BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 40 **FREDAGEN DEN 4 DECEMBER 2009**

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 10 december kl. 13.00.

SEMINARIER

Fr 12–04 kl. 11.00–12.00. Optimization and Systems Theory Seminar. *(Observera lokalen!)* **Anders Forsgren,** Optimeringslära och systemteori, KTH: *A sufficiently exact inexact Newton step based on reusing matrix information.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.

Fortsättning på nästa sida.

Workshop on Perfect codes and related topics

Denna skall äga rum vid KTH den 4 – 5 december. Se Bråket nr 39 sidorna 5 – 6.

Disputation i numerisk analys

Tomas Oppelstrup skall disputera på avhandlingen *Simulation of relaxation processes in complex condensed matter systems: Algorithmic and physical aspects* torsdagen den 10 december kl. 10.00 i sal D3, KTH, Lindstedtsvägen 5, b.v. Se Bråket nr 39 sidan 10.

Disputation i matematik

Daniel Schnellmann skall disputera vid KTH på avhandlingen *Viana maps and limit distributions of sums of point measures* torsdagen den 17 december kl. 10.00. Se sidan 10.

Disputation i matematik

Samuel Lundqvist skall disputera vid SU på avhandlingen *Computational algorithms for algebras* fredagen den 18 december kl. 10.00. Se sidan 11.

Analysis, probability and geometry in quantum physics and classical mechanics

Ett symposium med denna titel skall äga rum vid KTH tisdagen den 8 december. Se Bråket nr 39 sidan 6.

Ledig tjänst

SU söker en universitetslektor i matematisk statistik. Se sidan 12.

Algebra and Geometry Pre-Seminars

Torsten Ekedahl skall ge korta introduktioner till seminarierna. Se sidan 7.

Seminarier (fortsättning)

Må 12–07 kl. 11.00. Minicourse in mathematics. Kelly Jabbusch: *Positivity in Algebraic Geometry. Fourth lecture.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 37 sidan 4.

Ti 12–08 kl. 9.00 – 9.05. Nobelföreläsningarna 2009. Svante Lindqvist, Kungl. Vetenskapsakademiens preses: *Introduction.* Aula Magna, SU.

Ti 12–08 kl. 9.05 – 9.45. Nobelföreläsning i fysik. Charles K. Kao, Standard Telecommunication Laboratories, Harlow, UK, and The Chinese University of Hong Kong: *Sand from centuries past send future voices fast.* Föreläsningen kommer att hållas av **Mrs. Gwen Kao.** Aula Magna, SU.

Ti 12–08 kl. 9.45 – 10.25. Nobelföreläsning i fysik. Willard Stering Boyle, Bell Laboratories, Murray Hill, USA: *CCD — an extension of man's vision.* Aula Magna, SU.

Ti 12–08 kl. 10.25 – 11.05. Nobelföreläsning i fysik. George Elwood Smith, Bell Laboratories, Murray Hill, USA: *The invention and early history of the CCD.* Aula Magna, SU.

Ti 12–08 kl. 12.30 – 13.10. Nobelföreläsning i kemi. Venkatraman Ramakrishnan, MRC Laboratory of Molecular Biology, Cambridge, UK: *Reading the genetic code: The 3D version.* Aula Magna, SU.

Ti 12–08 kl. 13.10 – 13.50. Nobelföreläsning i kemi. Thomas A. Steitz, Yale University, USA: *From understanding ribosome structure and function to new antibiotics.* Aula Magna, SU.

Ti 12–08 kl. 13.50 – 14.30. Nobelföreläsning i kemi. Ada E. Yonath, Weizmann Institute of Science, Israel: *Polar bears, unpaved roads, Everest climbing and ribosomes in action.* Aula Magna, SU.

Ti 12–08 kl. 15.00 – 15.40. Nobelföreläsning i ekonomi. Elinor Ostrom, Indiana University, Bloomington, USA: *Beyond markets and states: polycentric governance of complex economic systems.* Aula Magna, SU.

Ti 12–08 kl. 15.40 – 16.20. Nobelföreläsning i ekonomi. Oliver E. Williamson, University of California, Berkeley, USA: *Transaction cost economics: The natural progression.* Aula Magna, SU.

