BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 28 **FREDAGEN DEN 17 SEPTEMBER 2004**

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 23 september kl. 13.00.

SEMINARIER

Fr 09–17 kl. 10.00 – 12.00. Högre seminarium i språkfilosofi och logik. Per Martin-Löf: *100 years of Zermelo's axiom of choice: What was the problem with it?* Rum D700, Filosofiska institutionen, SU.

Fr 09–17 kl. 13.15. Presentation i kursen "Elliptiska kurvor". David Jacquet, Martin Skoglund: *Faktorisering av heltal med ECM.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 27 sidan 5.

Må 09–20 kl. 13.15 – 14.15. DNA-seminariet Uppsala-KTH (Dynamics, Number theory, and Analysis). Charles Favre, Institut Mathématique de Jussieu, Université Denis Diderot, Paris: *Equidistribution of points of small heights (joint work with Juan Rivera-Letelier).* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 27 sidan 4.

Må 09–20 kl. 14.15 – 15.00. Seminarium i numerisk analys. Tomas Karlsson, Alfvénlaboratoriet, KTH: *The auroral current circuit, satellite measurements and modelling.* Rum 4523, Nada, KTH, Lindstedtsvägen 5, plan 5. Se Bråket nr 27 sidan 6.

Fortsättning på nästa sida.

Disputation i matematisk statistik

Per Hallberg disputerar på avhandlingen *Gibbs Measures and Phase Transitions in Potts and Beach Models* fredagen den 24 september kl. 10.00 i Kollegiesalen, Administrationsbyggnaden, KTH, Valhallavägen 79. Se Bråket nr 27 sidan 5.

Disputation i matematik

Magnus Rosenlund disputerar på avhandlingen *Radical operations in rings and topological spaces* fredagen den 17 september kl. 14.00 i Kollegiesalen, Administrationsbyggnaden, KTH, Valhallavägen 79. Se Bråket nr 27 sidan 2.

Kurs

Anders Martin-Löf: Populationsmodeller. Se sidan 4.

Seminarier (fortsättning)

Må 09–20 kl. 15.15–16.15 (cirka). Licentiatseminarium i matematik. Agneta Avasjö presenterar sin licentiatavhandling: *Automata and growth functions of Coxeter groups.* Opponent: **Docent Henrik Eriksson,** Nada, KTH. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 27 sidan 4.

Ti 09–21 kl. 10.15. Plurikomplexa seminariet. Charles Favre, Paris: *Valuations and plurisubharmonic functions.* Sal 2244, MIC, Polacksbacken, Uppsala universitet. Se sidan 4.

Ti 09–21 kl. 13.30. Plurikomplexa seminariet. Mattias Jonsson, KTH: *A valuative criterion of integrability.* Sal 2244, MIC, Polacksbacken, Uppsala universitet. Se sidan 5.

Ti 09–21 kl. 14.00–15.00. Mittag-Leffler Seminar. Jorma Virtamo, Helsinki University of Technology: *Balanced fairness — computational aspects and some extensions.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

Ti 09–21 kl. 15.15–17.00. Didaktikseminarium. Barbara Jaworski, Høgskolen i Agder, Norge: *A spectrum of pedagogical awareness for undergraduate mathematics teaching.* Sal 31, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 8.

Ti 09–21 kl. 15.30–16.30. Mittag-Leffler Seminar. Markus Fidler, Aachen University: *Network calculus fundamentals and new approaches to aggregate scheduling.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

On 09–22 kl. 10.00–11.45. Logikseminariet Stockholm-Uppsala. Per Martin-Löf: *Normalization by evaluation and by the method of computability. Part II.* (Fortsättning från seminariet den 15 september.) Sal 16, hus 5, Matematiska institutionen, SU, Kräftriket.

On 09–22 kl. 10.15–12.00. Kombinatorikseminarium. Jonas Sjöstrand, KTH: *Mutually unbiased bases.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

On 09–22 kl. 13.15–14.15. Seminarium i analys och dynamiska system. Julius Borcea, SU: *On rational approximation of algebraic functions.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 27 sidan 8.

On 09–22 kl. 13.15–15.00. Algebra and Geometry Seminar. Jan-Erik Roos: *Derived functors of* $\varprojlim$ *revisited.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

On 09–22 kl. 15.15. Seminarium i matematisk statistik. Fredrik Liljeros, Sociologiska institutionen, SU: *Att studera strukturella egenskaper hos stora sociala nätverk.* Rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 8.

