BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 5 **FREDAGEN DEN 11 FEBRUARI 2000**

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 17 februari
kl. 13.00.

Gävle Workshop on Several Complex Variables

Denna äger rum den 18 – 20 februari 2000. Se sidan 5.

Kurser

Sven Erick Alm: Scan statistics. Se sidan 8.

Bioinformatics. Se sidan 5.

SEMINARIER

Fr 02–11 kl. 9.00 – 10.00. Kollokvium i fysik. Jonas Gårding, Elekta Instrument AB, Stockholm: *Computerized image-based treatment planning for Gamma Knife surgery.* Sal F 01, Fysiska institutionen, KTH, Lindstedtsvägen 24, b.v. Se sidan 6.

Fr 02–11 kl. 15.15 – 16.15. Potentialanalysseminarium. Professor Mark L. Agranovsky, Bar Ilan University: *Global geometry of stationary sets for the wave equation.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 4 sidan 6.

Må 02–14 kl. 13.15 – 15.00. Algebra and Geometry Seminar. Tatiana Smirnova-Nagnibeda, KTH: *Growth functions, cone types, and rewriting systems in finitely generated groups.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101. Se sidan 4.

Må 02–14 kl. 15.15. Seminarium i matematisk statistik. Professor Svante Janson, Uppsala universitet: *Parking problem, hashing, random forests, graph enumeration, random walks and Brownian motion.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 4 sidan 5.

Ti 02–15 kl. 10.15. Plurikomplexa seminariet. Björn Ivarsson, Uppsala: *Exhaustion functions for hyperconvex domains.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101. Se sidan 3.

Ti 02–15 kl. 13.15. Plurikomplexa seminariet. Valerii Beloshapka, Moskva: *New models of real submanifolds of complex space.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101. Se sidan 5.

Fortsättning på nästa sida.

Seminarier (fortsättning)

Ti 02–15 kl. 13.15. Seminarium i teoretisk fysik. Ulf Nilsson: *The cosmic microwave background and the geometry of the universe.* Rum 4731, Fysikum, SU. (Observera det nya seminarierummet.) Se sidan 7.

Ti 02–15 kl. 14.15 – 15.15. Mittag-Leffler Seminar. Stefan Jacobsson, Lund: *Criteria for positivity of biharmonic Green's functions.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

On 02–16 kl. 10.30. Logikseminariet Stockholm-Uppsala. Peter Hertling: *On left-computable random real numbers.* (Fortsättning från seminariet den 9 februari.) Sal 2:315, Matematiska institutionen, Polacksbacken, Uppsala universitet. Se Bråket nr 4 sidan 5.

On 02–16 kl. 13.15. Dynamiska systemseminariet. Juan Rivera-Letelier, Université Paris Sud, Orsay: *Rigid annuli.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 4 sidan 3. Internet-adressen till information om seminariet är http://www.math.kth.se/math/research/dynsyst.

On 02–16 kl. 15.00 – 17.00. Arbetsgrupp i komplex analys. Bruno Fabre, SU: *Abel's theorem and its geometric applications.* Rum 321, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101.

On 02–16 kl. 15.00 – 17.00. Seminarium i statistik: Pedagogiskt seminarium. *(Observera tiden!)* **Urho Karvonen,** Statistiska centralbyrån, inleder med sina erfarenheter från deltidskursen *Dataanalys och metodöversikt,* 10 p. Därefter följer allmän diskussion. Rum B705, Statistiska institutionen, SU.

To 02–17 kl. 14.00 – 15.00. Informal seminar on A^1-homotopy theory of schemes. Sandra Di Rocco, Wojciech Chacholski. Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

To 02–17 kl. 14.15 – 15.15. Mittag-Leffler Seminar. Kaj Nyström, Umeå: *Non-stationary hydrodynamical potentials in non-smooth time-dependent domains.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

To 02–17 kl. 15.45 – 16.45. Mittag-Leffler Seminar. Vladimir Kozlov, Linköping: *On bounded solutions of the multi-dimensional Emden-Fowler equation in a semi-cylinder.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

Fr 02–18 kl. 9.00 – 10.00. Kollokvium i fysik. Olle Inganäs, Tillämpad fysik, Linköping: *Polymer photodiodes — from thin film optics and picosecond optical spectroscopy to photovoltaic devices.* Sal F01, Fysiska institutionen, KTH, Lindstedtsvägen 24, b.v.

Fr 02–18 kl. 11.00 – 12.00. Optimization and Systems Theory Seminar. Mattias Nordin, Optimeringslära och systemteori, KTH: *Nonlinear backlash compensation of speed controlled elastic system.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 4.

Må 02–21 kl. 15.15 – 16.00. Seminarium i matematisk statistik. Ylva Gustafsson presenterar sitt examensarbete: *Hidden Markov models with applications in speaker verification.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 7.

Fortsättning på nästa sida.

Seminarier (fortsättning)

On 02–23 kl. 13.15. Dynamiska systemseminariet. Universitetslektor Gustav Amberg, Mekanik, KTH: *Mathematical models of phase change and dendritic solidification.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6. Internet-adressen till information om seminariet är http://www.math.kth.se/math/research/dynsyst.

On 02–23 kl. 15.15–16.00. Seminarium i matematik och fysik vid Mälardalens högskola (Västerås). Laura Fainsilber, Chalmers tekniska högskola och Göteborgs universitet: *Talteori möter gaskinetik: När en diskret hastighetsmodell för Boltzmannekvationen använder summor av kvadrater av heltal.* Rum N24, Mälardalens högskola, Högskoleplan, Västerås. Se sidan 8. Internet-adressen till information om seminariet är http://www.ima.mdh.se/_seminars.htm.

Fr 02–25 kl. 9.00–10.00. Kollokvium i fysik. Professor emeritus Göran Einarsson, Teletransmissionsteori, KTH: *Quantum communication theory.* Sal F01, Fysiska institutionen, KTH, Lindstedtsvägen 24, b.v.

PLURIKOMPLEXA SEMINARIET

Björn Ivarsson:
Exhaustion functions for hyperconvex domains

Abstract: It can be shown that the following Dirichlet problem for the complex Monge-Ampère operator

$$\begin{cases} \det\Big(\dfrac{\partial^2 u}{\partial z_j \partial \overline{z}_k}\Big) = f(z,u) \text{ in } \Omega \\ \lim\limits_{z\to z_0} u(z) = 0 \text{ for all } z_0 \in \partial\Omega \\ \sup\Big(\Big|\dfrac{\partial u}{\partial x_i}(z)\Big|; z \in \Omega\Big) < \infty, \end{cases}$$

where $f \in C^\infty(\overline{\Omega}\times\mathbb{R})$ and $f(z,u) > 0$, is uniquely solvable with a smooth strictly plurisubharmonic solution if and only if there is a bounded plurisubharmonic exhaustion function ρ for Ω satisfying

$$\begin{cases} \det\Big(\dfrac{\partial^2 \rho}{\partial z_j \partial \overline{z}_k}\Big) \geq 1 \text{ in } \Omega \\ \lim\limits_{z\to z_0} \rho(z) = 0 \text{ for all } z_0 \in \partial\Omega \\ \sup\Big(\Big|\dfrac{\partial \rho}{\partial x_i}(z)\Big|; z \in \Omega\Big) < \infty. \end{cases}$$

Because of this result it would be interesting to describe which domains have a bounded strictly plurisubharmonic exhaustion function which is globally Lipschitz. I will give examples of domains having such an exhaustion function and examples of domains not having such a function.

Tid och plats: Tisdagen den 15 februari kl. 10.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101.

ALGEBRA AND GEOMETRY SEMINAR

Tatiana Smirnova-Nagnibeda: Growth functions, cone types, and rewriting systems in finitely generated groups

Abstract: Given a finitely generated group G and a finite system of generators S in it, a *growth function* can be naturally associated to the pair (G, S). It associates to an integer $n \geq 0$ the number $\sigma(n)$ of elements of G of length n, the length of an element being the minimal number of letters necessary to write the element as a word in the alphabet $S \cup S^{-1}$. Growth functions of finitely generated groups were first introduced by V. Efremovich and A. Schwarz in the 1950's, became famous after the work of J. Milnor in the 1960's, and were extensively studied in geometry, group theory, and theory of formal languages by such authors as J. Cannon, D. Epstein, R. Grigorchuk, M. Gromov, and others. The growth functions are usually studied under the form of the *growth series*

$$f(z) = \sum_{n=0}^{\infty} \sigma(n) z^n.$$

The talk will be devoted to the following two aspects of the study of growth series of finitely generated groups:

- Connections between geometric properties of a group and rationality of its growth series.
- Computation of growth series via combinatorics of words.

Tid och plats: Måndagen den 14 februari kl. 13.15 – 15.00 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101.

OPTIMIZATION AND SYSTEMS THEORY SEMINAR

Mattias Nordin: Nonlinear backlash compensation of speed controlled elastic system

Abstract: Backlash is one of the most important non-linearities that limit the performance of speed and position control in industrial, robotics, automotive, automation and other applications. This thesis deals with various aspects of two-mass systems with backlash, representing the majority of such systems, such as modelling, identification and control.

One important contribution of this thesis is the novel backlash compensation method. The method is based on smart and soft switching between well-designed linear controllers. The algorithm, and design method, is successfully tested by simulations and experiments on a real system.

Another important contribution is the new models for backlash in drive trains, also showing the limitations of the dead zone models. The new models were also successfully compared to measurements on a laboratory system.

An extensive survey of previous methods for control of systems with backlash is also included, as well as a winning QFT design for a benchmark problem of an elastic system without backlash.

Tid och plats: Fredagen den 18 februari kl. 11.00 – 12.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

PLURIKOMPLEXA SEMINARIET

Valerii Beloshapka:
New models of real submanifolds of complex space

Abstract: Automorphisms, invariants and classification of the real manifolds of a complex space were studied by Poincaré, Elie Cartan, Tanaka, Chern, Moser, and others. A lot of interesting results were obtained by the method of tangent quadrics. This method works both for hypersurfaces and for surfaces of higher codimension. But there are two types of situations were quadrics are not good: when the codimension of the surface is very high and when we have a hypersurface with degeneration. Then we need new models — and such models do exist.

Tid och plats: Tisdagen den 15 februari kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket, Roslagsvägen 101.

Gävle Workshop on Several Complex Variables

Den 18 – 20 februari 2000 arrangeras en workshop i flera komplexa variabler vid Högskolan i Gävle. Föredragshållare:

- Mats Andersson, Göteborg
- Jörgen Boo, Sundsvall
- Urban Cegrell, Umeå/Sundsvall
- Alicia Dickenstein, Buenos Aires
- Peter Ebenfelt, Stockholm
- Anders Fällström, Sundsvall
- Niklas Lindholm, Göteborg
- Mikael Passare, Stockholm
- Ragnar Sigurdsson, Reykjavik/Sundsvall

Mer information, inklusive hela programmet för workshopen, finns på www.hig.se/~lfn/workshop.html. Organisatörer är Lars Filipsson, e-post lfn@hig.se, och Mikael Forsberg, e-post mfg@hig.se, vid Högskolan i Gävle.

GRADUATE COURSE IN BIOINFORMATICS

Uppsala, February 24 – 26, 2000,
and Gothenburg, March 23 – 25, 2000

The course is arranged by Gothenburg Stochastic Centre at Chalmers, Department of Mathematical Statistics at Uppsala University, Linnaeus Centre of Bioinformatics in Uppsala, and Stockholm Bioinformatics Centre.

Course committee: Tom Britton (tom.britton@math.uu.se), Mathematical Statistics, Uppsala University, Olle Nerman (nerman@math.chalmers.se), Gothenburg Stochastic Centre, Chalmers University of Technology, Siv Andersson (Siv.Andersson@molbio.uu.se), Linnaeus Centre of Bioinformatics, Uppsala, and Jens Lagergren (jensl@nada.kth.se), Stockholm Bioinformatics Centre.

Late applications should be sent to Tom Britton by e-mail.

Updated information about the course can be found at http://www.math.chalmers.se/Stat/Bioinfo/. (Click at "National course in bioinformatics".) See also Bråket 1999 no. 37, pages 6 – 8.

KOLLOKVIUM I FYSIK

Jonas Gårding: Computerized image-based treatment planning for Gamma Knife surgery

Abstract: Leksell Gamma Knife is a non-invasive neurosurgical tool for the treatment of small to medium size intracranial lesions. A single dose of radiation is directed through the 201 ports of a collimator helmet to the target with the brain. The prototype Gamma Knife, designed by Börje Larsson and Lars Leksell, was built in 1968. Today the total number of patients treated exceeds 100 000, and there are more than 120 Gamma Knives installed throughout the world.

The success of the Leksell Gamma Knife as a neurosurgical tool is related to advances in medical imaging, notably MRI, which allows computerized treatment planning to be performed with the accuracy necessary for utilizing the full potential of the tool. In this talk I will briefly review the technology of Gamma Knife surgery, and focus on the present and future role of medical image generation, analysis and visualization in Gamma Knife treatment planning.

Tid och plats: Fredagen den 11 februari kl. 9.00 – 10.00 i sal F 01, Fysiska institutionen, KTH, Lindstedtsvägen 24, b.v.

DYNAMISKA SYSTEMSEMINARIET

Gustav Amberg: Mathematical models of phase change and dendritic solidification

Abstract: Solidification and phase change is of immense importance in engineering and science in general. Applications that can be mentioned are development and manufacture of new materials, as well as modelling of the melting and freezing of the polar ice, or understanding the dynamics of slowly solidifying magma in the earth's core.

In this talk I will try to briefly describe a few of the generic problems that are important in materials science, and ways in which they are studied theoretically there. One idealized case is the growth of a crystal from a nucleus in an undercooled melt. This growth is limited by the diffusion of heat away from the crystal, and is inherently unstable, due to the coupling between diffusion rate and interface shape. This instability, together with properties of the materials such as the interfacial energy, gives rise to the morphology of the material. One common morphology is 'dendrites', from the greek word 'dendros', tree.

I will show examples of simulations of dendritic growth using the phase field method. In this method a 'phase field' is introduced, which is governed by a certain partial differential equation that can be motivated from the thermodynamics of the system. This equation is solved together with the appropriate conservation laws for heat, mass, etc. We have recently studied, among other things, how the morphology is affected by a melt flow past the solidifying crystal, and are presently investigating the case when growth is limited by diffusion of an alloying element in addition to heat.

Tid och plats: Onsdagen den 23 februari kl. 13.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I TEORETISK FYSIK

Ulf Nilsson: The cosmic microwave background and the geometry of the universe

Abstract: Understanding the geometry of the universe is one of the most fundamental problems in physics. It is widely believed by cosmologists that a Friedmann-Lemaitre (FL) model can accurately describe the universe on sufficiently large scales. This is in spite of the fact that the FL models, which are based on an assumption of homogeneity and isotropy, were originally introduced as models of the universe for aesthetic reasons only. The belief stems mainly from the notion that the remarkable isotropy of the cosmic microwave background (CMB) radiation is only compatible with an FL model. There are, however, theoretical results that, in conjunction with the nature of the CMB, lend credence to this notion.

In a famous piece of serendipity, the cosmic microwave background radiation, one of the pillars of the hot Big Bang model, was discovered in 1965. For almost three decades, the CMB seemed to be perfectly isotropic. If this were indeed true, the fundamental theorem of Ehlers, Geren, and Sachs (1968), the so-called EGS theorem, could be used to actually prove that the universe is exactly an FL model. In 1992, the COBE satellite showed that the CMB is not perfectly isotropic, only "almost isotropic", by measuring small fluctuations in the CMB. Luckily, the EGS theorem can be generalized to the "almost EGS theorem", which, at a quick glance, seems to prove that the universe is "almost an FL model".

In this talk we will, in very general terms, discuss what the statement "almost an FL model" means, and whether the EGS theorems can be used for determining the geometry of the universe. This is done by considering the assumptions made in proving these theorems, and what happens when the assumptions are weakened to more comply with the observational situation.

Tid och plats: Tisdagen den 15 februari kl. 13.15 i rum 4731, Fysikum, SU.

SEMINARIUM I MATEMATISK STATISTIK

Ylva Gustafsson

presenterar sitt examensarbete:

Hidden Markov models with applications in speaker verification

Abstract: Speech recognition and speaker verification can be performed using a class of statistical models called hidden Markov models, HMM's. This report describes the field of HMM's, its use in speaker verification and some specific methods connected to parameter estimation in the models of the speakers.

Four methods are theoretically described: maximum likelihood (ML), maximum a posteriori (MAP), maximum likelihood linear regression (MLLR), and minimum classification error (MCE). A lot of research has already been done on the performance of models obtained through the ML method, and in this work the methods MAP and MLLR are investigated and compared to the ML method.

As far as the results of the tests performed in this work show, the methods MAP and MLLR are not better than ML, but there are still a lot of factors in the setup with need of further investigation.

Tid och plats: Måndagen den 21 februari kl. 15.15 – 16.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I MATEMATIK OCH FYSIK VID MÄLARDALENS HÖGSKOLA (VÄSTERÅS)

Laura Fainsilber: Talteori möter gaskinetik: När en diskret hastighetsmodell för Boltzmannekvationen använder summor av kvadrater av heltal

Sammanfattning: Boltzmannekvationen är en integral-differentialekvation som används för att beskriva gasmolekylernas rörelser och kollisioner i tunna gaser. I beräkningarna använder man modeller där molekylernas hastighet tas ur en diskret mängd; då försöker man uppskatta integralen med hjälp av ändliga summor. Man kan till exempel anta att hastigheterna tillhör gittret $\mathbb{Z}^n$ av punkter med heltalskoefficienter. I modellen behöver man då beskriva vilka punkter i gittret som ligger precis på en sfär med given radie r, d.v.s. representationer av r^2 som en summa av heltalskvadrater. Klassiska resultat av Gauss, Fermat, Euler och Jacobi visar vilka heltal som kan skrivas som summor av heltalskvadrater och på hur många olika sätt. För att visa att summorna konvergerar mot integralen behöver vi också veta att punkterna är väl fördelade på sfären. I dimension $n > 3$ finns många punkter och fördelningen är inget problem. I dimension 3 visade Bobylev, Palczewski och Schneider 1995 konvergensen med hjälp av modulära former. I dimension 2 finns få punkter, och det är inte klart än om de är tillräckligt bra fördelade.

Föreläsningen är tänkt för en allmän matematisk publik.

Tid och plats: Onsdagen den 23 februari kl. 15.15 – 16.00 i rum N24, Mälardalens högskola, Högskoleplan, Västerås.

DOKTORANDKURS I MATEMATISK STATISTIK

Sven Erick Alm: Scan statistics

Min tidigare annonserade doktorandkurs i Scan statistics (se Bråket nr 2 sidan 3) är flyttad till höstterminen 2000 med preliminär kursstart i början av september. Det visade sig nämligen att flera potentiella intressenter redan hade fulltecknat program under vårterminen.

Alla intresserade är välkomna! Jag skulle uppskatta en (icke-bindande) intresseanmälan före sommaren.

Vill du veta mer om scan-statistikor, är du välkommen att skicka e-post eller ringa.

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