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Sisällys

Keynote talks

Motives

Thu 09:30-10:15 C1

Toni Annala
University of Toronto

Cohomology theories are at the core of many applications of algebraic geometry to other fields, and algebraic geometry comes equipped with a surprisingly large collection of them. I will tell you how to construct all cohomology theories in algebraic geometry at once with a single, universal construction.

TBA

Thu 10:30-11:15 C1

Susanna Heikkilä
University of Jyväskylä

TBA

Sparse versus packable sets

Thu 13:00-13:45 C1

Timo Hänninen
Tampere University

The notion of disjointness of sets can be relaxed by allowing controllable overlaps between sets, leading to the notions of sparse sets and of packable sets. Such sets arise from, for example, the study of model operators in harmonic analysis. Roughly speaking, sets are called sparse if they have large disjoint parts, whereas sets are called packable if the sum of their areas can be bounded by the area of their union. For what kinds of sets are these two notions equivalent?

TBA

Fri 09:30-10:15 C1

Toni Karvonen
LUT University

TBA

From Mathematics to Neuroscience: Modelling Fluid Dynamics and Neurovascular Coupling in Epilepsy

Fri 10:30-11:15 C1

Maryam Samavaki
University of Eastern Finland

Understanding the brain requires more than observation; it demands interpretation, structure, and prediction, all of which mathematics provides. In this talk, I will explore how mathematical modelling, particularly fluid dynamics and diffusion equations, contributes to our understanding of brain function and neurological disorders. Focusing on neurovascular coupling, the process linking neuronal activity to blood flow, I will outline how tools such as the Navier-Stokes and convection-diffusion equations can help us simulate cerebral hemodynamics. I will discuss the role of mathematical modelling in integrating brain imaging data, uncovering physiological mechanisms, and guiding clinical insights, with a particular emphasis on epilepsy. This presentation highlights the power of mathematics to bridge neuroscience, imaging, and medicine, and reflects on the challenges and opportunities in modelling complex biological systems.

TBA

Fri 16:15-17:00 C1

Joni Teräväinen
University of Cambridge

TBA

Parallel sessions

Algebraic and Combinatorial Coding Theory

Automorphisms of Complex Hadamard Matrices

Thu 14:00-14:20 S203

Tuomo Valtonen
Aalto University

Symmetry in the context of equivalence or isomorphism is a fundamental and natural concept in any study of discrete structures. Symmetries are also important for non-discrete structures, but their treatment can be more challenging and is perhaps therefore often overlooked. This holds for many studies of complex Hadamard matrices, that is, matrices with unimodular complex entries satisfying the equation $HH^* = nI$. In the current work, equivalence of complex Hadamard matrices is considered, and algorithms for determining equivalence of matrices and the automorphism group of a matrix are presented.

On the intersection of q-ary Hamming balls

Thu 14:30-14:50 S203

Tuomo Lehtilä
Turku University

I present results on the intersection of multiple q-ary Hamming balls for $q \geq 3$. Given a set of center points S of t-radius Hamming balls, a link between the radius of the set S, the center region of the set S, and the size of the intersection is established. In the case of three balls, the maximum cardinality of the intersection is investigated. The intersection of multiple Hamming balls has become interesting lately due to the emergence of DNA-based data storage systems which often use a quaternary alphabet.

The Star Product of Uniformly Random Codes

Thu 15:00-15:20 S203

Johan Vester Dinesen
Aalto University

The star product (also known as the Schur or Hadamard product) of two linear codes is the subspace spanned by the component-wise products of codewords from the two codes. This operation is attracting increasing attention because of its connections with several areas of coding theory, information theory, and cryptography. We consider the problem of determining the expected dimension of the star product of two uniformly random linear codes. We show that asymptotically in both the field size and the dimensions of the two codes, the expected dimension reaches its maximum.

Derived matroids and coadjoints

Thu 15:30-15:50 S203

Patricija Šapokaitė
Aalto University

Matroids arise naturally in coding theory (as the combinatorial data of linear dependence between columns in a matrix), but can also be interpreted as a special class of hypergraphs. We generalize the recent notion of derived matroids (Freij-Hollanti, Jurrius, Kuznetsova 2023) to a novel notion of hypergraphical matroids, and identify an important special subclass of these, denoted natural hypergraphs and matroids. We show that if a natural matroid M has a coadjoint, then its derived matroid is an example of such a coadjoint.

Fractal Geometry

Multifractal formalism from large deviations

Fri 12:45-13:05 C4

Mirmukhsin Makhmudov
University of Oulu

It has often been observed that the Multifractal Formalism and the Large Deviation Principles are intimately related. In numerous examples in which the multifractal results have been rigorously established, the corresponding Large Deviation results are valid as well. A natural question, then, is under what conditions the multifractal formalism can be deduced from the corresponding large deviation results. More specifically, given a sequence of random variables $\{X_n\}_{n\in\mathbb{N}}$, satisfying a Large Deviation principle, what can be said about the multifractal nature of the level sets $K_\alpha = \{\omega : \lim_n \frac{X_n(\omega)}{n} = \alpha\}$. In this talk, I will present sufficient conditions for establishing both upper and lower bounds for multifractal spectra in terms of the associated large deviation rate functions. I will also briefly demonstrate that the proposed setup covers many previously studied frameworks in multifractal formalism.

Cantor spectrum of some Schrodinger operators and Fourier transform of fractal measures

Fri 13:15-13:35 C4

Gaétan Leclerc
University of Helsinki

Quantum properties of physical objects can be modelled by some Schrodinger operators. For quasicrystals, the associated Schrodinger operator typically have Cantor spectrum, and spectral measures are thus fractal. How can we relate the fractal properties of these measures to quantum dynamical properties of quasicrystals? We will discuss briefly the particular case of the "Fibonacci Hamiltonian", a common model for 1D quasicrystals.

Dvoretzky covering problem for general measures on the real line

Fri 13:45-14:05 C4

Roope Anttila

University of St Andrews

A random covering set is the set of points covered infinitely often by a random collection of balls with radii given by a predetermined sequence of positive real numbers and centers chosen independently at random with respect to a fixed measure. In 1956, in the context of the Lebesgue measure on the one dimensional torus, Aryeh Dvoretzky posed the following question: When does the random covering set fully cover the support of the measure almost surely? This question, which became known as the Dvoretzky covering problem, was answered for the Lebesgue measure in 1972 by Shepp, who showed that a necessary and sufficient condition for full covering is given by the divergence of a certain series which only depends on the sequence of radii. Shepps result was later generalised by Kahane, who characterised the covering of an arbitrary compact subset of the torus using a notion of capacity. In this talk, I will discuss an ongoing joint project with Markus Myllyoja, where we solve the Dvoretzky covering problem for arbitrary Borel probability measures and analytic subsets of the real line.

