BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 10 **FREDAGEN DEN 18 MARS 2005**

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: Onsdagen den 23 mars kl. 13.00.

Disputation i matematik

Fedor S. Duzhin disputerar vid KTH på avhandlingen *Lower estimates for a number of closed trajectories of generalized billiards* den 24 mars kl. 9.00. Se sidan 6.

Kurs

Alexander Ploner, Tom Britton: Statistical Computing. Se sidorna 4 – 5.

SEMINARIER

Må 03–21 kl. 10.30 – 11.30. Seminar in Random and Deterministic Spectra. Daniel Schnellman: *Weyl's integration formula.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

Må 03–21 kl. 15.15 – 17.00. Seminarium i matematisk statistik. Lars Holst: *Om rekord (fortsättning från seminariet den 7 mars).* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 9 sidan 6.

Må 03–21 kl. 18.30. Populärvetenskaplig föreläsning i fysik. Professor Ariel Goobar, Experimentell astropartikelfysik, SU: *Universum höljt i dunkel? Om observationer av supernovaexplosioner som visar att universums expansion accelererar.* Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se Bråket nr 9 sidan 6.

Ti 03–22 kl. 10.15. Plurikomplexa seminariet. Romain Dujardin: *A survey on laminar currents.* Sal MIC 2215, Matematiska institutionen, Polacksbacken, Uppsala universitet. Se sidan 4.

Ti 03–22 kl. 13.15. Plurikomplexa seminariet. Burglind Jöricke: *Hausdorff dimension of Cantor sets and polynomial hulls.* Sal MIC 2215, Matematiska institutionen, Polacksbacken, Uppsala universitet. Se sidan 7.

Fortsättning på nästa sida.

Nästa nummer av Bråket

utkommer den 24 mars, på skärtorsdagen. Material måste vara red. tillhanda senast onsdagen den 23 mars kl. 13.00.

Seminarier (fortsättning)

Ti 03–22 kl. 14.00–15.00. Mittag-Leffler Seminar. Sam Hsiao, University of Michigan: *Bivariate Catalan numbers and characters of quasisymmetric functions.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

Ti 03–22 kl. 15.30–16.30. Mittag-Leffler Seminar. Persi Diaconis, Stanford University: *Enumeration of lattice points in convex polytopes with applications.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

On 03–23 kl. 13.15. Seminarium i teoretisk datalogi. Henrik Björklund, Uppsala universitet: *Controlled linear programming for infinite games.* Rum 1537, Nada, KTH, Lindstedtsvägen 3, plan 5. Se sidan 3.

On 03–23 kl. 13.15–15.00. Algebra and Geometry Seminar. Jan-Erik Roos: *On the structure of non-(co)commutative Hopf algebras.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 3.

On 03–23 kl. 15.15–16.00. Docentföreläsning i matematisk statistik. Örjan Stenflo, SU: *Stokastisk iteration av funktioner.* Rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 9 sidan 6.

On 03–23 kl. 16.00–17.00. KTH/SU Mathematics Colloquium. Mikael Passare, SU: *From real ovals to complex crystals.* Sal 14, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 5.

To 03–24 kl. 14.00–15.00. Mittag-Leffler Seminar. Mireille Bousquet-Melou, Université Bordeaux 1: *Algebraic generating functions everywhere?* Institut Mittag-Leffler, Auravägen 17, Djursholm.

To 03–24 kl. 15.30–16.30. Mittag-Leffler Seminar. Günter Ziegler, Technische Universität Berlin: *Recent improvements on the Delsarte linear programming bounds for binary and for spherical codes.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

On 03–30 kl. 13.00. Seminarium i statistik. Lars-Erik Öller, Statistiska centralbyrån och Statistiska institutionen, SU: *An ignorance measure of macroeconomic variables.* Sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati. Se sidan 6.

On 03–30 kl. 13.15–14.15. Seminarium i analys och dynamiska system. Michael Benedicks, KTH: *Title to be announced.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

On 03–30 kl. 16.00–17.00. KTH/SU Mathematics Colloquium. Hans Ringström, KTH: *3-manifold topology, geometry and the Einstein flow.* 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 7.

To 03–31 kl. 14.00. Kollokvium i filosofi. Joseph Raz, University of Oxford: *The myth of instrumental rationality.* Rum D255, Filosofiska institutionen, SU.

SEMINARIUM I TEORETISK DATALOGI

Henrik Björklund:
Controlled linear programming for infinite games

Abstract: The controlled linear programming problem (CLPP) is a combinatorial optimization problem. An instance consists of a number of linear constraints of a certain form. A controller is allowed to select and discard constraints according to simple rules, with the goal of maximizing the optimal solution to the resulting linear program.