Ti 12–08 kl. 18.00. Populärvetenskaplig föreläsning i fysik. Henrik Johansson, Fysikum, SU: *Fysik och astrobiologi: Om utvecklingen från Big Bang till livets molekyler.* Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se Bråket nr 39 sidan 9.

On 12–09 kl. 10.00 – 11.00. Presentation av examensarbete i matematik (15 högskolepoäng, grundnivå). **Emma Knutsson:** *Gröbner bases and applications.* Handledare: **Ralf Fröberg.** Sal 21, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 6.

On 12–09 kl. 10.15 – 11.15. Kombinatorikseminarium. Christer Kiselman, Uppsala: *Characterizing digital straightness using the chord property, word combinatorics, Diophantine inequalities, and difference operators.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 39 sidan 9.

Fortsättning på nästa sida.

Seminarier (fortsättning)

On 12–09 kl. 13.15 – 14.15. Seminarium i analys och dynamiska system. Anders Öberg, Uppsala: *Uniqueness, mixing and Bernoullicity of g-measures.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

On 12–09 kl. 13.15 – 15.00. Algebra and Geometry Seminar. Timur Sadykov, Siberian Federal University och SU: *Dessins d'enfants and differential operators for generic algebraic curves.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 39 sidan 10.

On 12–09 kl. 14.00 – 15.00. Institut Mittag-Leffler Seminar. Erik Palmgren, Uppsala universitet: *Constructivist and structuralist foundations: Bishop's and Lawvere's theories of sets.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 6.

On 12–09 kl. 15.30 – 16.30. Institut Mittag-Leffler Seminar. Bill Mitchell, University of Florida, Gainesville: *The covering lemma: 35 years, and a question.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 7.

On 12–09 kl. 19.00 – 21.00. Populärvetenskaplig julföreläsning i fysik. Carl-Olof Fägerlind och **Max Kesselberg** visar historiska och mindre historiska fysikaliska experiment. *Välkomna till en experimentell exposé i Faradays anda!* Sal FD5 (The Svedbergsalen), Roslagstullsbacken 21, AlbaNova universitetscentrum.

To 12–10 kl. 14.00 – 15.00. Institut Mittag-Leffler Seminar. Stevo Todorcevic, University of Toronto: *A basis problem for compact spaces.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 7.

To 12–10 kl. 15.30 – 16.30. Institut Mittag-Leffler Seminar. Jouko Väänänen, Universitiy of Helsinki and Universitiy of Amsterdam: *Set theory and logic.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 8.

Fr 12–11 kl. 13.15 – 14.15. Graduate Student Seminar. Kathrin Vorwerk: *What is: "Combinatorial fixed point theorems"?* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 38 sidan 5.

Observera att Kathrin Vorwerks seminarium har flyttats till fredagen den 11 december. I Bråket nr 38 anges fel dag för detta seminarium.

Må 12–14 kl. 10.15. Licentiatseminarium i mekanik. David Tempelmann presenterar sin licentiatavhandling: *Stability and Receptivity of Three-Dimensional Boundary Layers.* Opponent: **Dr Stefan Hein,** DLR, Göttingen, Tyskland. Sal E35, KTH, Lindstedtsvägen 3, b.v. Se sidan 8.

Må 12–14 kl. 15.15 – 16.15. Matematiska kollokviet i Uppsala. Ari Laptev, KTH: *Spectrum of PDEs: From Weyl asymptotics to Lieb-Thirring inequalities.* Lokal meddelas senare. Kaffe/te serveras utanför föreläsningssalen kl. 14.55.

Må 12–14 kl. 15.15 – 16.15. Seminarium i matematisk statistik. Professor Jörgen W. Weibull, Handelshögskolan i Stockholm: *The Condorcet Jury Problem and Preference Heterogeneity.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 9.

Ti 12–15 kl. 10.15. Licentiatseminarium i mekanik. Johan Ohlsson presenterar sin licentiatavhandling: *Spectral-element simulations of separated turbulent internal flows.* Opponent: **Professor Jesper Oppelstrup,** Numerisk analys, KTH. Sal E3, KTH, Osquars Backe 14, 2 tr. Se sidan 9.

Fortsättning på nästa sida.

