

## Simis Seminar series on Quantum computing, quantum simulation and strongly-correlated systems

### Professor Antonio García-García

Shanghai Center for Complex Physics, School of Physics and Astronomy, Shanghai Jiao Tong University, Shanghai 200240, China

#### “Sachdev-Ye-Kitaev model: from quantum chaos to quantum gravity”

##### Abstract

I first introduce the Sachdev-Ye-Kitaev (SYK) model,  $N$  fermions in zero spatial dimensions with infinite range interactions in Fock space, and argue why it is a hot topic of research in theoretical physics. Afterwards, I review some of my recent research on this topic with a special emphasis on non-hermitian SYK models and its role in the definition of characterization of dissipative quantum chaos, the conditions for the occurrence of many-body topology, and the relation to wormhole physics. I conclude with a brief overview on the sparse SYK model that broadens the scope of theories with a gravity dual and also provides a novel platform for efficient quantum many-body fermionic simulations.

##### Biography of the speaker

Antonio received his PhD from the State University of New York at Stony Brook and has held research appointments in the Université Paris-Sud and Princeton University (2004-2009) where he was also a lecturer and Marie Curie Fellow. He was an assistant professor in the University of Lisbon and then staff member of the Cavendish Laboratory of Cambridge University for six years. In 2017, he joined Shanghai Jiao Tong University as a tenured associate professor and a senior 1000 talent of Shanghai municipality. From 2020, he is a full Professor in the School of Physics and Astronomy. He has over one hundred publications ( $h$ -index = 35), including papers in Nature Materials, (2) Physical Review X, (14) Physical Review Letters and Nanoletters, and over forty invitations to international conferences. He has supervised nine postdocs, six PhD students and several master students. and has been the recipient of fellowship and grants from public research agencies and private foundations in the UK, Portugal, Japan, Spain and China. Highlights of his previous research includes a theory of finite size effects in blackbodies and nanosuperconductors, and its experimental demonstration. The development of a novel theory of defect formation in dynamical phase transitions, an analytical description of the Anderson metal-insulator, and its characterization in quantum chaotic systems, and a symmetry classification of dissipative Sachdev-Ye-Kitaev (SYK) model and the identification of the field theory dual of Euclidean wormholes. The main themes of his current research is the physics of strongly-interacting quantum-chaotic systems with a special focus on the Sachdev-Ye-Kitaev model and its gravity dual, the description of dissipative and monitored many-body quantum systems and the study and optimization of superconducting circuits.

---

**Date and Place: 18th October 2024, 13:30h-14:30h. Room: 1401.** Send comments or questions to: Miguel Tierz to tierz at simis.cn