Curvilinear Furstenberg set estimates and one application

Fri 14:15-14.35 C4

Guangzeng Yi

University of Jyväskylä

Following the same method of Orponen-Shmerkin and Ren-Wang, we prove the Furstenberg set estimates for transversal families. Moreover, we use this to prove a sharp decay of the L^p-norm of the Fourier transform of a fractal measure supported on a smooth curve with non-zero curvature.

Problem session

Fri 14:45-15:35 C4

Amlan Banaji

Come and learn about open problems and potential avenues for future research in fractal geometry (and contribute your own!)

Functional Analysis and Operator Theory

Generalisation of the infinite Hilbert matrix on spaces of analytic functions

Fri 12:45-13:05 S110

Santeri Miihkinen
University of Reading

The (finite) Hilbert matrix is arguably one of the single most well-known matrices in mathematics. The infinite Hilbert matrix $\mathcal{H}$ was introduced by David Hilbert around 120 years ago in connection with his double series theorem. It can be interpreted as a linear operator on spaces of analytic functions by its action on their Taylor coefficients and admits an integral representation

$$\mathcal{H}(f)(z) = \int_0^1 \frac{1}{1+(t-1)z} f\left(\frac{t}{1+(t-1)z}\right) dt, \tag{1}$$

where $z \in \mathbb{C}$, $|z| < 1$, and the function f typically belongs to some Banach space of analytic functions on the unit disc of the complex plane. The boundedness and compactness properties of the Hilbert matrix operator $\mathcal{H}$ have been investigated extensively on various analytic function spaces and there exist different generalisations of the operator $\mathcal{H}$.

In this talk, we consider a generalised Hilbert matrix operator $\mathcal{H}_\mu$, where the Lebesgue measure dt in (1) is replaced by a probability Borel measure $d\mu$ on $[0, 1[$. We will see how the boundedness and compactness properties of $\mathcal{H}_\mu$ defined on the Bergman spaces can be described in terms of the measure $d\mu$. This talk is based on a joint work with Carlo Bellavita and others [1].

[1] C. Bellavita, V. Daskalogiannis, S. Miihkinen, D. Norrbo, G. Stylogiannis and J. A. Virtanen. *Generalized Hilbert matrix operators acting on Bergman spaces.* J. Funct. Anal., 288(9), 2025. https://doi.org/10.1016/j.jfa.2025.110856

Exchanging essential norm and integration

Fri 13:15-13:35 S110

David Norrbo

Åbo Akademi University

Abstract: Let X be a Banach space and let $\{S_t : t \in]0,1[\}$ be a family of bounded operators on X. Assume the integral operator

$$\int_0^1 S_t\,dt \colon f \mapsto \int_0^1 S_t f\,dt$$

is well defined. What type of families $\{S_t\}$ satisfies

$$\Big\| \int_0^1 S_t\,dt \Big\|_e = \int_0^1 \|S_t\|_e\,dt?$$

In this talk, we will give a sufficient function-theoretic condition for the equality above to hold when $\{S_t\}$ is a family of weighted composition operators acting on the reflexive Bergman spaces $A^p, p > 1$. This talk is based on [1]

[1] D. Norrbo Essential norm and integration of a family of weighted composition operators. arXiv:2505.21268 [math.FA], `http://arxiv.org/abs/2505.21268`.

Berezin transform and Carleson measures

Fri 13:45-14:05 S110

Atte Pennanen

UEF

For a radial weight ω, let B_ω denote the Berezin transform induced by the weight ω. In the unweighted case, it is known that in some ways the Berezin transform can be seen as an analogue of the Poisson transform for the Bergman space A^p. We show an interesting connection between the Carleson measures of the weighted Bergman space A^p_ω and the boundedness of B_ω in the case of when ω is doubling. We also note how the situation is related to the connection between the Carleson measures of the Hardy space H^p and the boundedness of the Poisson transform. Presentation is based on ongoing joint work with Bo He, Zengjian Lou, Jouni Rättyä and Fanglei Wu.

Two-weight fractional derivatives

Fri 14:15-14:35 S110

Antti Perälä

UmeåUniversity

The concept of a fractional derivative has a long history that can be traced back to the 18th century. For the purposes of this talk, the starting point is the 1932 work of Hardy and Littlewood, which was further developed by Zhu. Motivated by these ideas, we discuss a fractional derivative that is generated by two radial weights on the disk. Such derivatives can be of any positive real order, but also finer than this. We present some recent results demonstrating how these fractional derivatives can be used in analysis – and how they indeed possess properties similar to those of the classical derivatives.

Nilpotent quotient algebras of strictly singular by compact operators on Banach spaces

Fri 14:45-15:05 S110

Henrik Wirzenius

Czech Academy of Sciences

The Banach algebra $\mathcal{A}$ is called n-nilpotent if the product of n number of elements in $\mathcal{A}$ is zero. If $\mathcal{A}$ is n-nilpotent but not $(n-1)$-nilpotent, then n is the index of nilpotency of $\mathcal{A}$.

Let $\mathcal{S}(X)$ and $\mathcal{K}(X)$ denote the closed operator ideals of strictly singular operators and compact operators on a given Banach space X, respectively. I will describe recent joint work with Niels Laustsen (Lancaster), where we determine the index of nilpotency of the quotient algebra $\mathcal{S}(X)/\mathcal{K}(X)$ for a direct sum X of finitely many Banach spaces chosen from the following three families: (i) the Baernstein spaces B_p for $1 < p < \infty$; (ii) the p-convexified Schreier spaces S_p for $1 \leq p < \infty$; (iii) the sequence spaces ℓ_p for $1 \leq p < \infty$ (and c_0).

Berezin transform of Toeplitz operators on the weighted Bergman space

Fri 15:15-15:35 S110

Zhan Zhang

University of Helsinki

In this paper, we obtain some reproducing kernel estimates and some Carleson properties that play an important role. With these tools, we completely characterized cases of the bounded and compact Toeplitz operators on the weighted Bergman spaces with Bekollé-Bonami weights in terms of Berezin transforms.