Seminarier (fortsättning)

On 12–16 kl. 13.00. Seminarium i statistik. Pär Stockhammar: *Density forecasting of the Dow Jones share index.* Sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati. Se sidan 7.

On 12–16 kl. 13.15 – 15.00. Algebra and Geometry Seminar. Boris Shapiro, SU: *On some algebras associated with a simple graph.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

On 12–16 kl. 15.15. Licentiatseminarium i matematisk statistik. Anne Wangombe presenterar sin licentiatavhandling: *Stochastic epidemic models for tick-borne diseases.* Inbjuden diskussionsinledare: **Professor Ziad Taib,** AstraZeneca och Chalmers tekniska högskola. Rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 5.

On 12–16 kl. 16.00. KTH/SU Mathematics Colloquium. Sandra Di Rocco, KTH: *Interaction between Convex and 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 sidan 10.

On 12–16 kl. 18.00 – 19.00. Offentlig föreläsning på Kungl. Vetenskapsakademien. Professor Ola Hössjer, Matematisk statistik, SU: *Matematisk statistik och genletning.* Beijersalen, Kungl. Vetenskapsakademien, Lilla Frescativägen 4A, Stockholm. Se nedan.

Ola Hössjers föreläsning föregås av utdelningen av Tobiaspriset. Detta är ett medicinskt forskningsstipendium med anknytning till benmärgstransplantationer.

To 12–17 kl. 15.15 – 16.15. AlbaNova and Nordita Colloquium in Physics. Ulf Leonhardt, University of St Andrews, UK: *Geometry, light and a wee bit of magic.* Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 11.

OFFENTLIG FÖRELÄSNING PÅ KUNGL. VETENSKAPSAKADEMIEN

Ola Hössjer: Matematisk statistik och genletning

Sammanfattning: Många ärftliga sjukdomar orsakas av mutationer i DNA som ärvts från en gemensam anfader. Inom genletning registreras DNA för ett antal personer. Syftet är att hitta DNA-regioner som skiljer sig åt mellan sjuka och friska individer och därför med stor sannolikhet innehåller en mutation. För att kunna beräkna sådana sannolikheter behövs slumpmodeller för nedärvning (Mendels ärftlighetslagar), utbyte av genetiskt material (rekombinationer) och mutationer. I föredraget presenteras några olika genletningsmetoder, speciellt moderna datorintensiva metoder som går ut på att det historiska släktträdet med den muterade anfadern återskapas bakåt i tiden (så kallad koalescensteori). Vidare berörs några av de matematiska möjligheter och svårigheter som orsakas av den molekylärbiologiska utvecklingen — möjligheten att sekvensera DNA för varje enskild individ.

Tid och plats: Onsdagen den 16 december kl. 18.00 – 19.00 i Beijersalen, Kungl. Vetenskapsakademien, Lilla Frescativägen 4A, Stockholm.

OPTIMIZATION AND SYSTEMS THEORY SEMINAR

Anders Forsgren:
A sufficiently exact inexact Newton step based on reusing matrix information

Abstract: Newton's method is a classical method for solving a nonlinear equation. We derive inexact Newton steps that lead to an inexact Newton method, applicable near a solution. The method is based on solving for a fixed Jacobian during p consecutive iterations. One such p-cycle requires $2^p - 1$ solves with the fixed Jacobian. If matrix factorization is used, it is typically more computationally expensive to factorize than to solve, and we envisage that the proposed inexact method would be useful as the iterates converge. The inexact method is shown to be p-step convergent with Q-factor 2^p under standard assumptions where Newton's method has quadratic rate of convergence. The method is thus sufficiently exact in the sense that it mimics the convergence rate of Newton's method. It may be interpreted as a way of performing iterative refinement by solving the linear subproblem sufficiently exactly by a simplified Newton method. The method is contrasted to a simplified Newton method, where it is known that a cycle of $2^p - 1$ iterations gives the same type of convergence. We present some numerical results and also discuss how this method might be used in the context of interior methods for linear programming.

Tid och plats: Fredagen den 4 december kl. 11.00 – 12.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

LICENTIATSEMINARIUM I MATEMATISK STATISTIK

Anne Wangombe

presenterar sin licentiatavhandling:

Stochastic epidemic models for tick-borne diseases

Inbjuden diskussionsinledare: **Professor Ziad Taib,** AstraZeneca och Chalmers tekniska högskola.

