Model Order Reduction for State-Space Neural Networks

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Deep Learning methods and, in particular, neural networks have revolutionized computational science during last years. Due to the strong approximation abilities they allow efficient modeling of highly nonlinear systems in science and engineering. At the same time, the best results are usually achieved by overparametrized neural networks, meaning that successful deep learning models are memory and computationally greedy.

Many attempts have been made to reduce size of neural networks. Recently, a novel, highly efficient architecture based on the state-space model has been introduced [1, 2] to tackle this problem. In particular it is shown that linear state-space model can be used as a building block for a neural network. Moreover, with an efficient initialization scheme, state space neural networks are shown to perform better than convolutional and recurrent neural networks.

In addition to state space neural networks being more memory efficient than standard neural networks architectures, it is also possible to apply model order reduction methods to further decrease memory and computational costs. In this contribution, I introduce projection-based MOR method for state space neural networks.

REFERENCES

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