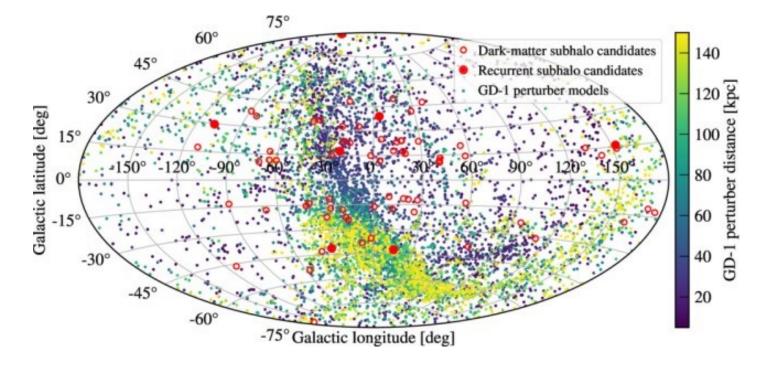# Searching For Dark Matter Clumps in the Milky Way's Halo

Dark matter is a mysterious form of matter which makes up the majority of mass in our universe but does not give off light of any kind. Large galaxies like the Milky Way have extended "halos" of dark matter that can be observed by the way the gravity of this matter distorts light. When we run computer simulations of how dark matter in the Milky Way's halo should behave, they suggest that there should be thousands of smaller clumps called "subhalos." How can we directly observe whether this is true?

We searched for potential subhalos using two methods:

1) Gamma rays: we used a Machine Learning program to search through Fermi data, looking for bursts of particles that may come from dark matter collisions. This resulted in 73 objects compatible with possible dark matter signatures.

2) Gaps in stellar streams around our galaxy: when smaller galaxies are pulled apart by the Milky Way's gravity, they create "streams" of stars, all moving together. Gaps in these rivers of stars might be caused by past encounters with subhalos. Data from the Gaia mission revealed stellar stream GD-1 may have been disturbed by a subhalo between 1 million and 100 million times the Sun's mass.

These observations will enable us to learn more about how dark matter behaves in the halos of galaxies, and whether it exists in small clumps. So little is known about dark matter right now, any new information about it will help us better understand how galaxies form and change over time.