Geometric Analysis

Comparison geometry and isoperimetric inequalities

Fri 12:45-13:05 S212

Toni Ikonen
University of Fribourg

A Cartan–Hadamard space is a complete geodesic metric space that satisfies a 'slimness' condition on geodesic triangles. These spaces naturally occur in geometric group theory (e.g. as Cayley graphs of hyperbolic groups) or in Riemannian geometry as universal covers of complete Riemannian spaces with sectional curvature bounded from above by zero. The slimness condition is also stable under gluing along a totally geodesic subset, and many examples of interest, such as infinite-dimensional Hilbert spaces, are non-proper.

The slimness condition is often difficult to verify directly. Indeed, this essentially requires the analysis of all the geodesics in the metric space. However, a Euclidean isoperimetric inequality is at times easier to verify, and in the proper case, equivalent to the slimness condition by a seminal theorem by Lytchak and Wenger (2018). We discuss recent progress in the non-proper case.

Based on joint work with Stefan Wenger.

Nodal resolution of quasiregular curves via bubble trees

Fri 13:15-13:35 S212

Jonathan Pim
University of Helsinki

I will discuss normal and quasinormal families of quasiregular curves, and in particular how studying the latter leads to a version of Gromov' compactness theorem for quasiregular curves into manifolds of bounded geometry via bubbling of the domain. Though I will restrict to the special case of mappings between closed manifolds. This bubbling process transforms the domain into a bubble tree over the original manifold and our procedure for extending quasiregular curves over bubbles requires us to pass to a more general class of mappings which are only asymptotically quasiregular. However, after the inductive bubbling process terminates, the sequence which has been extended to the bubble tree, converges locally uniformly to a true quasiregular curve on the bubble tree. On one hand, this limiting curve may be interpreted as a weak and non-unique replacement for the classical locally uniform limit of the original sequence. On the other hand, the measure it induces may be seen as a resolution

of the singular parts of the limiting measure of the original sequence. As a corollary we obtain a normality criterion for families of quasiregular curves.

Quasiregular curves are a class of mappings between non-equidimensional oriented Riemannian manifolds which includes both the classical quasiregular mappings and Gromov's pseudoholomorphic curves. They are defined with respect to a calibration i.e. a smooth closed form with unit comass. This calibration is used to define a replacement for the distortion inequality and the mapping induces a measure on its domain via the pullback of this calibration. The calibration gives, in some sense, the allowed directions for the curve, while the distortion constant controls both the curve's deviation from these allowed directions and the classical distortion.

Attempt at interpolating Sobolev spaces on arbitrary planar domains

Fri 13:45-
14:05 S212

Zofia Grochulska
University of Jyväskylä

A normed space A is an interpolation space between A_0 and A_1 if, roughly, it is contained in between these spaces and a certain additional desirable property holds. By means of the real interpolation method (introduced by Peetre), we will see that interpolation is closely related to density. I will discuss what is known and interesting about interpolating Sobolev spaces, especially Sobolev spaces on planar domains.

This is work in progress with Pekka Koskela and Riddhi Mishra (both from University of Jyväskylä).

Radial and nonradial minimizers of the p-harmonic energy and its variants

Fri 14:15-
14:35 S212

Akseli Jussinmäki
Aalto Unviersity

In nonlinear elasticity, one studies existence and properties of minimizers of various energy integrals. One of the most commonly studied energies is the p-harmonic energy. In this talk I will study this energy between planar and higher-dimensional annuli and give conditions to guarantee that the minimizer is found within the class of radial mappings, as well as providing examples of nonradial minimizers. This talk is based on a joint work with my advisor Aleksis Koski.

Limit shapes and harmonic tricks

Fri 14:45-15:05 S212

Nikolai Kuchumov
Åbo Akademi

The talk will present an application of a novel method — the tangent plane method — for analyzing a particular class of variational problems motivated by a statistical physics model, the so-called dimer model. The talk will consist of three parts. In the first part, we will briefly introduce the dimer model and the necessary concepts, including the associated variational problem and the limit shape phenomenon. The second part will focus on the use of harmonic and conformal coordinates in the analysis. In the third part, we will consider two specific examples of limit shape: the Aztec diamond with a hole, and a hexagon with a hexagonal hole.

Heat kernel estimates on metric spaces

Fri 15:15-15:35 S212

Riku Anttila
University of Jyväskylä

The heat kernel is, by definition, the fundamental solution to the heat equation. On general metric spaces, heat kernels and many related PDE techniques can be developed using the theory of abstract Dirichlet forms. This approach provides tools to understand functional inequalities, such as Poincaré inequalities and Harnack inequalities, through the properties of the heat kernel.

In this talk, I will introduce some basic concepts related to heat kernels and their applications to analysis on metric spaces.

Integral Geometry

Elastic ray transform

Thu 14:00-
14:20 S204

Joonas Ilmavirta
University of Jyväskylä

Singularities of solutions to the elastic wave equation travel like point particles. Linearization of travel times of elastic waves leads to a ray transform problem. I will describe the linearization (and how it fails to be linear) and the kernel of the ray transform. This is joint work with Antti Kykk"anen and Teemu Saksala.

Non-Abelian light ray transform on stationary Lorentzian manifolds

Thu 14:20-
14:50 S204

Miika Sarkkinen
University of Helsinki

In this talk, we consider the invertibility of a non-Abelian light ray transform on Lorentzian manifolds. We show that the transform arises in the problem of recovering a matrix-valued potential on a general globally hyperbolic manifold M from the knowledge of the source to solution map of a wave equation including a connection 1-form term. Under the assumption that the manifold M is stationary and that the connection term is time independent, the non-Abelian light ray transform is reduced, by Fourier slicing with respect to time, to a non-Abelian magnetic X-ray transform on the Riemannian base manifold N. Our main theorem then states that the injectivity of the non-Abelian magnetic X-ray transform on N is sufficient for the injectivity of the non-Abelian light ray transform on M.

The matrix-weighted real-analytic double fibration transforms

Thu 15:00-15:20 S204

Shubham Jathar

LUT University

In this talk, we present a microlocal result showing that the real-analytic matrix-weighted double fibration transform determines the analytic wavefront set of a vector-valued function. As an application, we prove the injectivity of the matrix-weighted ray transform on two-dimensional, non-trapping, real-analytic Riemannian manifolds with strictly convex boundary. Furthermore, we show that a real-analytic Higgs field can be uniquely recovered from the nonabelian ray transform on real-analytic manifolds of any dimension, provided the manifold has a strictly convex boundary point.

One-form tomography in gas giant geometry

Thu 15:30-15:50 S204

Eetu Satukangas

University of Jyväskylä

Gas giant geometry is a special type of Riemannian manifold with boundary that describes acoustic wave propagation in gas giant planets. In this talk I will discuss some properties of the geometry and present a new result, based on joint work with Joonas Ilmavirta and Antti Kykk"anen, for the solenoidal injectivity of the geodesic ray transform of one-forms in gas giant geometry. The injectivity result answers the following question in integral geometry: Can we uniquely determine a one-form from its integrals over maximal geodesics in gas giant geometry?

