BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 35 **FREDAGEN DEN 25 OKTOBER 2002**

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 31 oktober
kl. 13.00.

Disputation i matematik

Pär Holm disputerar vid SU på avhandlingen *Differential Operators on Arrangements of Hyperplanes* lördagen den 26 oktober 2002 kl. 10.00. Se sidan 3.

SEMINARIER

Fr 10–25 kl. 10.15–12.00. Valda problem i geometri. Sergei Merkulov: *Quantum complex and symplectic manifolds?* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 34 sidan 5.

Må 10–28 kl. 10.30. Algebraseminarium. *(Observera tiden!)* **Professor Santiago Zarzuela,** Universitat de Barcelona: *Linearization of local cohomology modules.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 34 sidan 6.

Professor Zarzuela är fakultetsopponent vid Pär Holms disputation. Se sidan 3.

Må 10–28 kl. 13.15–14.15. Seminar in Analysis and its Applications. Björn Gustafsson: *On the curvature of free boundaries in two dimensions.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Må 10–28 kl. 15.15–16.00. Jubileumsseminarieserie på Nada hösten 2002: Återblickar och framtidsblickar. Magnus Persson: *Några aspekter på "Grid Computing".* Sal E2, KTH, Lindstedtsvägen 3, b.v. Se Bråket nr 34 sidan 10.

Må 10–28 kl. 15.15–16.00. Seminarium i matematisk statistik. Jonathan Wendin presenterar sitt examensarbete: *Estimation of the Spectral Measure and the Tail Dependence Coefficient for Regularly Varying Random Vectors.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 34 sidan 10.

Ti 10–29 kl. 14.00–15.00. Mittag-Leffler Seminar. Soeren Fournais, Paris: *Analyticity of atomic densities.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 3.

Fortsättning på nästa sida.

Seminarier (fortsättning)

Ti 10–29 kl. 15.30–16.30. Mittag-Leffler Seminar. Thomas Østergaard Sørensen, Aalborg: *Regularity of atomic wavefunctions up to order $C^{1,1}$.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 5.

On 10–30 kl. 10.15–12.00. Research Seminar Series. Andreas Wannebo: *Unpublished work in function space theory.* (Det första av tre seminarier.) Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

On 10–30 kl. 10.15–12.00. Seminarium i diskret matematik. Sergey V. Avgustinovich, Novosibirsk: *On ranks and kernels problem of perfect codes. (Joint work with O. Heden and F. I. Solov'eva.)* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 34 sidan 9.

On 10–30 kl. 13.15–15.00. Algebraic Geometry Seminar. Jon Eivind Vatne, Universitetet i Bergen: *Multiple structures in projective geometry II.* (Fortsättning från seminariet den 24 oktober.) Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 34 sidan 10.

On 10–30 kl. 15.15. Seminarium i matematisk statistik. Esbjörn Ohlsson, SU: *Generaliserade Linjära Modeller möter kredibilitetsteori.* Rum 306, Cramérrummet, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 6.

To 10–31 kl. 10.15–11.15. Seminarium i analys och dynamiska system. *(Observera dagen, tiden och lokalen!)* **Maria Saprykina:** *Some new examples in analytic ergodic theory.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.

To 10–31 kl. 11.30–12.30. Seminarium i analys och dynamiska system. *(Observera dagen, tiden och lokalen!)* **Kristian Bjerklöv:** *Non-zero Lyapunov exponent for the discrete one-dimensional quasi-periodic Schrödinger equation with a C^1-potential.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

To 10–31 kl. 14.00–15.00. Mittag-Leffler Seminar. Alberto Parmeggiani, Bologna: *Lower bounds of pseudodifferential systems and related spectral problems.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 4.

To 10–31 kl. 15.30–16.30. Mittag-Leffler Seminar. Grigori Rozenblioum, Göteborg: *Spectral asymptotics for very weakly perturbed multi-dimensional Dirac and Schrödinger operators with constant magnetic field.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 7.

