Mini-School

Introduction to classical and quantum chaos

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In these lectures, we will introduce the main features of classically chaotic systems to develop their quantum mechanical counterparts.

We will study classical chaos, and we will introduce the Lyapunov exponent as the primary quantitative measure of chaos. We will then move to the quantum regime, and we will deduce that quantum mechanical systems whose classical counterparts are chaotic are characterized by level repulsion, in opposition to the level crossing typical of quantum integrable systems. This will provide us with the central intuition that quantum chaotic systems are universally described by random matrix theory (RMT) which we will introduce. Finally, we will study some modern alternative definitions of quantum chaos based on the notion of out-of-time-ordering correlators (OTOCs).

6 October 2020, Lecture 1: Classical chaotic systems: the Lyapunov exponent

13 October 2020, Lecture 2: Moving to the quantum regime: level repulsion

20 October 2020, Lecture 3: Random matrix theory as a universal description of quantum chaos

27 October 2020, Lecture 4: The out-of-time-ordering correlators and quantum Lyapunov exponents

Time: 14h00 – 15h00

Short bio: Dario Rosa was born in Milan and grew up in Genoa (Italy). He got his Bachelor and Master degrees at Genoa University, while he got his PhD at Milano-Bicocca University in 2015. After that, Dario moved to Korea, as a post-doctor in Seoul National University and a research fellow in Korea Institute for Advanced Study. He is currently a postdoctoral fellow at the Korea Advanced Institute of Science and Technology. He started his scientific activity working on supergravity and supersymmetric field theories on curved spaces. He started to be interested in quantum chaos in 2016.

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