



# BRÅKET



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

NR 39

FREDAGEN DEN 28 NOVEMBER 2008

### 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 4 december  
kl. 13.00.

### SEMINARIER

Fr 11–28 kl. 10.00. Seminarium i teoretisk datalogi.  
Assistant Professor Ryan O'Donnell, School of  
Computer Science, Carnegie Mellon University,  
USA: *Nearly spherical cubes*. Rum 4523, KTH  
CSC, Lindstedtsvägen 5, plan 5. Se sidan 5.

*Ryan O'Donnell är opponent vid Per Austrins disputation. Se sidan 6.*

Fr 11–28 kl. 10.00–10.45. Miniworkshop in PDE and  
Potential Theory. Olof Runborg, KTH: *Computational high frequency wave propagation*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 38 sidan 9.

Fr 11–28 kl. 11.00–11.45. Miniworkshop in PDE and  
Potential Theory. Stefan Rauch-Wojciechowski, Linköpings universitet: *An effective criterion of separability for the Schrödinger equation and for the Hamilton-Jacobi equations of natural Hamiltonian systems*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 38 sidan 9.

**Fortsättning på nästa sida.**

### Miniworkshop in PDE and Potential Theory

Denna skall äga rum vid KTH  
fredagen den 28 november. Se  
Bråket nr 38 sidorna 9–10.

### Disputation i mekanik

*Espen Åkervik* skall disputerar på avhandlingen *Global stability and feedback control of boundary layer flows* fredagen den 5 december kl. 10.30 i sal E1, KTH, Lindstedtsvägen 3, b.v. Se Bråket nr 38 sidan 7.

### Disputation i datalogi

*Per Austrin* skall disputerar vid KTH på avhandlingen *Conditional Inapproximability and Limited Independence* fredagen den 28 november kl. 13.00. Se sidan 6.

### Disputation i matematik

*Rikard Olofsson* skall disputerar vid KTH på avhandlingen *Problems in Number Theory related to Mathematical Physics* måndagen den 8 december kl. 13.00. Se sidan 12.

**Money, jobs:** Se sidorna 13–14.

### Seminarier (fortsättning)

- Fr 11–28 kl. 12.15–13.00. GRU-seminarium i matematik. Mats Boij och Krister Svanberg:** *Hur ser KTHs lärare på matematikens roll i civilingenjörsprogrammen?* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.
- Fr 11–28 kl. 13.15–14.00. Miniworkshop in PDE and Potential Theory. Marek Fila,** Department of Applied Mathematics and Statistics, Comenius University, Bratislava: *Reaction versus diffusion: Blow-up induced and inhibited by diffusivity.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 38 sidan 9.
- Fr 11–28 kl. 14.15–15.00. Miniworkshop in PDE and Potential Theory. Filippo Gazzola,** Department of Mathematics, Politecnico di Milano: *Decay and eventual local positivity for biharmonic parabolic equations.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 38 sidan 10.
- Fr 11–28 kl. 15.15–16.15. Matematiska kollokviet i Uppsala. Lars Andersson,** Albert Einstein Institut, Golm, och Institut Mittag-Leffler: *Black holes, horizons and stability.* Polhemsalen, Ångströmlaboratoriet, Uppsala universitet. Kaffe/te serveras utanför föreläsningssalen kl. 14.55. Se Bråket nr 38 sidan 11.
- Må 12–01 kl. 15.15–16.00. Seminarium i finansiell matematik. Mikael Hatanpää** presenterar sitt examensarbete: *Using Replicating Portfolios for Hedging Swedish Traditional Life Insurance Companies.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 7.
- Ti 12–02 kl. 13.15. Plurikomplexa seminariet. Andreas Axelsson,** SU: *An introduction to the Hodge-Dirac operator  $d + \delta$ .* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 8.
- On 12–03 kl. 8.00. Presentation av magisterarbete i matematisk statistik. Tommy Nyberg:** *Fully Decentralized Sequential Detection in an Underwater Setting.*Handledare: **Ola Hössjer.** Sal 31, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 9.
- On 12–03 kl. 9.00. Presentation av kandidatarbete i matematisk statistik. Sini Kilpeläinen:** *Microarray Data Analysis of Dyslexi Candidate Genes.*Handledare: **Ola Hössjer.** Sal 31, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 10.
- On 12–03 kl. 10.00. Presentation av magisterarbete i matematisk statistik. Erland Ekheden:** *The Pricing of Catastrophe Cover in Life Reinsurance.*Handledare: **Ola Hössjer.** Sal 31, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 10.
- On 12–03 kl. 10.15–12.00. Kombinatorikseminarium. Anders Björner:** *Användning av FKG och liknande olikheter i extremal kombinatorik.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 7.
- On 12–03 kl. 10.30–12.30. Logikseminariet Stockholm-Uppsala. Vera Koponen:** *Zero-one laws for finite substructures of countably categorical structures.* Sal 80101, Ångströmlaboratoriet, hus 8, markplanet, Uppsala universitet. Se sidan 8.

