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Binary neutron star populations in the Milky Way

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Binary neutron stars (BNSs) wield a pivotal role in modern astrophysics. Merging BNSs not only can be loud sources of gravitational waves, but also trigger short gamma-ray bursts and kilonovae. A great example of such event is the renowned GW170817; the observation of its electromagnetic counterpart paved the way for new frontiers in multimessenger astrophysics.
Moreover, thanks to the timing precision of pulsars, BNSs are unique laboratories to probe gravitational physics. From the theoretical point of view, many open questions persist: what are the processes that most affect the evolution of a BNS, eventually leading to its merger? What are the birth spins and magnetic fields of neutron stars and how do they evolve?
In this talk, I will try to answer some of these questions through a new detailed analysis of the properties and evolution of BNSs. I combined cosmological simulations with the state-of-the-art population-synthesis code SEVN and explored the impact of binary star evolution prescriptions,
such as the common envelope efficiency, the supernova kick model and neutron star spin and magnetic field properties on the population of BNSs. I will also show how my results compare against the Galactic pulsar population.
Finally, I will discuss the implications of my results for the next-generation gravitational wave detectors and radio observatories.

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