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SimNet: A neural network solver for multi-Physics applications OLIVER HENNIGH, KAUSTUBH TANGSALI, AKSHAY SUBRAMANIAM, SUSHEELA NARASIMHAN, MOHAMMAD NABIAN, JOSE DEL AGUILA FERRANDIS, SANJAY CHOUDHRY, Nvidia — There is an ever-growing body of work using neural networks to solve partial differential equations (PDEs) often referred to as Physics Informed Neural Networks (PINNs). By virtue of inherent data parallelism and use of point clouds, neural networks eliminate time consuming tasks like domain decomposition for parallelization or meshing for domain discretization in numerical solvers. In addition, neural network solvers can solve parameterized problems and offer a powerful tool that can evaluate multiple designs simultaneously thereby facilitating a faster design cycle. Despite the considerable interest in this field there has been little success in solving complex problems beyond simple benchmarks. SimNet improves on existing work to handle real world engineering problems while taking maximal advantage of GPU computing. In this work we present new neural network architectures and training methodologies that allow for solving multi-physics problems with complex geometries. In particular, we present the solution of conjugate heat transfer problems for heat sinks used to cool the next generation of DGX servers.

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