Fortsättning på nästa sida.

### Seminarier (fortsättning)

- On 12–03 kl. 11.00. Presentation av magisterarbete i matematisk statistik. Mickael Kyrlis:** *An Overview of Stochastic Claims Reserving with an Application Using Chain Ladder, GLM and Bootstrap*. Handledare: **Ola Hössjer**. Sal 31, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 10.
- On 12–03 kl. 11.00–12.00. KTH/Nordita/SU Seminar in Theoretical Physics. David Haviland,** Tillämpad fysik, KTH: *Intermodulation Atomic Force Microscopy*. Sal FA31, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se Bråket nr 38 sidan 11.
- On 12–03 kl. 13.00. Seminarium i statistik. Docent Gebrenegus Ghilagaber,** Stockholms universitet, och **professor Rolf Larsson,** Uppsala universitet: *Maximum likelihood adjustment of anticipatory covariates in analysing retrospective survey data*. Sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati. Se Bråket nr 38 sidan 12.
- On 12–03 kl. 13.15–15.00. Algebra and Geometry Seminar. Fredrik Nordström:** *Homotopy colimits over categories of chain complexes*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 9.
- On 12–03 kl. 14.30–15.30. KCSE (KTH Computational Science and Engineering Centre) Seminar. Erwin Laure,** CERN: *Providing a production Grid infrastructure for collaborative science*. Sal FB42, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 5.
- On 12–03 kl. 19.00. Populärvetenskaplig föreläsning i fysik. Jan Schober,** Astronomi, SU: *"Gör intet afwel af sig": Om den svenska almanackan från omkring 1540 till dataåldern*. Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se Bråket nr 38 sidan 3.
- To 12–04 kl. 13.15–14.00. Seminarium i numerisk analys. Dr Hailang Liu,** Iowa State University, USA: *Alternating evolution vs. flux refinement for convection diffusion problems*. Rum 1537, KTH CSC, Lindstedtsvägen 3, plan 5. Se sidan 8.
- To 12–04 kl. 13.15–14.15. DNA-seminariet Uppsala-KTH (Dynamical systems, Number theory, Analysis). Nikolai Proskurin,** Steklov Institute: *On the computation of L-series values with special reference to Rankin-Selberg convolutions of Maass wave forms*. Sal 64119, Ångströmlaboratoriet, Uppsala universitet. Se sidan 4.
- To 12–04 kl. 14.00–15.00. Institut Mittag-Leffler Seminar. Göran Bergqvist,** Linköpings universitet: *Causal tensors*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 11.
- To 12–04 kl. 15.30–16.30. Institut Mittag-Leffler Seminar. Justin Corvino,** Lafayette College, Easton: *The center of mass of isolated systems from a geometric point of view*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 11.
- Må 12–08 kl. 9.00–9.05. Nobelföreläsningarna 2008. Bo Sundqvist,** Kungl. Vetenskapsakademiens preses: *Introduktion*. Aula Magna, SU.
- Må 12–08 kl. 9.05–9.45. Nobelföreläsning i fysik. Pristagaren Yoichiro Nambus** föreläsning kommer att framföras av **Giovanni Jona-Lasinio,** La Sapienza, University of Rome, Italien: *Spontaneous symmetry breaking in particle physics: a case of cross fertilization*. Aula Magna, SU.

