

Guido Mazzuca

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Education

SISSA - Scuola Internazionale Superiore di Studi Avanzati , Mathematics	Trieste, Italy Jan 2017 – Jan 2021
University of Milan , Mathematics	Milan, Italy Jan 2012 – Jan 2017

Experience

Tulane University , Postdoctoral Researcher	New Orleans, LA Jan 2023 – present 3 years 1 month
KTH Royal Institute of Technology , Stockholm, Sweden , Postdoctoral Researcher	Stockholm, Sweden Jan 2021 – Jan 2023 2 years 1 month

Volunteer

BATS and GIST , Organizer Organizer for BATS and GIST math outreach programs.	New Orleans, LA Jan 2023 – present
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Publications

Adiabatic invariants for the FPUT and Toda chain in the thermodynamic limit.

We study the periodic Fermi-Pasta-Ulam-Tsingou system as a perturbation of the periodic Toda lattice equations. Exploiting this idea, we show that the Toda integral of motions are adiabatic invariants for the Fermi-Pasta-Ulam-Tsingou system in the thermodynamic limit. This result holds in probability with respect to the Gibbs measure of the system.

Guido Mazzuca, Tamara Grava, Alberto Maspero, Antonio Ponno

doi.org/10.1007/s00220-020-03866-2

Generalized Gibbs ensemble of the Ablowitz-Ladik lattice, circular beta-ensemble and double confluent Heun equation

In this paper, we prove a polynomial Central Limit Theorem for several integrable models, and for the β ensembles at high-temperature with polynomial potential. Furthermore, we are able to relate the mean values, the variances and the correlations of the moments of these integrable systems with one of the β ensembles. Moreover, we show that for several integrable models, the local functions' space-correlations decay exponentially fast.

Guido Mazzuca, Ronan Mémín

doi.org/10.1007/s00023-024-01435-0

Generalized Gibbs ensemble of the Ablowitz-Ladik lattice, circular beta-ensemble and double confluent Heun equation

We consider the discrete defocusing nonlinear Schrödinger equation in its integrable version, which is called defocusing Ablowitz-Ladik lattice. We consider initial data sample according to the Generalized Gibbs ensemble for this lattice with periodic boundary conditions with period N . In this setting, the Lax matrix of the Ablowitz-Ladik lattice is a random CMV-periodic matrix, and it is related to the Killip-Nenciu circular β -ensemble at high-temperature. Furthermore, we obtain the generalized free energy of the Ablowitz-Ladik lattice and the density of states of the random Lax matrix by establishing a mapping to the one-dimensional log-gas. For the Gibbs measure related to the Hamiltonian of the Ablowitz-Ladik flow, we obtain the density of states via a particular solution of the double-confluent Heun equation.

Guido Mazzuca, Tamara Grava

doi.org/10.1007/s00220-023-04642-8

Skills

Mathematics

Programming

Languages

Italian

Native speaker

English

Fluent

Spanish

Basic knowledge

Interests

Mathematics

Projects

Mathematical Fundation of Soliton Gas theory and Generalized Hydrodynamics

Jan 2017 – present

Study of the mathematical aspects of Soliton Gas theory and Generalized Hydrodynamics (GHD) for integrable PDEs.

- Soliton Gas
- Generalized Hydrodynamics

References

Professor Tamara Grava

Professor Alberto Maspero

Professor Ken McLaughlin

Professor Herbert Spohn