DNN application for hydrodynamic task solution

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The possibility of GPU usage combined with the substitution of numerical computations with the trained neural network for both relativistic and non-relativistic hydrodynamic equations yields the 104 - 106 performance boost compared to the standard numerical methods. The main idea behind the work starts from the fact that neural network is the so-called perceptron on the universal type. The deep sense behind this definition is that actually a neural network with one hidden layer can become the mapping of any type for smooth differentiable continuous functions. The trained Neural Network can as well perform the role of the time-dependent solution of the hydro-equations performing the regression and classification tasks for various types of hydro – solutions. The results of DNN application to the non-relativistic hydro problem are demonstrated for 1D and 2D cases. Further 3D generalization options and problems are discussed.

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