**Fortsättning på nästa sida.**

**Seminarier (fortsättning)**

- Må 12–08 kl. 9.45–10.25. Nobelföreläsning i fysik. Makoto Kobayashi**, High Energy Accelerator Research Organization, Tsukuba, Japan: *CP violation and flavour mixing*. Aula Magna, SU.
- Må 12–08 kl. 10.25–11.05. Nobelföreläsning i fysik. Toshihide Maskawa**, Yukawa Institute for Theoretical Physics, Kyoto University och Kyoto Sangyo University, Japan: *What did CP violation tell us?* Aula Magna, SU.  
*Toshihide Maskawas föreläsning kommer att hållas på japanska, men en engelsk översättning kommer att visas på en separat skärm.*
- Må 12–08 kl. 12.30–13.10. Nobelföreläsning i kemi. Osamu Shimomura**, Marine Biological Laboratory, Woods Hole, USA, och Boston University Medical School, USA: *Discovery of Green Fluorescent Protein, GFP*. Aula Magna, SU.
- Må 12–08 kl. 13.10–13.50. Nobelföreläsning i kemi. Martin Chalfie**, Columbia University, New York, USA: *GFP: Lighting up life*. Aula Magna, SU.
- Må 12–08 kl. 13.50–14.30. Nobelföreläsning i kemi. Roger Y. Tsien**, Howard Hughes Medical Institute, University of California, San Diego, La Jolla, USA: *Constructing and exploiting the fluorescent protein paint box*. Aula Magna, SU.
- Må 12–08 kl. 15.00–15.50. Nobelföreläsning i ekonomi. Paul Krugman**, Princeton University, USA: *Increasing returns*. Aula Magna, SU.
- On 12–10 kl. 13.00. Seminarium i statistik. Pär Stockhammar och Lars-Erik Öller:** *On the probability distribution of economic growth*. Sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati. Se sidan 13.
- On 12–10 kl. 16.00. KTH/SU Mathematics Colloquium. Nikolai Vorobiev**, University of Bath, England: *Compact approximations and topological complexity of definable sets*. Sal 14, hus 5, Matematiska institutionen, SU, Kräftriket. Kaffe/te serveras från kl. 15.30 i institutionens lunchrum. Se sidan 11.
- To 12–11 kl. 14.15–15.00. Seminarium i finansiell matematik. (Observera dagen och tiden!) Jérémie Finas** presenterar sitt examensarbete: *Forecasting power prices on the French electricity market — An overview*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 13.
- Fr 12–12 kl. 13.15–14.15. Graduate Student Seminar. Christian Lundkvist**, Matematik, KTH: *Title to be announced*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

**DNA-SEMINARIET UPPSALA-KTH  
(DYNAMICAL SYSTEMS, NUMBER THEORY, ANALYSIS)**

**Nikolai Proskurin:**

**On the computation of  $L$ -series values with special reference  
to Rankin-Selberg convolutions of Maass wave forms**

*Abstract:* I will talk about computation of  $L$ -series values by means of an ‘approximate’ functional equation. I will look at the problem from a general point of view, with emphasis on the case of Rankin-Selberg convolutions of Maass wave forms.

*Tid och plats:* Torsdagen den 4 december kl. 13.15–14.15 i sal 64119, Ångströmlaboratoriet, Uppsala universitet.

## SEMINARIUM I TEORETISK DATALOGI

**Ryan O'Donnell:**  
**Nearly spherical cubes**

*Abstract:* What is the least surface area of a shape that tiles  $d$ -dimensional space when shifted by all vectors in the integer lattice? A unit cube is such a shape, and has surface area  $2d$ . On the other hand, any such shape must have volume 1 and hence surface area at least that of the volume-1 ball, namely about  $\sqrt{2\pi e}\sqrt{d}$ . We nearly close the gap, using a randomized construction to show that there exists a tiler with surface area at most  $4\pi\sqrt{d}$ . The problem was originally motivated by questions in computational complexity theory; our construction generalizes a discretized solution given by Raz in the complexity-theory setting.

This is joint work with Guy Kindler (Hebrew University), Anup Rao (IAS), and Avi Wigderson (IAS).

*Tid och plats:* Fredagen den 28 november kl. 10.00 i rum 4523, KTH CSC, Lindstedtsvägen 5, plan 5.

## GRU-SEMINARIUM I MATEMATIK

**Mats Boij och Krister Svanberg:**  
**Hur ser KTHs lärare på matematikens roll  
i civilingenjörsprogrammen?**

*Sammanfattning:* I seminariet redovisar vi resultaten av en enkätundersökning som utförts på uppdrag av KTHs utbildningsutskott. Enkäten innehåller 27 påståenden om matematik. Drygt 60 utvalda lärare och programansvariga på KTH har angett i vilken grad de instämmer i respektive påstående. Dessutom har många skrivit fria kommentarer i anslutning till svaren. Det påstående som fick starkast stöd av alla visade sig vara "Matematikutbildningen på KTH skall leda till att studenten förvärvar problemlösningsförmåga". Baserat på enkätsvaren föreslår vi att en ny "matematisk baskurs" utvecklas och får inleda utbildningen på många civilingenjörsprogram.

*Tid och plats:* Fredagen den 28 november kl. 12.15–13.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

## KCSE SEMINAR

**Erwin Laure:**  
**Providing a production Grid infrastructure  
for collaborative science**

*Abstract:* EGEE (Enabling Grids for eScience) operates a large scale production Grid infrastructure federating over 250 sites from 52 countries world-wide providing over 70000 CPUs and about 20 PB of disk storage to a wide variety of scientific applications. In this talk we review the challenges and successes of EGEE in building, operating, and evolving the Grid infrastructure and highlight a few example applications. In the second half of this talk we will discuss future directions of Grids in Europe, in particular how National Grid Infrastructures will pave the way to the sustainable provision of production Grids.