Må 11–04 kl. 15.15–17.00. Seminarium i finansiell matematik. Professor Timo Teräsvirta, Handelshögskolan, Stockholm: *Common features in conditional distributions.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

On 11–06 kl. 10.15–12.00. Research Seminar Series. Andreas Wannebo: *Unpublished work in function space theory.* (Det andra av tre seminarier.) Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

To 11–07 kl. 16.30. 2002 Manne Siegbahn Memorial Lecture. Professor Lene Vestergaard Hau, Lyman Laboratory, Harvard University, USA: *Light at bicycle speed . . . and slower yet!* Föreläsningssalen, Manne Siegbahn-byggnaden, Frescativägen 24, Stockholm. Se sidan 5.

DISPUTATION I MATEMATIK

Pär Holm

disputerar på avhandlingen

Differential Operators on Arrangements of Hyperplanes

lördagen den 26 oktober 2002 kl. 10.00 i sal 14, hus 5, Matematiska institutionen, SU, Kräftriket. Till fakultetsopponent har utsetts *professor Santiago Zarzuela,* Departament d'Àlgebra i Geometria, Universitat de Barcelona.

Abstract of the thesis

In this thesis we study different aspects of the ring of differential operators associated to an arrangement of hyperplanes over a field k of characteristic zero. The thesis consists of the following three papers:

I: *Differential Operators on Hyperplane Arrangements*

In this paper we show that if $\mathcal{A}$ is any hyperplane arrangement over k, and if $I \subseteq R = k[x_1, \ldots, x_n]$ is the defining ideal for $\mathcal{A}$, then the subring of the Weyl algebra of differential operators preserving I, $\mathcal{D}(I)$, has a nice decomposition as an R-module, $\mathcal{D}(I) = \bigoplus \mathcal{D}^{(m)}(I)$, where $\mathcal{D}^{(m)}(I)$ is the module of operators of homogeneous order m preserving I. In the case when $\mathcal{A}$ is generic, we give explicit generators for $\mathcal{D}^{(m)}(I)$, and we use these to show that $\mathcal{D}(I)$ is finitely generated as a k-algebra. From this we deduce the corresponding results for $\mathcal{D}(A)$, where A is the coordinate ring of the variety of the hyperplane arrangement.

II: *Gelfand-Kirillov Dimension of a Class of Differential Operator Rings*

The results in this paper applies in particular to the coordinate ring of the variety of a hyperplane arrangement, but they hold more generally. Namely, we show that if A is a commutative, noetherian and reduced k-algebra, with minimal primes $\mathfrak{p}_1, \ldots, \mathfrak{p}_r$, such that $A/\mathfrak{p}_i$ is regular for each i, then the Gelfand-Kirillov dimension of $\mathcal{D}(A)$ equals twice the Krull dimension of A.

We also calculate the dimensions of the two finite-dimensional vector spaces $\mathcal{C}(A) = A/\gamma(A)$ and $\mathcal{H}(A) = \mathcal{D}(A)/\mathcal{D}(A, \gamma(A))$, where A is the coordinate ring of a finite set of lines through the origin in the affine plane over k, and where $\gamma(A) = \sum_i \bigcap_{j \neq i} \mathfrak{p}_j$.

III: *High Order Freeness of Hyperplane Arrangements*

A central arrangement $\mathcal{A}$ is free if the module $D(\mathcal{A})$ of derivations preserving the defining ideal for $\mathcal{A}$ is free as an R-module. In this paper we generalize this notion to saying that $\mathcal{A}$ is m-free if the module $\mathcal{D}^{(m)}(\mathcal{A})$ of homogeneous mth order operators preserving the defining ideal for $\mathcal{A}$ is free.

We show that all generic n-arrangements with $|\mathcal{A}| \leq n$, and all 2-arrangements are m-free for all $m \geq 1$. Finally, we show that a generic n-arrangement with $|\mathcal{A}| = r > n \geq 3$ is free for $m = r - n + 1$, but not for $m = 1, \ldots, r - n$.

MITTAG-LEFFLER SEMINAR

Soeren Fournais: Analyticity of atomic densities

Abstract: In this talk we will prove that the density associated to an atomic (or molecular) eigenfunction is real analytic away from the nucleus (nuclei). This is recent joint work with Maria Hoffmann-Ostenhof, Thomas Hoffmann-Ostenhof, and Thomas Østergaard Sørensen.

