Integrability in Condensed Matter Physics and Quantum Field Theory

Report of Contributions

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Contribution ID: **1** Type: **not specified**

Arrival and check in

Friday 3 February 2023 14:00 (5h 30m)

Contribution ID: **2** Type: **not specified**

Registration

Saturday 4 February 2023 09:00 (1 hour)

Contribution ID: **3** Type: **not specified**

Informal discussions

Saturday 4 February 2023 10:30 (1h 30m)

Contribution ID: **4** Type: **not specified**

Talk: Integrable sigma models at RG fixed points: quantisation as affine Gaudin models

Saturday 4 February 2023 14:45 (55 minutes)

The goal of my talk will be to summarise joint work with G. Kotousov and S. Lacroix approaching the quantisation of some integrable non-linear sigma models through their conformal limits. We focus mostly on the example of the Klimcık model, which is a two-parameter deformation of the Principal Chiral Model on a Lie group G. The UV fixed point of this theory is described classically by two decoupled chiral affine Gaudin models, encoding its left- and right-moving degrees of freedom, respectively. The chiral structure provides the basis for a quantisation of the affine Gaudin models following work of Feigin and Frenkel. The integrable structure of the quantised Klimcık model can be represented either by local or by non-local integrals of motion. The representation as affine Gaudin models allows us to construct quantum local integrals of motion, and suggests a description of their spectra using a variant of the ODE/IQFT-correspondence. Evidence is given for the existence of quantum monodromy matrices satisfying the Yang-Baxter algebra, paving the way for the quantisation of the non-local integrals of motion.

Presenter: Prof. TESCHNER, Joerg (DESY)

Contribution ID: **5** Type: **not specified**

Talk: Constructing perturbative long-range deformations of spin chains.

Saturday 4 February 2023 16:10 (55 minutes)

Integrable spin chains play an important role, both in condensed matter and in high-energy physics. The presence of integrability allows us to apply several advanced techniques to address problems in these fields, especially when the Hamiltonians have nearest-neighbour interactions. When the Hamiltonians have interaction of range higher than two, however, there are several points that remain to be understood.

In this talk, I will explain a method to systematically construct perturbatively long-range deformations of spin chains. I will apply the method to perturbatively construct the Lax pair and the R-matrix for up to three loops for the su(2) sector in planar N=4SYM and discuss further applications and open problems.

Presenter: Dr RETORE, Ana (Durham University)

Contribution ID: **6** Type: **not specified**

Talk: Bethe ansatz inside Calogero–Sutherland models

Saturday 4 February 2023 17:10 (55 minutes)

The Haldane–Shastry spin chain has long-range interactions and remarkable properties including Yangian symmetry at finite length and explicit highest-weight wave functions featuring Jack polynomials. This stems from the trigonometric spin-Calogero–Sutherland model, which is intimately related to affine Hecke algebras, already enjoys these properties from affine Schur–Weyl duality and reduces to the Haldane–Shastry chain in the 'freezing'limit. I will present some new results for these models, including Heisenberg-like symmetries whose spectrum can be characterised by Bethe ansatz.
Based on recent work with D. Serban and ongoing work with G. Ferrando, F. Levkovich-Maslyuk and D. Serban.

Presenter: Dr LAMERS, Jules (IPhT, Saclay)

Contribution ID: **7** Type: **not specified**

Talk: Perturbative expansion of energy densities in integrable models: the full analytic trans-series

Saturday 4 February 2023 18:20 (55 minutes)

In this talk I will consider the energy density of integrable scattering theories, which can be calculated using a linear integral TBA equation. These include the Gaudin-Yang and Lieb-Liniger models as well as integrable quantum field theories in which a conserved charge is coupled to an external field. I will explain how these TBA equations can be expanded perturbatively and investigate the asymptotic properties of the perturbative coefficients. The asymptotical behaviour reveals non-perturbative corrections. I will construct the full trans-series, which contains all non-perturbative corrections together with their own perturbative expansions.

Presenter: Prof. BAJNOK, Zoltan (Wigner institute)

Contribution ID: **8** Type: **not specified**

Informal discussions

Sunday 5 February 2023 09:00 (1 hour)

Contribution ID: **9** Type: **not specified**

Informal discussions

Sunday 5 February 2023 10:30 (1h 30m)

Contribution ID: **10** Type: **not specified**

Talk: Reflection relations and singular vectors

Sunday 5 February 2023 13:45 (55 minutes)

Fermionic basis allows to solve the reflection relations introduced by Fateev, Fradkin, Lukyanov, Zamolodchikov and Zamolodcikov. We explain that the solution is compatible with the singular vectors of CFT. Necessary checks lead to certain integrals which look rather complicated but nevertheless allow explicit computation.

