Quantisation of moduli spaces from different perspectives

Report of Contributions

https://indico.global/e/9625

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

Program details

for the zoom link please ask nezhla.aghaee@gmail.com

Program details:
Starts on Sunday 24th dinner at 19:00 until Friday 29th at 13:00 including Lunch.

Introduction lectures (Monday, Tuesday, and Wednesday Morning)
1) Joerg Teschner (Monday morning)
2) Ricardo Schiappa (Monday afternoon)
3) Anton Alekseev (Tuesday morning)
4) Bertrand Eynard (Tuesday afternoon) Quantum curves from topological recursion
5)Jørgen Andersen (Wednesday morning)

List of confirmed speakers:
Wednesday afternoon
1) Tom Bridgland, Title:
2) Kohei Iwaki, Title: Topological recursion, resurgence and BPS structure

Thursday Morning
3) Eckhard Meinrenken, Title: Symplectic geometry of the Teichmueller space of hyperbolic 0-metric,
4) Gabriele Rembado, Title: The Knizhnik–Zamolodchikov connection (KZ) from quantum isomonodromic deformations

Thursday afternoon
5) Oleg Lisovyy, Title: Heun connection matrix from Liouville conformal blocks and Darboux theorem
6) Murad Alim, Title:

On Friday morning, we will have an open questions session.

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

Titles and abstracts

– Anton Alekseev
Title: Combinatorial quantization and BV structures of moduli of flat connections

Abstract: In these two lectures, we will start by recalling the definition and properies of Goldman brackets and of the Fock-Rosly bivector on the representation space of a fundamental group of an oriented surface. We will then sketch a combinatorioal quantization scheme for modulis paces inspired by the Faddeev-Reshetikhin-Takhtajan (FRT) presentation of quantum groups, and we will point out some links to other quantization schemes.

If time permits, we will also discuss the notion of Turaev cobracket and its relation to Batalin-Vilkovisky (BV) structures on moduli spaces.

These lectures are based on joint works with H. Grosse, F. Naef, J. Pulmann, V. Schomerus and P. Severa.

– Murad Alim
Title: Resurgence, BPS structures and topological string S-duality

Abstract:
The partition function of topological string theory is an asymptotic series in the topological string coupling and provides in a certain limit a generating function of Gromov-Witten (GW) invariants of a Calabi-Yau threefold. I will discuss how the resurgence analysis of the partition function allows one to extract Donaldson-Thomas (DT) or BPS invariants of the same underlying geometry. I will further discuss how the analytic functions in the topological string coupling obtained by Borel summation admit a dual expansion in the inverse of the topological string coupling leading to another asymptotic series at strong coupling and to the notion of topological string S-duality. This S-duality leads to a new modular structure in the topological string coupling. I will also discuss relations to difference equations and the exact WKB analysis of the mirror geometry. This is based on various joint works with Lotte Hollands, Arpan Saha, Iván Tulli and Jörg Teschner as well as on work in progress.

– Jørgen Andersen
Title:TBA

Abstract:

– Tom Bridgland
Title:From the A2 quiver to the Painleve I tau function

Abstract:
In simple examples the DT invariants of a CY3 category can be encoded in a geometric structure on its space of stability conditions. I will describe the case of the A2 quiver where the resulting structures are closely related to Painleve I.

– Bertrand Eynard
Title: Quantum curves from topological recursion

Abstract: Starting from a spectral curve S (a plane curve with some structure), Topological Recursion defines a sequence of differential forms, called $\omega_{g,n}(S)$. From this sequence, one can define a

formal series $\ln \psi(\hbar, S, x) = \sum_{g,n} \frac{1}{n!} \hbar^{2g-2+n} \int_\infty^x \cdots \int_\infty^x \omega_{g,n}(S)$, called the "wave function" (the TR wave function).
An important claim is that this wave function is annihilated by a differential operator with rational coefficients (and formal series of $\hbar$). In fact to make the claim complete, one has to extend it to transseries. The differential operator is called the "quantum curve" or the "quantization of the spectral curve".
We will introduce the setting, show examples, and explain how this claim has been proved in some classes of spectral curves.