Tid och plats: Tisdagen den 29 oktober kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINAR IN ANALYSIS AND ITS APPLICATIONS

Björn Gustafsson:
On the curvature of free boundaries in two dimensions

Abstract: I shall present a new proof of the fact that free boundaries in some obstacle type problems in two dimensions satisfy natural inner ball conditions (joint work with M. Sakai). The topic was discussed in a seminar on March 25 (see Bråket no. 11 page 3), with a proof using conformal mapping. The new proof is simpler and more direct. Still it works only in two dimensions.

In terms of the forward (well-posed) Hele-Shaw flow moving boundary problem the result to be proved can be formulated as follows: Whenever the fluid penetrates an initially empty half-plane, the complement of the fluid region with respect to that half-plane remains for all time convex in Poincaré metric of the half-plane.

Tid och plats: Måndagen den 28 oktober kl. 13.15 – 14.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

RESEARCH SEMINAR SERIES

Andreas Wannebo:
Unpublished work in function space theory

Three seminars, each on 90 minutes, are scheduled on consecutive Wednesdays, beginning on October 30, at 10.15 – 12.00 in seminar room 3721, Department of Mathematics, KTH, Lindstedtsvägen 25, floor 7.

The topics discussed are theories of:

- Hardy inequalities for domains;
- Poincaré type inequalities;
- Capacities and polynomial capacities;
- The question of the possibility to write Sobolev functions as differences of non-negative ones;
- The relationship between polynomial capacities and spectral synthesis in Sobolev space;
- Truncation in higher order Sobolev space;
- Operators instead of gradients in Hardy inequalities;
- The historic development of the subject;
- Somewhat on the applications.

For easier access, the seminars will start with Hardy inequalities and also their background and history. Then we will proceed with the rest of the topics.

MITTAG-LEFFLER SEMINAR

Alberto Parmeggiani: Lower bounds
of pseudodifferential systems and related spectral problems

Abstract: I will give an overview of some recent results concerning lower bounds of the quadratic form associated with a formally self-adjoint pseudodifferential system, and describe the spectral problems relative to some model-systems that arise in this context.

Tid och plats: Torsdagen den 31 oktober kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

MITTAG-LEFFLER SEMINAR

Thomas Østergaard Sørensen:
Regularity of atomic wavefunctions up to order $C^{1,1}$

Abstract: In 1957 Kato showed that the eigenfunctions of the Schrödinger operator for a non-relativistic atom are continuous with bounded gradient. He also partly characterized the singularities of the gradient. In a recent paper, the singularities of the gradient of the eigenfunctions were explicitly extracted, thereby characterizing singularities of the eigenfunctions up to order $C^{1,\alpha}$ for all $\alpha \in (0,1)$. In this talk, we go one step further, and characterize the singularities up to order $C^{1,1}$. The result trivially extends to molecules.

Tid och plats: Tisdagen den 29 oktober kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Maria Saprykina:
Some new examples in analytic ergodic theory

Abstract: We present a construction method permitting to obtain examples of non-linearizable Haar measure preserving analytic diffeomorphisms of the two-torus, enjoying different statistical properties with respect to this measure: minimality without being ergodic, unique ergodicity, weak mixing. The construction of weakly mixing diffeomorphisms is a joint work with B. Fayad.

Tid och plats: Torsdagen den 31 oktober kl. 10.15 – 11.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

2002 MANNE SIEGBAHN MEMORIAL LECTURE

Lene Vestergaard Hau:
Light at bicycle speed . . . and slower yet!

Abstract: Light pulses have been slowed in a Bose-Einstein condensate to only 17 m/s, more than seven orders of magnitude lower than the light speed in vacuum. Associated with the dramatic reduction factor for the light speed is a spatial compression of the pulses by the same large factor. A light pulse, which is 1 – 2 miles long in vacuum, is compressed to a size of ~ 50 μm, and at that point it is completely contained within the atom cloud. This further allows the light pulse to be completely stopped and stored in the atomic medium for up to several milliseconds, and subsequently regenerated with no loss.