To 09–23 kl. 14.00–15.00. Mittag-Leffler Seminar. Sergei Zuyev, University of Strathclyde: *Measures everywhere.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

To 09–23 kl. 15.30–16.30. Mittag-Leffler Seminar. Alexandre Proutière, France Telecom R & D, Paris: *Stochastic bounds in queueing networks — applications to wired and wireless data network modelling.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

Fortsättning på nästa sida.

Seminarier (fortsättning)

Fr 09–24 kl. 13.00–14.00. Presentation av examensarbete i matematik. Viktor Blåsjö: *The Isoperimetric Problem.* Handledare: **Hans Rullgård.** Sal 16, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 5.

Må 09–27 kl. 13.15–14.15. DNA-seminariet Uppsala-KTH (Dynamics, Number theory, and Analysis). Martin Olbrich, Technische Universität Clausthal och Georg-August-Universität Göttingen: *Relations between length spectrum and topology of certain infinite volume hyperbolic manifolds.* Sal 3513, MIC, Polacksbacken, Uppsala universitet. Se nedan.

Martin Olbrich kommer att besöka Uppsala universitet från måndagen den 27 september till onsdagen den 29 september.

Må 09–27 kl. 14.15–15.00. Seminarium i numerisk analys. Daniel Appelö, Nada, KTH: *Title to be announced.* Rum 4523, Nada, KTH, Lindstedtsvägen 5, plan 5.

Må 09–27 kl. 15.00. Docentföreläsning. Lars Kjelldahl, Nada, KTH: *Vad ser vi i bilderna från datorgrafik och visualisering?* Sal D2, KTH, Lindstedtsvägen 5, b.v. Se sidan 7.

On 09–29 kl. 13.15–14.15. Seminarium i analys och dynamiska system. M. Shashahani, IPM, Tehran: *Multi-temporal wave equation on symmetric and locally symmetric spaces.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 7.

On 09–29 kl. 13.15. Algebra Seminar. Sergey Chulkov: *Hilbert's and Hilbert-Samuel's polynomials for a system of linear partial differential equations with constant coefficients.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 7.

DNA-SEMINARIET UPPSALA-KTH (DYNAMICS, NUMBER THEORY, AND ANALYSIS)

Martin Olbrich: Relations between length spectrum and topology of certain infinite volume hyperbolic manifolds

Abstract: It is known for a long time that the length spectrum of a finite volume hyperbolic surface determines its topology completely. This can be established as follows: The length spectrum defines a certain holomorphic function on a right half-plane, the Selberg zeta function. Using Selberg's trace formula one can meromorphically continue this zeta function to the whole complex plane. Moreover, one can analyse the order of its singularities. In particular, the Euler characteristic and the number of cusps of the surface can be recovered by these orders. This analysis becomes much more involved for infinite volume surfaces or even higher dimensional manifolds of infinite volume. The problem is to separate topological from spectral contributions to the singularities. We discuss how this problem is related to conjectures of Patterson. Eventually, we show that the Euler characteristic of a geometrically finite surface without cusps is determined by its length spectrum.

Tid och plats: Måndagen den 27 september kl. 13.15–14.15 i sal 3513, MIC, Polacksbacken, Uppsala universitet.

PLURIKOMPLEXA SEMINARIET

Charles Favre: Valuations and plurisubharmonic functions

Abstract: In this talk we shall present some recent joint work with Mattias Jonsson.

Let u be a plurisubharmonic function defined in a neighbourhood of the origin in $\mathbb{C}^2$. A classical way to analyse the singular behaviour of u is through its Lelong number, which gives information about the rate of growth of u near 0. Various generalizations of this number have been introduced, by Kiselman and by Demailly. The latter attached to any sufficiently regular plurisubharmonic weight φ a "generalized Lelong number" denoted by $\nu(u,\varphi)$. Our results grew out of an attempt to understand what information these generalized Lelong numbers capture from the singularity of u.

Our starting point is the remark that any valuation ν on the ring of holomorphic functions $\mathbb{C}\{x,y\}$ can be evaluated on a plurisubharmonic function u, and that this evaluation is a generalized Lelong number in the sense that $\nu(u) = \nu(u,\varphi)$ for some weight φ.