– Kohei Iwaki
Title: Topological recursion, resurgence and BPS structure

Abstract: I'll discuss resurgence structures of topological recursion partition function. I'll show exactly solvable examples, related to the classical limit of the hypergeometric ODEs, and describe a relation to BPS structures associated with the Stokes graphs of the ODEs.
I will also consider a family of genus 1 spectral curves which is related to Painlev¥'e I, and propose conjectures on the resurgence properties and relation to BPS structure.
This talk is based on joint works with O. Kidwai, T. Koike, M. Marino and YM. Takei.

– Oleg Lisovyy
Title: Heun connection matrix from Liouville conformal blocks and Darboux theorem

Abstract: Conformal blocks of the Liouville CFT are known to have very simple analytic structure with respect to the positions of degenerate fields. The corresponding monodromy is « quantum » (operator-valued) as it involves shifts of internal momenta. In the quasiclassical limit, the BPZ equation satisfied by the simplest nontrivial example of such conformal block reduces to Heun equation. I will explain how careful
analysis of the limit allows to solve the Heun connection problem in terms of quasiclassical Virasoro conformal blocks, generalizing a conjectural relation between quasiclassical Liouville CFT and Heun accessory parameter function found by Zamolodchikov in 1986. I will then discuss how this conjecture can be checked with the help of the classical Darboux theorem relating the Heun connection matrix to the large-order asymptotics of the coefficients of the corresponding Frobenius solutions.

– Eckhard Meinrenken
Title: Symplectic geometry of the Teichmueller space of hyperbolic 0-metric

Abstract:A hyperbolic 0-metric on a compact surface with boundary is a hyperbolic metric on the interior, with a boundary behaviour similar to that of the Poincare metric on the upper half plane. We show that the infinite-dimensional Teichmueller space of such metrics has a natural symplectic structure, and is an example of a Hamiltonian Virasoro space.
Based on joint work with Anton Alekseev.

– Gabriele Rembado
Title:The Knizhnik–Zamolodchikov connection (KZ) from quantum isomonodromic deformations

Absreact= The KZ equations first arose in 2d conformal field theory, as constraints satisfied by correlation functions in the Wess–Zumino–Novikov–Witten model. The standard mathematical construction of the linear PDEs involves spaces of (co)vacua associated to highest-weight modules for affine Lie algebras, and a different derivation was later given by Reshetikhin and Harnad via quantisation of the Schlesinger Hamiltonians; in turn, the latter control isomonodromic deformations of Fuchsian systems on the Riemann sphere.

In this talk we will aim at a review of part of this story. If time allows we will also present a generalisation involving moduli spaces of (nongeneric) irregular singular connections, as well as 'generalised' highest-weight modules for affine Lie algebras.
(This extension is joint work with P. Boalch, J. Douçot, G. Felder, M. Tamiozzo and R. Wentworth.)

– Ricardo Schiappa
Title: On the Uses and Applications of Resurgence to String Theory

Abstract:I will briefly review how resurgence is of interest in addressing a number of non-perturbative string theoretic problems, including short introductions to the subject associated to these different applications. I will then focus on alien calculus associated to resonant problems, their genericness in string theory, and how they shed light on a "diagonal take"on non-perturbative large N duality.

– Joerg Teschner
Title: Quantum analytic Langlands correspondence

Abstract: The analytic Langlands correspondence can be regarded as a variant of the geometric Langlands correspondence imposing additional conditions of analytic nature.

It predicts a correspondence between opers with real holonomy and eigenfunctions of the quantised Hitchin system. We will discuss a one-parameter deformation of this correspondence called quantum analytic Langlands correspondence. This deformation has natural relations to the quantisation of moduli spaces, the separation of variables, and conformal field theory. A key role is played by the Verlinde line operators. These operators represent a quantum deformation of the grafting operation creating eigenstates of the quantum Hitchin system from a cyclic vector. This is joint work with D. Gaiotto.