Presenter: Prof. SMIRNOV, Fedor (Université Pierre et Marie Curie)

Contribution ID: **11** Type: **not specified**

Talk: Application of the hidden fermionic structure to the integrable QFT

Sunday 5 February 2023 14:45 (55 minutes)

We discuss the hidden fermionic structure of the six vertex model
as well as its applications to the CFT and the sine-Gordon model.
The key role in the above construction is played by the transcendental
function ω. Our special attention will be paid to the discussion
of few recent results on the properties of this function.

Presenter: Prof. HERMANN, Boos (University of Wuppertal)

Contribution ID: **12** Type: **not specified**

Talk: The quantum deformed Haldane-Shastry model at q=i

Sunday 5 February 2023 16:10 (55 minutes)

I will present an ongoing work on an integrable long-range version of the XXZ spin chain which can also be seen as a quantum deformation of the Haldane-Shastry model. At generic values for the deformation parameter, the model possess quantum affine symmetry, but when q is root of unity we expect extra symmetries to occur. We are studying the case q=i, which in the nearest neighbour case is solvable by the Jordan-Wigner transformation. The long-range case is also reducible to a fermionic long-range model. I will discuss the main characteristics of the model, which are very different for the even and odd number of sites.

Presenter: Prof. SERBAN, Didina ((IPhT, Paris))

Contribution ID: **13** Type: **not specified**

Talk: Gaudin Integrability of Conformal Blocks

Sunday 5 February 2023 17:10 (55 minutes)

TBA

Presenter: Prof. SCHOMERUS, Volker (DESY)

Contribution ID: **14** Type: **not specified**

Talk: Conformal Bootstrap from Gaudin Integrability

Sunday 5 February 2023 18:20 (55 minutes)

In d>2 dimensions, the bootstrap program for conformal field theory (CFT) explores the constraints on scaling dimensions and OPE coefficients imposed by the crossing symmetry equations of correlation functions. The kinematical constituents of the crossing equations, called conformal blocks, were recently identified as the wave functions of certain many body quantum integrable systems in the moduli space of Gaudin models. In this talk, I will review some recent applications of multipoint conformal block integrability to the bootstrap. By studying asymptotic limits and rational degenerations of the integrable systems, the crossing equations are solved analytically for the CFT data near singular loci. Explicit examples in four- and five-point functions suggest an interesting classification of singularities at higher points.

Presenter: Dr MANN, Jeremy (King's College London)

Contribution ID: **15** Type: **not specified**

Informal discussions

Monday 6 February 2023 09:00 (1 hour)

Contribution ID: **16** Type: **not specified**

Informal discussions

Monday 6 February 2023 10:30 (1h 30m)

Contribution ID: **17** Type: **not specified**

Talk: R-matrices, Howe duality and dynamical Weyl group

Howe duality, which will be reviewed in this talk, is a gl_M-gl_N duality generalizing the Schur-Weyl duality. It also has a quantum group version. We give a fermionic formula for R-matrices for exterior powers of vector representations of the quantum loop algebra U_q(Lgl_N) based on Howe duality. The formula is suitable for taking the large N limit and obtaining the R-matrix for Fock spaces. In the Yangian limit we recover a version of a formula proposed by A. Smirnov for instanton R-matrices. The duality relates R-matrices to the dynamical Weyl group of Etingof, Tarasov and Varchenko. One of the consequences is a dynamical action of the dynamical Weyl group on integrable U_q(gl_M)-modules extending the known action on zero weight spaces. The talk is based on joint work with Rea Dalipi.

Presenter: Prof. FELDER, Giovanni (ETH Zurich)

Contribution ID: **18** Type: **not specified**

Talk: Supersymmetric XYZ correlations and Painlevé VI

Monday 6 February 2023 14:45 (55 minutes)

The XYZ spin chain describes a chain of spin 1/2 quantum particles with a general anisotropic interaction between neighbors. When the anisotropy parameters satisfy J_x J_y + J_x J_z + J_y J_z = 0, the chain has an underlying supersymmetry. It is then possible to obtain exact results even for finite size systems. In the special case of the XXZ chain, this is related to very interesting combinatorics (e.g. the alternating-sign-matrix and Razumov-Stroganov ex-conjectures). There are also intriguing relations to Painlevé type differential equations. In this talk we will describe how nearest neighbor correlations for finite length supersymmetric XYZ spin chains can be computed explicitly in terms of tau functions of Painlevé VI. This is joint work with Christian Hagendorf (Louvain-la-Neuve).