We now look at the function $g_u(\nu) = \nu(u)$ on the set $\mathcal{V}$ of all valuations on $\mathbb{C}\{x,y\}$. It turns out that $\mathcal{V}$ has a quite striking topological structure, namely that it is a real-metric tree, and that g_u enjoys very special concavity properties on $\mathcal{V}$. We can thus define a suitable Laplacian of g_u which is a (positive finite) measure ρ_u on $\mathcal{V}$.

From this construction we are able to deduce the following consequence: For any plurisubharmonic weight φ, the generalized Lelong number associated to φ is an *average of valuations,* that is, $\nu(u,\varphi) = \int \nu(u) d\rho_\varphi(\nu)$ for any plurisubharmonic function u, where ρ_φ is the positive measure on $\mathcal{V}$ attached to φ by the preceding construction.

We are also able to prove a stronger version of a result due to Mimouni, saying that the Lelong number of any plurisubharmonic function can be made arbitrarily small by performing suitable blow-ups.

Tid och plats: Tisdagen den 21 september kl. 10.15 i sal 2244, MIC, Polacksbacken, Uppsala universitet.

DOKTORANDKURS I MATEMATISK STATISTIK

Anders Martin-Löf: Populationsmodeller

Under senare halvan av höstterminen 2004 kommer jag att ge en kurs om stokastiska modeller för biologiska populationer, smittspridning, populationsgenetik, m.m.

Sådana modeller kan vara svåra att behandla med exakta metoder, så en viktig del av kursen skall handla om approximationsmetoder vilka ger upphov till deterministiska eller stokastiska differentialekvationer och diffusionsekvationer som ibland är enklare att lösa.

Förkunskaper är grundläggande kurser i sannolikhetsteori och stokastiska processer, men mer avancerade begrepp kommer att förklaras. Kursen ger 4 poäng i forskarutbildningen. Examinationen sker i form av inlämningsuppgifter. Litteraturen kommer att bestå av föreläsningsanteckningar som utdelas under kursens gång.

Omfattning: 10 dubbelföreläsningar kl. 9.15 – 11.00 på onsdagar under tiden 6 oktober – 8 december i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

Välkomna!
Anders Martin-Löf

PLURIKOMPLEXA SEMINARIET

Mattias Jonsson:
A valuative criterion of integrability

Abstract: This talk may be viewed as a sequel to the talk by Charles Favre but will be presented in a largely independent way. Together the two talks show how valuations may be used as a powerful tool for analysing local singularities of planar plurisubharmonic functions.

Let u be a plurisubharmonic function defined in a neighbourhood of the origin in $\mathbf{C}^2$. Assume that u has a singularity at the origin in the sense that $u(0) = -\infty$. As explained in Favre's talk, there are several ways of measuring the "strength" of the singularity. Arguably the most fundamental of these is the Lelong number $\nu^L(u)$, measuring the generic rate of growth of u at the origin. More generally, given local coordinates (x, y) at the origin and weights (a, b) we can define the Kiselman number $\nu^{(x,y)}_{(a,b)}$, measuring the rate of growth at the origin inside suitable bidisks.

Another way of analysing the singularity is to check for what numbers $c > 0$, the function $\exp(-2cu)$ is locally integrable at the origin. The supremum of all such numbers c is the complex singularity exponent $c(u)$. Its reciprocal $\lambda(u) := 1/c(u)$ is known as the Arnold multiplicity.

Skoda proved that $\nu^L(u)/2 \leq \lambda(u) \leq \nu^L(u)$ and the examples $u = \log\|(x, y)\|$ and $u = \log|y|$ show that these bounds are sharp. Kiselman later gave similar (more precise) bounds of the Arnold multiplicity $\lambda(u)$ in terms of Kiselman numbers. Our first result shows that in fact $\lambda(u)$ is equal to the supremum of the Kiselman numbers over all local coordinates (x, y) and all weights (a, b) with $a + b = 1$. Moreover, either the supremum is attained, or u is of a very special form: $u = c\log|y| + u'$ in suitable local coordinates, where $c = \nu^L(u)$ and u' is a plurisubharmonic function with zero Lelong number. As consequences, we obtain two additional results. First, the set of $c > 0$ for which $\exp(-2cu)$ is locally integrable is an open interval, settling the "openness conjecture" by Demailly and Kollár in the affirmative. Second, the bound $\lambda(u) \leq \nu^L(u)$ holds with equality if and only if $u = c\log|y| + u'$ as above, strengthening a recent result by Mimouni.

