



BRÅKET



Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 22

TORSDAGEN DEN 5 JUNI 2008

BRÅKET

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

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100 44 Stockholm

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Sista manustid för nästa nummer:
Torsdagen den 12 juni kl. 13.00.

Disputation i matematik

Martin Bender disputerar vid KTH på avhandlingen *Limit theorems for generalizations of GUE random matrices* fredagen den 13 juni kl. 10.00. Se sidan 6.

Nästa nummer av Bråket,

som utkommer den 13 juni, blir det sista före sommaruppehållet. Numret därefter utkommer fredagen den 15 augusti.

SEMINARIER

To 06–05 kl. 11.00–12.00. Extra Algebra and Geometry Seminar. (*Observera dagen, tiden och lokalen!*) Fabrizio Zanella, Michigan Technological University, USA: *Interval Conjectures for level Hilbert functions*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 21 sidan 5.

To 06–05 kl. 13.15–14.15. Minicourse in Mathematics. Martin Gulbrandsen: *Local aspects of geometric invariant theory. Fourth lecture*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 17 sidan 10.

Fortsättning på nästa sida.

Disputation i matematik

Teitur Arnarson disputerar på avhandlingen *PDE methods for free boundary problems in financial mathematics* torsdagen den 5 juni kl. 14.00 i sal F3, KTH, Lindstedtsvägen 26, b.v. Se Bråket nr 21 sidan 10.

Disputation i strömningsmekanik

Linus Marstorp disputerar vid KTH på avhandlingen *Modelling of subgrid-scale stress and passive scalar flux in large eddy simulations of wall bounded flows* fredagen den 13 juni kl. 10.30. Se sidan 7.

Free Boundary Problems — Theory and Applications

En konferens med denna titel skall äga rum vid KTH den 9–13 juni. Se <http://www.math.kth.se/FBP08/>.

Risk Modelling in Insurance and Finance

En konferens med denna titel skall äga rum vid KTH fredagen den 13 juni. Se Bråket nr 21 sidorna 8–10.

Seminarier (fortsättning)

To 06–05 kl. 13.15–15.00. Algebra and Geometry Seminar. (*Observera dagen!*) **Professor Alexandru Suciu**, Northeastern University, Boston, USA: *Topology and combinatorics of polyhedral products*. Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 20 sidan 12.

Professor Suciu är opponent vid Alexander Berglunds disputation. Se Bråket nr 20 sidan 12.

To 06–05 kl. 14.00–15.00. Mittag-Leffler Seminar. **Mats Andersson**, Chalmers tekniska högskola, Göteborg: *The Briançon-Skoda theorem on a singular variety*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se Bråket nr 21 sidan 7.

To 06–05 kl. 14.00. Licentiatseminarium i mekanik. **Shervin Bagheri** presenterar sin licentiatavhandling: *Stability analysis and control design of spatially developing flows*. Opponent: **Professor Martin Berggren**, Datavetenskap, Umeå universitet. Sal D41, KTH, Lindstedtsvägen 17, 1 tr. Se Bråket nr 20 sidan 11.

To 06–05 kl. 15.15–15.45. Redovisning av examensarbete i matematik. **Nicklas Löf**: *Automatisk detektion och kvantifiering av ikosaedriska virus*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 21 sidan 6.

To 06–05 kl. 15.15–16.15. AlbaNova and Nordita Colloquium in Physics. **Professor Ramesh Narayan**, Harvard: *Measuring black hole spin*. Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se Bråket nr 20 sidan 15.

To 06–05 kl. 15.30–16.30. Mittag-Leffler Seminar. **Burglind Juhl-Jöricke**, Institut Mittag-Leffler: *Envelopes of holomorphy and holomorphic discs*. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se Bråket nr 21 sidan 7.

Må 06–09 kl. 13.15–14.15. DNA-seminariet Uppsala-KTH (Dynamical systems, Number theory, Analysis). **Rafael de la Llave**, University of Texas at Austin: *Some geometric mechanisms of instability in Hamiltonian dynamical systems*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Må 06–09 kl. 15.15–16.15. CIAM Colloquium. **Charles Wampler**, General Motors and Adj. Professor at the University of Notre Dame, USA: *Robots, mechanisms, and Algebraic Geometry*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 21 sidan 12.

Må 06–09 kl. 15.15. Seminarium i matematisk statistik. **Ulf Sandström**, ISAK, Linköpings universitet, och Industriell dynamik, KTH: *Waring-distributioner: tillämpningar på svenska universitet och institutioner*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Ti 06–10 kl. 10.15–11.00. Seminarium i matematisk statistik. (*Observera dagen och tiden!*) **Magnus Carlsen** presenterar sitt examensarbete: *Condition Monitoring on Sub-Ice Systems*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Ti 06–10 kl. 11.15–12.00. Seminarium i finansiell matematik. (*Observera dagen och tiden!*) **Daniel Rufelt** presenterar sitt examensarbete: *Fast trading: Stochastic Modeling and Simulation of Latency in Marketplace Systems*. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 8.

Fortsättning på nästa sida.

Seminarier (fortsättning)

- On 06–11 kl. 10.00–11.00. Presentation av examensarbete i matematik** (15 högskolepoäng, påbyggnadsnivå). **Kharema Ebshesh**: *Operator theory in finite-dimensional vector spaces*. Handledare: **Andrzej Szulkin** och **Yishao Zhou**. Sal 21, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 7.
- On 06–11 kl. 11.15–12.15. Presentation av examensarbete i matematik** (30 högskolepoäng, fördjupningsnivå). **Magnus Sörin**: *Algebraic properties of completely discretely stable graphs*. Handledare: **Jörgen Backelin**. Sal 21, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 7.
- On 06–11 kl. 13.00–14.00. Presentation av examensarbete i matematik** (30 högskolepoäng, fördjupningsnivå). **Karin Fremling**: *Mathematical properties of epidemiological case-cohort designs*. Handledare: **Juni Palmgren** och **Samuli Ripatti**. Sal 21, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 8.
- On 06–11 kl. 13.15–15.00. Algebra and Geometry Seminar.** **Samuel Boissière**, Nice: *The Cohomological Crepant Resolution Conjecture*. Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 5.
- On 06–11 kl. 15.15. Seminarium i matematisk statistik.** **Tom Britton**, SU: *Random graphs: a useful tool in epidemic modelling*. Rum 306 (Cramértrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 6.
- On 06–11 kl. 16.00–17.00. KTH/SU Mathematics Colloquium — CIAM Colloquium.** **Andrew J. Sommese**, Director of the Center for Applied Mathematics and V. Duncan Professor of Mathematics at the University of Notre Dame, USA: *A brief introduction to Numerical Algebraic Geometry*. 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 Bråket nr 21 sidan 11.
- Fr 06–13 kl. 10.00. Licentiatseminarium i optimeringslära och systemteori.** **Yohei Kuroiwa** presenterar sin licentiatavhandling: *Sensitivity Shaping under Degree Constraint: Nevanlinna-Pick Interpolation for Multivariable and Time-Delay Systems*. Opponent: **Professor Per-Olov Gutman**, Technion, Haifa, Israel. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.
- Fr 06–13 kl. 15.15–16.15. CIAM tutorial on the program Bertini.** **Jon Hauenstein**, University of Notre Dame, USA: *Algorithms of Numerical Algebraic Geometry and Bertini*. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 21 sidan 11.
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**DNA-SEMINARIET UPPSALA-KTH
(DYNAMICAL SYSTEMS, NUMBER THEORY, ANALYSIS)**

Rafael de la Llave:

**Some geometric mechanisms of instability
in Hamiltonian dynamical systems**

Abstract: There are several geometric structures that provide road maps for trajectories to perform several wide excursions in Hamiltonian dynamical systems. We want to present several of them, obtained in joint work with A. Delshams, M. Gidea, T. M. Seara.

