BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 2 **FREDAGEN DEN 21 JANUARI 2005**

BRÅKET

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

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Sista manustid för nästa nummer:
Torsdagen den 27 januari kl. 13.00.

Kurser

Dan Laksov: Talteori. Se sidan 8.

Sergei Merkulov: Galois Theory. Se sidan 10.

Sergei Merkulov: Koszul duality for algebras, operads and PROP's. Se sidan 6.

Hans Ringström: Icke-linjära vågekvationer. Se sidan 5.

SEMINARIER

Fr 01–21 kl. 13.00–15.00. Seminar on Etale Cohomology. Lars Halvard Halle: *Title to be announced.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

Må 01–24 kl. 10.30–11.30. Seminarium i PDE och spektralteori. Ari Laptev, KTH: *Mass transportation approach to sharp functional inequalities.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Må 01–24 kl. 13.15–14.15. Presentation av examensarbete i matematik. Sven Berglund: *Fast computation of attenuated Radon transform.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidorna 8–9.

Ti 01–25 kl. 10.15. Plurikomplexa seminariet. Bruno Fabre, SU: *Cohomology and locally residual currents on algebraic varieties.* Sal MIC 2144, Matematiska institutionen, Polacksbacken, Uppsala universitet. Se sidan 7.

Fortsättning på nästa sida.

Disputation i matematik

Dmitri Beliaev disputerar vid KTH på avhandlingen *Harmonic measure on random fractals* fredagen den 4 februari kl. 13.00. Se sidan 4.

Disputation i optimeringslära och systemteori

Anders Blomqvist disputerar vid KTH på avhandlingen *A convex optimization approach to complexity constrained analytic interpolation with applications to ARMA estimation and robust control* måndagen den 7 februari kl. 10.00. Se sidan 9.

Money, jobs: Se sidorna 11–12.

Seminarier (fortsättning)

Ti 01–25 kl. 13.15. Plurikomplexa seminariet. Mattias Jonsson, KTH: *Attenuation of singularities of currents.* Sal MIC 2115, Matematiska institutionen, Polacksbacken, Uppsala universitet. Se sidan 10.

Ti 01–25 kl. 14.00–15.00. Mittag-Leffler Seminar. Alain Lascoux, Université de Marne-la-Vallée: *Pfaffians, using representations of the symmetric group.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

Ti 01–25 kl. 15.30–16.30. Mittag-Leffler Seminar. Svante Linusson och **Johan Wästlund,** Linköpings universitet: *On the random assignment problem.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

On 01–26 kl. 13.00. Seminarium i statistik. Anders Grimvall, Linköpings universitet: *Regression models preserving partial orders.* Sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati. Se sidan 3.

On 01–26 kl. 13.15–14.15. Seminarium i analys och dynamiska system. Dmitri Beliaev, KTH: *Harmonic measure on random sets.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 3.

On 01–26 kl. 13.15. Logikseminariet Stockholm-Uppsala. Olov Wilander: *An E-bicategory of E-categories.* Sal MIC 3513, Matematiska institutionen, Polacksbacken, Uppsala universitet. Se sidan 5.

On 01–26 kl. 14.15–15.00. Seminarium i numerisk analys. *(Observera dagen!)* **Raul Tempone,** University of Texas at Austin: *Partial differential equations with uncertainty: the stochastic input case.* Rum 4523, Nada, KTH, Lindstedtsvägen 5, plan 5. Se sidan 7.

On 01–26 kl. 15.15. Presentation av examensarbete i matematisk statistik. Elisabeth Gomez, SU: *Marknadsvärdering av försäkringstekniska avsättningar samt matchning av dessa och tillgångarna.* Rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket. Se sidorna 6–7.

On 01–26 kl. 16.00–17.00. Stockholms matematiska kollokvium. Boris Shapiro, SU: *Mystery of point charges after C. F. Gauß, J. C. Maxwell and M. Morse.* Sal 14, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 11.

To 01–27 kl. 14.00–15.00. Mittag-Leffler Seminar. Jörn Olsson, University of Copenhagen: *Partitions and characters of symmetric groups.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

To 01–27 kl. 15.30–16.30. Mittag-Leffler Seminar. Axel Hultman, KTH: *The combinatorics of twisted involutions in Coxeter groups.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

Fr 01–28 kl. 11.00–12.00. Optimization and Systems Theory Seminar. Anders Blomqvist, Optimeringslära och systemteori, KTH: *A well-posed approach to ARMA estimation and Hinf control synthesis.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 1 sidan 5.