Inverse Problems

Inverse problems for the viscoacoustic wave equation

Fri 12:45-13:05 C5

Giovanni Covi
University of Jyväskylä

We study the viscoacoustic wave equation, which has a time-convolutional term in addition to the usual wave operator. This equation is used for modeling an elastic medium with memory, in which the stress depends on all the history of the gradient of the deformation. We will show that it is possible to recover both the wave speed and the kernel of the memory term under convenient geometric assumptions. We will do so via a Gaussian beam quasimode construction and a propagation of singularities argument. As an application, we introduce the extended Maxwell model, which represents the viscoelastic behaviour of a polymeric medium by means of a microscopic parallel array of spring/dashpots elements. We show how our theoretical result can be applied to the recovery of the physical parameters of the medium. This is an ongoing joing project with Maarten de Hoop and Mikko Salo.

On the stability of a hyperbolic inverse problem

Fri 13:15-13:35 C5

Spyros Filippas
University of Helsinki

The Boundary Control method is one of the main techniques in the theory of inverse problems. It allows to recover the metric or the potential of a wave equation in a Riemannian manifold from its Dirichlet to Neumann map (or variants) under very general geometric assumptions. In this talk we will address the issue of obtaining stability estimates for the recovery of a potential in some specific situations. As it turns out, this problem is related to the study of the blow-up of quantities coming from control theory and unique continuation. This is based on joints works with Lauri Oksanen.

Lorentzian Calderón problem on vector bundles

Fri 13:45-14:05 C5

Seán Gomes

University of Helsinki

We discuss a version of the Calderón problem for the connection Laplacian

$$P = \nabla^*\nabla + V(t, x)$$

acting on sections of a Hermitian vector bundle E over a fixed Lorentzian manifold (M, g). Under suitable geometric assumptions on (M, g), we show that the connection ∇ and potential V are uniquely determined by the Dirchlet–to–Neumann map up to the natural group of gauge transformations. In particular, the result is applicable to (M, g) that are small perturbations of Minkowski geometry. This investigation builds on earlier works in the scalar setting by Alexakis–Feizmohammadi–Oksanen.

A Computational Method for the Inverse Robin Problem with Convergence Rate

Fri 14:15-14:35 C5

Marvin Knöller

University of Helsinki

In this talk we consider the inverse Robin problem, which is the determination of the Robin parameter a appearing in an elliptic partial differential equation's boundary condition. Let $\Omega \subset \mathbb{R}^2$ be bounded and sufficiently regular. Suppose that we know the solution to the Robin problem

$$\begin{aligned} \Delta u &= f \quad \text{in } \Omega\,, \\ \partial_\nu u + au &= g \quad \text{on } \partial\Omega \end{aligned}$$

only on a small subdomain $\omega \subset \Omega$ as well as the right hand sides $f \in L^2(\Omega)$ and $g \in H^{1/2}(\partial\Omega)$. Under the main assumption that the Robin parameter lies in a finite dimensional space of continuously differentiable functions, we establish a Newton-type algorithm for its reconstruction. This reconstruction algorithm requires first order piecewise continuous finite elements only. We show that the algorithm converges quadratically in the finite element's mesh size to the unknown Robin parameter. Moreover, we establish a perturbation analysis. We study several numerical examples that highlight the efficacy of our approach. Furthermore, we verify our theoretical convergence rates numerically.

This talk is based on joint work with Erik Burman (University College London) and Lauri Oksanen (University of Helsinki).

Horizontal and vertical regularity of elastic wave geometry

Fri 14:45-15:05 C5

Antti Kykkänen
Rice University

The elastic properties of a material are encoded in a stiffness tensor field and the propagation of elastic waves is modeled by the elastic wave equation. In this talk characterize analytic and algebraic properties a general anisotropic stiffness tensor field has to satisfy in order for Finsler-geometric methods to be applicable in studying inverse problems related to imaging with elastic waves. The talk is based on joint work with Joonas Ilmavirta and Pieti Kirkkopelto.

An explicit reconstruction formula for inverse Born scattering

Fri 15:15-15:35 C5

Lisa Schätzle
Aalto University

We consider the inverse medium scattering problem for the Helmholtz equation in two dimensions, i.e., the task to recover a compactly supported penetrable two-dimensional scatterer, modeled by a contrast function, from full knowledge of the associated far field data or, equivalently, of the far field operator. Although this problem is uniquely solvable, it is (1) severely ill-posed as small perturbations in the observed far field data may lead to large reconstruction errors and (2) nonlinear. In the regime of weak scattering, the Born approximation yields a linearized relation between the contrast and the far field data and thus overcomes the second difficulty of nonlinearity. This linear setting allows us to build on recent work for linearized EIT, which relies on a triangular Zernike decomposition, to derive an explicit reconstruction formula that expresses the expansion coefficients of the contrast in terms of those of the far field data. By choosing the expansion functions appropriately, the resulting system matrix decouples in angular direction and becomes lower triangular for each angular frequency separately. Consequently, each of these systems can independently be solved by performing a forward substitution. In this talk, we derive the resulting reconstruction formula and show numerical examples. Remarkably, our numerical experiments indicate that this formula together with an adequate regularization method remains effective even when applied to full nonlinear far field data beyond the Born regime. This is a joint work with Nuutti Hyvönen.

Logic

Characterizing Graph Neural Networks with Random Initialization

Fri 12:45-13:05 S303

Matias Selin
Tampere University

State-of-the-art methods of processing data in the form of graphs revolve around the use of graph neural networks (GNNs), an application of deep learning that has received considerable interest during the past decade. However, theoretical work has lagged behind, and even the basic expressive power of many of these models has long remained ambiguous. Recent years have seen considerable interest in filling this gap by giving logical characterizations of these models and of how architectural adjustments affect them, one of which is random node initialization. The talk presents recent results in this research program, including a novel characterization developed in my master's thesis based on the work of Ahvonen et al. (2024).

Regular Representations of Uniform TC^0

Fri 13:15-13:35 S303

Kerkko Luosto
Tampere University

This is joint work with Lauri Hella and Juha Kontinen. In descriptive complexity theory, complexity classes are studied by using various logics. A lot of progress in this field has concerned complexity classes below PTIME during the last two decades. In particular, we considered the circuit complexity classes DLOGTIME-uniform AC^0 and DLOGTIME-uniform TC^0 and, in short, just AC^0 and TC^0. Both of these have well-known characterizations in terms of logics and so-called built-in relations.

