Øresundsseminar

Tuesday, May 22, 2018
Auditorium 8,
H.C. Ørsted Institute,
Universitetsparken 5, Copenhagen

12:45-12:55: Arrival and Coffee

You are welcome to have a coffee with us before the first talk in the lunch room on the top floor of the MATH Department (room 4.4.19)

13:00-14:00

Complex-Valued Harmonic Morphisms from Lie Groups and Symmetric Spaces

Sigmundur Gudmundsson (University of Lund)

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Abstract

The study of harmonic morphisms in the 3-dimensional Euclidean space goes back to a paper of Jacobi from 1848. This was then introduced into the setting of Riemannian geometry, in the late 1970s by Fuglede and Ishihara, independently. A harmonic morphism $\varphi : (M, g) \to (N, h)$ between two Riemannian manifolds is a map that pulls back real-value harmonic functions on (N, h) to harmonic functions on (M, g).

In 1983 Baird and Eells have shown that in the case when the codomain is a surface, the regular fibres of a harmonic morphism form a minimal conformal foliation on the domain. These are interesting geometric objects and our main motivation for studying harmonic morphisms in this particular case.

Harmonic morphisms are solutions to an over-determined non-linear system of partial differential equations. They do not have a general existence theory. There even exist rather simple 3-dimensional Lie groups for which one can show that local solutions do not exist.

In this talk we will explain the general theory and give a survey of what is known when (M, g) is a Lie group or a symmetric space and (N, h) is the flat complex plane.

14:00-15:00

Laplace–Carleson Embeddings and Weighted Hankel Operators

Jonathan R. Partington (University of Leeds)

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Abstract

Beginning with a brief review of the theory of Laplace–Carleson embeddings [2], we show how it gives results on the boundedness of weighted Hankel operators [1].

We also hope to say something about Laplace–Carleson embeddings in the context of model spaces, discussing work with R. Zawiski [3]; this leads to results on the boundedness of truncated Hankel and Toeplitz operators.

Keywords: Laplace transform, Carleson embeddings, Hankel operators, truncated Toeplitz operators, model spaces.

References

[1] A. Bashar Abusaksaka and J. R. Partington (2017) Diffusive systems and weighted Hankel operators, *Operators and Matrices*, **11**, no. 1, 125–132.

[2] B. Jacob, J. R. Partington and S. Pott (2013) On Laplace–Carleson embedding theorems, *Journal of Functional Analysis*, **264**, 783–814.

[3] J. R. Partington and R. Zawiski (2018) Carleson measures for model spaces, Hankel operators, and controllability of diagonal systems, *in preparation*.

15:00-15:30: Coffee Break

15:30-16:30

News on the Moser-Trudinger Inequality: From Sharp Estimates to the Leray-Schauder Degree

Luca Martinazzi (University of Padova)

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Abstract

The existence of critical points for the Moser-Trudinger inequality for large energies has been open for a long time. We will first show how a collaboration with G. Mancini allows to recast the Moser-Trudinger inequality and the existence of its extremals (originally due to L. Carleson and A. Chang) under a new light, based on sharp energy estimate. Building upon a recent subtle work of O. Druet and P.-D. Thizy, in a work in progress with O. Druet, A. Malchiodi and P.-D. Thizy, we use these estimates to compute the Leray-Schauder degree of the Moser-Trudinger equation (via a suitable use of the Poincaré-Hopf theorem), hence proving that for any bounded non-simply connected domain the Moser-Trudinger inequality admits critical points of arbitrarily high energy.

16:30-17:30

Are Quantum Computers More Powerful Than Classical Ones?

Laura Mancinska (Copenhagen University)

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Abstract

In this talk I will present a classification of two-qubit commuting Hamiltonians in terms of their computational complexity. Suppose one has a two-qubit commuting Hamiltonian H which can be applied to any pair of qubits, starting in a computational basis state. We prove a dichotomy theorem: either this model is efficiently classically simulable or it allows one to sample from probability distributions which cannot be sampled from classically unless the polynomial hierarchy collapses. Furthermore, the only simulable Hamiltonians are those which fail to generate entanglement. This shows that generic two-qubit commuting Hamiltonians can be used to perform computational tasks which are intractable for classical computers under plausible

assumptions. Our proof makes use of new postselection gadgets and Lie theory. (This is a joint work with A. Bouland and L. Xi.)

18:30-20:30: Social Dinner at Restaurant Madklubben Østerbro
Østerbrogade, 79, first floor.
