FACOLTÀ DI SCIENZE MATEMATICHE, FISICHE E NATURALI
DIPARTIMENTO DI MATEMATICA E FISICA "NICCOLÒ TARTAGLIA"

Exploring quantum complexity in holographic systems

Introduce:
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Abstract

The holographic duality, originating from string theory, relates a classical gravity theory in anti de Sitter spacetime to a quantum field theory on the boundary of the spacetime. In the past decade, this duality (also known as the AdS/CFT correspondence) has been used to explore information theoretic quantities in strongly coupled systems. The most well known example is the Ryu-Takayanagi prescription, which provides a geometric route to calculating the entanglement entropy of conformal field theories. More recently, there have also been proposals to calculate the complexity of strongly coupled field theories using AdS/CFT. Briefly, complexity of a quantum state is the minimal number of unitary transformations necessary to construct this state from a given reference state.

In this talk, the holographic methods of calculating complexity, which are known in the literature as Complexity=Volume and Complexity=Action conjectures, will be reviewed (including the concept of subregion complexity). Subsequently, some recent work elucidating the general properties of subregion holographic complexity (focusing on the divergence structure) will be described. Another scenario in which it is interesting to observe the behaviour of holographic complexity is phase transitions. In this context, investigations using the Complexity=Volume conjecture will be described and, where appropriate, similarities and differences with entanglement entropy will be pointed out. Finally, both the Complexity=Volume and Complexity=Action conjectures will be studied in an Einstein-dilaton gravity model. This represents a scenario in which complexity is calculated in a gravity model with matter fields. The motivation behind introducing this particular model will be explained. The results obtained from both proposals will be explained and significant differences from the existing literature will be pointed out. We shall finally end by summarising the main body of the talk and conclude with outlining some future directions.

Seminario

Mercoledì 10 aprile 2019
Sala Riunioni, ore 14.30
Via dei Musei 41 - Brescia

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