With the most recent extension of the method, the *light roadblock,* light pulses have been compressed from 2 miles to only 1 – 2 μm. This system has been used to generate the superfluid analogue of shock waves, *Quantum Shock Waves,* in Bose-Einstein condensates. These dramatic excitations result in the formation of solitons that in turn decay into quantized vortices — created far out of equilibrium, in pairs of opposite circulation — revealing directly the process of superfluid breakdown in Bose-Einstein condensates.

Tid och plats: Torsdagen den 7 november kl. 16.30 i föreläsningssalen, Manne Siegbahnbyggnaden, Frescativägen 24, Stockholm.

SEMINARIUM I MATEMATISK STATISTIK

Esbjörn Ohlsson:
Generaliserade Linjära Modeller möter kredibilitetsteori

Sammanfattning: Generaliserade Linjära Modeller (GLM) används numera ofta för analys av tariffen för skadeförsäkringar, närmare bestämt premierelationen mellan olika grupper av försäkringstagare. Kredibilitetsteori, å andra sidan, är en klassisk metod för att göra en avvägning mellan en skattning baserad på begränsad erfarenhet från en liten grupp försäkringstagare och en säkrare bestämd, men mindre relevant, skattning från ett större kollektiv som gruppen tillhör. Vi visar hur dessa båda metoder kan förenas genom att införa en stokastisk effekt med konjugerad fördelning i GLM.

Tid och plats: Onsdagen den 30 oktober kl. 15.15 i rum 306, Cramérrummet, hus 6, Matematiska institutionen, SU, Kräftriket.

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Kristian Bjerklöv: Non-zero Lyapunov exponent
for the discrete one-dimensional quasi-periodic Schrödinger equation
with a C^1-potential

Abstract: It is well-known that for a non-constant analytic potential function $V : \mathbb{T} \to \mathbb{R}$ and a frequency $\omega \in \mathbb{T} \setminus \mathbb{Q}$, the discrete quasi-periodic Schrödinger equation

$$(Hu)_n = -(u_{n+1} + u_{n-1}) + \lambda V(\theta + n\omega)u_n = Eu_n$$

has a positive Lyapunov exponent for all $E \in \mathbb{R}$, provided that $|\lambda|$ is sufficiently large. The classical proof of this fact is based on the theory of analytic functions and hence cannot be extended even to the C^∞ case.

We shall study the problem when V is only assumed to be a non-constant C^1-function. In fact, we show that for all big $|\lambda|$ there is a large set of ω's, and to each of them there corresponds a large set of energies E, all lying in the spectrum of H, for which we can estimate the Lyapunov exponent from below by $\log|\lambda|/4$.

Tid och plats: Torsdagen den 31 oktober kl. 11.30 – 12.30 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I FINANSIELL MATEMATIK

Timo Teräsvirta:
Common features in conditional distributions

Abstract: The study of common features in (economic) time series has been mostly restricted to common features in the conditional mean or variance. In this seminar we extend the definition of a common feature to cover the case of a whole distribution. We first discuss and exemplify so-called dominant properties or features in time series and with their help define the common feature in distributions. The definition is based on the concept of conditional copula. Potential usefulness of the definition is illustrated by an application to the consumption-income relationship over the business cycle in the US using monthly time series.

Tid och plats: Måndagen den 4 november kl. 15.15 – 17.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

MITTAG-LEFFLER SEMINAR

Grigori Rozenblioum: Spectral asymptotics for very weakly perturbed multi-dimensional Dirac and Schrödinger operators with constant magnetic field

Abstract: The spectrum of the Schrödinger and Dirac operators with constant full rank magnetic field consists of infinitely degenerate eigenvalues, Landau levels. Under perturbation by a compactly supported electric potential with constant sign, discrete eigenvalues may arise near the Landau levels. We show that an infinite set of such eigenvalues arises near each Landau level, and moreover, they obey some unusual asymptotic law.

Tid och plats: Torsdagen den 31 oktober kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.