To u we can also associate its multiplier ideal. This is the set $J(u)$ of holomorphic germs ψ at the origin such that $|\psi|^2\exp(-2u)$ is locally integrable. In general, multiplier ideals may not be computed in terms of Kiselman numbers. However, they are computable in terms of more general valuations and this explains the title of the talk!

Tid och plats: Tisdagen den 21 september kl. 13.30 i sal 2244, MIC, Polacksbacken, Uppsala universitet.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Viktor Blåsjö:
The Isoperimetric Problem

Handledare: **Hans Rullgård.**

Abstract: The isoperimetric problem asks us to enclose as much area as possible within a given perimeter. The solution is the circle. We study the contributions of the Greeks, the calculus of variations of the 18th century, Steiner's synthetic proofs of the 19th century, and 20th century contributions including proofs based of Fourier analysis, conformal mappings, vector analysis, parallel curves, and integral geometry.

Tid och plats: Fredagen den 24 september kl. 13.00 – 14.00 i sal 16, hus 5, Matematiska institutionen, SU, Kräftriket.

KOMBINATORIKSEMINARIUM

Jonas Sjöstrand:
Mutually unbiased bases

Abstract: Take the Hilbert space $\mathbf{C}^N$ with the usual Hermitian inner product. We say that two unitary bases $(a_1, \ldots, a_N)$ and $(b_1, \ldots, b_N)$ are *unbiased* if $|\langle a_i, b_j\rangle| = 1/\sqrt{N}$ for all $1 \leq i, j \leq N$. How many mutually unbiased bases (MUB's) exist in dimension N?

It can be shown that there are no more than $N+1$ MUB's. For prime powers N this maximal number of MUB's can be constructed by means of a finite field of order N. Almost nothing is known for composite N, not even for $N = 6$.

The research on MUB's lives mostly in the area of quantum physics, where they are important through their connection to certain commuting operators. From a combinatorial point of view the potential connections to affine (or projective) planes, orthogonal Latin squares and finite fields are especially interesting.

I will discuss what we already know and what we would like to know about MUB's.

Tid och plats: Onsdagen den 22 september kl. 10.15 – 12.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

ALGEBRA AND GEOMETRY SEMINAR

Jan-Erik Roos:
Derived functors of $\varprojlim$ revisited

Abstract: I will recall the definition and properties of inverse systems and their $\varprojlim$ (inverse limit) in abelian categories. In particular their right derived functors $\varprojlim^{(i)}$ will be studied. I will show in particular that in an abelian category $\mathcal{C}$ satisfying the Grothendieck axioms AB3 (existence of infinite sums) and AB4* (existence of infinite products and infinite products of epimorphisms is an epimorphism) *and having a set of generators,* the $\varprojlim^{(i)} = 0$ for $i \geq 1$ for inverse sequences when the transition maps are epimorphisms. The recent examples by Deligne and Neeman (Inventiones Math., vol. 148 (2002), pp. 397 – 420), which will also be explained, show that the condition that $\mathcal{C}$ has a set of generators is *necessary.*

It is clear that AB4* is verified in categories of modules over a ring, but it is rather rare that AB4* is verified in e.g. categories of sheaves on a topological space X. This leads to the definition and study of derived functors of infinite products $\prod^{(i)}_{\alpha\in I}\mathcal{F}_\alpha$ (they are special cases of $\varprojlim$). In particular we will see that an abelian sheaf $\mathcal{F}$ on a topological space X is calculable in degrees $\leq p$ in the sense of Grothendieck (Bull. Soc. Math. France 84 (1956), p. 3) if and only if $\prod^{(i)}_I \mathcal{F} = 0$ for all index sets I and for $1 \leq i \leq p$. This can be used to show that in the previous $\varprojlim^{(i)}$-result the condition AB4* is also necessary.

I have profited from discussions with Ofer Gabber and Lorenzo Ramero, both in connection with the $\varprojlim^{(i)} = 0$-result above and in connection with my old characterization of the abelian categories satisfying AB4* and AB6 and having generators as being exactly the categories studied in Gabber-Ramero, Almost ring theory (Springer Lecture Notes in Mathematics, vol. 1800 (2003)). All notions used above will be explained.

Tid och plats: Onsdagen den 22 september kl. 13.15 – 15.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

DOCENTFÖRELÄSNING

Lars Kjelldahl:
Vad ser vi i bilderna från datorgrafik och visualisering?