Abstract: This thesis consists of two papers:

1. Wangombe, A., Andersson, M., Britton, T. (2009): *A stochastic epidemic model for tick-borne diseases: initial stages of an outbreak and endemic levels.* (Submitted.)

2. Wangombe, A., Andersson, M., Britton, T. (2009): *A stage-structured stochastic epidemic model for tick-borne diseases.* (Manuscript.)

Both papers deal with the formulation of stochastic models for the spread of tick-borne diseases amongst cattle. Multi-type branching process approximation of the early stages of the epidemic process is used to derive a threshold quantity which determines whether an epidemic may take off in the tick-host system as well as outbreak probabilities when above threshold. Expressions of the endemic level in case of a major outbreak are also derived. A "homogeneous version" of the outbreak is also derived. A "homogeneous version" of the stage-structured model is defined and compared with the one-stage model. It is shown that the two models are different.

Avhandlingen finns på http://www.math.su.se/pub/jsp/polopoly.jsp?d=9674&a=37310.

Tid och plats: Onsdagen den 16 december kl. 15.15 i rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket.

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Emma Knutsson:
Gröbner bases and applications

Handledare: **Ralf Fröberg.**

Abstract: Bruno Buchberger initiated the theory of Gröbner bases and Buchberger's algorithm 1965, since then it has been the key to solve many problems in physics, chemistry and last but not least computational algebra. This essay is a first introduction to Gröbner bases. We will go through the theoretical background of Gröbner bases and Buchberger's algorithm, and we will look at some applications where we use Gröbner bases to solve systems of polynomial equations and implicitization problems.

Tid och plats: Onsdagen den 9 december kl. 10.00 – 11.00 i sal 21, hus 5, Matematiska institutionen, SU, Kräftriket.

INSTITUT MITTAG-LEFFLER SEMINAR

Erik Palmgren:
Constructivist and structuralist foundations:
Bishop's and Lawvere's theories of sets

Abstract: Bishop's informal set theory is briefly discussed and compared to Lawvere's Elementary Theory of the Category of Sets (ETCS). We then present a constructive and predicative version of ETCS, whose standard model is based on the constructive type theory of Martin-Löf. The theory, CETCS, provides a structuralist foundation for constructive mathematics in the style of Bishop.

Tid och plats: Onsdagen den 9 december kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

ALGEBRA AND GEOMETRY SEMINAR

Boris Shapiro:
On some algebras associated with a simple graph

Abstract: Around 2000 A. Postnikov and myself introduced two pairs of commutative algebras associated with any simple graph G. One subalgebra in each pair is associated with a monomial ideal and another with an ideal generated by powers of linear forms. Both algebras in each pair have the same Hilbert series which in the first case is the generating function of the number of spanning forests and in the second case is the generating function of the number of spanning trees in G according to their external activity. These Hilbert series can be obtained as specializations of the Tutte polynomial of G. In connection with this project we also introduced the notion of a G-parking function which is now actively studied by specialists in combinatorics. Recently joint with A. Kirillov we defined two new algebras which can be thought as a 'K-theoretic' analogue of the former algebras. They seem to have the same total dimensions (i.e. the total number of forests and trees resp.) but according to some new statistics which is still a mystery. I will report on this work in progress, formulate some few results and state several conjectures.

Tid och plats: Onsdagen den 16 december kl. 13.15 – 15.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

INSTITUT MITTAG-LEFFLER SEMINAR

Bill Mitchell:
The covering lemma: 35 years, and a question

Abstract: This talk will survey the development of the covering lemma, and associated core models, with an emphasis on the two breakthroughs of Jensen's original discovery and the intervention of Woodin cardinals.

At the end I will observe that in the presence of a Woodin cardinal the covering lemma dwindles to almost nothing, and ask whether any more can be saved.

Tid och plats: Onsdagen den 9 december kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

INSTITUT MITTAG-LEFFLER SEMINAR

Stevo Todorcevic:
A basis problem for compact spaces

Abstract: Using Forcing Axioms we analyse a possible structure of the class of compact spaces. We also look at formulations of the problem in some of its dual or double-dual forms in classes of Boolean algebras, Banach spaces and Choquet simplices.