Presenter: Prof. ROSENGREN, Hjalmar (Chalmers University)

Contribution ID: **19** Type: **not specified**

ʾt Hooft loops and integrability

Monday 6 February 2023 16:10 (55 minutes)

A ʾt Hooft loop is the simplest disorder operator in the N=4 super-Yang-Mills theory exactly S-dual to a Wilson loop. Insertion of a ʾt Hooft loop defines a defect CFT which is expected to be integrable. I will describe how to compute 1pt functions in this setup by combining S-duality, localization and holography for protected operators and integrability for unprotected.

Presenter: Prof. ZAREMBO, Konstantin (NORDITA)

Contribution ID: **20** Type: **not specified**

Talk: Snake Modules, Extended T-Systems and Correlation Functions for higher rank

Monday 6 February 2023 17:10 (55 minutes)

My talk will be about an application of the snake modules intruduced by Moukhin and Young in 2012. I will give a short summary of the construction regarding a recursion formula for the correlation functions of the rational spin ½ XXX chain that was done by Boos et al. in 2004. Most surprisingly, the behaviour of this recursion is completely determined by the Kirillov Reshetikhin modules. Then, I will explain an attempt for the generalization to higher rank and describe how certain snake modules naturally appear as candidats for the generalizations of the Kirillov Reshetikhin modules.

Presenter: Mr JUERGENS, Henrik (University of Wuppertal)

Contribution ID: **21** Type: **not specified**

Talk: Systems with a Hilbert space fragmentation

Monday 6 February 2023 18:20 (55 minutes)

Fragmentation of the Hilbert space is a specific fenomena that appears in systems with a presence of non-dynamical domain walls which lead to the exponential degeneration of energy levels. Such degeneration was observed in multiple systems. In particular such property was discovered in the folded-XXZ model ArXiv:2105.02252 (see also 2009.04995, 2011.01159). Further generalization of this model leads to new classes of integrable systems that also possess Hilbert space fragmentation. We discuss this progress based on arXiv:2108.13724 and yet unpublished results.

Presenter: Dr HUTSALYUK, Arthur (ELTE)

Contribution ID: **22** Type: **not specified**

Informal discussions

Tuesday 7 February 2023 09:00 (1 hour)

Contribution ID: **23** Type: **not specified**

Informal discussions

Tuesday 7 February 2023 10:30 (1h 30m)

Contribution ID: **24** Type: **not specified**

Talk: Orthogonal ring patterns and discrete surfaces

Tuesday 7 February 2023 13:45 (55 minutes)

We introduce orthogonal ring patterns consisting of pairs of concentric circles. They generalize orthogonal circle patterns which can be treated as conformal limit. It is shown that orthogonal ring patterns in euclidean and hyperbolic planes and in a sphere are governed by integrable equations, in particular by the discrete master equation Q4. We deliver variational principles which are used to prove existence and uniqueness results, and also to compute ring patterns with classical boundary conditions. The later are used to generate discrete cmc surfaces. Relation to minimal surfaces in S3 and AdS3 is discussed. Numerous virtual and printed models as well as animation movies will be demonstrated.

Presenter: Prof. BOBENKO, Alexander (TU Berlin)

Contribution ID: **25** Type: **not specified**

Talk: Constant mean curvature embeddings and the Fateev model IQFT

Tuesday 7 February 2023 14:45 (55 minutes)

TBA

Presenter: Dr KOTOOUSOV, Gleb (Leibniz University Hannover)

Contribution ID: **26** Type: **not specified**

Talk: Discrete surfaces and integrability

Tuesday 7 February 2023 16:10 (55 minutes)

We consider relations between discrete surfaces and integrability. More specifically, we consider discretizations of conjugate nets. We introduce a set of projective invariants together with a Poisson structure. This Poisson structure turns out to be invariant under discrete dynamics. In the case of biperiodic nets and circular nets we show the existence of commuting Hamiltonians.

Presenter: Dr AFFOLTER, Niklas (TU Berlin)

Contribution ID: **27** Type: **not specified**

Talk: Towards a mathematical theory of the ODE/IM correspondence

Tuesday 7 February 2023 17:10 (55 minutes)

The ODE/IM correspondence is, in a nutshell, the fact that the solutions to the Bethe equations of some integrable quantum field theory can be exactly represented as spectral determinants of some linear differential operators. This discovery goes back to Dorey and Tateo 1998 paper, and there has been tremendous development since then, which, mathematically speaking, amounts to a formidable series of fascinating and hard conjectures.