Tid och plats: Måndagen den 9 juni kl. 13.15–14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I MATEMATISK STATISTIK

Ulf Sandström:

**Waring-distributioner: tillämpningar
på svenska universitet och institutioner**

Sammanfattning: Seminariet kommer att behandla ett internt KTH-projekt där Waring-metoden används för att undersöka författarproduktiviteten på institutionsnivå. Därutöver visas tillvägagångssättet för den tillämpning av metoden som användes på svenska universitet under perioden 2003–2006.

Rekommenderad läsning: Ulf Sandström och Erik Sandström: Resurser för citeringar. Högskoleverkets rapport 2008:18R. Denna finns att hämta på <http://www.hsv.se/download/18.8f0e4c9119e2b4a60c80006308/0818R.pdf>.

Tid och plats: Måndagen den 9 juni kl. 15.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I MATEMATISK STATISTIK

Magnus Carlsen

presenterar sitt examensarbete:

Condition Monitoring on Sub-Ice Systems

Abstract: Enormous oil and gas resources are located in seas that for large parts of the year are covered with ice. Subsea structures can be a way of dealing with ice related problems, such as damage to the structure, but instead maintenance access could be a problem.

Condition monitoring can be used to discover developing failures and it can possibly also be used to prognosticate remaining machine life. Currently there is almost no condition monitoring on subsea installations. Several ways to study machine condition exist, especially on rotating machinery.

To study if, how and why condition monitoring facilitates extraction of oil and gas in sub-ice environments, a reliability, availability and maintainability analysis is performed. The analysis shows that condition monitoring considerably improves availability and costs for sub-ice installations. The largest positive effects are shown on components with heavy rotating parts and on Xmas trees (structures close to the well containing lots of valves).

Tid och plats: Tisdagen den 10 juni kl. 10.15–11.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

ALGEBRA AND GEOMETRY SEMINAR

Samuel Boissière:

The Cohomological Crepant Resolution Conjecture

Abstract: The Cohomological Crepant Resolution Conjecture is one form of Ruan's conjecture concerning the relation between the geometry of a quotient singularity X/G — where X is a smooth complex variety and G a finite group of automorphisms of X — and the geometry of a crepant resolution of singularities of X/G . It generalizes the classical McKay correspondence. Following the example of the Hilbert schemes of points on surfaces and the example of the weighted projective spaces, I will explain how the theory has been developed during the last years.

Tid och plats: Onsdagen den 11 juni kl. 13.15–15.00 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

LICENTIATSEMINARIUM I OPTIMERINGSLÄRA OCH SYSTEMTEORI

Yohei Kuroiwa

presenterar sin licentiatavhandling:

Sensitivity Shaping under Degree Constraint: Nevanlinna-Pick Interpolation for Multivariable and Time-Delay Systems

Opponent: **Professor Per-Olov Gutman**, Technion, Haifa, Israel.

Abstract: This thesis is a collection of papers about generalizations and applications of the theory of the analytic interpolation with complexity constraint by C. I. Byrnes, T. T. Georgiou and A. Lindquist. The first paper is about a generalization to the bi-tangential interpolation problem. A smooth and complete parameterization of interpolants is given by solving a convex optimization problem similar to previous works. There is a new feature such that the class of free parameters may be specified to obtain lower degree of interpolants.

In the second paper, the theory is generalized to the two-sided Nudelman interpolation problem. The interpolation problem includes Carathéodory-Fejer, Nevanlinna-Pick, and bi-tangential Nevanlinna-Pick with multiple interpolation points. For an application, a benchmark problem of the H_∞ control is considered in terms of the generalized theory.

In the third paper, the unweighted H_∞ sensitivity shaping of systems with time delays is considered. It was pointed out by C. Foias, A. Tannenbaum and G. Zames in 1987 that the unweighted H_∞ sensitivity minimization of systems with time delays can be cast as a finite-dimensional Nevanlinna-Pick interpolation problem. This problem is studied in terms of the theory of the Nevanlinna-Pick interpolation with degree constraint.

