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Binary Neutron Star populations in the Milky Way

Binary neutron star (BNS) systems play a central role in many areas of modern astrophysics. Thanks to high precision of timing measurements of pulsars, BNSs can be considered as cosmic laboratories for gravitational physics. Furthermore, their mergers can be loud sources of gravitational waves, the observation of the electromagnetic counterpart of GW170817 paved the way for new frontiers in multimessenger astrophysics. From the theoretical point of view, there are still many open questions associated to BNSs. What are the processes that most affect the evolution of a BNS? What are the birth spins and magnetic fields of neutron stars and how do they evolve?
In my work, I carried out a detailed analysis of the properties of the BNS population in the Milky Way through an innovative computational approach. I combined cosmological simulation suites, EAGLE and IllustrisTNG, with the state-of-the-art binary-population synthesis code SEVN. I implemented in SEVN detailed prescriptions for the evolution of spins and magnetic fields of neutron stars and I studied the resulting population of BNSs for various common envelope efficiencies and magnetic field decay timescales. After accounting for radio survey selection effects, I compared the results of my simulations with the observed population of Galactic BNSs. I found a best-fit model that agrees with both the radio population of pulsars and the current BNSs merger rate.
In this talk, I present preliminary results on the best-fit model and I discuss the parameters that most affect my results. Finally, I discuss the implications of my results for the forthcoming generation of radio telescopes and gravitational-wave detectors.

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