*Tid och plats:* Onsdagen den 3 december kl. 14.30–15.30 i sal FB42, Roslagstullsbacken 21, AlbaNova universitetscentrum.

## DISPUTATION I DATALOGI

Per Austrin

skall disputera på avhandlingen

**Conditional Inapproximability and Limited Independence**

fredagen den 28 november 2008 kl. 13.00 i sal D3, KTH, Lindstedtsvägen 5, b.v. Till opponent har utsetts *Assistant Professor Ryan O'Donnell*, School of Computer Science, Carnegie Mellon University, USA.

*Abstract of the thesis*

Understanding the theoretical limitations of efficient computation is one of the most fundamental open problems of modern mathematics. This thesis studies the *approximability* of intractable optimization problems. In particular, we study so-called MAX CSP problems. These are problems in which we are given a set of constraints, each constraint acting on some  $k$  variables, and are asked to find an assignment to the variables satisfying as many of the constraints as possible.

A predicate  $P : [q]^k \rightarrow \{0, 1\}$  is said to be *approximation resistant*, if it is intractable to approximate the corresponding CSP problem to within a factor which is better than what is expected from a completely random assignment to the variables. We prove that if the Unique Games Conjecture is true, then a sufficient condition for a predicate  $P : [q]^k \rightarrow \{0, 1\}$  to be approximation resistant is that there exists a pairwise independent distribution over  $[q]^k$  which is supported on the set of satisfying assignments  $P^{-1}(1)$  of  $P$ .

We also study predicates  $P : \{0, 1\}^2 \rightarrow \{0, 1\}$  on two boolean variables. The corresponding CSP problems include fundamental computational problems such as MAX CUT and MAX 2-SAT. For any  $P$ , we give an algorithm and a Unique Games-based hardness result. Under a certain geometric conjecture, the ratios of these two results are shown to match exactly. In addition, this result explains why additional constraints beyond the standard “triangle inequalities” do not appear to help when solving these problems. Furthermore, we are able to use the generic hardness result to obtain improved hardness for the special cases of MAX 2-SAT and MAX 2-AND. For MAX 2-SAT, we obtain a hardness of  $\alpha_{LLZ} + \epsilon \approx 0.94016$ , where  $\alpha_{LLZ}$  is the approximation ratio of the algorithm due to Lewin, Livnat and Zwick. For MAX 2-AND, we obtain a hardness of 0.87435. For both of these problems, our results surprisingly demonstrate that the special case of balanced instances (instances where every variable occurs positively and negatively equally often) is not the hardest. Furthermore, the result for MAX 2-AND also shows that MAX CUT is not the hardest 2-CSP.

Motivated by the result for  $k$ -CSP problems, and their fundamental importance in computer science in general, we then study  $t$ -wise independent distributions with random support. We prove that, with high probability,  $\text{poly}(q) \cdot n^2$  random points in  $[q]^n$  can support a pairwise independent distribution. Then, again with high probability, we show that  $(\text{poly}(q) \cdot n)^t \log(n^t)$  random points in  $[q]^n$  can support a  $t$ -wise independent distribution. For constant  $t$  and  $q$ , we show that  $\Omega(n^t)$  random points are necessary in order to be able to support a  $t$ -wise independent *balanced* distribution with non-negligible probability. Also, we show that *every* subset of  $[q]^n$  with size at least  $q^n(1 - \text{poly}(q)^{-t})$  can support a  $t$ -wise independent distribution.

Finally, we prove a certain noise correlation bound for low-degree functions with small Fourier coefficients. This type of result is generally useful in hardness of approximation, derandomization, and additive combinatorics.

## SEMINARIUM I FINANSIELL MATEMATIK

Mikael Hatanpää

presenterar sitt examensarbete:

### Using Replicating Portfolios for Hedging Swedish Traditional Life Insurance Companies

*Abstract:* Due to declining equity and fixed income markets, insurers of traditional life suffer from declining buffer capital since it has to make capital injections to fulfil obligations against its policyholders.

In this thesis, a method of solvency improvement for traditional insurance companies is developed and evaluated. At first, a fictional proprietary traditional insurance company is created as a test object. This company will then be applied a hedging strategy by matching sensitivities of a replicating portfolio, which is an approximation of the insurer's expected liability with hedging instruments traded on the market.

As a part of the analysis, this company will be subjected to different economic stress scenarios consistent with those defined in the traffic-light model, a regulatory tool developed by the Swedish Financial Supervisory Authority.

The results indicate that the fictional insurance company can reduce its required buffer capital between 40 % and 60 % without any actions from the regulator, depending on which year the traffic-light test was executed.

