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Microcanonical Action and the Entropy of Hawking Radiation

The island formula –an extremization prescription for generalized entropy –is known to result in a unitary Page curve for the entropy of Hawking radiation. This semi-classical entropy formula has been derived for Jackiw-Teitelboim (JT) gravity coupled to conformal matter using the "replica trick"to evaluate the Euclidean path integral. Alternatively, for eternal Anti-de Sitter black holes, we derive the extremization of generalized entropy from minimizing the microcanonical action of an entanglement wedge. The on-shell action is minus the entropy and arises in the saddle-point approximation of the (nonreplicated) microcanonical path integral. When the black hole is coupled to a bath, islands emerge from maximizing the entropy at fixed energy, consistent with the island formula. Our method applies to JT gravity as well as other two-dimensional dilaton gravity theories.

Type of contribution

Contributed Talk or Poster

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