In particular, in 2004 Bazhanov, Lukyanov & Zamolodhchikov conjectured that to each state of the Quantum KdV model there corresponds a certain quantum anharmonic oscillator, called a monster potential, such that the spectral determinant of the latter coincides with the eigenvalue of the Q operator of the former. In this talk I provide an outline of the proof –conditional on the existence of a certain Puiseux series –of the BLZ conjecture, that I have recently obtained in collaboration with Riccardo Conti. In
particular, I will present the large-momentum analysis of the monster potentials and of the Destri-De Vega equation for the Quantum KdV model.

Presenter: Prof. MASOERO, Davide (University of Lisbon)

Contribution ID: **28** Type: **not specified**

Talk: Topological gauging and non-relevant deformations of Quantum Field Theories

Tuesday 7 February 2023 18:20 (55 minutes)

In the last few years, much attention has been devoted to the study of a peculiar class of irrelevant deformations of 2-dimensional Quantum Field Theories, known as "Solvable Irrelevant Deformations". The poster child of these is the celebrated "TTbar deformation". They display unusual properties in the UV, which can be described exactly, their irrelevant nature notwithstanding. For this reason they represent a sensible extension of Quantum Field Theory beyond the Wilsonian paradigm and have attracted a considerable attention from the high energy theory community. The property of being solvable is shared with a wider class of deformations, constructed out of pairs of conserved currents. In general these are marginal deformations, thus presenting very different UV properties. Nonetheless their structures are similar to the TTbar ones, hinting at the existence of a universal description.

In this talk I will present a very general framework that accommodates both solvable irrelevant and solvable marginal deformations, which amounts to a "topological gauging"of the symmetries of the system. Through simple path integral computations, I will recover the main features of these theories and show their equivalence to TST and Yang-Baxter deformations. For the case of TTbar, the topological gauging perspective explains the previously not understood relation to field theory in non-commutative Minkowski space-time and to the centrally extended Poincaré algebra.

Presenter: Dr NEGRO, Stefano (NYU)

Contribution ID: **29** Type: **not specified**

Informal discussions

Wednesday 8 February 2023 09:00 (1 hour)

Contribution ID: **30** Type: **not specified**

Informal discussions

Wednesday 8 February 2023 10:30 (1h 30m)

Contribution ID: **31** Type: **not specified**

Talk: An Ising-type formulation of the six-vertex model

Wednesday 8 February 2023 13:45 (55 minutes)

We show that the celebrated six-vertex model of statistical mechanics (along with its multistate generalizations) can be reformulated as an Ising-type model with only a two-spin interaction. Such a reformulation unravels remarkable factorization properties for row to row transfer matrices, allowing one to uniformly derive all functional relations for their eigenvalues and present the coordinate Bethe ansatz for the eigenvectors for all higher spin generalizations of the six-vertex model. The possibility of the Ising-type formulation of these models raises questions about the precedence of the traditional quantum group description of the vertex models. Indeed, the role of a primary integrability condition is now played by the star-triangle relation, which is not entirely natural in the standard quantum group setting, but implies the vertex-type Yang-Baxter equation and commutativity of transfer matrices as simple corollaries. As a mathematical identity the emerging star-triangle relation is equivalent to the Pfaff-Saalschuetz-Jackson summation formula, originally discovered by J. F. Pfaff in 1797. Plausibly, all vertex models associated with quantized affine Lie algebras and superalgebras can be reformulated as Ising-type models. (Based on the joint work with Sergey Sergeev, arXiv:2205.10708)

Presenter: Prof. BAZHANOV, Vladimir (ANU)

Contribution ID: **32** Type: **not specified**

Talk: Geometrical web models

Wednesday 8 February 2023 14:45 (55 minutes)

We introduce a family of geometrical lattice models generalising the well-known loop model on the hexagonal lattice. These models have a $U_q(sl_n)$ quantum group symmetry, the loop model being the $n = 2$ case. The general models give rise to branching webs and describe, at a special point, the interfaces in Z_n symmetric spin models. We mainly discuss the $n = 3$ case of bipartite cubic webs, which is based on the Kuperberg A_2 spider. We exhibit a local vertex-model reformulation, analogous to the well-known correspondence between the loop model and the nineteen-vertex model. The local formulation allows us in particular to study the model by means of transfer matrices and conformal field theory. We find that it has a rich phase diagram, including a dense and a dilute phase that generalise those known for the loop model. We finally discuss the construction of integrable models related to the other rank-two cases, with B_2 and G_2 symmetries.

Based on joint work with Augustin Lafay and Azat Gainutdinov (arXiv:2101.00282, 2107.10106, and in preparation).

Presenter: Prof. JACOBSEN, Jesper (ENS Paris)

Contribution ID: **33** Type: **not specified**

Talk: Algebraic Bethe ansatz for the open XXZ spin chain with non-diagonal boundary terms via $U_q sl_2$ symmetry

Wednesday 8 February 2023 16:10 (55 minutes)

Although the open XXZ spin chain with non-diagonal boundary terms is known to be integrable, the corresponding Bethe ansatz equations cannot be derived directly because of the lack of a suitable reference state. They also present many unusual features, among which an "inhomogeneous" term which vanishes only if the parameters of the model satisfy a certain quantization condition known as the Nepomechie constraint. Reinterpreting the Hamiltonian of this spin chain as an abstract element of the two-boundary Temperley-Lieb algebra evaluated in its 2^N-dimensional vacuum representation, we construct a different $U_q sl_2$-invariant realization of the same system. Using this stronger symmetry, we are then able to implement the standard boundary algebraic Bethe ansatz procedure for all values of the parameters satisfying the Nepomechie constraint. Additionally, our formalism provides a simple representation-theoretic interpretation of this condition in terms of $U_q sl_2$ fusion rules. If time permits, we will also comment on the scaling limit of this model. Based on joint work with A. Gainutdinov, J. Jacobsen and H. Saleur (2207.12772 + 2212.09696).

Presenter: Mr CHERNYAK, Dmitry (ENS Paris)

Contribution ID: **34** Type: **not specified**

Talk: Factorization of density matrices for the critical RSOS models

Wednesday 8 February 2023 17:10 (55 minutes)

Local operators in interaction round a face models can be expressed in terms of generalized transfer matrices. We use the properties of the local Boltzmann weights to derive discrete functional equations of reduced q-Knizhnik-Zamolodchikov type satisfied by the reduced density matrices for a sequence of consecutive sites in inhomogeneous
generalizations of these models. For the critical restricted solid-on-solid (RSOS) models we find that these density matrices can be 'factorized'in certain topological sectors, i.e. expressed in terms of a single nearest-neighbour correlator. The coefficients in such an expansion are independent of model parameters such as system size and inhomogeneities. Determining these coefficients we obtain explicit expressions for multi-point local height probalities.

Presenter: Prof. FRAHM, Holger (Leibniz University Hannover)

Contribution ID: **35** Type: **not specified**

Talk: On the influence of boundary conditions on the critical behaviour of the staggered six-vertex model

Wednesday 8 February 2023 18:20 (55 minutes)

The periodic staggered six-vertex model with the anisotropy parameter \(|q|=1\) is critical and exhibits several phases with interesting universal behaviour. In a certain regime its scaling limit possesses a non-compact degree of freedom. In this talk, we discuss the influence of quantum group invariant boundary conditions on the finite-size spectrum of the model in the special case of the non-compact regime (arXiv:2111.00850). We interpret our results in the context of the \(D^{(2)}_2\) spin chain, whose R-matrix can be factorised into that of the six-vertex model, and identify a more general correspondence of boundary conditions of models which factorise (arXiv:2209.06182).

Presenter: Mr GEHRMANN, Sascha (Leibniz University Hannover)

Contribution ID: **36** Type: **not specified**

Informal discussions

Thursday 9 February 2023 09:00 (1 hour)

Contribution ID: **37** Type: **not specified**

Informal discussions

Thursday 9 February 2023 10:30 (1h 30m)

Contribution ID: **38** Type: **not specified**

Talk: Generalized Fishnet CFTs

Thursday 9 February 2023 13:45 (55 minutes)

I will describe a broad class of d-dimensional conformal field theories of SU(N) adjoin scalar fields generalizing the 4d Fishnet CFT (FCFT) discovered by O. Gurdogan and myself, as a special limit of γ-deformed N = 4 SYM theory. In the planar limit the perturbation theory of FCFTs is dominated by the generalized "fishnet"planar Feynman graphs. These graphs are explicitly integrable, as was shown long ago by A. Zamolodchikov. The Zamolodchikov's construction is based on the dual Baxter lattice (straight lines on the plane intersecting at arbitrary slopes) and the star-triangle identities. It can serve as a "loom"for "weaving"the Feynman graphs of these FCFTs, with certain types of propagators, at any d. The Baxter lattice with M different slopes and any number of lines parallel to those, generates an FCFT consisting of M(M − 1) fields and a certain number of chiral vertices of different valences with distinguished couplings. These nonunitary, logarithmic CFTs enjoy certain reality properties for their spectrum due to a symmetry similar to the PT-invariance of non-hermitian hamiltonians proposed by C. Bender and S. Boettcher. The talk is based on my recent work with E.Olivucci.