The CLPP captures and generalizes parity, mean payoff, discounted payoff, and simple stochastic games. For its most general version, the exact complexity is still unknown, but several rich subclasses can be shown to belong to the NP intersection coNP. In this talk we use linear algebra to characterize the properties of such subclasses and prove a number of new results. We also identify sufficient conditions for a class to be solvable in randomized subexponential time.

Tid och plats: Onsdagen den 23 mars kl. 13.15 i rum 1537, Nada, KTH, Lindstedtsvägen 3, plan 5.

ALGEBRA AND GEOMETRY SEMINAR

Jan-Erik Roos:
On the structure of non-(co)commutative Hopf algebras

Abstract: Let k be a field. A Hopf algebra A over k is an associative (with a unit) algebra over k which is also a co-algebra, i.e. has a mapping

$$\Delta : A \longrightarrow A \otimes_k A$$

which satisfies the dual axioms to those of an algebra (coassociativity, co-unit etc.). One supposes further that Δ is a map of algebras, when $A \otimes_k A$ is given the natural structure of an algebra (and the existence of an "antipode"). One can also study Hopf algebras in the category of vector spaces with extra structure.

If A is neither commutative nor co-commutative then the structure theory is rather difficult, but also very interesting even in the finite-dimensional case. In 1975 Kaplansky formulated 10 problems about Hopf algebras and the 10th ("Are there only a finite number of isomorphy classes of Hopf algebras of a given dimension?") is now solved in the negative. There is a class of Hopf algebras whose study was started by Nichols (a student of Kaplansky). Milinsky and Schneider managed to associate to any Coxeter group W a Hopf algebra A_W of this type. I proved some years ago using the program BERGMAN by Backelin et al. that this Hopf algebra is finite-dimensional for $W = S_4, S_5$ (the smaller symmetric groups are easy to handle), but it is still unknown if this is true for $W = S_6$ (some workers in this field even think it might be false) although Backelin has constructed an experimental version of BERGMAN that might solve this problem. I will give background theory and explain how I proved that non-Koszul algebras come up here. I will also explain another closely related line of thought related to so-called Woronowicz exterior algebras in non-commutative geometry. In this way one obtains "small" non-commutative models of ordinary differential geometry. Here Majid has been able to introduce and study Yang-Mills equations on finite symmetric groups, Feynman integrals become ordinary integrals, etc.

Tid och plats: Onsdagen den 23 mars kl. 13.15 – 15.00 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

PLURIKOMPLEXA SEMINARIET

Romain Dujardin:
A survey on laminar currents

Abstract: In this talk, I will report on some old and new results on closed positive currents with geometric structure and some of their applications.

We will first see how to construct laminar and geometric currents as limits of subvarieties with controlled geometry.

In the second half of the talk, we will try to interpret the wedge products of laminar currents in geometric terms and give some applications. If time permits, I will try to give some further insight into the intriguing geometry of these objects.

Tid och plats: Tisdagen den 22 mars kl. 10.15 i sal MIC 2215, Matematiska institutionen, Polacksbacken, Uppsala universitet.

GRADUATE COURSE IN STATISTICAL COMPUTING

Spring/Fall 2005

Lecturers: **Dr Alexander Ploner,** Department of Medical Epidemiology and Biostatistics, Karolinska Institutet. **Professor Tom Britton,** Department of Mathematical Statistics, Stockholm University.

Aims: The course aims to give graduate students in statistics a background in computational methods that are relevant for understanding and applying computation-based statistical methodology.

Participants and prerequisites: The course is primarily aimed at graduate students in different branches of statistics. Prerequisites include a basic course in statistical inference plus computing experience, preferably programming experience. Other participants are welcome, provided they have the stated prerequisites.

Registration: Please send an e-mail to Alexander.Ploner@meb.ki.se stating your intention to attend and one or two sentences about your study background and university affiliation.

Examination and credit points: Evaluation of the students' weekly assignments will serve for examination. A total of 5 credit points are awarded conditional on carrying out 75 % of the weekly assignments. Credit points can be awarded separately for the two parts of the course (see below).

Time and place: The course will start in May 2005 and end in October 2005. It will be based on weekly lectures and student presentations during one afternoon per week for $6 + 8$ weeks. The first lecture will take place on Monday, May 2, at 14.00, in Room North-2 at the Department of Medical Epidemiology and Biostatistics on the Karolinska Institutet North campus (http://www.meb.ki.se).

Literature: Due to the wide range of topics (see below), no single book will cover the whole course. We will make use of selected reference papers and lecture notes and supply a supplementary reading list for advanced reading.

Programming language: The main computing environment for the course will be the free statistical software R (http://cran.r-project.org/).

(Continued on the next page.)

Part I: Computational tools

Credits: 2 points.

Time: Monday afternoons during May and June 2005, starting on May 2 (see above) and ending before Midsummer (6 weeks).