Tid och plats: Torsdagen den 10 december kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINARIUM I STATISTIK

Pär Stockhammar:
Density forecasting of the Dow Jones share index

Abstract: The distribution of differences in logarithms of the Dow Jones share index is compared to the normal (N), normal mixture (NM) and a weighted sum of a normal and an Asymmetric Laplace distribution (NAL). It is found that the NAL fits best. We came to this result by studying samples with high, medium and low volatility, thus circumventing strong heteroscedasticity in the entire series. The NAL distribution also fitted economic growth, thus revealing a new analogy between financial data and real growth.

Tid och plats: Onsdagen den 16 december kl. 13.00 i sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati.

ALGEBRA AND GEOMETRY PRE-SEMINARS

I intend to, starting on Wednesday, December 2, give short pre-seminars to the Algebra and Geometry Seminar. They are not meant to replace the introduction to the seminar subject to be given by the speaker, but rather to give the opportunity to potential attendants to have gaps in their knowledge (quickly) filled, hopefully allowing them to better appreciate such an introduction (as well as the rest of the seminar).

The pre-seminar will start at 12.55 (possibly to be adjusted) and will be held each time before an Algebra and Geometry Seminar unless a cancellation is announced.

Torsten Ekedahl

INSTITUT MITTAG-LEFFLER SEMINAR

Jouko Väänänen:
Set theory and logic

Abstract: I will discuss the relationship between two ways to investigate mathematical structures, namely the set theoretic way and the model theoretic way. I compare hierarchies of both and establish level by level matches. I will discuss "sort logic" as the ultimate limit of model theoretic languages.

Tid och plats: Torsdagen den 10 december kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

LICENTIATSEMINARIUM I MEKANIK

David Tempelmann

presenterar sin licentiatavhandling:

Stability and Receptivity of Three-Dimensional Boundary Layers

Opponent: **Dr Stefan Hein,** DLR, Göttingen, Tyskland.

Abstract: The stability and the receptivity of three-dimensional flat plate boundary layers is studied employing parabolised stability equations. These allow for computationally efficient parametric studies. Two different sets of equations are used. The stability of modal disturbances in the form of crossflow vortices is studied by means of the well-known classical parabolised stability equations (PSE). A new method is developed which is applicable to more general vortical-type disturbances. It is based on a modified version of the classical PSE and describes both modal and non-modal growth in three-dimensional boundary layers. This modified PSE approach is used in conjunction with a Lagrange multiplier technique to compute spatial optimal disturbances in three-dimensional boundary layers. These take the form of streamwise oriented tilted vortices initially and develop into streaks further downstream. When entering the domain where modal disturbances become unstable, optimal disturbances smoothly evolve into crossflow modes. It is found that non-modal growth is of significant magnitude in three-dimensional boundary layers. Both the lift-up and the Orr mechanism are identified as the physical mechanisms behind non-modal growth.

Furthermore, the modified PSE are used to determine the response of three-dimensional boundary layers to vortical free-stream disturbances. By comparing to results from direct numerical simulations it is shown that the response, including initial transient behaviour, is described very accurately. Extensive parametric studies are performed, where effects of free-stream turbulence are modelled by filtering with an energy spectrum characteristic for homogeneous isotropic turbulence. It is found that a quantitative prediction of the boundary layer response to free-stream turbulence requires detailed information about the incoming turbulent flow field.

Finally, the adjoint of the classical PSE is used to determine the receptivity of modal disturbances with respect to localised surface roughness. It is shown that the adjoint approach yields perfect agreement with results from Finite-Reynold-Number Theory (FRNT) if the boundary layer is assumed to be locally parallel. Receptivity is attenuated if nonlocal and non-parallel effects are accounted for. Comparisons to direct numerical simulations and extended parametric studies are presented.

Tid och plats: Måndagen den 14 december kl. 10.15 i sal E35, KTH, Lindstedtsvägen 3, b.v.

SEMINARIUM I MATEMATISK STATISTIK

Jörgen W. Weibull:
The Condorcet Jury Problem and Preference Heterogeneity

Abstract: The talk is based on joint work with Jean-François Laslier (École Polytechnique, Paris).