Sammanfattning: Inom datorgrafik har fokus normalt varit på datoregenskaper såsom hastighet och minne. Det är lätt att glömma bort att tänka på hur vi uppfattar de bilder som produceras. Det mänskliga synsystemet bearbetar de intryck vi får. Vissa egenskaper i bilden kan förvanskas eller misstolkas. Det kan gälla hur färger påverkar varandra eller hur vi uppfattar djup i en tvådimensionell bild. Vissa detaljer ser vi inte alls. Det här har betydelse för datorgrafik och visualisering. Hur skall vi ta hänsyn till perception när vi skapar våra bilder? Det är ingen mening att generera detaljer som vi inte kan uppfatta. I föredraget ges en översikt av några perceptuella egenskaper och hur de kan komma in i datorgrafik och visualisering.

Tid och plats: Måndagen den 27 september kl. 15.00 i sal D2, KTH, Lindstedtsvägen 5, b.v.

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

M. Shashahani:
Multi-temporal wave equation
on symmetric and locally symmetric spaces

Abstract: The generalization of the wave equation to symmetric spaces naturally leads to systems of partial differential equations with multi-dimensional time. Nevertheless one can develop a spectral and scattering theory for these systems, where the incoming and outgoing subspaces in the conventional treatment of the wave equation are replaced by subspaces parametrized by the Weyl group. The methods depend strongly on representation theory of semi-simple groups and its applications to analysis on symmetric and locally symmetric spaces.

Tid och plats: Onsdagen den 29 september kl. 13.15 – 14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

ALGEBRA SEMINAR

Sergey Chulkov:
Hilbert's and Hilbert-Samuel's polynomials
for a system of linear partial differential equations
with constant coefficients

Abstract: It is a joint work with Professor A. Khovanskii. In this work we investigate a connection between the symbol of the system (we consider the symbol as an algebraic variety) and the spaces of analytic and formal solutions of the system. Applying elementary methods of commutative and linear algebra, we establish the connection between the spaces of formal and analytic solutions of the system and the basic algebraic invariants of the symbol, such as the ring of algebraic functions on them, Hilbert's and Hilbert-Samuel's polynomials, etc.

Tid och plats: Onsdagen den 29 september kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

DIDAKTIKSEMINARIUM

Barbara Jaworski:
A spectrum of pedagogical awareness for undergraduate mathematics teaching

Abstract: I will describe a 4-level spectrum of pedagogical awareness (SPA) that emerged from the analysis of six undergraduate mathematics tutors'

1. conceptualizations of their first-year students' difficulties;
2. descriptive accounts of their strategies for facilitating their students' overcoming of these difficulties; and,
3. self-reflective accounts regarding their teaching practices,

as recorded in 45 semi-structured interviews conducted during the 8-week Oxford University term and following minimally-participant observation of their tutorials. I will exemplify the four levels of SPA across 1 – 3, in a number of characteristic examples where tutors discuss episodes from the observed tutorials. The design and analyses of the study reflect underlying theoretical perspectives: learning and teaching are examined both in terms of constructivist/ developmental theories such as Concept Image / Concept Definition and as a process of enculturation in university mathematics culture. The study aimed to explore the professional craft knowledge of undergraduate mathematics teachers, and the SPA emerged as a pedagogic descriptor for this purpose. In the seminar I will use participants' own comments to substantiate the claim that the methodology of the study offered an opportunity for pedagogical reflection, for raising pedagogical awareness, and for demonstrating the potential of a closer collaboration between mathematicians and mathematics educators.

Tid och plats: Tisdagen den 21 september kl. 15.15 – 17.00 i sal 31, hus 5, Matematiska institutionen, SU, Kräftriket.

SEMINARIUM I MATEMATISK STATISTIK

Fredrik Liljeros:
Att studera strukturella egenskaper hos stora sociala nätverk

Sammanfattning: Mänskliga sociala kontaktnätverk tycks ibland skilja sig markant från de antaganden om slumpmässig homogen interaktion som ofta görs i epidemiologiska modeller och sociala diffusionsmodeller. Detta gäller både för hur forskare samarbetar, hur individer flirtar med varandra på Internet, samt hur patienter har kontakter med varandra på sjukhus. I huvudsak kommer seminariet att behandla erfarenheter från pågående forskning på SMI/MEB samt diskutera olösta metodologiska problem som kan tänkas vara av intresse för matematiska statistiker.

Tid och plats: Onsdagen den 22 september kl. 15.15 i rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket.