25TH ANNIVERSARY

NORDAN 2024

Östanskär, Sweden, 3-5 May, 2024

Friday, May 3

Arrival – Coffee with sandwich

17:30	Opening by Vice Chancellor Anders Fällström
17:45–18:15	Håkan Samuelsson Kalm, Chalmers University of Technology and University of Gothenburg
18:30–19:00	Janne Heittokangas, University of Eastern Finland
19:30	Dinner

Saturday, May 4

09:30–10:00	Zakarias Sjöström Dyrefelt, Aarhus University
10:15–10:45	Björn Ivarsson, Aalto University
10:45–11:15	Swedish fika
11:15–11:45	Alan Sola, Stockholm University
12:00–13:00	Lunch
	Social activities
19:00	Dinner

Sunday, May 5

09:30–10:00	Mårten Nilsson, Lund University
10:15–10:45	Erlend Fornæss Wold, University of Oslo
10:45–11:15	Swedish fika
11:15–11:45	Benedikt Steinar Magnússon, University of Iceland
12:00–13:00	Lunch
	Departure to Sundsvall

On proper intersections on analytic spaces

Håkan Samuelsson Kalm

Abstract: Suppose Y is a complex manifold and Z_1, Z_2 are pure-dimensional cycles in Y with supports $|Z_1|$ and $|Z_2|$. The cycles Z_1, Z_2 intersect properly if

$$\operatorname{codim} |Z_1| \cap |Z_2| = \operatorname{codim} |Z_1| + \operatorname{codim} |Z_2|.$$

In this case there is a classical intersection product $Z_1 \cdot Z_2$ with many useful properties. However, if Y is allowed to have singularities, then there is no proper intersection product except in quite special situations. In this talk I will present a new approach to the classical intersection product based on local $\bar{\partial}$-potentials and calculus of pseudomeromorphic currents. Under some additional assumptions this approach works also in case Y has singularities.

The talk is based on joint work with Mats Andersson.

Standard solutions of complex linear differential equations

Janne Heittokangas

Abstract: For a meromorphic function f and $c \in \widehat{\mathbb{C}}$, the classical Nevanlinna's deficiency is defined by

$$\delta_N(c, f) := \liminf_{r \to \infty} \frac{m(r, c, f)}{T(r, f)},$$

where $m(r, c, f)$ is the proximity function and $T(r, f)$ is the Nevanlinna characteristic. Roughly a hundred years ago, Nevanlinna proved that f can have at most a countable number of deficient values c for which $\delta_N(c, f) > 0$, and that the sum of such deficiencies is $\leq 2\pi$. This is known as the deficiency relation.

In 1969, Petrenko introduced an analogous quantity

$$\delta_P(c, f) := \liminf_{r \to \infty} \frac{\mathscr{L}(r, c, f)}{T(r, f)},$$

which he called the magnitude of the deviation of f from c. Here $\mathscr{L}(r, c, f)$ denotes the logarithmic maximum modulus. In 1997, Eremenko introduced another deviation as the quantity

$$\delta_P(c, f) := \liminf_{r \to \infty} \frac{\mathscr{L}(r, c, f)}{A(r, f)},$$

where

$$A(r, f) = \frac{1}{\pi} \int_{|z|<r} f^{\#}(z)^2 \, dm(z)$$

is the normalized spherical area of the image of $|z| < r$ under f (counting multiplicities). Both quantities $\delta_P(c, f)$ and $\delta_E(c, f)$ are known to satisfy an analogue of the deficiency relation, but the theory is much more flavourful and intense.

A meromorphic solution of a complex linear differential equation (with meromorphic coefficients) for which the value $c = 0$ is the only possible finite deficient/deviated value is called a standard solution. A theorem of Wittich from 1955 states, in modern terminology, that all rapidly growing meromorphic solutions are N-standard solutions. This result has laid the foundation of the oscillation theory of complex differential equations.

Conditions for the existence and the number of standard solutions for the three aforementioned quantities are discussed in this talk.

This talk is based on joint papers with Samu Pulkkinen (Finland), Hui Yu (China) and Amine Zemirni (Algeria).

On generalised Monge-Ampère equations

Zakarias Sjöström Dyrefelt

Abstract: Generalised Monge-Ampère (gMA) equations were introduced by Pingali and capture several well-known families of PDE on compact Kähler manifolds, including the J-equation, inverse Hessian equations, and certain deformed Hermitian-Yang-Mills and Z-critical equations. By results of Datar-Pingali and Fang-Ma (extending those of Gao Chen, Song, and others) solvability of gMA equations is equivalent to a Demailly-Păun type positivity condition tested on subvarieties, reminiscent of slope stability. In general this slope condition can be violated by infinitely many subvarieties, of any codimension. However, as a main result we deduce from the the divisorial Boucksom-Zariski decomposition that the destabilising subvarieties actually form a finite set in the semistable case, if we impose enough positivity on a certain $(1,1)$ -class. This leads to first existence results and first examples toward the following conjectural picture: Under suitable assumptions, the "space of gMA equations" admits a (locally finite) wall-chamber decomposition, in arbitrary dimension.

This is ongoing joint work with Sohaib Khalid (SISSA).

Homotopy classes of maps in Gromov's Vaserstein problem

Björn Ivarsson

Abstract: The solution to Gromov's Vaserstein problem states that any null-homotopic holomorphic map from a Stein space to the special linear group can be written as a product of a finite number of unipotent factors. In some cases, for example when the space is contractible, all maps are null-homotopic. The identity map of the special linear group is one example of a map that is not null-homotopic. I will discuss, using Morse Theory, how to recognize when a Stein space have maps that are not null-homotopic and draw some conclusions.

Local descriptions of stable polynomials and ideals of admissible numerators

Alan Sola

Abstract: A polynomial p is said to be stable in $\mathbb{H}^d$, a product of upper half-planes, if $p(z) \neq 0$ in $\mathbb{H}^d$. Reporting on joint work with K. Bickel, G. Knese, and J.E. Pascoe, I will discuss local descriptions of stable polynomials near isolated boundary zeros, and present applications to the bounded numerator problem: given a stable p, determine which polynomials q have the property that q/p is bounded in $\mathbb{H}^d$. A characterization when $d = 2$ was recently completed by J. Kollar. I will explain this two-variable result, and indicate some recent progress in the higher-dimensional setting.

Boundary behavior of plurisubharmonic functions on b-regular domains

Mårten Nilsson

Abstract: In potential theory of the complex plane, the Perron method together with the extended maximum principle allows us to uniquely solve the Dirichlet problem on all domains with non-polar boundary, for bounded boundary data continuous outside polar sets. Due to linearity, one may then construct harmonic measure, which in the case of the unit disk (where all bounded harmonic functions are represented by Poisson integrals) immediately yields something more: The Dirichlet problem is also uniquely solvable for boundary data continuous outside sets of arc length zero. We suggest a way to understand and resolve this disparity - simply replace polar sets by boundary polar sets! We will discuss how this approach generalizes to the Dirichlet problem for the complex Monge–Ampère operator on b-regular domains, and also discuss a related problem where the picture is entirely different in higher dimensions. If time permits, we shall also discuss plurisubharmonic functions with singularities on the boundary of the domain, analogous to Poisson integrals of continuous L^1 functions on the unit circle.

Oka properties of complements of complements of closed convex sets in $\mathbb{C}^n$

Erlend Fornæss Wold

Abstract: From fairly recent breakthroughs by Y. Kusakabe much is known about Oka properties of complements of (polynomially) convex compact sets in $\mathbb{C}^n$. In this talk we will give results in the case of non-compact sets. We will also point out some open problems in the area. This is joint work with Franc Forstneric.

Polynomials with exponents in compact convex sets and associated pluripotential theory

Benedikt Steinar Magnússon

Abstract: For a given a set in $\mathbb{R}^n_+$ we can define a grading of polynomials of n variables. Using the associated logarithmic supporting functions we can define a new Lelong-class of plurisubharmonic functions which growth reflects the aforementioned polynomial grading. Using this connections we can study the interplay between holomorphic functions and pluripotential theory. I will explain what classical results generalize to this settings, and under what conditions on the initially chosen set they hold.

Participants

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The Nordic Complex Analysis Meeting

1997 Trosa, Stockholm University
1998 Marstrand, Chalmers/GU
1999 Saltsjöbaden, Stockholm University
2000 Örnköldsvik, Mid Sweden University/Umeå University
2001 Voksenåsen, University of Oslo
2002 Reykjavik, University of Iceland
2003 Visby, Stockholm University
2004 Nösund, Orust, Chalmers/GU
2005 Sigtuna, Uppsala University
2006 Sundsvall, Mid Sweden University/Umeå University
2007 Drøbak, University of Oslo
2008 Mariehamn, Åland, Stockholm University, Part of the Mittag-Leffler program
2009 Reykholt, University of Iceland
2010 Lökeberg, Chalmers/GU
2011 Röstånga, Lund University
2012 Kiruna, Mid Sweden University/Umeå University
2013 Svolvær, University of Oslo
2014 Luminy, CIRM, Nordan+Kawa
2015 Reykjavik, University of Iceland
2016 Stockholm, Part of the 27th Nordic Congress of Mathematics
2017 Tollered, Chalmers/GU
2018 Hjelmeland, University of Stavanger
2019 Lunteren, University of Amsterdam
2020 Covid-19
2021 Covid-19
2022 Covid-19
2023 Rydebäck, Lund University
2024 Östanskär, Mid Sweden University/Umeå University

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