Demonstrating a Potential Method for Black Hole Information Recovery via Simulated Hawking Radiation

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This project modeled the effects of Hawking radiation on black hole evolution and investigated whether black hole initial conditions can be inferred from radiation temperature data. A numerical simulation was developed in Python to reproduce black hole evaporation dynamics using recursive equations to compute mass, temperature, radius, and spin across discrete timesteps. The model calculates decay time by integrating the evaporation process until mass approaches zero, with visualization tools implemented to analyze temporal behavior. Rotational effects were incorporated using the Kerr solutions to Einstein's field equations, and Gaussian noise was added to approximate realistic observational uncertainty. An inverse modeling prediction algorithm was constructed to estimate the initial black hole mass by comparing simulated radiation emission curves against generated reference data across a bounded search range. The results demonstrate that the initial mass of a non-rotating black hole can be estimated using radiation emission data within the constraints of the numerical simulation model.

Awards Won: