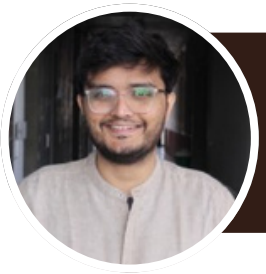
SELF-INTERACTIONS OF ULDM TO THE RESCUE?

SEMINAR

The fundamental physical properties of Dark Matter (DM) e.g. particle mass, spin, couplings, etc. still remain a mystery. If DM particles are spinless and ultra-light $(m \sim 10^{-22}\ \mathrm{eV})$, what are the observational constraints on its properties like mass and in particular, self-couplings? In this talk we attempt to answer this question by considering the following scenarios: (a) Using observational upper limits on the amount of mass contained within some region around the galactic centre, one can impose constraints in the $\lambda - m$ plane, where allowed self-couplings can be as small as $\lambda \sim \pm 10^{-96}$, (b) requiring that observed galactic rotation curves of dwarf galaxies as well as an empirical soliton-halo relation have to be simultaneously satisfied allows one to probe self-couplings as small as $\lambda \sim \mathcal{O}(10^{-90})$, and (c) survival of dwarf satellite galaxies orbiting in the potential of larger halos on cosmological timescales can be used to probe both attractive and repulsive self-couplings as small as $\lambda \sim \pm 10^{-92}$.

Towards the end of the talk, we shall also discuss how machine learning models like neural networks could be used to learn DM parameters (in particular ULDM mass *m*) from galactic rotation curves.



Bihag Dave
Ahmedabad University

TUESDAY, JULY 09, 2024

03:00 PM

PAMU SEMINAR ROOM

Everyone is invited to attend