Location: MEB/KI, see above.

Lecturer: Alexander Ploner.

Contents:

1. Numerical linear algebra for statisticians: Numerical properties of matrices, QR and singular value decomposition, linear equation systems, linear least squares, principal components.

2. Numerical optimization: Different optimization techniques with or without derivatives, solving non-linear equations, non-linear least squares, iterative solution of linear equations.

Part II: Computational statistics

Credits: 3 points.

Period: September to October 2005 (8 weeks). Details to be announced.

Location: Mathematical Statistics, SU. Details to be announced.

Lecturers: Alexander Ploner (bootstrapping), Tom Britton (MCMC, EM algorithm).

Contents:

1. Bootstrapping: Introduction to random number generation and Monte Carlo simulation. Introduction to bootstrapping (variance estimation, bias correction, confidence intervals, hypothesis testing).

2. Markov chain Monte Carlo (MCMC): Bayesian methods, Metropolis-Hasting algorithm, Gibbs sampling.

3. Expectation-maximization algorithm (EM).

KTH/SU MATHEMATICS COLLOQUIUM

Mikael Passare:
From real ovals to complex crystals

Abstract: In 1871 Axel Harnack proved that a smooth real algebraic curve in the plane cannot have more than $1 + (d-1)(d-2)/2$ connected components, where d denotes the degree of the curve. He also gave a construction of curves having this maximal number of components, or "ovals". These matters were pursued further by David Hilbert, who also included the study of ovals in problem 16 of his famous list.

It has recently been discovered that the Harnack curves and their complexifications possess many other extremal properties. For instance, the amoeba of a complex Harnack curve is of maximal area, and it has the maximal number of "holes" that precisely correspond to the ovals of the real curve. In fact, the area of the holes can be taken as coordinates for the moduli space of Harnack curves of a given degree.

In the work of Andrei Okounkov and his collaborators the very same Harnack curves and their amoebas unexpectedly show up in combinatorial random surface models for partially dissolved crystals.

Tid och plats: Onsdagen den 23 mars kl. 16.00 – 17.00 i sal 14, hus 5, Matematiska institutionen, SU, Kräftriket.

DISPUTATION I MATEMATIK

Fedor S. Duzhin

disputerar på avhandlingen

Lower estimates for a number of closed trajectories of generalized billiards

torsdagen den 24 mars kl. 9.00 i Kollegiesalen, Administrationsbyggnaden, KTH, Valhallavägen 79. Till fakultetsopponent har utsetts *professor Oleg Viro,* Matematiska institutionen, Uppsala universitet.

Abstract of the thesis

Consider a billiard system on the Euclidean plane. Let T be a strictly convex domain in $\mathbb{R}^2$ with a smooth boundary. A billiard ball is a point that moves in T along a straight line and rebounds from the boundary making the angle of incidence equal to the angle of reflection. George Birkhoff considered the following question: Given an integer k, how to estimate from below the number of closed billiard trajectories of period k? He proved that if $k > 2$, then there are at least $\varphi(k)$ closed trajectories of a billiard ball in T with k rebounds, where $\varphi(k)$ is the number of integers $q < k$ such that q and k are coprime.

In the present thesis, G. Birkhoff's problem is studied in the most generality. A definition of a closed trajectory for a billiard, whose boundary (in some sense) is an arbitrary manifold embedded in a Euclidean space, is given.

The main result is Theorem 1.2.1 containing the following estimates. Let $M^m \subset \mathbb{R}^n$ be a smooth closed manifold, $B = \sum_{i=0}^{m} \dim H_i(M; \mathbb{Z}_2)$. If the embedding $M \hookrightarrow \mathbb{R}^n$ is generic, then the number of closed billiard trajectories of period 2 is not less than

$$\frac{B^2 + (m-1)B}{2},$$

while the number of closed billiard trajectories of period 3 is at least

$$\frac{B^3 + 3(m-1)B^2 + 2B}{6}.$$

If $p > 3$ is a prime integer, then the number of closed billiard trajectories of period p is at least

$$\frac{(B-1)((B-1)^{p-1} - 1)}{2p} + \frac{mB}{2}(p-1).$$

The last chapter of the thesis investigates whether all the obtained estimates are sharp.

SEMINARIUM I STATISTIK

Lars-Erik Öller:
An ignorance measure of macroeconomic variables

Abstract: A measure is presented that could be said to reflect the quality of a macroeconomic statistical time series. The measure is a combination of how predictable the series is and how much its statistics needs to be revised. An "ignorance window" provides a snapshot of the quality and may signal that a statistical variable is close to worthless.

Tid och plats: Onsdagen den 30 mars kl. 13.00 i sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati.

