, N\}$, then how large a progression can we guarantee that the difference set $A - A := \{a - a' : a, a' \in A\}$ contains? On the one hand one may use the methods of Fourier analysis to find a lower bound of the shape $\exp(\Omega(\sqrt{\log N}))$; on the other Ruzsa introduced the idea of a set with a random large spectrum to show that there are sets whose difference set does not contain a progression longer than $\exp(O_\varepsilon(\log^{2/3+\varepsilon} N))$. We shall discuss a model version of this problem which has received particular attention with the aim of illustrating how probabilistic ideas have made a large impression on additive combinatorics.

Tid och plats: Tisdagen den 20 januari kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINARIUM I MATEMATISK STATISTIK

Priscilla Greenwood:
The stochastic dynamics of a neuron

Abstract: The dynamics of a Hodgkin-Huxley or Morris-Lecar neuron includes a limit cycle and a limit point inside it. The process becomes stochastic when the random behaviour of ion channels is modelled. There is random switching between limit point and limit cycle corresponding to quiescent and firing periods of the neuron. Following multi-scale analysis of the stochastic process, we compute the inter-spike-interval (ISI) distribution and the distribution of the numbers of successive firings, given a constant stimulus. We compare the Morris-Lecar model with leaky integrate-and-fire (LIF) models.

Tid och plats: Onsdagen den 21 januari kl. 15.15 i rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket.

INSTITUT MITTAG-LEFFLER SEMINAR

Tatyana Turova:
Asymptotics for the size of the largest component scaled to "$\log n$" in inhomogeneous random graphs

Abstract: We study the inhomogeneous random graphs in the subcritical case. We derive an exact formula for the size of the largest connected component scaled to $\log n$ where n is the size of the graph. Sufficient conditions for the largest connected component to be of order $\log n$ (even for unbounded kernels) are provided as well. It is shown that the same well-known equation for the survival probability, whose positive solution determines the asymptotics of the size of the largest component in the supercritical case, plays the crucial role in the subcritical case as well. However, these are the negative solutions which are under consideration now.

Tid och plats: Torsdagen den 22 januari kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINARIUM I FINANSIELL MATEMATIK

Jesper Andreasen:
On adjusting a general local volatility model for stochastic volatility

Abstract: We describe a numerically tractable way of adjusting a general local volatility model for stochastic volatility.

Tid och plats: Tisdagen den 20 januari kl. 15.15 – 16.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

INSTITUT MITTAG-LEFFLER SEMINAR

Tomasz Luczak:
Chasing robbers on random graphs

Abstract: Cops and Robbers is a perfect information game played by two players on a (connected) graph G. The first player starts the game by putting a set of k tokens (cops) on any set of k vertices, where $k \geq 1$. The second player answers by placing a token (the robber) on some vertex of G. Then the cops and the robber play in alternate rounds using edges to move from vertex to vertex. All cops are allowed to move in one round, more than one cop may occupy a vertex at the same time, and the players may remain on their current positions. The cops win and the game ends if at least one of the cops eventually occupies the same vertex as the robber; otherwise, that is, if the robber can avoid this indefinitely, he wins.

The cop number $c(G)$ of G is the minimum number of cops needed to win on G. In the talk we study the behaviour of $c(G(n,p))$ for the binomial random graph $G(n,p)$.

This is a joint work with Pawel Pralat.

Tid och plats: Torsdagen den 22 januari kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINAR AT THE SCHOOL OF ELECTRICAL ENGINEERING, KTH

A. D. Ioannidis:
Waveguides in E/M theory: the general linear medium in arbitrary geometry

Abstract: We discuss the electromagnetic wave propagation in a waveguide of arbitrary cross-section, filled with a general linear medium. The treatment is done in the guidelines of the classical theory and is pure functional analytic. Actually, we model the phenomenon as a degenerate spectral problem (alternatively: we consider a linear operator pencil), where the propagation constants appear as the eigenvalues and the modes as the corresponding eigenvectors. By using methods from the theory of compact operators in Banach spaces, we prove that our problem has a discrete spectrum. We consider also the problem of the completeness of the root vectors; that is whether the field can be expressed as an infinite sum of modes. Last, but not least, we illustrate the inverse problem, namely to determine the material by the knowledge of the propagation constants.

Tid och plats: Fredagen den 30 januari kl. 14.00 i seminarierummet, Teknikringen 33, 1 tr., KTH.

KTH/NORDITA/SU SEMINAR IN THEORETICAL PHYSICS

Jonas Larson:
Cold atomic gas in an optical lattice:
effects of coupling internal atomic states

Abstract: In recent years, systems of cold atoms in optical lattices have drawn great interest. Due to their purity and high controllability of system parameters, they provide a salient model for the study of correlated many-body systems. In the milestone experiment by Bloch and co-workers, the first atomic phase transition between a Mott insulator state to a superfluid state was demonstrated. Such a transition derives from an interplay between atom-atom interaction and atomic kinetic energies. In this talk I first consider the ground state of an ideal coupled two-component gas of ultracold atoms in a one-dimensional optical lattice, either bosons or fermions. In particular, I will show that despite lack of atom-atom interaction a first order phase transition is possible, originating from a competition between internal and external atomic degrees of freedom. In the case of fermions it is argued that the phase transition has a topological character. Secondly, I will consider interacting bosons and outline how coupling of internal atomic states modifies the Mott-superfluid phase diagram.

