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A new approach to core-collapse supernovae gravitational wave asteroseismology

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Core-collapse supernovae are among the most promising future gravitational wave (GW) sources. GW emission is mainly due to the excitation of oscillation modes of the proto-neutron star (PNS) and the stalled accretion shock. Those oscillations will allow in future GW observations to perform asteroseismology to infer properties of the PNS. These oscillations can be represented by a system of equations that can be solved as an eigenvalue problem. Using Physics Informed Neural Networks (PINNs) we introduce a machine learning technique to solve this problem. The advantage of the PINNs over standard methods is that it simplifies the implementation of differential equations and complex boundary conditions. These features of PINNs will allow us to lift some approximations made in previous studies and obtain a more realistic system.

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