In the fourth paper, a uniqueness of an ARMA modelling filter for a solution to the rational covariance extension problem in the multivariable case is given. For given covariance data and specified MA part of the modelling filter, there exists a unique AR part of the modelling filter. The MA part of the modelling filter provides a complete parameterization of all positive rational extensions of a covariance sequence. This uniqueness of the multivariable ARMA modelling filter is shown by applying degree theory to a nonlinear map which is homotopic to a nonlinear map determining the maximum entropy solution.

Tid och plats: Fredagen den 13 juni kl. 10.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I MATEMATISK STATISTIK

Tom Britton:

Random graphs: a useful tool in epidemic modelling

Abstract: When an infectious disease spreads in a community, two characteristics affect the dynamics: the disease agent and its transmissability, and the social structure in the community. Usually neither of these characteristics is fully known, making stochastic models useful. The social structure may be modelled using random graphs/networks incorporating known structures of the community, such as degree distribution (the number of friends) and/or clustering (the presence of social triangles). The disease outbreak is modelled by randomly thinning edges in the graph, and vaccination prior to the outbreak by thinning of nodes in the graph. In the talk we illustrate these methods with some examples and also apply them to data.

Tid och plats: Onsdagen den 11 juni kl. 15.15 i rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket.

DISPUTATION I MATEMATIK

Martin Bender

disputerar på avhandlingen

Limit theorems for generalizations of GUE random matrices

fredagen den 13 juni 2008 kl. 10.00 i sal F3, KTH, Lindstedtsvägen 26, b.v. Till opponent har utsetts *professor Arno Kuijlaars*, Department of Mathematics, Katholieke Universiteit Leuven, Belgien.

Abstract of the thesis

This thesis consists of two papers devoted to the asymptotics of random matrix ensembles and measure valued stochastic processes, which can be considered as generalizations of the Gaussian unitary ensemble (GUE) of Hermitian matrices $H = A + A^\dagger$, where the entries of A are independent identically distributed (iid) centred complex Gaussian random variables.

In the first paper, a system of interacting diffusing particles on the real line is studied; special cases include the eigenvalue dynamics of matrix-valued Ornstein-Uhlenbeck processes (Dyson's Brownian motion). It is known that the empirical measure process converges weakly to a deterministic measure-valued function and that the appropriately rescaled fluctuations around this limit converge weakly to a Gaussian distribution-valued process. For a large class of analytic test functions, explicit formulae are derived for the mean and covariance functionals of this fluctuation process.

The second paper concerns a family of random matrix ensembles interpolating between the GUE and the Ginibre ensemble of $n \times n$ matrices with iid centred complex Gaussian entries. The asymptotic spectral distribution in these models is uniform in an ellipse in the complex plane, which collapses to an interval of the real line as the degree of non-Hermiticity diminishes. Scaling limit theorems are proven for the eigenvalue point process at the right-most edge of the spectrum, and it is shown that a non-trivial transition occurs between Poisson and Airy point process statistics when the ratio of the axes of the supporting ellipse is of order $n^{-1/3}$.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Kharema Ebshesh:

Operator theory in finite-dimensional vector spaces

Handledare: **Andrzej Szulkin och Yishao Zhou.**

Abstract: The theory of linear operators is an extensive area. This thesis is about the linear operators in finite-dimensional vector spaces. We study the symmetric, unitary, isometric, and normal operators, and orthogonal projections in the unitary space, the eigenvalue problem and the resolvent. We give a proof of the minimax principle in the end.

Tid och plats: Onsdagen den 11 juni kl. 10.00 – 11.00 i sal 21, hus 5, Matematiska institutionen, SU, Kräftriket.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Magnus Sörin:

Algebraic properties of completely discretely stable graphs

Handledare: **Jörgen Backelin.**

Abstract: In this thesis, we investigate a class of graphs called completely discretely stable, and also a kind of graph extensions called stitches. The properties of their independence complexes and face lattices are studied. As a corollary, we calculate the f - and h -vectors of a type of combinatorially determined Gorenstein complexes.

