Gravitational waves as a probe to resolve dichotomy in compact objects

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Abstract:
Over the past few decades, various direct or indirect observations have revealed some intriguing celestial objects, including super-Chandrasekhar white dwarfs (WDs), white dwarf pulsars, soft gamma repeaters (SGRs), and anomalous X-ray pulsars (AXPs). Observations of over-luminous type Ia supernovae predicted more than a dozen super-Chandrasekhar WDs (WDs that exceed the Chandrasekhar mass-limit of 1.4 solar mass). SGRs, on the other hand, were discovered via bursts in hard X-rays or soft gamma-rays, while AXPs were discovered via soft X-rays. Most of these objects are confirmed to be highly magnetized neutron stars (NSs) due to their supernova remnant associations. However, certain SGRs and AXPs do not appear to be associated with any supernova remnants. As a result, many researchers argue that these can also be WDs. Similarly, none of the super-Chandrasekhar WDs have been observed directly so far. Furthermore, the masses of some WD pulsars are still unknown, and current electromagnetic observations can at best put a bound on their masses. In my talk, I'll illustrate how gravitational wave (GW) observations can resolve all of these dichotomies. If these objects rotate with a specific orientation, they can emit gravitational radiation continuously for a long time. I'll further show that various proposed GW detectors, such as LISA, TianQin, BBO, DECIGO, and others, can detect such objects in the future with a high signal-to-noise ratio and thereby remove the shortcomings.

References:

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