We formulate what it means that that a logic is regular in the context of built-in relations. It is known that AC^0 is not closed under restricting AC^0-computable queries into simple subsequences of the input. This implies that the characterizations of AC^0 as a logic are not regular. It is not transparent from the known characterizations of TC^0 either, that the logics of TC^0 are regular, but we present logics with (generalized) quantifiers and built-in linear order that make this apparent. Actually, TC^0 is the regular closure (where the closure is defined in the natural way) of AC^0.

We discuss these concepts, results, and techniques behind the results.

Logical characterizations of graph transformers

Fri 13:45-14:05 S303

Veeti Ahvonen
Tampere University

Transformers form the foundation of modern large language models (LLMs), such as ChatGPT and Copilot, and have proven highly effective for addressing a wide range of problems. Recently, graph transformers – that is, transformers tailored for graph data – have gained significant attention in the field of graph learning, which has traditionally been dominated by graph neural networks and related frameworks. Nevertheless, little is known about the precise expressive power of graph transformers. In this talk, we will explore a recently published joint work that introduces logical characterizations of graph transformers.

A new Ehrenfeucht-Fraïssé game for dependence logic

Fri 14:15-14:35 S303

Joni Puljujärvi
University College London

We define a new Ehrenfeucht-Fraïssé game for dependence logic. A version of the EF game for dependence logic was already introduced by Väänänen almost two decades ago; however, that game was essentially the EF game of existential second-order logic, i.e. the moves of the game are sets instead of elements, making the game rather cumbersome to actually play. Our new game is, on the other hand, a variant of the ordinary EF game for first-order logic where the moves are elements. It differs from the first-order game in that the first player makes certain commitments during a play: he is allowed to declare that a move he makes is determined by a given number of previous moves.

Of course, trying to see any kind of dependences between moves in a single play of the game is a fool's errand, but if the players proceed to play several different plays and the first player declares the same dependences in each one, then it is possible to investigate whether the first player truly has played according to his commitments.

The existence of a so-called uniform winning strategy for the second player in this newly defined game captures equivalence in dependence logic the same way the existence of a winning strategy for the second player in the previous game of Väänänen does, but this one, we claim, appeals more to the intuition of playing the Ehrenfeucht-Fraïssé game than the old game of second-order flavour.

This is joint-work with Jouko Väänänen.

Borel sets and the generalized Baire spaces

Fri 14:45-15:05 S303

Miguel Moreno
University of Helsinki

One of the main motivations to develop Generalize Descriptive Set Theory was the connection with Model Theory (in particular Stability Theory and Shelah's Main Gap). The development was done under the assumptions $\kappa^{<\kappa} = \kappa$. One of the main objectives in the Generalized Descriptive Set Theory program has been its development without this assumption, and the definition of κ-Borel sets; in a way that the theory is meaningful and the connections with other fields are not lost (in particular the connection with Model Theory).

In a joint work with Tapani Hyttinen and Jouko Väänänen, we develop Descriptive Set Theory in Generalized Baire Spaces without assuming $\kappa^{<\kappa} = \kappa$. Our notion of κ-Borel coincides with the established one when the assumption $\kappa^{<\kappa} = \kappa$ is made. We found that our generalized notion has connections with Model Theory in a similar way to when the assumption $\kappa^{<\kappa} = \kappa$ is made.

This is joint work with Tapani Hyttinen and Jouko Väänänen

Singular cardinals in choiceless models

Fri 15:15-15:35 S303

Otto Rajala
University of Helsinki

The study of choiceless models of set theory, that is, models satisfying the ZF axioms but not the Axiom of Choice, has been a centrally important theme in set theory during the past half-century. The research on such models is motivated, on the one hand, by the enormously powerful implications of determinacy principles on the properties of cardinals and the structure of sets of real numbers. On the other hand, many natural strengthenings of large cardinal axioms are incompatible with the Axiom of Choice. There are many intriguing phenomena related to cardinals in choiceless models, especially in models satisfying the Axiom of Determinacy. I will discuss some of these phenomena, and I will also talk about ongoing research on forcings that singularize cardinals in choiceless models.

This work is joint with Rahman Mohammadpour and Sebastiano Thei.

Mathematical Physics

Φ^4_3 as a Markov field

Fri 12:45-13:05 S204

Nikolay Barashkov
MPI-MiS Leipzig

Random Fields which posses the Markov Property have played an important role in the development of Constructive Field Theory. They are related to their relativistic counterparts through Nelson Reconstruction. In this talk I will describe an attempt to understand the Markov Property of the Φ^4_3 measure in 3 dimensions. This is joint work with T.Gunaratnam.

Quantum Computing Today: A Brief Status Update

Fri 13:15-13:35 S204

Toni Annala
University of Toronto

I will give an overview of several recent advances in verifiable quantum computation, including Quantinuum's protocol for remotely generating certified random numbers and Google's experiment on estimating out-of-time-ordered correlators (OTOCs). I will also comment on how these developments can be used in scientifically interesting ways. Finally, I will discuss the role of QMill, a new Finnish quantum-algorithm startup, and explain how it fits into this rapidly evolving landscape.

Boundary mathematician as an AdS disentangler

Fri 13:45-14:05 S204

Niko Jokela
University of Helsinki

I will discuss some recent advances in making progress in reconstructing the gravity dual to boundary field theory. Such advances are made possible thanks to techniques developed by inverse mathematicians, now interpreted within the AdS/CFT framework.

Twist Operators in CFT and Zeta Determinants

Fri 14:15-14:35 S204

Jiasheng Lin
Aalto University

I will introduce the so-called "twist operator"of a CFT on a Riemann surface with one motivation. Then I will explain how this can be related, in the case of the free Boson, to the Zeta determinant of the self-adjoint Laplacian on a "slit domain"with twisted boundary conditions. We expect that this will lead to rigorous (probabilistic) constructions of such operators via path integrals.

Effective dynamics for weakly interacting bosons in an iterated high-density thermodynamic limit

Fri 14:45-15:05 S204

Kalle Koskinen
GSSI L'Aquila

A fundamental problem in quantum many-body theory is the persistence of Bose-Einstein condensation under time evolution in the appropriate large particle number limit. This problem has been solved in a variety of contexts, including the mean-field regime and the weakly interacting case, leading to the Gross-Pitaevskii equation. In this talk, we will discuss the aforementioned persistence problem in a context where we can naturally introduce the notion of volume and density of the system. Subsequently, we will be able to study the problem in an iterated double limit where we first let the volume of the system grow to infinity while keeping the density fixed, and only then allow the density to grow to infinity. This talk is based on joint work with Daniele Ferretti.