*Tid och plats:* Måndagen den 1 december kl. 15.15–16.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

## KOMBINATORIKSEMINARIUM

Anders Björner:

### Användning av FKG och liknande olikheter i extremal kombinatorik

*Sammanfattning:* Extremala problem dyker upp inom alla delar av kombinatoriken. Det finns flera ofta förekommande rent mängdteoretiska frågeställningar som utgör en kärna inom vad som brukar kallas "extremal kombinatorik". Gil Kalai har nyligen skrivit en serie underhållande och informativa bloggar om detta område, se <http://wordpress.com/tag/extremal-combinatorics/>.

Extremal kombinatorik har rykte om sig att vara ett "laglöst territorium", där allmänna metoder saknas och framsteg åstadkoms enbart via slingriga ad-hoc-resonemang och stor list. Ryktet är inte helt ogrundat. Men laglösheten är inte total. Till exempel beskriver Gil en viktig allmän metod: så kallad "skiftning" av mängdfamiljer.

Jag tänker informera litet allmänt om extremal kombinatorik och framför allt berätta om en intressant metod (som Gil inte omnämner), nämligen användande av FKG-olikheten och dess generaliseringar. Kanske också något om skiftning.

Seminariet har allmänbildningskaraktär och kräver inga förkunskaper. Men läs gärna Gils bloggar.

*Tid och plats:* Onsdagen den 3 december kl. 10.15–12.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

## PLURIKOMPLEXA SEMINARIET

**Andreas Axelsson:**

### **An introduction to the Hodge-Dirac operator $d + \delta$**

*Abstract:* This talk is meant to give a short elementary introduction to the non-commutative extension of one-variable complex analysis, to real Euclidean  $n$ -dimensional space. Here complex algebra is generalized to non-commutative Clifford algebra, and the Cauchy-Riemann equations generalize to the Hodge-Dirac equation. We shall see how the Cauchy reproducing formula generalizes to  $\mathbb{R}^n$  and how monogenic fields, i.e. the higher-dimensional analytic functions, relates to conformal/Möbius mappings.

For those interested in calculus with exterior and Clifford algebra, we mention that the speaker plans to give a graduate course on the topic in the fall of 2009.

*Tid och plats:* Tisdagen den 2 december kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

## LOGIKSEMINARIET STOCKHOLM-UPPSALA

**Vera Koponen:**

### **Zero-one laws for finite substructures of countably categorical structures**

*Abstract:* We consider a probability measure on finite structures, such that if  $M$  belongs to a certain class of countably categorical structures with the finite submodel property, then: For every first-order sentence, it is true in  $M$  if and only if it is almost surely true in any finite substructure of  $M$ . (With the uniform probability measure this does not necessarily hold.)

*Tid och plats:* Onsdagen den 3 december kl. 10.30–12.30 i sal 80101, Ångströmlaboratoriet, hus 8, markplanet, Uppsala universitet.

## SEMINARIUM I NUMERISK ANALYS

**Hailang Liu:**

### **Alternating evolution vs. flux refinement for convection diffusion problems**

*Abstract:* High resolution computation of convection and diffusion is important in many applied partial differential equations, ranging from Euler, Navier-Stokes to Fokker-Planck equations. In this talk I shall present two novel numerical methods for problems involving these terms: i) the alternating evolution (AE) method for convection — based on sampling of a refined description of the underlying equation on alternative grids, and ii) the direct discontinuous Galerkin (DDG) method for diffusion — based on a novel numerical flux formula for the solution gradient. For each method I shall highlight the essential step — a step in which the ‘physics’ is incorporated into the method via the model refinement. The discretization of the refined model is then purely of numerical nature. Some numerical results will be presented to show the capacity of these methods.

*Tid och plats:* Torsdagen den 4 december kl. 13.15–14.00 i rum 1537, KTH CSC, Lindstedtsvägen 3, plan 5.



## ALGEBRA AND GEOMETRY SEMINAR

**Fredrik Nordström:**

### Homotopy colimits over categories of chain complexes

*Abstract:* The category of finitely generated free (projective)  $A$ -modules is a classical construction, used among other things to compute the topological Hochschild homology of  $A$ . One way to describe this category is as the full subcategory of  $(A\text{-Mod} \downarrow 0)$ , the category of  $A$ -modules over 0, defined by the objects with finitely generated and free domain. This definition invites two generalizations; first, the zero module may be replaced with a general  $A$ -module  $M$ , second, the ambient category  $A\text{-Mod}$  may be replaced with  $\text{Ch}(A)$ , the category of positively graded chain complexes of  $A$ -modules. By placing conditions on the length of these chain complexes, and possibly also additional homological conditions, a family of categories is produced for each fixed  $M$ .

