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Dark matter in the Milky Way: from SgrA * to the entire halo

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Relaxation mechanisms of collisionless self-gravitating systems of fermions in cosmology, can lead to spherical equilibrium states which are stable, long-lived, and able to explain the dark matter (DM) halos in galaxies. The most general fermionic DM profile out of such a mechanism, develops a degenerate compact core which is surrounded by an extended halo. When applied to the Milky Way, it is demonstrated that while the outer halo can explain the rotation curve of the Galaxy, the central DM-core explain the dynamics of all the best resolved S-cluster stars orbiting SgrA *, without the need of assuming a central black hole (BH). Interestingly, for the same DM particle mass used to explain the Galactic halo, the critical mass for gravitational collapse of a degenerate fermion DM core into a BH is 10^8 Mo. This result may provide ~ the initial seed for the formation of supermassive BH in active galaxies, leading to a paradigm shift in the understanding of galactic cores.

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