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Neural Networks for solving fundamental Differential Equations of Physical Significance with focus on the Dirac Equation

In this work we discuss a Neural Networks scheme falling in the category of the Physics Informed Neural Networks (PINN), that has recently aroused the intense interest among the researchers. After discussing the state of the art of the topic we focus on some important applications that are connected to the fundamental Differential Equations of Physical Significance (such as the Schrödinger, the Dirac etc. equations).
As a concrete application, we utilize the aforementioned computational tool to obtain accurate wave functions and energies of some leptonic atomic systems such as the Muonium, the Positronium etc. by solving numerically these differential equations. Such wave functions describe the energy spectra of the leptonic atoms. The developed algorithms, in Python, read as input the parameters of the quantum system in question and may provide predictions for a set structure and evolution properties.

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