Invited Talk

Prof. Salman Beigi

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Title: Additivity of Quantum Relative Entropies as a Single-Copy Criterion

Date & Time: Monday, 28 July 2025 9:30 am (CET)

Zoom link:
https://tum-conf.zoom-x.de/j/63632016037?pwd=WjJBczN2RSs5TnJJRThCYnEvaGhhZz09

Abstract

The fundamental goal of information theory is to characterize complex operational tasks using efficiently computable information quantities, Shannon's capacity formula being the prime example of this. However, many tasks in quantum information can only be characterized by regularized entropic measures that are often not known to be computable and for which efficient approximations are scarce. It is thus of fundamental importance to understand when regularization is not needed, opening the door to an efficiently computable characterization based on additive quantities. In this talk, it is demonstrated that for a large class of problems, the question of whether regularization is needed or not can be determined at the single-copy level. Specifically, that regularization of the Umegaki relative entropy, along with related quantities such as the Petz and sandwiched relative entropies, is not needed if and only if a single-copy optimizer satisfies a certain property. These results, in particular, imply necessary and sufficient conditions for the additivity of various error exponents in quantum hypothesis testing with arbitrarily varying hypotheses. This talk is based on a joint work with Roberto Rubboli and Marco Tomamichel.

Speaker Bio:

Prof. Salman Beigi received his PhD in Mathematics from the Massachusetts Institute of Technology (MIT) in 2009 under the supervision of Prof. Peter Shor. Following a postdoctoral fellowship at the Institute for Quantum Information at Caltech, he joined the Institute for Research in Fundamental Sciences (IPM) in 2011, where he currently holds the position of Full Professor. He is also the recipient of several national and international honors, including a Gold Medal at the 41^{st} International Mathematical Olympiad (IMO) held in Taejon, South Korea, in 2000. His research lies at the forefront of quantum information theory, with contributions spanning quantum complexity theory, algorithms, error-correcting codes, quantum foundations, Shannon theory, and quantum machine learning.