PIICQ workshop ”Excursions in Integrability”

Monday, May 23, 2022 - Friday, May 27, 2022

SISSA

Book of Abstracts

Contents

35

Matrix valued orthogonality and random tilings

Author: Arno Kuijlaars[1]

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Matrix valued orthogonal polynomials play a role in random tiling models with periodic weightings. The talk will be focused on lozenge tilings of a hexagon, and it will be shown that the matrix valued orthogonality can be related to orthogonality for meromorphic functions on a Riemann surface. The higher genus cases are of particular interest since these are believed to correspond to random tiling models with three different phases in the large size limit.

47

Biased doubly periodic Aztec diamond and an elliptic curve

Author: Maurice Duits[1]

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I will report on a recent joint work with Alexei Borodin on the biased doubly periodic Aztec diamond. Our main result is a double integral formula for the correlation kernel, in which the integrand is expressed in terms of a linear flow on an elliptic curve. For special choices of parameters the flow is periodic, and this allows us to perform a saddle point analysis for the correlation kernel. I will discuss how, in these periodic cases, one can compute the local correlations in the smooth disordered (or gaseous) region.

31

Asymptotic Analysis of the Interaction Between a Soliton and a Regular Gas of Solitons (a.k.a. Gulliver and the Lilliputians)

Authors: Alexander Minakov[1]; Ken McLaughlin[2]; Manuela Girotti[3]; Robert Jenkins[4]; Tamara Grava[5]

[1] *Univerzita Karlova*

[2] *Colorado State University*

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We analyze the case of a (dense) mKdV soliton gas and its large time behaviour in the presence of a single tracer soliton. The solution, which can be expressed in terms of Fredholm determinants, can be decomposed as the sum of the background gas solution (an elliptic wave), plus a soliton solution: the individual expressions are however quite convoluted due to the interaction dynamics. Additionally, we are able to derive the kinetic velocity equations and the local phase shift of the gas after the passage of the soliton, and we can trace the location of the soliton peak as the dynamics evolves.

This is a joint work with T. Grava (SISSA, Bristol), R. Jenkins (UCF), K. McLaughlin (CSU) and A. Minakov (U. Karlova).

36

The complex elliptic Ginibre ensemble at weak non-Hermiticity

Author: Thomas Bothner[1]

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In this talk we will focus on the complex elliptic Ginibre ensemble (eGinUE) and analyze the statistical behavior of its eigenvalues in a suitable scaling limit, known as the weak nonHermiticity limit. In this limit the asymmetry parameter in the model scales with the matrix dimension and the so obtained 2D limiting point processes generalize the well-known sine and Airy processes from the Gaussian unitary ensemble. Using integro-differential Painlevé transcendents we will show how the gap functions of the 2D limiting point processes can be evaluated in closed form and how Riemann-Hilbert techniques can subsequently yield precise asymptotic information for the same functions. Based on current joint work with Alex Little.

53

On the longtime behavior of solutions of the KdV equation on the line

Author: Percy Deift[1]

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The speaker will describe recent work on this long-standing problem and the issues involved in their resolution.
This is joint work with Ken McLaughlin and Thomas Kriecherbauer and incorporates works with people over many years, going back to 1994 with Xin Zhou and Stephanos Venakides, 2000 with Irina Nenciu and also some useful discussions with Deniz Bilman

55

On the longtime behavior of solutions of the KdV equation on the line: use of Riemann-Hilbert and d-bar methods for the analysis

Author: Ken McLaughlin[1]

[1] *Colorado State University*

This is intended to be part 2 of the previous talk (of Percy Deift), and the collaborations are as described by Percy in his abstract . The presentation was crafted together with Thomas Kriecherbauer. By way of introduction, we will consider the stationary phase analysis of an integral, when the

steepest descent method doesn't immediately work. The basic d-bar operator will play a useful rule. We will then carry out some analysis of the Riemann-Hilbert problem for the KdV equation in the longtime limit, explaining the use of the d-bar method.

58

Integrability Of Integro-Differential Painlevé Equations

37

Generalized Gibbs states for the Calogero fluid

Author: Herbert Spohn[1]

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The Calogero fluid is an integrable many-particle system with interaction potential 1/sinh^2. I will explain how to compute the generalized free energy and the associated density of states of the Lax matrix. As a novel method, scattering coordinates will be used. Also the classical version of the Bethe equations will be pointed out.

43

From the Ablowitz-Ladik lattice to the Circular β-ensemble

Author: Guido Mazzuca[1]

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The main focus of this talk is the interplay between the theory of integrable systems, and random matrix theory.
Specifically, I consider the Ablowitz-Ladik lattice, which is an integrable system, I introduce the Generalized Gibbs ensemble for this lattice, and I relate it with a random matrix model, the Circular β ensemble. This connection allows me to compute explicitly the density of states for the Ablowitz-Ladik lattice in terms of the one of the random matrix ensemble.
This talk is mainly based on my recent paper with Tamara Grava, 2107.02303, and the one with Ronan Memin, 2201.03429

33

Marking and conditioning of determinantal point processes

Authors: Gabriel Glesner[1]; Tom Claeys[1]

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The Its-Izergin-Korepin-Slavnov procedure is a method that allows to express Fredholm determinants of integrable kernel operators in terms of Riemann-Hilbert method, and hence paves the road for asymptotic analysis and for the study of underlying integrable systems. I will explain that this procedure allows more generally to characterize the correlation kernels of certain conditional determinantal point processes. I will show how these conditional ensembles are connected with a remarkable rigidity result, with tail distributions of the KPZ equation, and with integrable PDEs. The talk will be based on joint work with Gabriel Glesner.

23

Determinantal point processes: quasi-symmetries and interpolation

Author: Alexander Bufetov[None]

For the sine-process, it is proved that almost every realization with one particle removed is a complete and minimal set for the Paley-Wiener space, whereas if two particles are removed, then one obtains a zero set for the Paley-Wiener space. In joint work with Qiu and Shamov, it is proved that almost every realization of a determinantal point process is a uniqueness set for the underlying Hilbert space.
To every realization of the sine-process we assign a random entire function, an infinite product with zeros at the particles of our configuration, the scaling limit of the ratio of two values of the characteristic polynomial of a random matrix.
In order to study the behaviour of the logarithm of this product, we introduct a Gaussian field under which the variance of the random variable assigned to a given function is proportional to the square of its Sobolev 1/2-norm. More specifically now, we consider the Gaussian process, indexed by point in the upper half-plane, of Cauchy transforms of our configuration, as well as the process of antiderivatives of the Cauchy transforms: precisely, the differences of the logarithms occurring in the logarithm of our random entire function. The key rôle is played by the remark that the Gaussian process formed by the antiderivatives of the Cauchy transforms is invariant under the Lobachevskian isometries of the upper half-plane. The argument then proceeds by taking the scaling limit in the Borodin-Okounkov-Geronimo-Case formula and obtaining an analogue of the Johansson change of variable formula for the sine-process, using the quasi-invariance of the sine-process under the group of diffeomorphisms with compact support.
In joint work with Qiu, the Patterson-Sullivan construction is used to interpolate Bergman functions from a realization of the determinantal point process with the Bergman kernel, in other words, by the Peres-Virág theorem, the zero set of a random series with independent complex Gaussian entries. The invariance of the zero set under the isometries of the Lobachevsky plane again plays a key rôle.

40

Integrable differential equations for KPZ fixed point with narrow-wedge initial condition

Author: Jinho Baik[1]

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The KPZ fixed point is a two-dimensional random field that is the conjectured limit of the height functions of the KPZ universality class for random growth models. The one-point distribution of the KPZ fixed point is the Tracy-Widom distribution which is related to the Painlevel II equation. The equal-time, multi-position distributions are also known to be related to integrable differential

equations. We will discuss integrable differential equations for multi-time distributions. We also discuss similar results for the periodic KPZ fixed point.