Presenter: Prof. KAZAKOV, Vladimir (ENS Paris)

Contribution ID: **39** Type: **not specified**

Talk: Double-scaling limits of rectangular fishnets

Thursday 9 February 2023 14:45 (55 minutes)

Basso-Dixon integrals evaluate rectangular fishnets –Feynman graphs with massless scalar propagators which form a m × n rectangular grid –which arise in certain one-trace four-point correlators in the 'fishnet'limit of N = 4 SYM. Recently, Basso, Dixon, Kosower, Krajenbrink and Zhong explored the thermodynamical limit m $\longrightarrow \infty$ with fixed aspect ratio n/m. They showed that the thermodynamical limit is not sensitive to the coordinates of the four operators unless two of the operators get close in a controlled way. In this talk, I consider the thermodynamics in the double scaling limit when two pairs of operators become close to light-like. In this double scaling limit, the rectangular fishnet depends on both coordinate cross ratios. All singular limits of the fishnet can be attained within the double scaling limit, including the null limit with the four points approaching the cusps of a null quadrangle.

Presenter: Prof. KOSTOV, Ivan (IPhT, Saclay)

Contribution ID: **40** Type: **not specified**

Talk: The light-cone leading-logs of higher-point correlators via Stampedes

Thursday 9 February 2023 16:10 (55 minutes)

The Stampedes are a perturbative method for the computation of the leading logarithmic UV divergence of correctors of four or more points in quite general CFT, both in presence of gauge symmetry (e.g.: N=4 SYM) and in its absence (e.g.: Fishnet theories, Loom FCFTs). I will explain its formulation, providing examples about four-point functions and outline some future applications to Feynman diagrams of 5- or 6-points in Fishnet CFTs and recently formulated Loom theories.

Presenter: Dr OLIVUCCI, Enrico (Perimeter Institute)

Contribution ID: **41** Type: **not specified**

Talk: Fusion products and finite-dimensional quotients for periodic Temperley-Lieb algebras

Thursday 9 February 2023 17:10 (55 minutes)

In this talk, I will report on recent developments in the study of periodic Temperley-Lieb algebras and their applications in physics. I will first discuss ongoing progress done in collaboration with Y. Ikhlef in defining fusion products for representations of these algebras, that reproduce the expected fusion rules in conformal field theory. I will also describe joint work with A. Langlois-Rémillard on the study of finite-dimensional quotients for these algebras and the construction of their Wenzl-Jones projectors.

Presenter: Dr MORIN-DUCHESNE, Alexi (Ghent University)

Contribution ID: **42** Type: **not specified**

Talk: Thermal form factor series for dynamical two-point functions of local operators in integrable quantum chains

Thursday 9 February 2023 18:20 (55 minutes)

Evaluating a lattice path integral in terms of the spectral data and matrix elements of a suitably defined qunatum transfer matrix we obtain a thermal form factor series' for the dynamical two-point functions of local operators in fundamental Yang-Baxter integrable models at finite temperature and, in the same way, in many other physically relevant settings. We shall consider in some detail the case of spin-zero operators of the XXZ chain. In this case the matrix elements factorize into auniversal part' and an operator-dependent part that is a product of two 'thermal form factors'. The latter satisfy a discrete form of the reduced qKZ equation, have multiple integral representations and can be evaluated with the fermionic basis approach. In this approach the physical content enters through only two functions ρ and ω. For the XXZ chain in the antiferromagnetic massive regime at zero temperature we have obtained explicit expressions for the universal part and for the functions ρ an ω in terms of
known special functions of basic hypergeometric and q-Gamma type. Using these results we obtain explicit series representations, e.g., for the dynamical two-point functions of two magnetization operators or of two spin-current operators. The latter determine the spin conductivity of the model.

Presenter: Prof. GOEHMANN, Frank (University of Wuppertal)

Contribution ID: **43** Type: **not specified**

Informal discussions

Friday 10 February 2023 09:00 (1 hour)

Contribution ID: **44** Type: **not specified**

Informal discussions

Friday 10 February 2023 10:30 (1h 30m)

Contribution ID: **45** Type: **not specified**

Talk: Nonthermal electronic orders in photo-doped Mott systems

Friday 10 February 2023 13:45 (55 minutes)

A main goal in the field of nonequilibrium condensed matter physics is the control of electronic orders and the induction of ordered states which do not exist in equilibrium. Striking examples of nonthermal phases have been discovered experimentally, e. g. in fullerides and dichalcogenides, and also in numerical studies of correlated electron systems. Relevant insights have been gained into the mechanisms which stabilize such hidden phases in photo-excited Mott insulators. I will discuss four examples from recent model studies based on nonequilibrium dynamical mean field theory: (i) nonthermal magnetic and orbital order in a quarter-filled two-orbital Hubbard model [1], (ii) hidden excitonic order in the vicinity of a spin-state transition in the half-filled two-orbital Hubbard model [2], (iii) nonthermal odd-frequency order in a model for Mott insulating fullerides [3], and (iv) photo-induced eta-pairing [4] and chiral superconductivity [5] in Mott systems.

[1] Jiajun Li, Hugo U. R. Strand, Philipp Werner and Martin Eckstein, Nature Comm. 9, 4581 (2018).
[2] Philipp Werner and Yuta Murakami, Phys. Rev. B 102, 241103 (2020).
[3] Philipp Werner and Yuta Murakami, Phys. Rev. B 104, L201101 (2021).
[4] Philipp Werner, Jianju Li, Denis Golez, and Martin Eckstein, Phys. Rev. B 100, 155130 (2019).
[5] Jiajun Li, Markus Müller, Aaram J. Kim, Andreas Läuchli, Philipp Werner, arXiv:2202.10176 (2022).

Presenter: Prof. WERNER, Philipp (University of Fribourg)

Contribution ID: **46** Type: **not specified**

Talk: Analytical solutions of Dirac-Bogoliubov-de Gennes equations for inhomogeneous quantum many-body systems

Friday 10 February 2023 14:45 (55 minutes)

I will discuss a pair of coupled partial differential equations identified as Bogoliubov-de Gennes equations with Dirac operators and show that they appear naturally in the effective dynamics of inhomogeneous quantum many-body systems in one dimension. The equations feature an effective local gap that opens up due to inhomogeneities, coupling right- and left-moving degrees of freedom, leading to scattering, and so far were not solved in general. I will show that one can obtain analytical solutions using ordered exponentials and algebraic properties of the equations, which yield detailed and even explicit information about the dynamics. The main physical motivation comes from so-called inhomogeneous Tomonaga-Luttinger liquids, but the equations also arise in descriptions of superconductor-normal-metal interfaces, polymer chains, and a toy model for coupled fractional quantum Hall edges.

Presenter: Dr MOOSAVI, Per (ETH Zurich)

Contribution ID: **47** Type: **not specified**

Talk: Selberg-Dyson integral and aspects of quantum geometry

Friday 10 February 2023 16:10 (55 minutes)

The talk is based on the recent paper with Anton Zabrodin where we discussed an ensemble of particles with logarithmic repulsive interaction on a closed plane contour, a geometric deformation of the Dyson-Selberg integral Z_N(\Gamma)=\oint_\Gamma \prod_{i>j=1}ˆN|z_i-z_j|ˆ{2\beta} d z_1\dots dz_N. In the limit of a large number of variables, the integral converges to the spectral determinant of the Neumann jump operator of the domain of integration, a curve \Gamma, or equivalently to the Fredholm determinant of the Neumann–Poincare operator, objects of quantum field theories and quantum geometry. These results suggest that the Dyson-Selberg integral utilizes the finite-dimensional approximation of the complex geometry and boundary conformal field theory.

Presenter: Prof. WIEGMANN, Pavel (University of Chicago)

Contribution ID: **48** Type: **not specified**

Talk: Tracy-Widom distribution in supersymmetric gauge theories

Friday 10 February 2023 17:10 (55 minutes)

It was recently recognized that various observables in four-dimensional supersymmetric gauge theories can be computed for an arbitrary 't Hooft coupling as determinants of certain semi-infinite matrices. I will show that these quantities can be expressed as Fredholm determinants of the so-called Bessel kernel and they are closely related to celebrated Tracy-Widom distribution (more precisely, its finite temperature generalization) describing level-spacing distributions in matrix model.

Presenter: Prof. KORCHEMSKY, Gregory (IPhT, Saclay)

Contribution ID: **49** Type: **not specified**

Talk: Separation of variables and correlation functions from spin chains to CFT

Friday 10 February 2023 18:20 (55 minutes)

I will present new results in the separation of variables (SoV) program for integrable models. The SoV is expected to be very powerful but until recently has been almost undeveloped beyond the simplest gl(2) examples. I will describe how to realize the SoV for any gl(N) spin chain and demonstrate how to solve the longstanding problem of deriving the scalar product measure in SoV. Using these results I will show how to compute a large class of correlation functions and overlaps in a compact determinant form. I will also demonstrate the power of SoV in 4d integrable CFT's such as the fishnet theory. In addition, I will present related results on Yangian symmetry for correlators in the most general 'loom' fishnet CFT in any (even) dimension. Lastly I will outline highly promising applications in computation of exact correlators in N=4 super Yang-Mills theory.

