1154-37-581 **Lu Lu*** (lu_lu_1@brown.edu), Providence, RI 02906, and **P Jin**, **Y Su** and **George Karniadakis**. *OpNet: Learning nonlinear operators for identifying differential equations.* Preliminary report.

It is well-known that neural networks can be used to approximated any continuous function to arbitrary accuracy. Another approximation result, which is yet more surprising but has not been appreciated enough, states that a neural network with one hidden layer can approximate accurately any nonlinear continuous operator. This approximation theorem indicates the potential application of neural networks to learn nonlinear operators from data. However, it only guarantee the small approximation error for the sufficient large network, and does not consider the optimization error and generalization error. To realize this theorem in practice, we propose operator networks (OpNets) to learn operators accurately and efficiently. OpNet significantly improves generalization by constructing two sub-networks. We test the performance of OpNet on identifying two types of operators, including dynamic systems (in the form of ordinary differential equations) and partial differential equations. (Received September 07, 2019)