UNIVERSITÀ DEGLI STUDI DI MILANO

Time: **Nov, 11th (Tuesday), 2025**
14:00 (Rome, GMT+1)

Location: **Aula B3**
Dipartimento di Biologia – Via G. Celoria 26

Extreme Superposition: Rogue Waves of Infinite Order, Universality, and Anomalous Temporal Decay

Focusing nonlinear Schrödinger equation serves as a universal model for the amplitude of a wave packet in a general one-dimensional weakly-nonlinear and strongly-dispersive setting that includes water waves and nonlinear optics as special cases. Rogue waves of infinite order are a novel family of solutions of the focusing nonlinear Schrödinger equation that emerge universally in a particular asymptotic regime involving a large-amplitude and near-field limit of a broad class of solutions of the same equation. In this talk, we will present several recent results on the emergence of these special solutions along with their interesting asymptotic and exact properties. Notably, these solutions exhibit anomalously slow temporal decay and are connected to the third Painlevé equation. Finally, we will extend the emergence of rogue waves of infinite order to the first several flows of the AKNS hierarchy—allowing for arbitrarily many simultaneous flows. Time permitting, we will report on recent work regarding their space-time asymptotic behavior under an arbitrary flow from the hierarchy.

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Deniz Bilman
Associate Professor

Deniz Bilman is associate professor in mathematics at the University of Cincinnati. His research interests lie primarily in nonlinear waves, integrable systems, and dispersive PDEs.
Previously, he was a postdoc at the University of Michigan (2015–2019). His PhD thesis advisor was Irina Nenciu and his thesis was on Hamiltonian perturbations of the doubly-infinite Toda lattice.
He currently serves as the secretary for the SIAM Activity Group Nonlinear Waves and Coherent Structures and on the junior editorial board of Studies in Applied Mathematics.