Tid och plats: Onsdagen den 21 januari kl. 11.00 – 12.00 i sal FB55, Roslagstullsbacken 21, AlbaNova universitetscentrum.

FÖRDJUPNINGSKURS I MATEMATIK

Mattias Dahl:
Differential geometry (SF2722)

The subject of this course is the study of differentiable manifolds, which are a kind of spaces which generalize the familiar Euclidean space $\mathbb{R}^n$ in an extremely useful manner. Locally a manifold looks like an open set in Euclidean n-space, and we can say what it means for a real-valued function on such a space to be differentiable. Familiar examples are spheres, tori, projective spaces. They constitute the natural habitat of a large part of calculus: integration, differentiation, vector fields, etc., make sense on differentiable manifolds. Indeed, this often leads to a better way of expressing properties you already know from calculus. Apart from that, new features (related to the topology of the manifold, or to the curvature of a geometric structure) come into play. The concept is central in mathematics. Also many physical theories (relativity theory, electromagnetism, gauge theory) have a very geometric character and use differentiable manifolds in their descriptions.

Keywords: Differentiable manifolds and maps, tangent vectors, flows of vector fields, Lie groups, differential forms, Stokes theorem, de Rham cohomology, degree of a mapping, Riemannian metrics, curvature.

Time and place: Tuesdays at 10.15 – 12.00 in seminar room 3733, Department of Mathematics, KTH, Lindstedtsvägen 25, floor 7. The course will start on January 27, 2009.

Information: http://www.math.kth.se/math/GRU/2008.2009/SF2722/.

Welcome!
Mattias Dahl

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Ioannis Parissis:
Effective dimension bounds for the maximal function along a polynomial curve

Abstract: Let $d\mu$ be a probability measure on $\mathbb{R}^d$ and $d\mu_r$ be appropriate dilations of the measure $d\mu$. The maximal operator associated with the measure $d\mu$ is then defined as

$$\mathcal{M}(f)(x) = \sup_{r>0} (|f| * d\mu_r)(x).$$

The usual maximal operators can be put in this general context. I will discuss an approach in proving L^2 bounds for $\mathcal{M}$ without using the endpoint weak L^1 bounds and interpolation (initiated by Stein, Wainger, Bourgain and others). I will then study in more detail the maximal function along the polynomial curve $(\gamma_1 t, \ldots, \gamma_d t^d)$:

$$\mathcal{M}(f)(x) = \sup_{r>0} \frac{1}{2r} \int_{|t|\leq r} |f(x_1 - \gamma_1 t, \ldots, x_d - \gamma_d t^d)| dt,$$

and outline the proof of the following estimate:

$$\|\mathcal{M}f\|_{L^2(\mathbb{R}^d)} \leq c \log d \|f\|_{L^2(\mathbb{R}^d)},$$

where $c > 0$ is an absolute constant. The proof follows the ideas of Bourgain. The new element is a construction of an appropriate semi-group of operators which is compatible with the anisotropic structure implied by the curve $(\gamma_1 t, \ldots, \gamma_d t^d)$.

Tid och plats: Onsdagen den 21 januari kl. 13.15 – 14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I FINANSIELL MATEMATIK

Adam Andersson:
On weak differentiability of quadratic forward-backward SDEs with application to cross hedging

Abstract: We present that the solution process Y to a quadratic non-degenerate FBSDE is a member of a local Sobolev space $H^1_{\text{loc}}(\mathbb{R}^m)$. The result extends the results on classical differentiability by Imkeller, Ankircher and Dos Reis (2007, "Pricing and hedging of derivatives based on non-tradable underlyings").

Differentiability assumptions, restrictive in applications, have been relaxed. The proof uses results on Dirichlet spaces and SDEs by Bouleau and Hirsch (1989, "On the derivability with respect to the initial data of the solution of a stochastic differential equation with Lipschitz coefficients"). Similar results have been proved by N'Zi, Ouknine and Sulem (2006, "Regularity and representation of viscosity solutions of partial differential equations via backward stochastic differential equations") for FBSDEs with a Lipschitz continuous generator. Applied to mathematical finance an explicit cross hedging strategy can be obtained, expressed in terms of weak gradients of FBSDEs. This makes it possible to write European options on non-tradable assets. A short introduction to BSDEs will be given, an outline of the proof, and something about the application to cross hedging.

