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Investigation of Open Cluster NGC 7789 Using GAIA EDR3 Data

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We present the initial study on the membership determination of the open clusters in Cassiopeia. Proper motion and parallax of stars collected in the Gaia Early Data Release 3 are used to derive the cluster members by employing the Hierarchical Density-Based Spatial Clustering of Applications with Noise (HDBSCAN) algorithm which is further improved upon using a Gaussian Mixture Model. We showed that HDBSCAN is great for determining values while GMM is great for determining the frequency and degree of a star's membership in a cluster. We calculate the parallax and distance of the NGC 7789 cluster center to be 0.1994 ± 0.11 mas and 18637 ± 333110 pc respectively. The position of the cluster center is calculated to be $\alpha = 359^\circ 16' 56.44''$ $\delta = 56^\circ 42' 38.46''$ and proper motion to be $\mu\alpha = -1.386 \pm 0.68$ mas/yr and $\mu\delta = -1.052 \pm 0.37$ mas/yr. Our results are consistent as well with the known values from the previous studies. The stars in NGC 7789 show very little movement on proper motion and might be caused by fainter observations. The cluster is peppered with younger stars in the main phase sequence with several blue stragglers and redder stars in the turnoff region.

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