Discovery of Transiting Exoplanet Candidates Orbiting White Dwarfs Using Automated Transient Analysis of ZTF Light Curves

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White dwarfs (WDs) are a unique window into the fate of planetary systems, but confirmed planets around WDs are rare and transit signals last only minutes, making them easy to miss in ground-based surveys. I present an automated pipeline that repurposes archival wide-field data to search for short-duration, transit-like dips in WD light curves. It integrates Gaia astrometry and photometry with Zwicky Transient Facility (ZTF) time-series data and performs statistical dip detection (median normalization; MAD to s; =5s thresholds), quadrant-level neighbor/condition vetting to suppress instrumental and atmospheric systematics, and cross-validation with NASA's TESS (SPOC/QLP or TESSCut light curves; MJD to BTJD alignment). From ~30,000 ZTF r-band WD light curves drawn from a 232,290-object Gaia-ZTF cross-match, the pipeline flagged ~300 anomaly curves (~1%). To broaden sensitivity beyond conservative thresholds, HDBSCAN clustering in a skewness-von Neumann feature space identified ~400 additional outliers. After neighbor-based and quality vetting across both sets, ~100 astrophysically credible events remained for further analysis. TESS verification identified nine WD systems with transit-like or coherent variability (~0.03% of the sample), including three periodic, box-shaped signals consistent with intact exoplanets (observed candidate fraction ˜10^-4 for periodic systems; ˜3×10^-4 including all TESS-supported events). These results demonstrate that ZTF can contribute to systematic searches for WD planetary candidates when coupled with rigorous automation and space-based cross-checks. Future work (multi-band g/r/i photometry, high-cadence monitoring) will refine validation and occurrence constraints and enable a full-catalog search for planets that survive stellar death.

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