Astronomers detect multiple extended tidal tails in an old globular cluster

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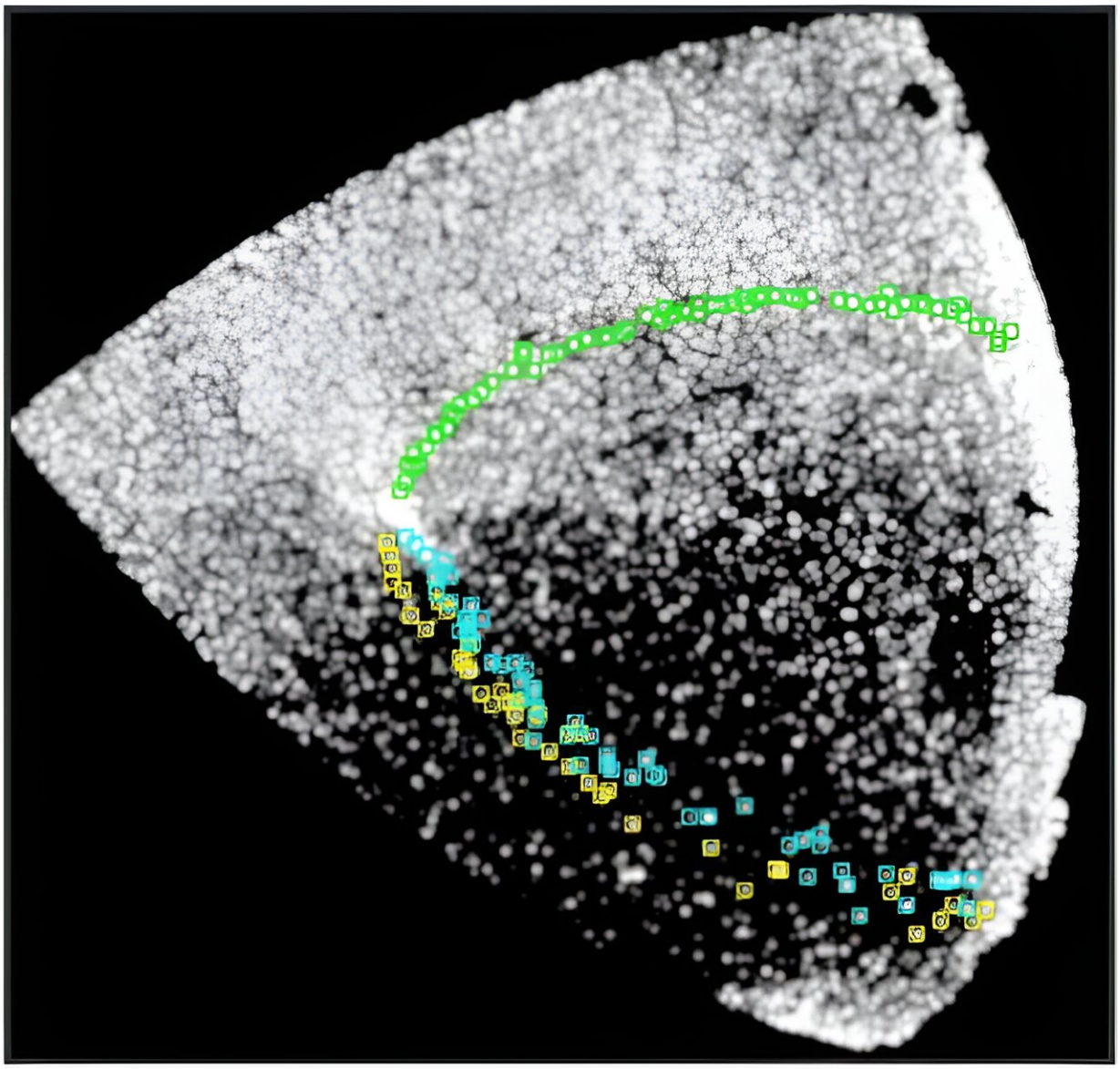

High-probability members of NGC 288's tidal tails. The green points show stars

lying along the trailing tail, the cyan points designate candidate stars in the inner leading tail, and yellow points show stars we assign to the outer leading tail. Credit: Grillmair et al., 2024.

By analyzing the data from various astronomical surveys, astronomers have investigated an old globular cluster known as NGC 288. As a result, they detected multiple extended tidal tails associated with this cluster. The finding was reported in a paper published September 25 on the pre-print server *arXiv*.

Tidal tails are thin, elongated regions of stars and interstellar gas extending into space. They are formed as a result of gravitational interactions between galaxies and star clusters. The observations show that some interacting objects have two distinct tails, while other systems have only one tail.

Detecting and studying tidal tails offers clues on the tides experienced by the cluster and its internal dynamics. Such studies can also reveal essential information about the evolution of a cluster and could shed new light on the lumpiness of dark matter distribution in a galaxy. However, to date, only a handful of clusters with tidal tails have been detected in the Milky Way galaxy.

NGC 288 is a Galactic globular cluster located some 29,200 light years away. It is an old metal-poor cluster with an estimated mass of about 96,000 solar masses and a half-mass radius of approximately 27.9 light years.

Previous observations of NGC 288 have detected its extended envelope and found evidence of tidal streams extending from the cluster. Now, a team of astronomers led by Carl J. Grillmair of the California Institute

of Technology (Caltech), reports that these tidal streams are more complex than previously thought.

The observations conducted by Grillmair's team identified a clear surplus of stars extending at least 40 degrees north of NGC 288, along the 300 degrees meridian, and possibly up to about 80 degrees from the cluster, where it becomes overwhelmed by the Galactic disk. This feature, which was named the leading tail, appears to be composed of two or more spatially offset and kinematically distinct stellar streams that are less than about 650 light years in width each.

Furthermore, the astronomers found a 35 to 70 degrees-long trailing tail extending to the upper right of the cluster. This trailing tail turned out to be considerably narrower in the sky than the leading tail. The researchers added that the trailing tail is well matched in position by a stream model incorporating a massive infalling Large Magellanic Cloud (LMC)—the Milky Way's satellite galaxy.

According to the paper, the membership of the stars in these tidal streams to NGC 288 still needs further confirmation, which should be done with follow-up radial velocity measurements.

"If even a few of the most outlying candidates can be confirmed as having once belonged to NGC 288, this stream will become another particularly sensitive probe of the shape of the inner halo potential and an important contributor to our understanding of the influence of the LMC and other components of the galaxy," the scientists concluded.

More information: Carl J. Grillmair, The Multiple Extended Tidal Tails of NGC 288, *arXiv* (2024). DOI: 10.48550/arxiv.2409.17361