Svenska matematikersamfundet

The Swedish Mathematical Society

Autumn metting 2025

Programme

All ordinary lectures of the meeting will take place at Uppsala University in

Sonja Lyttkens room 101121, Hus 10 LOCATION

and on Zoom via

https://stockholmuniversity.zoom.us/j/66597707357

The schedule refers to Stockholm time (CET).

Friday, 21 November

12.00-13.00 **Lunch** (restaurant **Rullan**, by own responsibility)

13.00-13.50 **Christiane Tretter**, SMS distinguished lecturer

14.00-14.25 **Mikael Passare**, *in memoriam*

14.30-15.00 **Coffee break**

	room 101121	room 2001
15.05-15.30	**Dario Giandinoto**	**Haguma Gratien**
15.35-16.00	**Dmitrii Panasenko**	**Levi Haunschmid-Sibitz**
16.05-16.30	**Alejandro Rodriguez Sponheimer**	**Nicolas Boulle**
16.35-17.00	**Suprokash Hazra**	**Malcolm Fack**

17.00-17.55 **Höstmöte, Svenska matematikersamfundet**

18.30-21.30 **Conference dinner (at restaurant** *Peppar Peppar*)

Register by sending e-mail to **president@swe-math-soc.se** before **November 14**.

Interaction of two KP solitons.

Nicolas Boulle (Mid Sweden University, Sundsvall)

The Kadomtsev-Petviashvili (KP) equation is a nonlinear integrable equation in $(2+1)$ dimensions that describes the evolution of solitons. We present a class of solutions built on matrices, providing explicit scalar solution formulas derived from the matrices' input data. Focusing on 2×2-matrices, corresponding to 12 independent input parameters, different soliton patterns can be obtained when varying those parameters. In particular, we study the class of $(2,2)$-soliton solutions representing the interaction of two incoming and two outgoing solitons. Although this is a restricted class, it already offers a large variety of phenomena. We then look at their asymptotic behaviour, including regularity and phase shift, and illustrate these properties with visual examples.

Towards a spectral refinement of symplectic Khovanov homology.

Malcolm Fack (Uppsala Univ.)

Using Lagrangian Floer theory in a family of spaces arising in Lie theory, Seidel and Smith constructed a group-valued invariant of oriented links called symplectic Khovanov homology. This invariant is known to agree with Khovanov‚Äôs combinatorially defined link invariant, at least over characteristic zero fields. Following technical advances in the circle of ideas known as *Floer homotopy theory*, it is now often possible to lift Floer-theoretic invariants to the level of spectra. In this talk I will explain how an application of Floer-homotopical techniques is expected to produce a spectrum-valued link invariant refining symplectic Khovanov homology. This would provide a symplectic counterpart to Lipschitz-Sarkar's combinatorially defined spectral refinement of Khovanov homology.

Spectral asymptotics of tridiagonal KMS matrices.

Dario Giandinoto (Stockholm Univ.)

KMS matrices are matrices whose entries on the diagonals are obtained by sampling continuous functions on a partition of $[0,1]$. They can be seen as a generalization of Toeplitz matrices, whose entries on the diagonals are constant. In this talk, we will provide numerical computations of the spectrum of KMS matrices, showing how it appears to accumulate on certain curves, similarly to Toeplitz matrices. We will then compute the spectral asymptotics in the case where the diagonals are sampled from piecewise constant functions, and explain how this could be used to study the spectrum of a randomized version of *KMS* matrices.

On the tangential boundary behavior of bounded holomorphic Functions in the Unit Disc.

Haguma Gratien (Linköping Univ. och Univ. of Rwanda)

In this talk, we present a joint work in collaboration with 0. Svensson and F. Di Biase. We will discuss some results (old and new) concerning the behavior of holomorphic Functions as the boundary of the unit disk is approached. The first theorem about the boundary limiting behavior of holomorphic functions was proved by P. Fatou in his thesis in 1906. He proved that every bounded holomorphic function defined on the unit disc in the plane admit boundary values, for almost every point in the boundary, provided we approach the boundary of the unit disc in a nontangential way. This important result has been generalized in a number of ways. Our interest here is in the fact that nontangential approach regions in Fatou result are optimal in the sense that convergence will fail if we approach the boundary inside larger regions, having a higher order of contact with the boundary. The first theorem of this sort is due to J.E. Littlewood in 1927, who proved that if we replace a nontangential region with the rotates of any fixed tangential curve, then convergence fails. There are also several generalizations of this Littlewood's theorem. For example, in 2006, A. Stokolos, F. Di Biase, 0. Svensson and T. Weiss proved a theorem of *Littlewood type* where the tangential curve is allowed to vary its shape, and do not require uniformity in the order of tangency. Hence it contains Littlewood's result. i.e., it is an extension of the set of those families of approach regions for which a theorem of *Littlewood type* holds. Our new theorem is also of *Littlewood type* and its novelty can be found in the fact that, while the previous results of this kind were centered around approach regions which either are curves or share with curves a certain topological property which excludes the possibility that they could be countably infinite, our new result deals with approach regions that satisfy a condition which does allow them to be countably infinite, without excluding the possibility that they could be curvilinear. Hence it contains both 1927 and 2006 results.