In this talk, I will discuss how these categories encode various algebraic and homological properties of  $A$  and  $M$ . Also, I will discuss methods for constructing homotopy colimits of functors indexed by these categories and taking values in  $\text{Ch}(A)$ . In particular, the forgetful functor will play an important role.

*Tid och plats:* Onsdagen den 3 december kl. 13.15–15.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

## PRESENTATIONER AV MAGISTER- OCH KANDIDATARBETEN I MATEMATISK STATISTIK

Onsdagen den 3 december kommer tre magisterarbeten och ett kandidatarbete i matematisk statistik att presenteras vid Matematiska institutionen, SU. Lokalen för alla presentationerna är sal 31, hus 5, Matematiska institutionen, SU, Kräftriket. De fyra rapporterna kommer inom kort att finnas på sidan <http://www2.math.su.se/matstat/reports/serieb>.

Kl. 8.00 ges följande presentation (magisterarbete):

**Tommy Nyberg:**

### Fully Decentralized Sequential Detection in an Underwater Setting

*Handledare:* **Ola Hössjer.**

*Abstract:* In this thesis we present a model for a detector network of acoustic sensor nodes to be used in the military underwater setting. The model accounts for well-known properties of acoustic sensing and communication equipment, and to this end we employ the traditional decentralized detection framework combined with ideas from the field of team decision theory, thus arriving at a network model which operates without a centralized fusion center. The model instead gives the decision to sound the alarm to individual detector nodes, which classify the presence of a target using the classic Bayes' detector framework, applied for time-dependent sequential hypothesis testing. The detector network employs an internal message-passing scheme, thus reducing outside communication to a minimum. Reduction of internal network communication is achieved through a sensor censoring scheme, where uninformative messages are withheld, and the detector nodes adjust for these missing data. Indicative simulation results are presented.

(Fortsättning på nästa sida.)

Kl. 9.00 ges följande presentation (kandidatarbete):

**Sini Kilpeläinen:**  
**Microarray Data Analysis of Dyslexia Candidate Genes**

*Handledare:* **Ola Hössjer.**

*Abstract:* The aim of this project is to identify downstream target genes and pathways of dyslexia candidate genes (DCGs) in a cell model.

The microarray data are first controlled and preprocessed by means of quality control and normalization of the arrays. Then a linear model is fitted to the log-intensity expression values and parameters are estimated for contrasts of the treated samples against the controls. The most significant genes are listed according to different statistics and expression measures and these are illustrated with different kinds of plots. The statistical analysis of the microarray data is performed using the statistical software R as implemented in the Bioconductor packages.

Kl. 10.00 ges följande presentation (magisterarbete):

**Erland Ekheden:**  
**The Pricing of Catastrophe Cover in Life Reinsurance**

*Handledare:* **Ola Hössjer.**

*Abstract:* What is the correct price of a catastrophe cover in life reinsurance? During a review of the current standard model due to Strickler (1960) we find that this model has some serious shortcomings. We therefore present a new model for the pricing of catastrophe excess of loss cover (Cat XL). The new model for annual claim cost  $C$  is based on a compound Poisson process of catastrophe costs. To evaluate the distribution of the cost of each catastrophe, we use the Peaks Over Threshold model for the total number of lost lives in each catastrophe and the beta binomial model for the proportion of these corresponding to customers of the insurance company. To be able to estimate the parameters of the model, two data sets with catastrophe data were collected and compiled, one international set with catastrophes claiming at least 20 lives and one Swedish list of accidents claiming at least 4 lives. Fitting the new model to data, we find the fit to be good. We also present how to extrapolate data, thus being able to draw conclusions about catastrophes claiming less than 20 lives. Finally we give the price of a Cat XL contract and perform a sensitivity analysis of how the parameters affect  $E[C]$  and  $SD(C)$  and thus the price.

Kl. 11.00 ges följande presentation (magisterarbete):

**Mickael Kyrlis:**  
**An Overview of Stochastic Claims Reserving**  
**with an Application Using Chain Ladder, GLM and Bootstrap**

*Handledare:* **Ola Hössjer.**

*Abstract:* Reserving is one of the most important subjects in non-life insurance mathematics. This project gives a brief overview of stochastic claims reserving, a field that has seen great development the latest decades.

Attention has been given to introduce reserving in a general framework in order to give the reader a background before describing mathematical reserving methodologies. Further on, we present a first application of Mack's chain ladder method and its assumptions. Thereafter, a modern bootstrap approach is used, with an underlying generalized linear model (GLM), using real paid claims automobile data.