Tid och plats: Måndagen den 26 januari kl. 15.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

OPTIMIZATION AND SYSTEMS THEORY SEMINAR

Angelo Cenedese: Shape analysis and deformation control

Abstract: The study of the shape of deformable objects is a challenging task both in understanding and in controlling the deformation. The reasons of this hardship range from the difficulty of finding a proper definition of "shape" that accords with the intuition, to that of providing a compact model of an intrinsic infinite-dimensionality object that is representative of its continuous deformation. Nonetheless, this study finds a motivation in various industrial applications and research fields: interestingly, the perception of shapes and motion is a canonical problem in the active vision field, and many approaches to shape description and analysis rely on and are derived from related research in this specific area.

In particular, modelling the shape can be obtained through procrustean techniques, based on the choice of spatially discrete landmarks or features of interest on the object surface, or conversely through integral approaches, resorting to the use of continuous functions such as, for example, two-dimensional silhouette curves for planar objects, or detectable patterns on the object surface. The choice of the model on the one side suggests suitable metrics to understand the difference in shape for classification and to allow the description of shape among several objects, on the other yields different methods to follow the shape evolution in time and discern the application of motion transformation from that of proper deformation, as actually grasped by human intuition.

Tid och plats: Fredagen den 30 januari kl. 11.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

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://www2.math.su.se/~johannes/mj.html.

Unless stated otherwise, a given date is the last date (e.g. for applications), and the year is 2009. 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.

(Continued on the next page.)

New information

Jobs to apply for

11. Lunds Tekniska Högskola söker doktorander i matematisk statistik. Sista ansökningsdag är den 13 februari. Web-info:
http://www3.lu.se/info/lediga/admin/document/PA2009-18.pdf.

Old information

Money to apply for

12. Vetenskapsrådet utlyser bidrag till anställning som postdok i Sverige. Bidraget skall ge möjlighet för forskare med svensk doktorsexamen eller med utländsk examen som bedöms motsvara doktorsexamen att vistas vid svensk högskola eller svenskt forskningsinstitut. Sista ansökningsdag är den 26 februari. Web-info: http://www.vr.se/huvudmeny/sokabidrag/vetenskapsradetsutlysningar/utlysningsvy.4.aad30e310abcb9735780004381.html?resourceId=-1873&languageId=1.

13. Vetenskapsrådet utlyser postdoktorsstipendium. Stipendierna skall ge möjlighet för forskare med svensk doktorsexamen eller examen från EUI (European University Institute) att vistas vid utländskt universitet eller forskningsinstitut. Sista ansökningsdag är den 26 februari. Web-info: http://www.vr.se/huvudmeny/sokabidrag/vetenskapsradetsutlysningar/utlysningsvy.4.aad30e310abcb9735780004381.html?resourceId=-1935&languageId=1.

14. Svenska matematikersamfundet utlyser resestipendier (Knut och Alice Wallenbergs stiftelses resefond och Mats Esséns minnesfond) avsedda för forskare som ej ännu avlagt doktorsexamen. Wallenbergsstipendierna (högst 3000 kr/person) är till för att utnyttjas som delfinansiering för konferensresor och kortare utlandsvistelser. Essénstipendierna (högst 6000 kr/person) är i första hand avsedda för deltagande i sommarskolor och liknande aktiviteter. Sista ansökningsdag är den 31 mars. Web-info:
http://www.maths.lth.se/matematiklu/personal/dencker/resebidrag.html.

15. Stiftelsen Anna-Greta och Holger Crafoords fond utlyser bidrag och anslag för att främja grundforskning inom matematik och vissa naturvetenskaper. Såväl enskilda som institutioner kan beviljas medel för bland annat vetenskaplig verksamhet, vetenskapliga konferenser och inbjudan av utländska gästforskare. Bidrag och anslag delas ut företrädesvis till unga forskare. Sista ansökningsdag är den 1 mars. Web-info: http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=11&br=ns&ver=6up.

16. Stiftelsen G. S. Magnusons fond utdelar stipendier och anslag inom ämnesområdet matematik för följande ändamål: Stöd till doktorander. Stöd till den som önskar ytterligare meritera sig efter doktorsexamen. Stöd till svenska forskare för forskning hemma eller i utlandet samt för inbjudan av utländska gästforskare. Bidrag för att kvarhålla forskare inom landet. Stöd till den som inom sin verksamhet utnyttjar matematik och som önskar bidrag till vetenskaplig förkovran inom ämnet. Sista ansökningsdag är den 2 februari. Web-info: http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=45.

Jobs to apply for

17. Lunds Tekniska Högskola söker minst två doktorander i matematik med inriktning mot bildanalys och datorseende. Sista ansökningsdag är den 19 januari. Web-info:
http://www3.lu.se/info/lediga/admin/document/PA2008-4091.pdf.

18. Institut Mittag-Leffler announces a number of Post Doctoral Fellowship Grants for the academic year 2009/2010. The subject areas for the year's two programs are: Mathematical Logic: set theory and model theory (September 1 – December 15, 2009). Dynamics and PDE's (January 15 – June 15, 2010). Last day for application is January 20. Web-info: http://www.mittag-leffler.se/programs/0910/grants.php.