32

The Maxwell-Bloch system in the sharp-line limit

Author: Peter Miller[1]

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We study the characteristic Cauchy problem for the Maxwell-Bloch system that describes the interaction of an optical pulse with an active quantum medium. It is well known that in the sharp-line limit that the atoms in the medium are not Doppler-shifted in frequency, this system can be embedded in the integrable hierarchy of the nonselfadjoint Zakharov-Shabat spectral problem. However, it is also known that there are certain difficulties with formulating and using the inverse-scattering transform based on this spectral problem in the usual way. We construct a Riemann-Hilbert problem that returns the unique causal solution of the Cauchy problem and use it to explain features of solutions such as the stimulated decay by a suitable optical pulse of an unstable medium to its stable state and the spontaneous generation of a dispersive tail of the optical pulse with positive time that ruins absolute integrability that would be needed for the standard inverse-scattering transform to make sense. This tail is related to a specific self-similar solution of the Maxwell-Bloch system that in turn is connected with a concrete special solution of the Painlevé-III equation that has become important in several recent application problems for the focusing nonlinear Schrödinger equation. This is joint work with Sitai Li (Xiamen).

59

Open TASEP and the Ribosome Flow Model

50

Curves on Hyperkähler varieties and modular forms

Author: Greog Oberdieck[1]

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The enumerative geometry of curves on algebraic surfaces is a fascinating subject with roots in the 19-th century. For example, Cayley and Salmon in 1849 proved the remarkable fact that every cubic surface in P3 contains precisely 27 lines. A more modern highlight is the Yau-Zaslow formula, proven by Beauville and Bryan-Leung in the 1990s, which says that the counts of rational curves on K3 surfaces are the Fourier coefficients of the reciprocal of the discriminant modular form. The result links together the geometry of K3 surfaces, modular forms and insights from string theory in a beautiful way. In this talk, I will review these results and then discuss an analogue of K3 surfaces in higher dimension, the mysterious class of hyperkähler varieties. For the most prominent deformation family of these varieties, the K3[n]-type hyperkähler varieties, I will discuss how counting of curves is linked to Jacobi forms. In particular, we obtain new constructions of vector-valued Jacobi forms and gain new tools to attack difficult enumerative problems about hyperkähler varieties and CHL Calabi-Yau threefolds.

52

Kyiv formula, its generalizations and applications

Author: Pavlo Gavrylenko[None]

I'm going to give an overview in the growing field that is developing after the formula by Gamayun, Iorgov, Lisovyy that expresses the general solution of Painlevé VI in terms of conformal blocks (Kyiv formula). This field now includes higher-rank generalizations, multi-point and toric generalizations, q-deformations, quantum deformations, expansions in the irregular region. I will tell some short stories about these generalizations done in different combinations, and also about related problems where the Kyiv formula can be used.

49

Large Genus Asymptotics for Intersection Numbers

Author: Amol Aggarwal[1]

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In this talk we explain results on the large genus asymptotics for intersection numbers between ψ-classes on the moduli space of curves. By combining this result with a combinatorial analysis of recently proven formulas of Delecroix-Goujard-Zograf-Zorich, we further describe some features about how random flat surfaces of large genus look. The proof uses a comparison between the recursive relations (Virasoro constraints) that uniquely determine them with the jump probabilities of a certain asymmetric simple random walk.