**INSTITUT MITTAG-LEFFLER SEMINAR**

**Göran Bergqvist: Causal tensors**

*Abstract:* In Lorentzian geometry, given any tensor one can construct an essentially unique square of it, having the pure energy component dominating the other components, i.e. satisfying the dominant energy condition or its higher-rank generalizations. Well-known examples are the energy-momentum tensors of Maxwell fields and massless scalar fields, and the Bel-Robinson and Bel tensors. We review this construction and present some recent applications.

*Tid och plats:* Torsdagen den 4 december kl. 14.00–15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

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**INSTITUT MITTAG-LEFFLER SEMINAR**

**Justin Corvino:**

**The center of mass of isolated systems  
from a geometric point of view**

*Abstract:* We discuss several definitions of the center of mass of asymptotically flat manifolds. We recall the role of the center of mass in geometric gluing constructions, and the relation of the center of mass to the isoperimetric problem. We present joint work with Haotian Wu, which identifies the Huisken-Yau center of mass with the center of mass arising from the Hamiltonian formulation of general relativity.

We will also survey recent work of Lan-Hsuan Huang, which, under fairly general asymptotics, develops a geometric center of mass and unifies the various definitions.

*Tid och plats:* Torsdagen den 4 december kl. 15.30–16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

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**KTH/SU MATHEMATICS COLLOQUIUM**

**Nikolai Vorobiev:**

**Compact approximations and topological complexity  
of definable sets**

*Abstract:* Around 1950 Petrovskii and Oleinik, and then in the 1960s Milnor and Thom, proved explicit upper bounds on total Betti numbers of real algebraic sets in terms of degrees and numbers of variables of the defining polynomials. The principal difficulty with expanding these results to formulae more general than conjunctions of polynomial equations arises when sets are not locally closed. We describe a construction for approximating arbitrary definable sets by compact ones with dominating topological complexity. This allows, in particular, to improve the known upper bounds on Betti numbers of semialgebraic sets and to obtain a singly exponential bound on Betti numbers of sub-Pfaffian sets.

*Tid och plats:* Onsdagen den 10 december kl. 16.00 i sal 14, hus 5, Matematiska institutionen, SU, Kräftriket. Kaffe/te serveras från kl. 15.30 i institutionens lunchrum.

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## DISPUTATION I MATEMATIK

Rikard Olofsson

skall disputeras på avhandlingen

**Problems in Number Theory related to Mathematical Physics**

måndagen den 8 december 2008 kl. 13.00 i sal F3, KTH, Lindstedtsvägen 26, b.v. Till opponent har utsetts Associate "Hadamard" Professor Nalini Anantharaman, Centre de Mathématiques Laurent Schwartz, École Polytechnique, Palaiseau Cedex, Frankrike.

***Abstract of the thesis***

This thesis consists of an introduction and four papers. All four papers are devoted to problems in Number Theory.

In Paper I, a special class of local  $\zeta$ -functions is studied. The main theorem states that the functions have all zeros on the line  $\operatorname{Re}(s) = 1/2$ . This is a natural generalization of the result of Bump and Ng stating that the zeros of the Mellin transform of Hermite functions have  $\operatorname{Re}(s) = 1/2$ .

In Paper II and Paper III we study eigenfunctions of desymmetrized quantized cat maps. If  $N$  denotes the inverse of Planck's constant, we show that the behaviour of the eigenfunctions is very dependent on the arithmetic properties of  $N$ . If  $N$  is a square, then there are normalized eigenfunctions with supremum norm equal to  $N^{1/4}$ , but if  $N$  is a prime, the supremum norm of all eigenfunctions is uniformly bounded. We prove the sharp estimate  $\|\psi\|_\infty = O(N^{1/4})$  for all normalized eigenfunctions and all  $N$  outside of a small exceptional set. For normalized eigenfunctions of the cat map (not necessarily desymmetrized), we also prove an entropy estimate and show that our functions satisfy equality in this estimate. We call a special class of eigenfunctions newforms and for most of these we are able to calculate their supremum norm explicitly. For a given  $N = p^k$ , with  $k > 1$ , the newforms can be divided in two parts (leaving out a small number of them in some cases), the first half all have supremum norm about  $2/\sqrt{1 \pm 1/p}$  and the supremum norm of the newforms in the second half have at most three different values, all of the order  $N^{1/6}$ . The only dependence of  $A$  is that the normalization factor is different if  $A$  has eigenvectors modulo  $p$  or not. We also calculate the joint value distribution of the absolute value of  $n$  different newforms.