Presenter: Dr LEVKOVICH-MASLYUK, Fedor (IPhT, Saclay)

Contribution ID: **50** Type: **not specified**

Informal discussions

Saturday 11 February 2023 09:00 (1 hour)

Contribution ID: **51** Type: **not specified**

Informal discussions

Saturday 11 February 2023 10:30 (1h 30m)

Contribution ID: **52** Type: **not specified**

Talk: How to deal with non-linear integral equations with singular kernels?

Saturday 11 February 2023 14:45 (55 minutes)

We present recent results for the computational treatment of the spectra of the integrable staggered six-vertex model and the $3-\bar{3}$ superspin chain.

The staggered six-vertex model has attracted the interest of several groups of authors who derived a wealth of results (e.g.˜Ikhlef, Jacobsen, Saleur 08, 12; Frahm, Martins 12; Candu, Ikhlef 13; Frahm, Seel 14; Bazhanov, Kotousov, Koval, Lukyanov 20). A remaining problem is how to compute the low-lying eigenvalues for arbitrary system sizes.

We derive by proven means a set of non-linear integral equations (NLIE) with the unpleasant property of singular terms in the kernel. Due to this fact, these equations do not lend themselves to an iterative treatment. However, we have succeeded in deriving from the singular NLIE an equivalent set of NLIE with purely regular kernel. This set can be solved for the lowest lying excitations for system sizes $L = 10, 10^2, 10^3, ..., 10^9, ...$ Interestingly, the singular NLIE can be used to derive the CFT data with logarithmic corrections $\mathcal{O}\left(1/(\log L)^2\right)$.

Finally, we present results for the $3-\bar{3}$ superspin chain intensively investigated by Essler, Frahm, Saleur (2005). Here we show how to derive two sets of NLIE, a singular one and a regular one. From the singular NLIE we derive the type of corrections to the CFT data. The numerical iteration of the regular NLIE is not yet successfully convergent: for the $3-\bar{3}$ model not only is the genuine NLIE singular, but in this case some of its solution functions also have singular properties.

Presenter: Prof. KLUEMPER, Andreas (University of Wuppertal)

Contribution ID: **53** Type: **not specified**

Talk: Recoupling coefficients and quantum entropies

Saturday 11 February 2023 16:10 (55 minutes)

We prove that the asymptotic behavior of the recoupling coefficients of the symmetric group is characterized by a quantum marginal problem – namely, by the existence of quantum states of three particles with given eigenvalues for their reduced density operators. This generalizes Wigner's observation that the semiclassical behavior of the 6j-symbols for SU(2) – fundamental to the quantum theory of angular momentum – is governed by the existence of Euclidean tetrahedra. As a corollary, we deduce solely from symmetry considerations the strong subadditivity property of the von Neumann entropy. Lastly, we show that the problem of characterizing the eigenvalues of partial sums of Hermitian matrices arises as a special case of the quantum marginal problem. We establish a corresponding relation between the recoupling coefficients of the unitary and symmetric groups, generalizing a classical result of Littlewood and Murnaghan.

Presenter: Prof. CHRISTANDL, Matthias (University of Copenhagen)

Contribution ID: **54** Type: **not specified**

Talk: Quantum local charges in chiral affine Gaudin models

Saturday 11 February 2023 17:10 (55 minutes)

Affine Gaudin models are field theories built from Kac-Moddy currents. At the classical level, they are known to be integrable, in the sense that they admit an infinite familly of Poisson-commuting charges. However, their quantum integrability is so far still conjectural. A natural starting point for exploring this question is the case of chiral affine Gaudin models, for which the underlying Kac-Moody currents are all either left-moving or right-moving fields of a conformal two-dimensional theory, whose quantisation can thus be described using the standard vertex operator algebra formalism. In this talk, I will present first results and conjectures on the study of quantum integrable structures in chiral affine Gaudin models and more precisely on the construction and the diagonalisation of an infinite familly of commuting local charges in the current vertex operator algebra. This formalism finds application in the quantisation of certain integrable sigma models at their conformal points, as discussed in the talk of J. Teschner.

Presenter: Dr LACROIX, Sylvain (ETH Zurich)

Contribution ID: **55** Type: **not specified**

Talk: TBA

TBA

Presenter: Dr SACCARDO, Davide (University of Geneva)

Contribution ID: **56** Type: **not specified**

Informal discussions

Sunday 12 February 2023 09:00 (1 hour)

Contribution ID: **57** Type: **not specified**

Informal discussions

Sunday 12 February 2023 10:30 (1h 30m)