

Guido Mazzuca

 gmazzuca@tulane.edu  New Orleans, LA  gmazzuca

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

New Orleans, LA

Organizer for BATS and GIST math outreach programs.

Jan 2023 – present

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