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Novel, Independent Approach to VLBI Black Hole Imaging

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The Event Horizon Telescope (EHT) collaboration's iconic images of the supermassive black holes in M87 and the Milky Way delivered profound implications for our understanding of fundamental physics under strong gravitational fields. Producing these images required pushing radio interferometric imaging to its limits—grappling with severely sparse data coverage, low signal-to-noise ratios, and calibration challenges from both the instrument and the propagation medium. These difficulties can introduce the risk of biases or artefacts unless handled with exceptional care. To provide independent verification of these scientifically critical results, we develop a novel approach using closure invariants—quantities that remain unaffected by calibration errors and therefore serve as robust observables of the true emission near the black hole's event horizon. By applying advanced generative deep learning techniques directly to closure invariants, we not only offer an independent method to cross-validate the EHT images, but also introduce a powerful new framework for Very Long Baseline Interferometry imaging under extreme observational conditions. In this talk, I will present our progress in developing and refining this approach.

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