54

Neural network, spin glasses and random matrices

Author: Francesco Mezzadri[1]

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Neural networks have been extremely successful when applied to machine learning problems, like computer vision, speech processing and media generation. Mathematically, training a neural network is achieved by optimising a loss function. For large neural networks this is a substantially complex problem. In a landmark paper, Choromanska et al. (2015) argued that training loss surfaces of large networks can be modelled by spherical multi-spin glasses. In this talk we present recent results about the loss surfaces of neural networks and generative adversarial networks using supersymmetric techniques from random matrix theory. Our results shed light on the strengths of spin glass models for neural networks. This is work in collaboration with Nicholas Baskerville, Jonathan Keating and Joseph Najnudel.

42

Probabilistic conformal block and its semi-classical limit

Author: Promit Ghosal[1]

[1] *MIT*

Conformal blocks are fundamental objects in the conformal bootstrap program of 2D conformal field theory and are closely related to four dimensional super-symmetric (SUSY) gauge theory via Alday-Gaitto-Tachikawa (AGT) correspondence.
In this talk, I will demonstrate a probabilistic construction of 1-point torus conformal block and discuss its semi-classical limit. This talk will be based on two separate works. The first one with Guillaume Remy, Xin Sun and Yi Sun and the second one with Harini Desiraju and Andrei Prokhorov.

46

TT* equations of Cecotti and Vafa, Riemann-Hilbert method and Iwasawa factorization.

Authors: Alexander Its[None]; Igor Krichever[None]; Martin Guest[None]

In this talk, some interesting (we believe !) new features of the Riemann-Hilbert method of the asymptotic analysis of integrable systems will be discussed. These features have emerged during the study of the global solution of the tt*equations of Cecotti and Vafa which the speaker has been pursuing, for some time already, together with M. Guest and Chang-Shou Lin. The method which we use in this study is based on a combination of the isomonodrtomy technique and Iwasawa factorization from the theory of loop groups. This allows us to simplify significantly the asymptotic analysis of the tt* equations and, simultaneously, to bring a new light on some aspects of the well known relation between the Birkhoff-Grothendieck and Iwasawa factorizations. Another important link - to a 1980 paper by I. Krichever on the nonlinear analog of the d'Alembert's formula, will be also highlighted.*

The talk represents an ongoing joint project of M. Guest, I. Krichever, and the speaker.

38

Quantum KdV and quasimodular forms

Author: Giulio Ruzza[1]

Co-author: Jan-Willem van Ittersum [2]

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A result of Dubrovin provides a full description of the spectrum of the dispersionless quantum Korteweg-de Vries (qKdV) hierarchy (in the first Poisson structure). Eigenvalues are shifted-symmetric functions of partitions, related, by a result of Bloch and Okounkov, to quasimodular forms on the full modular group SL(2,Z). We extend this relation to the dispersive case by showing that q-weighted traces of the Hamiltonian operators of the qKdV (in the first Poisson structure) are quasimodular of homogeneous weight. This is achieved by first establishing a general criterion for quasimodularity, which remarkably simplifies the recursion formula (in the form obtained by Buryak and Rossi) for the qKdV Hamiltonian densities. These results naturally extend to the Intermediate Long Wave hierarchy. Joint work with Jan-Willem van Ittersum.

51

Borel-Laplace multi-transform, and integral representations of solutions of qDEs

Author: Giordano Cotti[1]

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The quantum differential equation (qDE) is a rich object attached to a smooth projective variety X. It is an ordinary differential equation in the complex domain which encodes information of the enumerative geometry of X, more precisely its Gromov-Witten theory. Furthermore, the monodromy of its solutions conjecturally rules also the topology and complex geometry of X. These differential equations were introduced in the middle of the creative impetus for mathematically rigorous foundations of Topological Field Theories, Supersymmetric Quantum Field Theories and related Mirror Symmetry phenomena. Special mention has to be given to the relation between qDE’s and Dubrovin-Frobenius manifolds, the latter being identifiable with the space of isomonodromic deformation parameters of the former. The study of qDE’s represents a challenging active area in both contemporary geometry and mathematical physics. In this talk I will introduce some analytic integral multitransforms of Borel-Laplace type, and I will use them to obtain Mellin-Barnes integral representations of solutions of qDEs.

30

A Dubrovin-Frobenius manifold structure of NLS type on the orbit space of B_n

Author: Paolo Lorenzoni[1]

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We show that the orbit space of B_2 less the image of coordinate lines under the quotient map is equipped with two Dubrovin-Frobenius manifold structures which are related respectively to the defocusing and the focusing nonlinear Schrodinger equations. Motivated by this example, we study the case of B_n and we show that the defocusing case can be generalized to arbitrary n leading to a Dubrovin-Frobenius manifold structure on the orbit space of the group. The construction relies on the existence of a non-degenerate and non-constant invariant bilinear form that plays the role of the Euclidean metric in the Dubrovin-Saito standard setting. Up to n=4 the solutions of WDVV equations we get coincide with those associated with constrained KP equations. The talk is based on a joint work with Alessandro Arsie, Igor Mencattini and Guglielmo Moroni.

41

Janossy densities of the thinned Airy point process: the Schrödinger and (c)KdV equations

Authors: Gabriel Glesner[None]; Giulio Ruzza[1]; Sofia Tarricone[2]; Tom Claeys[2]

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[2] *UCLouvain*

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The aim of the talk is to show that the Janossy densities of a suitably thinned Airy kernel point process are governed by the Schrödinger and (cylindrical) KdV equations; moreover, we prove that the associated wave functions satisfy a system of coupled integro-differential Painlevé II equations. These results are obtained by characterizing the Janossy densities in terms of a Riemann-Hilbert matrix factorization problem with poles which is analysed by the theory of Darboux-Schlesinger transformations. This approach also allows to investigate asymptotics for the Janossy densities in various regimes (in progress). The talk is based on ongoing work with T. Claeys, G. Glesner and G. Ruzza.

45

Universality for free fermions

Author: Gaultier Lambert [None]

The ground state of a free Fermi gas is a classical example of determinantal processes introduced by Macchi (1975) whose correlation kernel is associated with a Schrödinger operator on R^n. In this talk, I will explain how one proves universality of local correlations for these models using semiclassical analysis. If time permits, I will also mention a central limit theorem for a one-dimensional Fermi gas and explain the connection with random matrix theory. Joint work with Alix Deleporte.

34

Solutions of the Bethe Ansatz Equations as Spectral Determinants

Author: Davide Masoero[1]

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The Quantum KdV model is a conformal field theory, which is integrable via the Bethe Ansatz Equations. It can be regarded as a deformation of the second KdV hamiltonian structure or as the scaling limit of the XXZ chain. In 1998,Dorey and Tateo discovered that the Bethe roots for the ground state of the Quantum KdV model coincide with the eigenvalues of certain anharmonic oscillators (ODE/IM correspondence).In 2004,Bazhanov, Lukyanov & Zamolodhchikov conjectured that the Bethe roots of every state of the model are the eigenvalues of a linear differential operator, namely an anharmonic oscillator with a monster potential. 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.

48

Modular transformation of tau-functions on the torus.

Author: Harini Desiraju[1]

Co-authors: Fabrizio Del Monte [2]; Pavlo Gavrylenko

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[2] *CRM Montreal*

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The connection constant of the tau-function on the torus corresponds to its modular transformation and is related to the modular kernel of conformal blocks. In this talk, I will show the connection constant in terms of the monodromy data for a torus with one simple pole as an example, but the techniques extend to any number of simple poles.

39

Perturbative connection formulas for Heun equations

Author: Oleg Lisovyy[1]

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The connection problem for Heun equation seeks to relate bases of Frobenius solutions associated to different Fuchsian singularities. In a recent paper 2201.04491 [hep-th], Bonelli, Iossa, Lichtig and Tanzini have proposed a conjecture relating the relevant connection coefficients to classical conformal blocks of the Virasoro algebra. In practical terms, their conjecture allows to compute the connection coefficients in the form of a perturbative expansion in a suitable parameter. I will explain how to derive the corresponding perturbative formulas directly from Heun's equation.

56

Poster Session

Author: Alex Little
Title:
Abstract:

Author: Chiara Franceschini
Title: Duality for interacting particle systems: an algebraic approach
Abstract:

Author: Cristoforo Iossa
Title: Heun connection formulae from Liouville correlators
Abstract: Reversing the logic of the bootstrap approach in Liouville CFT we explicitly compute the connection formulae for degenerate conformal blocks. In the semiclassical limit of the theory, this amounts to solving the connection problem of Fuchsian ODEs. Generalizing to irregular insertions we solve as well for various confluences of the ODE. Concentrating on the first nontrivial case after the hypergeometric equation, we explicitly computed the connection coefficients for the Heun equation and some of its confluences in terms of combinatorial objects exploiting the AGT duality. This has several applications in physics: indeed, when the wave equation of a black hole or a microstate is separable, it often reduces to Heun equations, and exact connection formulae give access to several interesting quantities. As a working example, we focus on the 4d Kerr black hole, and exactly compute the absorption coefficient, quasinormal modes and Love numbers in terms of combinatorial objects exploiting the AGT duality. This is a joint work with my supervisors Giulio Bonelli and Alessandro Tanzini, and with my colleague Daniel Panea.

Author:Fabrizio Del Monte
Title: isomonodromic tau functions beyond the Widom constant
Abstract:As shown by Cafasso, Gavrylenko and Lisovyy, Widom constants provide a powerful framework to write down explicit Fredholm determinant tau functions for both isospectral and isomonodromic systems, such as general Painlevé tau functions. In this poster I show how the ideas underlying this approach can be generalized to cases where the Widom constant approach does not

describe the tau function. When the structure group is an orthogonal, rather than linear group, the tau function is a Fredholm Pfaffian instead of a determinant. When the isomonodromic problem is formulated on a torus rather than on a sphere, the general SL(N) tau function is still a Fredholm determinant, but the Widom constant description is no longer sufficient. In this latter case, the Fredholm determinant formulation also allows to compute the modular properties of the tau function under SL(2,Z) transformations of the modular parameter.

Author: Giorgio Gubbiotti
Title: Coalgebra symmety and discrete integrable systems
Abstract: We introduce the concept of coalgebra symmetry for discrete systems. We use this powerful tool to prove (super)integrability, superintegrability of some discrete N-dimensional systems related to the Lie–Poisson algebra $\mathfrak{sl}_2(\mathbb{R})$.

Author: Giuseppe Orsatti
Title: Soliton shielding of the focusing nonlinear Schrodinger equation
Abstract: We consider a gas of N solitons of the Focusing Nonlinear Schrodinger (FNLS) equation in the limit $N \to \infty$ with a
point spectrum chosen to interpolate a given spectral soliton density over a
domain of the complex spectral plane. We call this class of initial data, deterministic soliton gas.
We show that when the domain is a disc and the soliton density is an analytic function, then the corresponding deterministic soliton gas surprisingly yields the one-soliton solution with point spectrum the center of the disc. We call this effect "soliton shielding".
When the domain is an ellipse, the soliton shielding reduces the spectral data to the soliton density concentrating between the foci of the ellipse.
The physical solution is asymptotically step-like oscillatory, namely, the initial profile
is a periodic elliptic function in the negative x–direction while it vanishes exponentially fast in the opposite direction.

Author: Luis Felipe Lopez reyes
Title: Monodromy Data of a 3-dim Frobenius Manifold along its Caustic
Abstract: Among many other properties, each tangent space to a Frobenius manifold carries a multiplication. There is a distinguished vector field E such that, if the operator of multiplication by E has different eigenvalues at p then the multiplication at the tangent space at p has no nilpotents. A Frobenius manifold also parametrizes a familiy of meromorphic differential equations over the Riemann sphere and; on a neighborhood U of a point such that multiplication by E has different eigenvalues, Dubrovin showed that this familiy is isomonodromic and moreover, the structure of a Frobenius manifold on U is determined by its monodromy data. Recently, Cotti, Dubrovin and Guzzetti extended this result to points where multiplication by E has repeated eigenvalues but the multiplication has no nilpotents. The points having nilpotent elements form an hypersurface called the caustic. In this poster I will present some results about the structure of the caustic, its monodromy data and we will show how in some 3-dimensional cases the stucture on the Caustic suffices to reconstruct the monodromy data (and hence the Frobenius manifold) in a neighborhood U "close" to the caustic but not intersecting it.

Author: Mateusz Piorkowski
Title: Orthogonal Polynomials with Logarithmic Weight Functions
Abstract:

Author: Michele Graffeo
Title: Moduli spaces of Z/kZ-constellations over the affine plane
Abstract: It is a classical result that, for any finite subgroup G of SL(n,C), for n=2,3, there exists (at least) one crepant resolution of the singularity "affine n-space modulo G-action". When G is abelian, thanks to a work of Craw and Ishii, any such resolution can be interpreted as the fine moduli space of certain coherent sheaves, called G-constellations, which are stable with respect to a GIT stability condition. In my work, first I computed, in the two dimensional abelian setting, the number of chambers in the space of stability conditions and then I introduced a combinatorial object called chamber stair that encodes the data needed to construct a chamber. Moreover, I have isolated a subset of the set of chambers —- the simple chambers —- which are enough to list all the toric constellations. Finally, I gave an explicit construction for the tautological bundles on these moduli spaces.

Author: Nedalko Bradinoff

Title: Circular β-ensamble and Benford's law

Abstract: Benford's Law describes a remarkable behavior of the leading digits of quantities of interest in
physics, engineering, finance, and mathematics. We describe formal conditions for proving Benford's
Law in the context of Random Matrix Ensembles. We prove that for Circular β-ensembles, the absolute value of the characteristic polynomial, $|\det(U_N - e^{i\theta} I_N)|$, obeys Benford's law in this context and describe interpretations of the result.

Author: Pierre Karim Emille Lazag

Title: A law of large numbers for Schur measures and a Schur process

Abstract: We prove a law of large numbers for local patterns in
discrete point processes coming from models of random partitions. We investigate two different situations: a class of point processes on
the one dimensional lattice including certain Schur measures, and a model of random plane partitions, introduced by Okounkov and Reshetikhin. The results state in both cases that the linear statistic of a function, weighted by the appearance of a fixed pattern in the random configuration and conveniently normalized, converges to the deterministic integral of that function weighted by the expectation with respect to the limit process of the appearance of the pattern.

Author: Sergey Berezin

Title: Products of Ginibre matrices: Gap probability for the critical kernel

Abstract: We will study a product of i.i.d. Ginibre matrices in the critical regime and a soft-edge scaling kernel discovered by Dang-Zheng Liu, Dong Wang, and Yanhui Wang. Specifically, we will discuss some recent results concerning the gap probability for this kernel. The poster talk is based on joint work with Eugene Strahov.

Author: Wen-Kui Liu

Title: Limit Shape and Fluctuations of q-Orthogonal Polynomial Ensembles

Abstract: One popular example of the dynamic q-Orthogonal polynomial ensembles (Dynamic q-OPE) is the q-volume Lozenge tiling in a hexagon. With the slowly varying Toeplitz structure raising from the recurrence relation of the q-orthogonal polynomials, we are able to study the asymptotics of the linear statistics of a dynamic q-OPE. We will give the law of large number and central limit results. In particular, we are able to prove the existence of a Gaussian free field in the liquid region of the q-volume (or more generally q-Racah) lozenge tiling in a suitable coordinate.