Tid och plats: Onsdagen den 11 juni kl. 11.15 – 12.15 i sal 21, hus 5, Matematiska institutionen, SU, Kräftriket.

DISPUTATION I STRÖMNINGSMEKANIK

Linus Marstorp

disputerar på avhandlingen

**Modelling of subgrid-scale stress and passive scalar flux
in large eddy simulations of wall bounded flows**

fredagen den 13 juni 2008 kl. 10.30 i sal D3, KTH, Lindstedtsvägen 5, b.v. Till opponent har utsetts *professor Pierre Comte*, Institut National Polytechnique de Grenoble, Frankrike.

Abstract of the thesis

The aim of the thesis is to develop and validate subgrid-scale models that are relevant for large eddy simulations of complex flows including scalar mixing. A stochastic Smagorinsky model with adjustable variance and time scale is developed by adding a stochastic component to the Smagorinsky constant. The stochastic model is shown to provide for backscatter of both kinetic energy and scalar variance without causing numerical instabilities. In addition, new models for the subgrid-scale stress and passive scalar flux are derived from modelled subgrid scale transport equations. These models properly account for the anisotropy of the subgrid scales and have potentials wall bounded flows. The proposed models are validated in wall bounded flows with and without rotation and show potential or significantly improve predictions for such cases.

SEMINARIUM I FINANSIELL MATEMATIK

Daniel Rufelt

presenterar sitt examensarbete:

Fast trading: Stochastic Modeling and Simulation of Latency in Marketplace Systems

Abstract: An increasing part of all the trading conducted at financial marketplaces (like stock exchanges) is executed by computers using different automated strategies. Whatever market one looks at, volume shares of over 30 % is not uncommon for this type of trading. Algorithmic trading has lead to increased volumes being traded (and thus better liquidity), as well as new opportunities to profit from small price changes and other information by quickly and automatically respond to the information by having a trading strategy that makes the right decision extremely fast. This has created a high demand for marketplaces with low latency (response time), and now the industry is talking about latency figures of milliseconds rather than seconds and the trend to lower figures is obvious.

In this master thesis the probability distribution of the latency in a computerized trading system (i.e. a marketplace) is analysed by making a simplified stochastic model of the system, with the goal to find bottlenecks, looking at scalability, and understanding how the latency distribution is affected when changing different parameters in the system. Special attention is given to the upper tail of the distribution, because the tail behaviour is crucial when specifying and agreeing on the latency demands of a marketplace.

The system is analysed using queue theory and stochastic discrete event simulation. The main conclusion is that stochastic simulation is probably the best approach when dealing with rather complex marketplace systems. This is valid in particular when it comes to systems with service stations having vacations and dependent arrival times which essentially differ from normal Poisson behaviour. The conclusion is mainly based on the fact that the framework of steady state queue theory is not general enough when it comes to modeling queue networks and relies too heavily on the assumptions of exponential distributions.

Tid och plats: Tisdagen den 10 juni kl. 11.15 – 12.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Karin Fremling:

Mathematical properties of epidemiological case-cohort designs

Handledare: Juni Palmgren och Samuli Ripatti.

Abstract: In this thesis, I describe, and relate to each other, central concepts in event history analysis, including Cox proportional hazards model, the log-linear model and the illness-death model. We are interested in the difference in bias and precision when including, or excluding, the baseline prevalent cases in an analysis of effects of genotype on the hazard using a case-cohort design. I generate populations, according to two models, where the cases, myocardial infarction, depend on the genotype. In one of the models there is a differential selection due to death prior to baseline, expected to distort the genotype-disease association. The case-cohort design is then used in the simulations to define prevalent and incident cases of myocardial infarction, depending on whether the event happened before or after the simulated start of the study. The results do not indicate any strong selection bias from including prevalent cases in the case-cohort analysis.

Tid och plats: Onsdagen den 11 juni kl. 13.00 – 14.00 i sal 21, hus 5, Matematiska institutionen, SU, Kräftriket.