Classification of extremal stationary measures of the multi-class ASEP and the stochastic six-vertex model.

Levi Haunschmid-Sibitz (KTH)

The asymmetric simple exclusion process and stochastic six vertex model are classical interacting particle systems. Their multi-class generalizations are natural generalizations stemming from a shared property called attractivity. We show that all extremal stationary measures of the multi-class stochastic six vertex model (with shift) or of ASEP are given either by a projections of the ASEP speed process or the q-Mallows measure, which gives a complete characterisation of the stationary measures of these processes, which generalizes the single-class statement due to Ligget.

Truncated tube domains with multi-sheeted envelope of holomorphy.

Suprokash Hazra (Mid Sweden University, Sundsvall)

We begin by defining the *envelope of holomorphy* of a domain in $\mathbb{C}^n$ and discussing the *schlichtness* of it by reviewing some examples and known results. Next, we address a group of problems raised by J. Noguchi and M. Jarnicki - P. Pflug, one of which asks whether the envelopes of holomorphy of truncated tube domains are always schlicht. By providing a counter-example diffeomorphic to the 4-ball, we then discuss an answer to the above problem jointly obtained by Egmont Porten and the author. We also discuss a sufficient condition for schlichtness in complex dimension two. Finally we state some open questions in the literature.

Computing regular set tolerances for combinatorial minimization problems

Dmitrii Panasenko (Umeå University)

Sensitivity analysis in combinatorial optimization examines how changes in the costs of elements affect the optimal solutions. In this talk, we focus on the concept of regular set tolerance for problems of type sum, that is, problems where the optimal objective value is given by the sum of the costs of the elements in the solution The regular set upper tolerance shows how much the sum of the costs of the elements of a set can be increased while ensuring that all current optimal solutions remain optimal. And the regular set lower tolerance shows how much the sum of the costs of the elements of a set can be decreased while ensuring that the objective value of the optimal solution is not changed. We present a general method for computing regular tolerances in combinatorial minimization problems of type sum and discuss the computation of regular tolerances for the Minimal Spanning Tree problem.

A Central Limit Theorem for Recurrence.

Alejandro Rodriguez Sponheimer (Lund University)

The famous Poincaré Recurrence Theorem states that, under some mild assumptions, almost every point in a probability-preserving dynamical system (X,μ,T,d) is recurrent, that is, for μ-a.e. point x, the orbit $\{T^n x\}_{n=1}^{\infty}$ returns arbitrarily close to x. Although a very general result, it gives us no quantitative information about the recurrence. In recent years, there have been several results establishing almost-sure limit laws for the sum

$$\sum_{k=1}^{n} \mathbf{1}_{B(x,r_k(x))}(T^k x)$$

for various decaying radii $r_k(x)$, which give quantitative information about the rate of recurrence as well as how close the ‘close returns’ really are. In this talk, I will explain what a probability-preserving dynamical system is and present a distributional limit law for the above sum. I will briefly explain the role of decay of correlations and short returns estimates, which can be interpreted as dynamical ‘long-term’ and ‘short-term’ analogues of independence in probability theory.

Challenges for non-selfadjoint spectral problems in analysis and computation.

Christiane Tretter (University of Bern, CH)

Non-selfadjoint spectral problems appear frequently in a wide range of applications. Reliable information about their spectra is therefore crucial, yet extremely difficult to obtain. This talk focuses on tools to master these challenges such as spectral pollution or spectral invisibility. In particular, the concept of essential numerical range for unbounded linear operators is introduced and studied, including possible equivalent characterizations and perturbation results. Compared to the bounded case, new interesting phenomena arise which are illustrated by some striking examples. A key feature of the essential numerical range is that it captures, in a unified and minimal way, spectral pollution which may affect e.g. spectral approximations of PDEs by projection methods or domain truncation methods. As an application, Maxwell’s equations with conductivity will be considered.
(Joint work with S. Boegli, M. Marletta, and also F. Ferraresso)