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A panchromatic approach to the merger-active galactic nuclei connection

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Collisions and interactions between galaxies are thought to be crucial phases in their evolution and mass assembly process, elevating star formation activity and potentially fueling accretion onto the central supermassive black holes. In this study, we leverage the high spatial resolution and sensitivity of the Hyper Suprime Cam survey and the associated rich multi-wavelength data in the GAMA 09 field to gain new insights into the role of mergers in triggering active galactic nuclei (AGN) up to z~1. We employ a deep learning convolutional neural network algorithm to identify galaxy mergers based on features learned from two different cosmological hydrodynamical simulation suites. We explore data from the X-ray to sub-millimeter regimes to robustly select mid-infrared (MIR) and X-ray AGN and derive a continuous distribution of the AGN fraction (f_{AGN}) for the first time. With this latter approach, we are able to explore how mergers are connected to the importance of AGN. Our findings reveal that mergers exhibit a higher fraction of galaxies with high f_{AGN} compared to non-mergers, accounting for ~40% of AGN-dominated galaxies. Furthermore, our binary classification analysis indicates that MIR AGN are twice as frequent in mergers than non-mergers, while X-ray AGN are only slightly more frequent in mergers. Additionally, the merger fraction in MIR AGN is higher than in MIR non-AGN controls (~40% vs. 25%), while the merger fraction in selected X-ray AGN is comparable to that in X-ray non-AGN controls. Our study sheds new light on the relationship between mergers and AGN evolution up to z~1.

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