Continuous Tensor Categories in Mathematical Physics

Fri 15:15-15:35 S204

Thomas Wasserman
Aalto University

I will explain how symmetries in low-dimensional Quantum Field Theories are captured by tensor categories. This is well-developed for finite (sometimes called rational) tensor categories of symmetries. I will discuss work in progress extending this to the setting of tensor categories with infinitely many building blocks and indicate its relevance to central charge $c = 1$ Conformal Field Theories.

Mathematics Education

Finnish University Mathematics Students' Use of Generative AI Tools

Fri 12:45-13:05 C310

Riikka Kangaslampi
Tampere University

This presentation is part of a collaborative study investigating university mathematics students' use of generative AI tools in Finland and the UK. A total of 558 Finnish students (data collected Dec 2024–Jan 2025) and 295 UK students (Feb 2023–Mar 2024) responded to an online survey. In this talk, we focus exclusively on the Finnish data and the quantitative analysis.

We examine how Finnish university mathematics students use generative AI applications for study-related purposes, what benefits and drawbacks they perceive, and their expectations for the future role of AI in learning mathematics. Particular attention is given to differences between men and women students, revealing distinct patterns in tool usage and perceptions. The results contribute to understanding students' engagement with generative AI in higher mathematics education and highlight factors that may encourage or prevent its adoption.

Joint work with Paola Iannone (University of Edinburgh), Johanna Rämö (University of Eastern Finland), Ozan Evkaya (University of Edinburgh), and Sirkku Lähdesmäki (University of Eastern Finland).

MATLAB Grader for targeted feedback

Fri 13:15-13:35 C310

Juho Ratava
LUT University

Experiences for using automated feedback on numerical methods courses is presented, focusing on problem design and identified strengths and weaknesses. Using various kinds of assessment automation is tempting with increasing frequency of hybrid and remote teaching and increasing cohort sizes. However, the simple translation of textbook problems into automatically assessed problems may lead to increased focus on finding the correct answer, not to talk about opportunities for unethical conduct. In the LUT School of Engineering Systems, MATLAB Grader is used on courses at various levels. Problem and feedback design is demonstrated along with approaches to take advantage of the opportunities and mitigating vulnerabilities.

MaTech-hanke matematiikan opintojen sujuvoittamiseen

Fri 13:45-14:05
C310

Simo Ali-Löytty[1], Emma-Karoliina Kurki[2], Juho Tiainen[3]
Tampereen yliopisto[1], Aalto University[2], Itä-Suomen yliopisto[3]

MaTech on kansallinen hanke, jonka tavoitteena on parantaa matematiikan opintojen sujuvuutta ja houkuttelevuutta tekniikan ja matemaattis-luonnontieteellisillä aloilla. Hankkeessa pyritään varmistamaan opiskelijoiden riittävät esitiedot yhteisen lukiomatematiikan kertauskurssin avulla, vähentämään perusopintojen päällekkäisyyksiä, tukemaan matematiikan opiskelijoiden opintoihin kiinnittymistä ja lisäämään korkeakouluun hakevien kiinnostusta matematiikkaa kohtaan. Lisäksi kehitetään diplomi-insinöörimatematiikan opetusyhteistyötä ja verkkomateriaaleja sekä mahdollistetaan syventävien kurssien ristiinopiskelu yliopistojen välillä. Hanke jakautuu neljään työpakettiin, jotka keskittyvät peruskurssien sisältöihin, kertausmateriaalien ja houkuttelevuusvideoiden tuottamiseen, opetusyhteistyön ja verkkomateriaalien kehittämiseen sekä ristiinopiskelusopimuksen valmisteluun. Esitelmässä kerrotaan hankkeen tavoitteista ja jo saavutetuista tuloksista, kuten kertauskurssin käynnistämisestä, houkuttelevuusvideon tuotannosta ja opetusyhteistyön suunnittelusta.

Yhteistyössä: Pekka Alestalo (Aalto-yliopisto), Johanna Rämö (Itä-Suomen yliopisto) ja Anne-Maria Ernvall-Hytönen (Helsingin yliopisto).

Number Theory

Poisson-Dirichlet approximation for prime factorizations

Thu 14:00-14:20 C4

Tony Haddad
University of Turku

Using the coupling method, I will present a general strategy to reduce the problem of finding an asymptotic formula for the number of integers whose prime factorization falls into any Borel set of $\ell^1(\mathbb{R})$, to finding upper bounds for two key probabilities measuring proximity to the boundary of the subset in question. We apply this strategy to give an asymptotic formula for counting integers in $[1, x]$ that have a divisor in an interval (y, z) with $z/y \to \infty$ as $x \to \infty$.

Bounding the error in the prime number theorem

Thu 14:30-14:50 C4

Mikko Jaskari
University of Turku

We investigate how to obtain explicit bounds for the prime number theorem by studying the distribution of zeros in the critical strip of the Riemann zeta function or L-functions in general.

On the Error Term of the Fourth Moment of the Riemann Zeta-function

Thu 15:00-15:20 C4

Neea Palojärvi
University of New South Wales

The k-th moment of the Riemann zeta function on the half-line is defined as $\int_0^T |\zeta(1/2+it)|^k dt$. It describes the average size of the Riemann zeta function in the respective region, and has connections to matrix theory [2]. In this talk, I will discuss about the error term of the fourth moment of the Riemann zeta function. Using spectral-theoretic approach, Motohashi [3] was able to show that the error term, denoted as $E_2(T)$, is $\ll T^{2/3}(\log T)^8$ and $\int_0^T E_2(T)^2 dt \ll T^2(\log T)^{22}$. Using Ivić bounds for certain sums [1] and our own refinements for Motohashi's method, I and Tim Trudgian were able to improve the exponents of the previous logarithms from 8 and 22 to 3.5 and 9, respectively.

[1] A. Ivić, On the moments of Hecke series at central points. Funct. Approx. Comment. Math., 30:49-82, 2002.

[2] J. P. Keating, & N. C. Snaith, Random Matrix Theory and . Commun. Math. Phys., 214: 57-89, 2000.

[3] Y. Motohashi, Spectral Theory of the Riemann Zeta-function. Cambridge Tracts in Mathematics, 127. Cambridge University Press, Cambridge. 1997.

On the real zeros of half-integral weight Hecke cusp forms

Thu 15:30-15:50 C4

Jesse Jääsaari

University of Turku

We will discuss recent work concerning the distribution of zeros of half-integral weight Hecke cusp forms of large weight on the surface $\Gamma_0(4)\backslash\mathbb{H}$. In particular, we are interested in the "real"zeros lying on the geodesic segments $\mathrm{Re}(s) = -1/2$ and $\mathrm{Re}(s) = 0$. We will give estimates for the number of these zeros as the weight tends to infinity.

Partial Differential Equations

Carleson-type removability for p-parabolic equations

Thu 14:00-14:20 C5

Theo Elenius
Aalto University

We characterize removable sets for Hölder continuous solutions to degenerate p-parabolic equations. Sufficient and necessary conditions for a set to be removable are given in terms of an intrinsic parabolic Hausdorff measure, which depends on the considered Hölder exponent. Our method to show the sufficient condition simplifies previous approaches, by using only fundamental properties of the obstacle problem and supersolutions. For the necessary condition, we establish the Hölder continuity of solutions with measure data, provided the measure satisfies a certain decay property.

Metastable dynamics of SPDEs: a short overview

Thu 14:30-14:50 C5

Petri Laarne
University of Helsinki

Take a heat equation and a potential with multiple minima. Add some noise to make the dynamics jump between those stable solutions. How often will that happen then? I will review how this question relates to potential theory and outline some challenges, recent developments, and open questions.

Global higher integrability for systems of parabolic p-Laplace type in noncylindrical domains

Thu 15:00-15:20 C5

Leah Schätzler
Aalto University

In this talk, we discuss higher integrability for Cauchy-Dirichlet problems for systems of parabolic p-Laplace type in noncylindrical domains $E \subset \mathbb{R}^n \times \mathbb{R}$. Under suitable assumptions on E, the gradient of a weak solution is integrable up to the lateral and initial boundaries beyond the natural exponent p.

The talk is based on joint work with Kristian Moring and Christoph Scheven.

On the regularity of positive solutions to Trudinger's equation

Thu 15:30-15:50 C5

Jarkko Siltakoski

University of Jyväskylä

Trudinger's equation is a doubly nonlinear equation that was originally suggested as an example of an equation that may have a simpler Harnack's inequality than the standard p-parabolic equation. In this talk, we discuss a recent result on the Lipschitz continuity of positive solutions. We also present an equivalence result between viscosity and weak solutions.

Why is math not liked?

Matematiikan osaaminen ja asenteet kansainvälisten arviointitutkimusten valossa

Fri 14:15-14:35 S204

Jenna Hiltunen

Tarkastelen esityksessäni suomalaisten nuorten matematiikan osaamista PISA- ja TIMSS-tutkimusten pohjalta, jotka ovat molemmat laajoja kansainvälisiä arviontitutkimuksia. PISA-tutkimuksessa tarkastellaan 15-vuotiaiden matematiikan osaamista soveltavasta näkökulmasta, jossa matemaattiset ongelmat on sijoitettu erilaisiin tosielämän tilanteisiin. TIMSS-tutkimuksessa 8. vuosiluokan oppilaiden matematiikan osaamista mitataan opetussuunnitelmapohjaisesti.

Suomalaisnuorten osaamistason lasku näkyy molempien tutkimusten perusteella, mutta PISAssa heikkeneminen on huomattavasti voimakkaampaa kuin TIMSSissä. PISA-tulosten mukaan suomalaisnuorten keskiarvo on laskenut kansainvälisesti verraten eniten vuodesta 2003, ja heikkojen osaajien osuus on yli kolminkertaistunut samalla kun erinomaisesti suoriutuvien osuus on pienentynyt kolmasosaan. TIMSSissä lasku on maltillisempaa, mutta kuitenkin tilastollisesti merkitsevää pitkällä aika välillä tarkasteltuna. Lisäksi matematiikan osaamisen hajonta on kasvanut, mikä näkyy erityisesti heikoimmin suoriutuvien oppilaiden aiempaa heikompina tuloksina.

Matematiikan eri sisältöalueittain tarkasteltuna PISAssa suurin osaamisen tason lasku on tapahtunut lukujen ominaisuuksia ja laskutaitoa mittaavalla osa-alueella (määrällisessä ajattelussa), kun taas geometrisissä sisällöissä (tila ja muoto -alueella) osaaminen on heikentynyt vähemmän. TIMSSissä geometrian osaaminen on jopa parantunut pitkällä aikavälillä, mutta tilastot ja todennäköisyys -osa-alueen osaaminen on heikentynyt eniten.

Suomalaisoppilaiden asenteet matematiikkaa kohtaan ovat olleet kansainvälisesti vertailtuna kielteisiä jo ensimmäisissä PISA- ja TIMSS-tutkimuksissa, mutta asenteet ovat viimeisimpien tutkimusten mukaan muuttuneet vielä kielteisemmiksi:

TIMSS-tutkimuksen mukaan vain 7 % suomalaisoppilaista ilmoitti pitävänsä paljon matematiikasta (kv. keskiarvo 21 %), ja 69 % suomalaisoppilaista ei pidä siitä lainkaan (kv. keskiarvo 46 %). Matematiikan arvostus on kansainvälistä keskiarvoa vähäisempää ja matalammalla tasolla kuin koskaan aikaisemmin. Luottamus omaan osaamiseen on kansainvälistä keskitasoa ja jopa hieman korkeammalla tasolla vuonna 2023 kuin vuonna 2019. Suoritusluottamuksen on havaittu olevan yksi vahvimmista matematiikan osaamisen vaihtelua selittävistä tekijöistä. Matematiikka-ahdistus sen sijaan on PISA-tutkimuksen mukaan vähäisintä Suomessa verrattuna muihin osallistujamaihin.

Kun matematiikka ei sytytä - ratkaisuja kiinnostuksen kipinään

Fri 14:45-15:05 S204

Piia Haapsaari

Matematiikan kiinnostuksen puute ei ole vain yksilön haaste, vaan yhteiskunnallinen ilmiö, joka vaikuttaa osaajatarpeeseen ja oppimisen tasa-arvoon. Matematiikan oppimisen haasteet alkavat jo varhaislapsuudessa. Suomessa olisikin syytä hyödyntää enemmän neuvolan- ja varhaiskasvatusjärjestelmän mahdollisuuksia matemaattisten taitojen tukemiseen. Lasten matemaattiset taidot lähtevät kehittymään jo heti syntymästä lähtien. Leikin kautta oppiminen on lapsille luontevaa. Useimmat vanhemmat eivät ole tietoisia tästä. Kouluun tullessa lasten matemaattisten taitojen erot ovat suuria.