I seminariet ger Anders Blomqvist en sammanfattning av sin doktorsavhandling. Disputationen äger rum den 7 februari. Se sidan 9.

On 02–02 kl. 13.00. Seminarium i statistik. Mindaugas Bloznelis, Vilnius University: *Hoeffding decomposition of combinatorial statistics and its applications to survey sampling and random graph models. Part II.* Sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati.

Fortsättning på nästa sida.

Seminarier (fortsättning)

On 02–02 kl. 13.15 – 14.15. Seminarium i analys och dynamiska system. Serguei Kisliakov, S:t Petersburg: *Double singular integrals: interpolation and correction.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 11.

On 02–02 kl. 13.15 – 15.00. Algebraseminarium. Thierry Coquand, Göteborg: *Heitmann dimension.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 10.

SEMINARIUM I STATISTIK

Anders Grimvall:
Regression models preserving partial orders

Abstract: Monotonic response patterns play a fundamental role in the modelling and analysis of a great variety of economic, technical and ecological systems. For example, the sale of a product can increase with decreased price and increased advertising. Likewise, it is common that the rates of biological, chemical and physical processes are monotonic functions of factors like temperature, pressure and humidity. More specific assumptions about the shape of the response function (or response surface) can often be questioned, but the monotonic response is so fundamental that it can serve as a ground for consensus regarding modelling and data analysis. The seminar is devoted to monotonic regression, which is a non-parametric statistical method that is designed especially for applications in which the expected value of a response variable (y) increases or decreases in one or more explanatory variables ($x_1, \ldots, x_p$). Estimation of such regression models can be formulated as an optimization problem in which a loss function is minimized under a set of simple constraints. However, it was not until we recently generalized the so-called pool adjacent violators (PAV) algorithm from fully to partially ordered data that it became feasible to handle typical multiple regression data. Theoretical descriptions of the cited algorithm will be accompanied by examples illustrating the estimation of monotonic response surfaces and temporal trends in environmental quality data.

Tid och plats: Onsdagen den 26 januari kl. 13.00 i sal B705, Statistiska institutionen, SU, Universitetsvägen 10B, plan 7, Frescati.

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Dmitri Beliaev:
Harmonic measure on random sets

Abstract: Many problems in complex analysis can be reduced to the evaluation of the *universal spectrum:* the supremum of multifractal spectra of harmonic measures for all planar domains. Its exact value is still unknown, with very few estimates available. We describe related problems and available estimates from above. Then we discuss in more detail estimates from below, describing the search for a fractal domain which attains the maximal possible spectrum.

Tid och plats: Onsdagen den 26 januari kl. 13.15 – 14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I PDE OCH SPEKTRALTEORI

Ari Laptev:

Mass transportation approach to sharp functional inequalities

Abstract: Following papers of C. Villani with his co-authors we shall discuss how mass transportation methods provide an elementary and powerful approach to the study of functional inequalities such as Sobolev or Brézis-Lieb inequalities.

Tid och plats: Måndagen den 24 januari kl. 10.30 – 11.30 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

DISPUTATION I MATEMATIK

Dmitri Beliaev

disputerar på avhandlingen

Harmonic measure on random fractals

fredagen den 4 februari kl. 13.00 i Kollegiesalen, Administrationsbyggnaden, KTH, Valhallavägen 79. Till fakultetsopponent har utsetts *professor Ilia Binder,* University of Toronto.

Abstract of the thesis

This thesis is devoted to the study of the fine structure of harmonic measure on random fractals. Many important problems in complex analysis can be stated in terms of the multifractal spectra of harmonic measure. In the majority of such problems answers are yet unknown but it was demonstrated by Carleson, Jones, and Makarov that extremal configurations should be fractal. In this thesis we analyse two classes of random fractals, obtaining spectra close to the conjectured maxima.

Let ϕ be a conformal mapping from the complement $\mathbb{D}_-$ of the unit disc to a domain $\Omega \subset \widehat{\mathbb{C}}$, $\phi(\infty) = \infty$. We define the *integral means spectrum* of ϕ or, equivalently, of Ω as

$$\beta(t) = \limsup_{r \to 1+} \frac{\log \int_0^{2\pi} |\phi'(re^{i\theta})| d\theta}{|\log(r-1)|}.$$

It turns out that $\beta(t)$ is related to the *dimension spectra* characterizing local scaling exponents of the harmonic measure on Ω. Following Makarov we define the *universal integral means spectrum* $B(t)$ as the supremum of $\beta(t)$ over all mappings ϕ. The problems which can be reduced to evaluating $B(t)$ or similar universal spectra include the asymptotical coefficient problem for the univalent maps in Σ, Brennan's conjecture, dimension estimates for the boundary of the Hölder domains. Exact value of $B(t)$ is unknown, with a big gap between available estimates from above and below.

The thesis consists of three parts. In the first part we give a short survey of previously known results about multifractal analysis of harmonic measure and related problems in geometric function theory. We also argue that in search of extremal configurations instead of standard deterministic fractals, one should study random ones. The reason is that the boundary behaviour of a conformal map to the complement of say, a von Koch snowflake or Julia set, depends on the $\arg z$ in a very complicated way and the spectra are hard to analyse. While this remains true for a particular realization of a random fractal, when we average over all realizations, the dependence on $\arg z$ disappears: the boundary behaviour of the conformal map becomes statistically the same for all approaches. We also suggest that one should define fractals using iterated conformal maps, rather than geometric constructions.

LOGIKSEMINARIET STOCKHOLM-UPPSALA

Olov Wilander:
An E-bicategory of E-categories

Abstract: A type-theoretic formalization of bicategories is introduced, and it is shown that small E-categories, together with their functor categories, form such an E-bicategory. This is carried out using only basic recursive definitions, in the version of predicative type theory with a hierarchy of universes implemented by Agda. This relates to earlier work by Huet and Saïbi, who constructed a large category of small categories in Coq, but with the use of inductive families. The construction presented here may be considered more natural, particularly from the point of view of higher-dimensional category theory.

Tid och plats: Onsdagen den 26 januari kl. 13.15 i sal MIC 3513, Matematiska institutionen, Polacksbacken, Uppsala universitet.

FÖRDJUPNINGSKURS I MATEMATIK

Seminariekurs II: Icke-linjära vågekvationer, 5B1457, 5 p

Föreläsare: **Hans Ringström,** Institutionen för matematik, KTH, rum 3629, Lindstedtsvägen 25, telefon 08-790 66 75, e-post hansr@math.kth.se.

Vågekvationer är bra matematiska modeller för många olika fysikaliska system. Till exempel kan de beskriva en sträng eller ett membran som vibrerar. I dessa exempel går det att modellera systemet med hjälp av en linjär vågekvation, och för sådana ekvationer finns det en väl utvecklad allmän teori. Einsteins allmänna relativitetsteori kan också formuleras som ett system av vågekvationer, men systemet är i allmänhet inte linjärt. Denna kurs behandlar ekvationer av den form som dyker upp inom till exempel den allmänna relativitetsteorin. Kursen kommer att börja med ett bevis av lokal existens av lösningar till ordinära differentialekvationer. Detta bevis illustrerar grundtanken för bevisen av lokal existens av lösningar till icke-linjära vågekvationer. Sedan behandlas $1+1$-dimensionella, icke-linjära vågekvationer. Detta fall är enklare än det allmänna fallet, och det går att säga mer. Slutligen behandlas icke-linjära vågekvationer i $n+1$ dimensioner. För lokal existens av lösningar finns det en allmän teori, och den kommer vi att behandla. För global existens av lösningar finns ingen allmän teori, och i det fallet kommer vi att betrakta exempel, bland annat tagna från den allmänna relativitetsteorin. Under kursens gång kommer vi att motivera vissa grenar av matematiken, såsom funktionalanalys och mått- och integrationsteori via de problem som uppstår inom analys av icke-linjära vågekvationer.

Målgrupp: Studenter i tredje eller fjärde årskursen vid KTH med intresse för matematik eller matematisk fysik. Kurserna 5B1202 Differentialekvationer och transformer II samt 5B1303 Analys grundkurs, eller motsvarande, utgör förkunskapskraven.

Kursmaterial kommer att utdelas under kursens gång och examination kommer att ske i form av inlämningsuppgifter. Föreläsningarna kommer att vara på engelska eller svenska beroende på deltagarna.

Första föreläsningstillfälle: Fredagen den 28 januari kl. 13.15 – 15.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Vid vilken tid senare föreläsningar kommer att äga rum avgörs av vad som passar deltagarna.

Välkommna!
Hans Ringström

GRADUATE COURSE IN MATHEMATICS

Koszul duality for algebras, operads and PROP's

Lecturer: **Sergei Merkulov,** Department of Mathematics, Stockholm University, e-mail sm@math.su.se.

Time: The course will be given during the spring term 2005 on Thursdays at 10.15 – 12.00 in room 306, Department of Mathematics, Stockholm University, house 6, Kräftriket. The first meeting is on January 27.

We shall try to give a self-contained and most up-dated introduction into the theory of Koszul duality for operads and PROP's, which nowadays undergoes an explosive development and finds applications not only in the homological algebra (where it was born) but also, rather unexpectedly, in differential geometry and mathematical physics (quantization including).

The Koszul duality was first introduced for associative algebras in the 1970's. In 1994 the idea was extended to operads (creatures which govern algebraic operations with several inputs and one output, e.g., associative, Lie, Gerstenhaber algebras). In recent few years the idea was further extended to PROP's (which govern the world of algebraic operations with several inputs and several outputs, e.g., bialgebras, quantum groups).

The lecture course will start with detailed definitions of operads and PROP's and of their algebras. Many concrete examples of Koszul operads and PROP's (such as associative, pre-Lie, Poisson algebras, bialgebras, Lie (bi)algebras, etc.) and various techniques of proving Koszulness will be discussed. We shall also explain how Koszul duality can be applied for constructing minimal resolutions of algebras, operads and PROP's.

In the first lecture on January 27 we shall introduce and illustrate the notion of PROP (shorthand for "PROducts and Permutations").

Sergei Merkulov

PRESENTATION AV EXAMENSARBETE I MATEMATISK STATISTIK

Elisabeth Gomez: Marknadsvärdering av försäkringstekniska avsättningar samt matchning av dessa och tillgångarna

Sammanfattning: När de så kallade IAS/IFRS-reglerna införs i Sverige skall försäkringsbolagets FTA marknadsvärderas enligt samma principer som tillgångarna. Då kommer det att vara viktigt för bolaget att göra marknadsmässiga ränteantaganden. Detta arbete visar att det finns tillgängliga ränteinstrument på marknaden som kan användas som alternativ till en fast ränta vid värderingen av FTA.

Med hjälp av en yieldkurva utifrån statsobligationer beräknas nuvärdet av framtida utbetalningar. Dessutom har en analys gjorts av hur resultatet av marknadsvärderingen av FTA inverkar på eget kapital. Slutligen studeras hur tillgångar och FTA kan matchas för att minimera ränterisken som marknadsvärderingen för med sig.

Resultaten av värderingen med yieldkurvan visar att marknadsvärdering av FTA ger ett minskat avsättningsbehov, detta på grund av högre marknadsräntor än dagens fasta ränta. Däremot ökar risken för mismatch vid matchningen av tillgångar och FTA då man har långa durationer på avsättningarna. Eftersom vi idag inte har tillgång till nominella terminsstrukturer med lika långa löptider som FTA kan man med hjälp av extrapolation eller antaganden förlänga kurvan. I dessa fall kommer man att få en återinvesteringsrisk, så någon form av återinvesteringsriskavdrag bör göras på FTA med längre löptider.

(Fortsättning på nästa sida.)

Rapporten kommer inom kort att finnas på sidan http://www.math.su.se/matstat/reports/serieb.

Tid och plats: Onsdagen den 26 januari kl. 15.15 i rum 306 (Cramérrummet), hus 6, Matematiska institutionen, SU, Kräftriket.

PLURIKOMPLEXA SEMINARIET

Bruno Fabre:
Cohomology and locally residual currents on algebraic varieties

Abstract: We try to show the utility of locally residual currents to formulate some theorems of algebraic geometry in a simple and general way. We present essentially two theorems, which are both variations of the following "inverse residue theorem" of Phillip Griffiths:

Let X be an algebraic variety of dimension n, with positive hypersurfaces $Y_1, \ldots, Y_n$ intersecting properly in a finite number of distinct points $P_1, \ldots, P_s$. Let $c_1, \ldots, c_n$ be complex numbers such that $\sum_{i=1}^{n} c_i = 0$. Then there exists a meromorphic n-form Ψ on X, with $\mathrm{Res}_{P_i}\Psi = c_i$ for all i.

The first theorem is a combination of a theorem of Miguel Herrera, Alicia Dickenstein, and Carmen Sessa, with a theorem of Boris Khesin, Alexei Rosly, and Richard Thomas, and can be formulated in the following way:

On an algebraic variety of dimension n, the cohomology of the sheaf of n-holomorphic forms can be computed from a complex of locally residual currents, obtained from meromorphic n-forms with simple poles.

The second theorem, which is a generalization of another theorem of Griffiths, called the "inverse Abel theorem", can be formulated in the following way:

A locally residual current of bidegree (N, p), in a neighbourhood of a complex p-plane in the projective space, extends to a residual current of the projective space if and only if its Abel-Radon transform is zero.

This theorem is related to web theory via the notion of abelian relations.

Tid och plats: Tisdagen den 25 januari kl. 10.15 i sal MIC 2144, Matematiska institutionen, Polacksbacken, Uppsala universitet.

SEMINARIUM I NUMERISK ANALYS

Raul Tempone:
Partial differential equations with uncertainty:
the stochastic input case

Abstract: The main aim of applied numerical simulations is to derive predictions. Since these predictions are the basis for decision making it is natural to question their accuracy, especially because in most of the cases there is uncertainty in data of the problem to solve.

We consider numerical approximations of partial differential equations (PDE) with stochastic coefficients, which is one way to address uncertainty quantification for PDE's.

We discuss efficient discretization strategies, give convergence results, and present numerical results.

Tid och plats: Onsdagen den 26 januari kl. 14.15 – 15.00 i rum 4523, Nada, KTH, Lindstedtsvägen 5, plan 5.

DOKTORANDKURS I MATEMATIK

Talteori, 5B5401, 5 p

Foreleser: **Dan Laksov,** Institutionen för matematik, KTH.

Elementær tallteori ær et av de *klassiske* områdene av matematikken. Grunnleggende kunnskaper i tallteori tilhører almendannelsen i matematikken. Hensikten med dette kurset er å gi kunnskaper om begreper som modulregning, primtall, primitive røtter, aritmetiske funksjoner, kvadratiske rester og diofantiske ligninger.

Kurset krever ingen forkunnskaper så det kan taes av alle studenter som har interesse for tallteori. Nivået på kurset kommer også til å være ganske moderat.

Tid och plats: Måndagar kl. 15.15 – 17.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Den första föreläsningen äger rum den 24 januari.

Språk: Norsk.

Lærebok: G. A. Jones and J. M. Jones: *Elementary Number Theory,* Springer Undergraduate Mathematics Series, Springer-Verlag, 1998, ISBN: 3-540-76197-7.

Alternativ literatur: K. Ireland and M. Rosen: *A Classical Introduction to Modern Number Theory,* Second edition, Graduate Texts in Mathematics 84, Springer-Verlag, 1990, ISBN: 0-387-97329-X. I. Niven, H. S. Zuckerman, H. L. Montgomery: *An Introduction to the Theory of Numbers,* Fifth edition, John Wiley & Sons, 1991. ISBN: 0-471-62546-9 11-01.

Eksamen: Hjemmeoppgaver.

Informasjon: http://www.math.kth.se/~laksov. Telefon: 08-790 62 36. E-post: laksov@math.kth.se.

Dan Laksov

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Sven Berglund:
Fast computation of attenuated Radon transform

Sven Berglund ger en översikt över sitt examensarbete vid Matematiska institutionen, SU. Detta projekt är ett led av ett samarbete mellan de matematiska institutionerna vid SU och KTH samt företaget Sidec Technology.

Abstract: The subject of this thesis is an algorithm for fast computation of a large set of line integrals, primarily in two-dimensional space. The algorithm in question is previously known and is here documented, analysed and extended.

The *Radon transform* of a function with domain $\mathbb{R}^2$ is given by the function integrated on straight one-dimensional lines of all locations and orientations. Given discrete data sampled from a function with compact support, this algorithm can approximate the Radon transform with an, under reasonable conditions, arbitrary accuracy.

The algorithm has been extended to computation of *attenuated* line integrals, i.e. with the integrand weighted by a function belonging to a certain class. The *attenuated Radon transform* arises as a model in tomography, where fast computation has applications in numerical inversion methods.

Furthermore, the algorithm has been generalized to arbitrary dimensions. In more than two dimensions it can be regarded as a discrete approximation of the *X-ray transform* (since the Radon transform in n-dimensional space integrates a function on $(n-1)$-dimensional hyperplanes whereas this algorithm, like the X-ray transform, sticks with integration along one-dimensional lines).

(Continued on the next page.)

Coordinates and parameterizations are given so that the algorithm can be defined as a composition of discrete operators. In this context an alteration of the algorithm enables computation of the *adjoint operator* as well.

Tid och plats: Måndagen den 24 januari kl. 13.15 – 14.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

DISPUTATION I OPTIMERINGSLÄRA OCH SYSTEMTEORI

Anders Blomqvist

disputerar på avhandlingen

A convex optimization approach
to complexity constrained analytic interpolation
with applications to ARMA estimation and robust control

måndagen den 7 februari kl. 10.00 i Kollegiesalen, Administrationsbyggnaden, KTH, Valhallavägen 79. Till fakultetsopponent har utsetts *professor Giorgio Picci,* Università di Padova.

Abstract of the thesis

Analytical interpolation theory has several applications in systems and control. In particular solutions of low degree, or more generally, of low complexity, are of particular interest since they allow for synthesis of simpler systems. The study of degree constrained analytic interpolation was initialized in the early 1980's and during the past decade it has had significant progress.

This thesis contributes in three different aspects to complexity constrained analytic interpolation: theory, numerical algorithms, and design paradigms. The contributions are closed related; shortcomings of previous design paradigms motivate developments of the theory, which in turn call for new robust and efficient numerical algorithms.

Mainly two theoretical developments are studied in the thesis. Firstly, the spectral Kullback-Leibler approximation formulation is merged with simultaneous cepstral and covariance interpolation. For this formulation, both uniqueness of the solution, as well as smoothness with respect to data, is proven. Secondly, the theory is generalized to matrix-valued interpolation, but then only allowing for covariance-type interpolation conditions. Again, uniqueness and smoothness with respect to data, is proven.

Three algorithms are presented. Firstly, a refinement of a previous algorithm allowing for multiple as well as matrix-valued interpolation in an optimization framework is presented. Secondly, an algorithm capable of solving the boundary case, that is, with spectral zeros on the unit circle, is given. This also yields an inherent numerical robustness. Thirdly, a new algorithm treating the problem with both cepstral and covariance conditions is presented.

Two design paradigms have sprung out of the complexity constrained analytical interpolation theory. Firstly, in robust control it enables low degree Hinf controller design. This is illustrated by a low degree controller design for a benchmark problem in MIMO sensitivity shaping. Also, a user support for the tuning of controllers within the design paradigm for the SISO case is presented. Secondly, in ARMA estimation it provides unique model estimates, which depend smoothly on the data as well as enable frequency weighting. For AR estimation, a covariance extension approach to frequency weighting is discussed, and an example is given as an illustration. For ARMA estimation, simultaneous cepstral and covariance matching is generalized to include prefiltering. An example indicates that this might yield asymptotically efficient estimates.

PLURIKOMPLEXA SEMINARIET

Mattias Jonsson: Attenuation of singularities of currents

Abstract: Positive closed $(1,1)$-currents on complex surfaces in many ways generalize curves. It is a classical fact that a curve on a surface can be desingularized by a sequence of point blowups. While the same statement is not true for currents, one can "attenuate" the singularities in a quite precise sense. I will discuss how to do this both in the local case (in a neighbourhood of the origin) and in the global case (on a compact surface).

This is joint work with Charles Favre.

Tid och plats: Tisdagen den 25 januari kl. 13.15 i sal MIC 2115, Matematiska institutionen, Polacksbacken, Uppsala universitet.

ALGEBRASEMINARIUM

Thierry Coquand: Heitmann dimension

Abstract: In 1958, Serre presented a purely algebraic theorem, directly motived by geometrical considerations (given a vector fibre bundle, if the dimension of the fibres are $>$ the dimension of the base, then there is a non-vanishing section). This can be formulated concretely as a general theorem about idempotent matrices over a commutative ring. The proof needed the ring to be Noetherian and it was natural to look for a non-Noetherian generalization. A breakthrough was obtained by a paper of Heitmann in 1984, but the non-Noetherian generalization of Serre's theorem was still missing. We present such a generalization, with a constructive and simple proof, that was obtained by giving a purely first-order formulation of Serre's theorem. (Other applications are Forster-Swan's theorem, and Bass cancellation theorem for finitely generated projective modules.)

This is joint work with H. Lombardi and C. Quitté.

Tid och plats: Onsdagen den 2 februari kl. 13.15 – 15.00 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

FÖRDJUPNINGSKURS I MATEMATIK

Galois Theory, MA418, 5 p

Lecturer: **Sergei Merkulov,** Department of Mathematics, Stockholm University, e-mail sm@math.su.se.

Time: The course will be given during the spring term 2005 on Fridays at 10.15 – 12.00 in room 306, Department of Mathematics, Stockholm University, house 6, Kräftriket. The first meeting is on January 28.

Galois theory is one of the masterpieces of mathematics.

In a transcription for drum, "it studies solvability by radicals of a polynomial equation $f(x) = 0$ through automorphism groups of finite fields generated by the coefficients of $f(x)$".

In reality, the music of Galois theory is much richer, with beautiful concatenations to the theory of finite fields, automorphism groups and famous constructions (duplication of the cube, trisection of the angle, and quadrature of the circle), which ancient Greeks were not able to perform.

Major reference book: I. Stewart, *Galois Theory,* Chapman and Hall.

Sergei Merkulov

STOCKHOLMS MATEMATISKA KOLLOKVIUM

Boris Shapiro:
Mystery of point charges
after C. F. Gauß, J. C. Maxwell and M. Morse

Abstract: We discuss the problem of finding an upper bound for the number of equilibrium points of a potential of several fixed point charges in $\mathbb{R}^n$. This question goes back to J. C. Maxwell and M. Morse. Using fewnomial theory we show that for a given number of charges there exists an upper bound independent of the dimension, and show it to be at most 12 for three charges. We conjecture an exact upper bound for a given configuration of nonnegative charges in terms of its Voronoi diagram, and prove it asymptotically.

Tid och plats: Onsdagen den 26 januari kl. 16.00 – 17.00 i sal 14, hus 5, Matematiska institutionen, SU, Kräftriket.

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Serguei Kisliakov:
Double singular integrals: interpolation and correction

Abstract: The orthogonal projection of L^2 on the two-dimensional torus onto the two-dimensional Hardy space H^2 is a prototypic example of a double singular integral. Though in general double singular integrals are difficult to handle, the above one can be analysed rather thoroughly by a specific trick. It turns out that the same trick applies to certain operators of one-dimensional Fourier analysis. This leads to new interpolation and correction theorems. My aim in the talk is to discuss such theorems for the Hardy-Littlewood square function in dimension 1. A short survey of the background material will also be given.

This is joint work with D. S. Anisimov.

Tid och plats: Onsdagen den 2 februari kl. 13.15 – 14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

MONEY, JOBS

Columnist: Hans Rullgård, Department of Mathematics, SU. E-mail: hansr@math.su.se.

Info = information. This will be given and repeated until obsolete. Rely on other sources as well.
BBKTH = Bulletin Board at the Department of Mathematics, KTH.
BBSU = Bulletin Board at the Department of Mathematics, SU.
The following information, with links, is also available at http://www.math.su.se/~hansr/mj.html.
Unless stated otherwise, a given date is the last date (e.g. for applications), and the year is 2005. A number without an explanation is a telephone number.

Standard information channels

1. A channel to information from Vetenskapsrådet: http://www.vr.se/naturteknik/index.asp.
2. A channel to information from the European Mathematical Society: http://www.emis.de.
3. A channel to information from the American Mathematical Society: http://www.ams.org.
4. KTH site for information on funds: http://www.kth.se/aktuellt/stipendier.
5. Stockholm University site for information on funds: http://www.su.se/forskning/stipendier/databas.php3.
6. Umeå site for information on funds: http://www.umu.se/umu/aktuellt/stipendier_fond_anslag.html.
7. Job announcement site: http://www.maths.lth.se/nordic/Euro-Math-Job.html. This is run by the European Mathematical Society.
8. Stiftelsen för internationalisering av högre utbildning och forskning (STINT) site for information on funds: http://www.stint.se.

(Continued on the next page.)

9. Nordisk Forskerutdanningsakademi (NorFA) site for information on funds: http://www.norfa.no.
10. Svenska institutet (SI) site for information on funds: http://www.si.se.

New information

Money, to apply for

11. Sigrid Arrhenius' stipendium kan sökas av forskare vid naturvetenskapliga fakulteten, SU, senast den 7 februari. Sökande får inte ha disputerat vid ansökningstidens utgång, och avhandlingen skall avses bli framlagd under 2005 eller 2006. Ansökan på särskild blankett skall skickas i 10 exemplar till Naturvetenskapliga fakultetsnämnden, Stockholms universitet, 106 91 Stockholm. Web-info: http://www.matnat.su.se/internt/index.html (fungerar endast inom SU).

Jobs, to apply for

12. Vetenskapsrådet utlyser nio anställningar vid svenska universitet och högskolor inom natur- och teknikvetenskap, varav en inom kombinatorik, 15 mars. Web-info: http://www.vr.se/sokbidrag/index.asp?id=190&dok_id=6817.

Old information

Money, to apply for

13. Från Knut och Alice Wallenbergs Stiftelse ställs anslag till rektors för KTH förfogande för att "i första hand användas till bidrag för sådana resor, som bäst befordrar ett personligt vetenskapligt utbyte till gagn för svensk forskning. Bidrag skall främst beviljas till yngre forskare. Medel kan även — efter rektors bedömning — undantagsvis disponeras för utländska gästforskare." Bidrag kan sökas under hela året. Info: Anette Nyström, 08-790 70 59. Web-info: se punkt 4 ovan.
14. Fulbright Grants for Visiting Lecturers and Research Scholars kan sökas för forskning och undervisning i USA 2005/06. Info: 08-534 818 85. Web-info: http://www.usemb.se/Fulbright/ och http://www.usemb.se/Fulbright/grants2005_6.pdf.
15. Institut Mittag-Leffler utlyser stipendier för verksamhetsåret 2005/06. Sista ansökningsdag är 31 januari. Info och anmälningsblankett, som kan kopieras, finns på Matematiska institutionens anslagstavla, SU.

Jobs, to apply for

16. Matematiska institutionen vid Luleå tekniska universitet söker en forskarassistent i matematisk statistik med inriktning industriell statistik, 28 februari. Info: Kerstin Vännman, 0920-49 11 27, e-post kerstin.vannman@ltu.se, Thomas Gunnarsson, 0920-49 10 61, e-post thomas.gunnarsson@sm.luth.se. Web-info: http://hogtrycket.adm.ltu.se/lediga_jobb.asp?annonsnr=380&SQL=100.
17. Institutionen för ekonomi och samhälle vid Högskolan Dalarna söker en universitetslektor i statistik, 17 februari. Info: Johan Bring, 070-311 22 21, e-post johan.bring@statisticon.se, Jan Åkerstedt, 023-77 86 53, e-post jak@du.se. Web-info: http://www.du.se/templates/NewsPage____3590.aspx.
18. Matematikcentrum vid Lunds universitet söker en doktorand i matematik med inriktning mot lineära partiella differentialekvationer, 21 januari. Info: Nils Dencker, 046-222 44 62, e-post Nils.Dencker@math.lu.se. Web-info: http://personalserver.pers.lu.se/document/6487.pdf och http://www.matematik.lu.se/JobsInLund/.
19. Matematikcentrum vid Lunds universitet söker en doktorand i matematik med inriktning mot icke-lineära partiella differentialekvationer, 21 januari. Info: Tomas Claesson, 046-222 85 57, e-post Tomas.Claesson@math.lu.se. Web-info: http://personalserver.pers.lu.se/document/6486.pdf och http://www.matematik.lu.se/JobsInLund/.
20. Matematiska vetenskaper vid Chalmers tekniska högskola i Göteborg utlyser doktorandtjänster inom matematik och matematisk statistik, 1 mars. Info: För tjänster i matematik, Laura Fainsilber, 031-772 35 60, e-post laura@math.chalmers.se, Hjalmar Rosengren, 031-772 53 58, e-post hjalmar@math.chalmers.se. För tjänster i matematisk statistik, Olle Häggström, 031-772 53 11, e-post olleh@math.chalmers.se, Torgny Lindvall, 031-772 35 74, e-post lindvall@math.chalmers.se. För biostatistik, Nanny Wermuth, 031-772 35 79, e-post wermuth@math.chalmers.se. Web-info: http://chalmersnyheter.chalmers.se/chalmers03/svensk/ext_ledigatjansterarticle.jsp?article=4337.