ICFT 2017 talks and posters

TALKS

Daniela Cadamuro: *Construction of two-dimensional quantum integrable models via wedge-local fields*

The construction of two-dimensional quantum integrable models was initiated by the form factor programme, with the aim of constructing model theories in the Wightman framework from the input of a factorizing S-matrix. The construction is based on an inverse scattering problem, that is, one postulates the form of the two-particle S-matrix and constructs the n-point functions of interacting local fields by expanding them in a series of form factors (i.e., certain matrix elements of the fields). However, this yields infinite series expansions whose convergence is hard to control. One can avoid these infinite series by considering, instead of strictly local operators, observables localized in unbounded wedge-shaped regions. This weaker localization property allows to construct fields with a simpler expression in momentum space. Strictly local observables can then be recovered by taking intersection of the C*-algebras generated by observables in right and left wedges. Using an abstract functional analytic argument, one then shows that this intersection is non-trivial. Finally, one solves the inverse scattering problem by computing the S-matrix using Haag-Ruelle scattering theory. This operator-algebraic approach has proved to be successful for the construction of a large class of integrable models, including some recent developments in models with bound states.

Robert Parini: *Algebro-geometric solutions to integrable defects*

Several 1+1 dimensional integrable field theories permit point-like defects or impurities which maintain the integrability of the model despite introducing a discontinuity. The effect of an integrable defect on an incoming soliton (stable solitary wave) is well known but many integrable field theories also permit a class of algebro-geometric solutions which are more general than solitons. I will show how algebro-geometric solutions in the presence of an integrable defect can be constructed using a Darboux transformation and discuss how they compare to the soliton solutions which can all be recovered in a suitable limit. This is the subject of joint work with Ed Corrigan detailed in arXiv:1612.06904.

Anatoly konechny : *RG boundaries and interfaces in Ising field theory*

Perturbing a CFT by a relevant operator on a half space and letting the perturbation flow to the far infrared we obtain an RG interface between the UV and IR CFTs. If the IR CFT is trivial we obtain an RG boundary condition. The space of massive perturbations thus breaks up into regions labelled by conformal boundary conditions of the UV fixed point. For the 2D critical Ising model perturbed by a generic relevant operator we find the assignment of RG boundary conditions to all flows. We use some analytic results but mostly rely on TCSA and TFFSA numerical techniques. We investigate real as well as imaginary values of the magnetic field and, in particular, the RG trajectory that ends at the Yang-Lee CFT. We argue that the RG interface in the latter case does not approach a single conformal interface but rather exhibits oscillatory non-convergent behaviour.

Sylvain Lacroix : *Recent developments on classical integrable sigma-models*

We review results on the study of integrable sigma-models, such as the principal chiral model and cosets models, in light of the recent developments on their integrable deformations. In the hamiltonian formalism, all of these models are described by so-called cyclotomic r/s systems with twist function. After reviewing this framework, we describe how it allows to study the symmetries and conservation laws of the models. We illustrate these results on the examples of the principal chiral model and its Yang-Baxter deformation, exhibiting both local and non-local conserved charges of these models.

Luigi Cantini : *Asymmetric simple exclusion process with open boundaries and Koornwinder polynomials*

In this talk I shall start by explaining the method of exchange--reflection equations for the study of the steady measure of a stochastic integrable system with boundaries.I shall then apply such method to the study of the steady state of the Asymmetric Simple Exclusion Process (ASEP) on a finite strip with two particle reservoirs at the two ends.

In the exchange--reflection equations methods the (unnormalized) probabilities of the particle configurations get promoted to Laurent polynomials in the spectral parameters and for the ASEP with open boundaries these are constructed in terms of non-symmetric Koornwinder polynomials. This allows to compute the normalization, which coincides with a symmetric Macdonald-Koornwinder polynomial and to compute the steady current and the average density of particles.

Matthieu Vanicat : *Matrix product construction for Koornwinder polynomials and fluctuations of the current in the open ASEP*

Starting from the deformed current-counting transition matrix for the open boundary ASEP, we prove that with a further deformation, the symmetric Koornwinder polynomials for partitions with equal row lengths appear as the normalisation of the twice deformed ground state. We give a matrix product construction for this ground state and the corresponding symmetric Koornwinder polynomials. Based on the form of this construction and numerical evidence, we conjecture a relation between the generating function of the cumulants of the current, and a certain limit of the symmetric Koornwinder polynomials.

Oleg Lisovyy : *Painlevé functions, conformal blocks, Fredholm determinants and combinatorics*

We will derive Fredholm determinant representation for isomonodromic tau functions of Fuchsian systems with n regular singular points on the Riemann sphere and generic monodromy in GL(N,\mathbb C). The corresponding operator acts in the direct sum of N(n-3) copies of L^2(S^1). Its kernel will be expressed in terms of fundamental solutions of n-2 elementary 3-point Fuchsian systems whose monodromy is determined by monodromy of the relevant n-point Fuchsian system via a decomposition of the punctured sphere into pairs of pants. For N=2 these building blocks have hypergeometric representations, the kernel becomes completely explicit and has Cauchy type. In this case principal minor expansion of the Fredholm determinant yields multivariate series representation for the tau function of the Garnier system obtained earlier via its identification with Fourier transform of Liouville conformal block (or a dual Nekrasov-Okounkov partition function). Further specialization to n=4 will provide an explicit series representation of the general solution to Painlevé VI equation.

Alessandro Torrielli : *Quantisation of the KP equation*

We will present recent work done in collaboration with Karol Kozlowski and Evgeny Sklyanin on the quantised version of the Kadomtsev-Petviashvili (KP) equation. We will construct the quantum Hamiltonian and demonstrate its integrability up to computer-algebra capacity, by utilising the Bethe ansatz in terms of an exact S-matrix. The spectrum is organised into a tower of particles with masses labelled by a positive integer.

POSTERS

David Palazzo: *From free bosons to 2D-TQFT*

We define a family of 2D TQFT in terms of free bosons and show that each TQFT is a generalised Verlinde algebra: there exists a representation of the modular group and the TQFT fusion coefficients are given by the Verlinde formula. We show that the fusion coefficients are non-negative integers by providing different combinatorial expressions, and that they are related to tensor product multiplicities of irreducible representations of the generalised symmetric group. Finally, we will relate the fusion coefficients of different 2D TQFT's via recursion formulae, taking advantage of the Heisenberg algebra. Our construction is motivated by a recent definition of a 2D TQFT in terms of the q- boson model of which this is the q=1 or classical limit. At q=0 one obtains the familiar su(n) Verlinde algebra of WZW conformal field theory. This is a joint work with Christian Korff.