Alakoulun opettajien matematiikan osaamisen lisäämiselle on tarvetta. Luokanopettajakoulutukseen tarvittaisiin lisää opintoja, jotka kehittävät oikeaa mateamaattista ajattelua. Alakouluikäiset lapset ovat vielä innokkaita matematiikan äärellä ja tekevässä iässä. Suomesta puuttuu yhtenäinen vastaava matematiikkakerho-ja harrastajapolku kaikenikäisiltä lapsille ja nuorille, kuten musiikiin ja urheiluun on luotu. Alakoulun viimeisimpiä luokkia voisi opettaaa matematiikan aineenopettajat, koska edistyneiden lasten eriyttäminen mahdollistuisi riittävän subtanssiosaamisen avulla.

Yläkoulumatematiikan oppimista varjostavat suuret ryhmäkoot, työrauhaongelmat sekä pirstoutunut koulujärjestelmä. Nuoria innostava käytännön työelämä- ja yliopistoyhteistyö ovat alkutekijöissä koulun arjessa. Oppimisen tuen muutos tuo lisääntyvän riskin: yläkoulun matematiikan opetus jatkaa etenemistä heikoimpien ehdoilla, olosuhteiden pakosta.

Lukiossa ohjelmiston harjoittelu vie nuorten aikaa itse matematiikan opiskelulta. Tietotekniikka tarvittaisiin omaksi oppiaineeksi yläkouluun ja lukioon. Ylioppilaskirjoitukset pitävät yllä lukiomatematiikan tasoa. Etenmistahti on liian nopea: matematiikan kurssit käydään läpijuoksuna ja nuorille jää keskimäärin epämukava olo matematiikan opiskelusta, kun asioita ei syvällisemmällä tasolla ymmärrä ja ehdi ajattelemaan. Lukiokoulutukseen on myös viime vuosina tullu paljon oheistoimintaa, jotka vievät oppitunteja aiheuttaen lisää ongelmia ja aukkokohtia matematiikan opiskeluun.

Lukio- ja korkeakouluopiskelijat eivät tiedä, mihin työtehtäviin matematiikan opinoista valmistutaan. Työelämäyhteistyön kytkeminen viimeistään korkeakoulun aloitusvaihetta voisi lisätä matematiikan opiskeliijoiden pitovoimaa yliopistossa. Samaan aikaan yrityksen huutavat lisää matematiikan ja datatieteen soveltavia osaajia. Yliopisto-opintoihin olisi tarpeen tuoda työelämäyhteistyötä konkreettisessa muodossa, jotta osaajat ja työtehtävät kohtaisivat onnistuneemmin yhteiskunnassa.

Matematiikka kuuluu kaikille – esteet pois ja seikkailu alkakoon!

Hitaan ajattelun puolustuspuhe

Fri 15:15-
15:35 S204

Juha Pietiläinen

TBA

Young Researchers

Construction of Laakso-type fractal spaces

Thu 14:00-14:20 S212

Lassi Rainio
University of Jyväskylä

In this talk, I will present the construction of (symmetric) Laakso-type fractal spaces. This class of metric spaces provides new examples of fractal spaces for which difficult problems, such as the attainment problem of conformal dimension, can be resolved. Joint work with Riku Anttila and Sylvester Eriksson-Bique.

Boundary Behaviour of Chordal Schramm Loewner Evolution

Thu 14:30-14:50 S212

Johanna Immonen
Aalto University

Chordal SLE is a family of measures for random, fractal curves that connect two boundary points in a simply connected domain. SLE curves arise in statistical physics as candidates for the conformally invariant scaling limits of random interfaces of lattice models. So-called boundary SLE Green's function is a suitably normalised probability that the curve visits a fixed boundary point. Explicit form for the Green's function is known for one and two fixed boundary points. In this talk, I discuss and explain to the general mathematical audience results that give an explicit form for multi point boundary SLE Green's function. The talk is based on ongoing joint work with Konstantin Izyurov, Kalle Kytölä and Eveliina Peltola.

Tensor Network Methods for Differential Equations

Thu 15:00-15:20 S212

Niilo Heikkinen
University of Helsinki

Over the last couple of decades, tensor network methods have become central to numerical many-body quantum physics. They provide compact and efficient representations of high-order tensors by expressing them as networks of lower-order ones. A particularly well-known and widely used example is the matrix product state (MPS) representation, also known as the tensor train (TT) representation.

Recently, there has been growing interest in applying tensor network ideas in other braches of science and mathematics. Notable progress has been made in applying these "quantum inspired" methods to numerical integration and solutions of differential equations arising in various different fields.

In my presentation, I will give an overview of the basic theory of tensor networks, with an emphasis on matrix product states in both finite- and infinite-dimensional Hilbert spaces. I will also discuss the quantics tensor cross interpolation (QTCI) method that has shown potential in solving partial differential equations numerically.

An inverse source problem for a quasilinear elliptic equation

Thu 15:30-15:50 S212

Shubham Jaiswal
University of Jyväskylä

We study inverse source problems for quasilinear elliptic equations i.e.,

$$\begin{cases} \nabla \cdot (\gamma(x,u,\nabla u)\nabla u) = F & in\ \Omega \\ u = f & on\ \Omega \end{cases}$$

on a bounded domain $\Omega \subset \mathbb{R}^n$, $n \geq 2$. We consider the non-linearity of the form $\gamma(x,u,\nabla u) = \sigma + qu$ and use nonlinearity to break the gauge of the inverse source problem for this type. For this, we try to recover the $\gamma(x,u,\nabla u)$ and $F(x)$ uniquely from the related Dirichlet-to-Neumann (DN) map. Here, nonlinearity helps, since for a linear equation it is not possible to recover both the conductivity and the source term. The method we use is the higher order linearization method and the key idea is to use unique continuation results for a coupled elliptic system. This is a joint work with Tony Liimatainen.

FMS Panel Discussion

Technology meets Mathematics

Thu 16:30-
17:30 C1

Tuomo Kuusi[1], Kalle Kytölä[2], Riikka Schroderus[3], Heli Virtanen[4]
University of Helsinki[1], Aalto University[2], RELEX Solutions[3], University of Helsinki[4]

Especially during the last year, the AI revolution has reached also mathematics and university education of mathematics. This revolution mixes with other current trends more specific to mathematics, such as a recent development of rigorous proof assistants. In this panel, we discuss these trends with Tuomo Kuusi (UH), Kalle Kytölä (Aalto), Riikka Schroderus (RELEX Solutions), and Heli Virtanen (UH). Pekka Pankka (FMS) hosts the panel.

Name Index