In Paper IV we prove a generalization of Mertens' theorem to Beurling primes, namely that  $\lim_{n \rightarrow \infty} (1/\ln n) \prod_{p \leq n} (1 - p^{-1})^{-1} = Ae^\gamma$ , where  $\gamma$  is Euler's constant and  $Ax$  is the asymptotic number of generalized integers less than  $x$ . Thus the limit

$M = \lim_{n \rightarrow \infty} (\sum_{p \leq n} p^{-1} - \ln(\ln n))$  exists. We also show that this limit coincides with  $\lim_{\alpha \rightarrow 0^+} (\sum_p p^{-1} (\ln p)^{-\alpha} - 1/\alpha)$ ; for ordinary primes this claim is called Meissel's theorem. Finally we will discuss a problem posed by Beurling, namely how small  $|N(x) - [x]|$  can be made for a Beurling prime number system  $Q \neq P$ , where  $P$  is the rational primes. We prove that for each  $c > 0$  there exists a  $Q$  such that  $|N(x) - [x]| \leq c \ln x$  and conjecture that this is the best possible bound.

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## SEMINARIUM I STATISTIK

Pär Stockhammar och Lars-Erik Öller:

### On the probability distribution of economic growth

*Abstract:* Normality is often mechanically and without sufficient reason assumed in econometric models. In this seminar three important and significantly heteroscedastic GDP series are studied. Heteroscedasticity is removed and the distributions of the filtered series are then compared to a Normal, a Normal-Mixture and a Normal-Asymmetric Laplace (NAL) distribution. NAL represents a reduced and empirical form of the Aghion and Howitt (1992) model for economic growth, based on Schumpeter's idea of creative destruction. The NAL distribution competes well with the alternatives, lending some support to the Aghion and Howitt hypothesis.

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

## SEMINARIUM I FINANSIELL MATEMATIK

Jérémie Finas

presenterar sitt examensarbete:

### Forecasting power prices on the French electricity market — An overview

*Abstract:* Electricity or power is a special energy commodity due to its non-storability. Thus, contrary to other commodities, the spot price of power is mainly driven by fundamentals, i.e. the state of the supply and the demand. That is why, even if it can be challenging, it is worth trying to develop models to estimate the spot price of power in a given market at a given time. The aim of this thesis is to construct and implement two families of models that simulate the future spot prices for power on a given market.

*Tid och plats:* Torsdagen den 11 december kl. 14.15–15.00 i seminarierum 3733, 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 2008. 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](http://www.umu.se/umu/aktuellt/stipendier_fond_anslag.html).

(Continued on the next page.)

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

#### *Jobs to apply for*

11. KTH utlyser postdoc-tjänster (postdoctoral fellowships) i matematik. De sökande förväntas bedriva forskning inom ett av följande områden: Algebraisk geometri, dynamiska system, kombinatorik, komplex analys, matematisk fysik och spektralteori, talteori eller partiella differentialekvationer. Tjänsten varar i ett år men kan förlängas med ytterligare ett år. Sista ansökningsdag är den 7 januari 2009. Web-info: <http://www.math.kth.se/postdocs/>.

### Old information

#### *Money to apply for*

12. 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 2009. Web-info: [http://www.kva.se/KVA\\_Root/swe/awards/scholarships/detail\\_scholarships.asp?grantsId=11&br=ns&ver=6up](http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=11&br=ns&ver=6up).
13. 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 2009. Web-info: [http://www.kva.se/KVA\\_Root/swe/awards/scholarships/detail\\_scholarships.asp?grantsId=45](http://www.kva.se/KVA_Root/swe/awards/scholarships/detail_scholarships.asp?grantsId=45).

#### *Jobs to apply for*

14. Lunds universitet söker en biträdande universitetslektor (associate senior lecturer) i matematik med inriktning mot icke-linjära partiella differentialekvationer. Sista ansökningsdag är den 28 november. Web-info: [http://www.science.lu.se/upload/LUPDF/natvet/Utlysningar/081128\\_3331e.pdf](http://www.science.lu.se/upload/LUPDF/natvet/Utlysningar/081128_3331e.pdf).
  15. Københavns Universitet söker doktorander i matematik. Sista ansökningsdag är den 1 januari 2009. Web-info: <http://www.math.ku.dk/english/programmes/ph.d/apply/>.
  16. 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, 2009. Web-info: <http://www.mittag-leffler.se/programs/0910/grants.php>.
  17. Umeå universitet söker två universitetslektorer i matematik, varav en är med inriktning mot matematisk analys. Sista ansökningsdag är den 15 december. Web-info: [http://www.umu.se/umu/aktuellt/arkiv/lediga\\_tjanster/312-3204,3036-08.html](http://www.umu.se/umu/aktuellt/arkiv/lediga_tjanster/312-3204,3036-08.html).
  18. Umeå universitet söker en professor i matematisk statistik. Sista ansökningsdag är den 15 december. Web-info: [http://www.umu.se/umu/aktuellt/arkiv/lediga\\_tjanster/311-3037-08.html](http://www.umu.se/umu/aktuellt/arkiv/lediga_tjanster/311-3037-08.html).
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