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THE DEPARTMENT OF MATHEMATICAL SCIENCES PROUDLY PRESENTS

COLLOQUIUM

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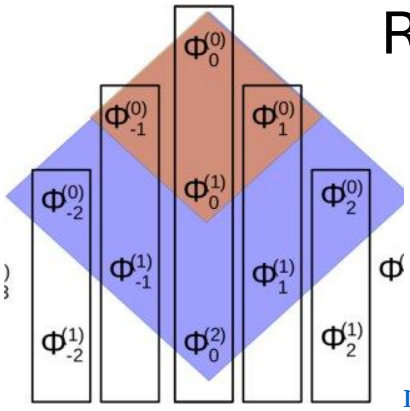
Quantum Point-Iteractions via Resurgence Analysis



Gabriel Coloma Irizarry

Ohio State University

Sept 18 - 2025
10:45 am
Monzón 201
meet.google.com/urm-rhmx-dhw

The methods of quantum point-interactions have a long history dating back to the use of Fermi pseudo-potentials as effective approximations for the action of short-range Hamiltonian interactions. The modern theory of point-interactions has proven its success as a first mathematically rigorous framework for the photoelectric effect in Quantum Mechanics. The models on the one hand are sufficiently simple to admit exact analytical and asymptotic evaluation, while on the other, they capture essential features shown to agree with experiment. In this talk we focus on a 1d quantum system for the evolution of a bound particle under the influence of an external oscillating field with two active resonant frequencies. In this scenario the model serves as an accurate candidate for the description of ionization phenomena such as by high-intensity laser radiation. We discuss new analytical tools, applicable well beyond perturbative regimes, fully valid for all ranges of amplitudes and frequencies. The techniques at hand involve classical asymptotics of Laplace transforms and their singularities from the perspective of Resurgence Analysis. In particular we illustrate how to construct transseries expansions of relevant quantities such as ionization probabilities of the bound particle. These expansions are exact & asymptotic representations valid for all times, and explicitly display meaningful information about the system such as Fermi Golden Rule exponents and multi-instanton effects.

Ph.D. in CISE
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