PLURIKOMPLEXA SEMINARIET

Burglind Jöricke:
Hausdorff dimension of Cantor sets and polynomial hulls

Abstract: We discuss an old question by W. Rudin how small the dimension of a compact subset of $\mathbb{C}^n$, $n \geq 2$, can be, provided its polynomial hull has non-empty interior. Asking about topological dimension, Vitushkin and Henkin constructed Cantor sets (i.e. sets of topological dimension zero) in $\mathbb{C}^2$ with the latter property. However, the mentioned sets have Hausdorff dimension at least two. On the other hand Sibony constructed a set of Hausdorff dimension one in $\mathbb{C}^n$, $n \geq 2$, whose polynomial hull has non-empty interior. This set is not a Cantor set and has infinite linear measure.

The structure of the polynomial hull of compact sets in $\mathbb{C}^n$ of finite but non-zero linear measure is not completely understood. E.g. it is a still open conjecture that Cantor sets of finite linear measure are polynomially convex. They are so if contained in the boundary of a strictly convex domain (Dinh, Lawrence). We discuss known results and give an example of a Cantor set of Hausdorff dimension one with interior points in the polynomial hull.

Tid och plats: Tisdagen den 22 mars kl. 13.15 i sal MIC 2215, Matematiska institutionen, Polacksbacken, Uppsala universitet.

KTH/SU MATHEMATICS COLLOQUIUM

Hans Ringström:
3-manifold topology, geometry and the Einstein flow

Abstract: The goal of the talk is to give relations between the geometrization ideas of Thurston and the asymptotic behaviour of cosmological spacetimes. I will start by giving a brief introduction to Lorentz geometry and a rough idea of what the statement of Thurston's geometrization conjecture is. Then I will discuss the initial value formulation of Einstein's equations. For this to make sense, one has to restrict one's attention to 4-manifolds that are topologically a Cartesian product of the real numbers and a 3-manifold. Cosmological spacetimes constitute the special case of this situation when the 3-manifold is compact. The Lorentz metric induces a family of Riemannian metrics on this 3-manifold, and I will give some conjectures and some results relating the behaviour of this family of metrics to the Thurston geometrization picture.

Tid och plats: Onsdagen den 30 mars kl. 16.00 – 17.00 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.

MONEY, JOBS

Columnist: Hans Rullgård, Department of Mathematics, SU. E-mail: hansr@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/~hansr/mj.html.
Unless stated otherwise, a given date is the last date (e.g. for applications), and the year is 2005. 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.

(Continued on the next page.)

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://www.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.

New information

Money, to apply for

11. Stockholms universitets donationsstipendier är utlysta. Sista ansökningsdag är den 15 april. Web-info: http://www.su.se/forskning/stipendier/donationsstipendier.php3.

Jobs, to apply for

12. Forskarskolan i matematik och beräkningsvetenskap (FMB) söker fyra doktorander. Ansökan skall göras på särskild blankett senast den 31 mars. Web-info, ansökningsblankett och kontaktpersoner: http://www.math.uu.se/fmb/annons2005.html.
13. Matematikcentrum vid Lunds universitet söker en doktorand i matematisk statistik, 18 mars. Info: Maria Hansson, 046-222 49 53, e-post Maria.Hansson@matstat.lu.se. Web-info: http://www.lth.se/lthjobb/JobbDetail.aspx?id=450.

Old information

Money, to apply for

14. Vetenskapsrådets årliga utlysning av bidrag till projekt, postdok, anställning som forskarassistent med mera finns nu på http://www.vr.se/forskning/bidrag/. Sista ansökningsdag för natur- och teknikvetenskap är den 19 april.
15. Stiftelsen G. S. Magnusons fond utdelar stipendier och forskningsanslag till doktorander och disputerade forskare i matematik. Sista ansökningsdag är den 31 mars. Web-info och ansökningsblankett: http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=8.
16. Från Knut och Alice Wallenbergs Stiftelse ställs anslag till rektors för KTH förfogande för att "i första hand användas till bidrag för sådana resor, som bäst befordrar ett personligt vetenskapligt utbyte till gagn för svensk forskning. Bidrag skall främst beviljas till yngre forskare. Medel kan även — efter rektors bedömning — undantagsvis disponeras för utländska gästforskare." Bidrag kan sökas under hela året. Info: Anette Nyström, 08-790 70 59. Web-info: se punkt 4 ovan.

Jobs, to apply for

17. Institutionen för matematik och fysik vid Mälardalens högskola utlyser en anställning som doktorand i matematik/tillämpad matematik inom Forskarskolan i matematik och beräkningsvetenskap, 31 mars. Info: Dmitrii Silvestrov, 021-10 16 67, e-post dmitrii.silvestrov@mdh.se. Web-info: http://www.mdh.se/jobb/VisaAnstallning?id=514.