1148-15-297 **Ryan A. Robinett*** (rrobinet@mit.edu), MIT Lincoln Laboratory Beaver Works Center, 300 Technology Square, Cambridge, MA 02139, and **Jeremy Kepner** (kepner@ll.mit.edu), MIT Lincoln Laboratory Beaver Works Center, 300 Technology Square, Cambridge, MA 02139.

RadiX-Net: Structured Sparse Matrices for Deep Neural Networks.

The sizes of deep neural networks (DNNs) are rapidly outgrowing the capacity of hardware to store and train them. Research over the past few decades has explored the prospect of sparsifying DNNs before, during, and after training by pruning edges from the underlying topology. The resulting neural network is known as a sparse neural network. More recent work has demonstrated the remarkable result that certain sparse DNNs can train to the same precision as dense DNNs at lower runtime and storage cost. An intriguing class of these sparse DNNs is the X-Nets, which are initialized and trained upon a sparse topology with neither reference to a parent dense DNN nor subsequent pruning. We present an algorithm that deterministically generates RadiX-Nets: sparse DNN topologies that, as a whole, are much more diverse than X-Net topologies, while preserving X-Nets' desired characteristics. We further present a functional-analytic conjecture based on the longstanding observation that sparse neural network topologies can attain the same expressive power as dense counterparts. (Received February 04, 2019)