

Wednesday, December 20, 14:00-15:00

Physics Department- H Block Seminar Hall (Tea & coffee at 13:45)



QUANTUM RESOURCES IN ACTION: Pinnacle of Quantum Superposition

Quantum technologies depend on fundamental principles of quantum theory, such as coherence and entanglement. These principles form the basis for their superiority in communication, computation, and information processing across a wide range of applications. These elusive quantum phenomena are comprehensively explained within the framework of quantum resource theories (QRTs). In this talk, I begin with a concise introduction to QRTs, highlighting the hierarchy of quantum states as a key branch that elucidates efficiency in task performance. The talk then explores the challenge of realizing maximal superposition states, also known as golden states, within the resource theory of superposition. By emphasizing the nuanced difference between coherence and superposition in their resource-theoretic formulations, I present a proof for the existence of states with maximal superposition. The presentation concludes by suggesting that Löwdin symmetric orthogonalization can serve as a valuable tool for characterizing pure superposition states, accentuating the profound link between coherence and superposition within the framework of resource theory.

Related Publications:

1. G. Torun, H. T. Şenyaşa, and A. Yildiz, Phys. Rev. A 103, 032416 (2021)
2. H. T. Şenyaşa and G. Torun, Phys. Rev. A 105, 042410 (2022)
3. G. Torun, J. Phys. A: Math. Theor. 56, 355302 (2023)
4. G. Torun, O. Pusuluk, and Ö. E. Müstecaplıoğlu, Turk. J. Phys. 47, 4(2) (2023)



Speaker: Dr. Gökhan Torun

Dr. Gökhan Torun, with a Ph.D. in Physics Engineering from İstanbul Technical University, conducted research in the Quantum Correlations group at the University of Nottingham. He then worked as a postdoctoral researcher at İTÜ, Boğaziçi University, Koç University, and TÜBİTAK Research Institute for Fundamental Sciences, specializing in Quantum Information Theory, Quantum Resource Theories, and Quantum Technologies.