We consider a committee (board or jury) that faces a binary collective decision under uncertainty, where each member holds some relevant private information. Members agree about what decision should be taken in each state of nature, had this been known. However, this is unknown and members may attach different values to the two types of mistake that may occur.

Standard voting rules have a plethora of uninformative equilibria, and informative voting may even be incompatible with equilibrium. We here generalize existing results with respect to preference heterogeneity across the committee, and also suggest and analyse a randomized majority rule that has a unique equilibrium. This equilibrium is asymptotically efficient: it implements the collectively optimal decision with probability one in the limit as the committee size goes to infinity.

Tid och plats: Måndagen den 14 december kl. 15.15 – 16.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

LICENTIATSEMINARIUM I MEKANIK

Johan Ohlsson

presenterar sin licentiatavhandling:

Spectral-element simulations of separated turbulent internal flows

Opponent: **Professor Jesper Oppelstrup,** Numerisk analys, KTH.

Abstract: The spectral-element method (SEM) offers new possibilities to examine transitional and turbulent flows at high accuracy in complex geometries. Simulations of canonical flow cases such as temporal K-type transition and turbulent channel flow are performed to investigate general resolution requirements and computational efficiency. It is shown that the numerical instability associated with SEM at high Reynolds numbers is cured either by over-integration (dealiasing) or a filter-based stabilization, thus rendering simulations of high Reynolds number flows possible. The generation of high quality turbulent inflow conditions is implemented, tested and finally applied to more complex spatially developing turbulent flows. Examples of such flows investigated in this thesis is the large-eddy simulation (LES) of turbulent separation in a plane asymmetric diffuser, where good agreement with numerical studies of Herbst et al. (2007) is obtained. In particular it is noticed that less grid points can be used to predict the separated flow with similar accuracy, leading to the conclusion that the use of a high-order method is advantageous for flows featuring pressure-induced separation. Another flow case studied is the direct numerical simulation (DNS) of turbulent separation in the truly three-dimensional asymmetric diffuser, experimentally investigated by Cherry et al. (2008). The massively parallel capabilities of the spectral-element method are exploited by running the simulations on up to 32 768 processors. Very good agreement with experimental data is obtained, and it is thus shown that well-resolved simulations of complex turbulent flows are possible at realistic Reynolds numbers with high accuracy even in complicated geometries.

Tid och plats: Tisdagen den 15 december kl. 10.15 i sal E3, KTH, Osquars Backe 14, 2 tr.

KTH/SU MATHEMATICS COLLOQUIUM

Sandra Di Rocco:
Interaction between Convex and Algebraic Geometry

Abstract: Toric geometry provides a useful bridge between Convex Geometry and Algebraic Geometry. Convex bodies are associated to complex toric varieties embedded in projective space. The benefit coming from this interaction is mutual. Unexpected properties of convex bodies have been shown thanks to the underlying toric geometry as well as many algebraic invariants of projective toric varieties are a reflection of convex properties of the associated polytope. Some classical and more recent examples, showing how fruitful this interplay can be, will be presented.

Tid och plats: Onsdagen den 16 december kl. 16.00 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.

DISPUTATION I MATEMATIK

Daniel Schnellmann

skall disputera på avhandlingen

Viana maps and limit distributions of sums of point measures

torsdagen den 17 december 2009 kl. 10.00 i sal F3, KTH, Lindstedtsvägen 26, b.v. Till opponent har utsetts *professor Masato Tsujii,* Kyushu University, Fukuoka, Japan.

Abstract of the thesis

This thesis consists of five articles mainly devoted to problems in dynamical systems and ergodic theory. We consider non-uniformly hyperbolic two-dimensional systems and limit distributions of point measures, which are absolutely continuous with respect to Lebesgue measure.

Let $f_{a_0}(x) = a_0 - x^2$ be a quadratic map, where the parameter $a_0 \in (1, 2)$ is chosen such that the critical point 0 is pre-periodic (but not periodic). In Papers A and B, we study skew-products $(\theta, x) \mapsto F(\theta, x) = (g(\theta), f_{a_0}(x) + \alpha s(\theta))$, $(\theta, x) \in S^1 \times \mathbb{R}$. The functions $g : S^1 \to S^1$ and $s : S^1 \to [-1, 1]$ are the base dynamics and the coupling functions, respectively, and α is a small, positive constant. Such quadratic skew-products are also called Viana maps. In Papers A and B, we show for several choices of the base dynamics and the coupling function that the map F has two positive Lyapunov exponents and for some cases we further show that F admits also an absolutely continuous invariant probability measure.

In Paper C we consider certain Bernoulli convolutions. By showing that a specific transversality property is satisfied, we deduce absolute continuity of the distributions associated to these Bernoulli convolutions.

In Papers D and E, we consider sequences of real numbers on the unit interval and study how they are distributed. The sequences in Paper D are given by the forward iterations of a point $x \in [0, 1]$ under a piecewise expanding map $T_a : [0, 1] \to [0, 1]$ depending on a parameter a contained in an interval I. Under the assumption that each T_a admits a unique absolutely continuous invariant probability measure μ_a and that some technical conditions are satisfied, we show that the distribution of the forward orbit $T_a^j(x)$, $j \geq 1$, is described by the distribution μ_a for Lebesgue almost every parameter $a \in I$. In Paper E we apply the ideas in Paper D to certain sequences, which are equidistributed in the unit interval and give a geometrical proof of a well-known result by Koksma from 1935.

ALBANOVA AND NORDITA COLLOQUIUM IN PHYSICS

Ulf Leonhardt:
Geometry, light and a wee bit of magic

Abstract: Many mass-produced everyday products of modern technology would appear to be completely magical to our ancestors: mobile phones, television, computers, electric light, cars, etc. Some devices that are still perceived as magical or mysterious are about to appear in the laboratory and are not so mysterious after all. For example, the first prototype of an electromagnetic cloaking device has been recently made at Duke University. This device makes an object invisible to microwave radiation of a single frequency and polarization. At Harvard University, first vital steps towards levitating objects on the forces of the quantum vacuum have been made. At St Andrews, we observed first indications of artificial black holes in the laboratory, using extremely short light pulses in photonic-crystal fibres. Invisibility devices, quantum forces and optical black holes have two things in common: they represent applications of Einstein's general relativity in Maxwell's electromagnetism, and their practical demonstrations are made possible by modern metamaterials. I will try to elucidate the scientific principles acing behind the scenes of such "pure and applied magic".

Tid och plats: Torsdagen den 17 december kl. 15.15 – 16.15 i Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum.

DISPUTATION I MATEMATIK

Samuel Lundqvist

skall disputera på avhandlingen

Computational algorithms for algebras

fredagen den 18 december 2009 kl. 10.00 i sal 14, hus 5, Matematiska institutionen, SU, Kräftriket. Till opponent har utsetts *professor H. Michael Möller,* Universität Dortmund.

Abstract of the thesis

This thesis consists of six papers.

In Paper I, we give an algorithm for merging sorted lists of monomials and together with a projection technique, we obtain a new complexity bound for the Buchberger-Möller algorithm and the FGLM algorithm.

In Paper II, we discuss four different constructions of vector space bases associated to vanishing ideals of points. We show how to compute normal forms with respect to these bases and give complexity bounds. As an application we drastically improve the computational algebra approach to the reverse engineering of gene regulatory networks.

In Paper III, we introduce the concept of multiplication matrices for ideals of projective dimension zero. We discuss various applications and, in particular, we give a new algorithm to compute the variety of an ideal of projective dimension zero.

In Paper IV, we consider a subset of projective space over a finite field and give a geometric description of the minimal degree of a non-vanishing form with respect to this subset. We also give bounds on the minimal degree in terms of the cardinality of the subset.

In Paper V, we study an associative version of an algorithm constructed to compute the Hilbert series for graded Lie algebras. In the commutative case we use Gotzmann's persistence theorem to show that the algorithm terminates in finite time.

In Paper VI, we connect the commutative version of the algorithm in Paper V with the Buchberger algorithm.

Stockholms universitet söker
en universitetslektor i matematisk statistik

Tjänsten är placerad vid Matematiska institutionen. Sista ansökningsdag är onsdagen den 9 december 2009.

Se http://www.math.su.se/pub/jsp/polopoly.jsp?d=5982&a=28839 för ytterligare information.