Introduction and Basic Notions about Neural Networks We seek here to introduce a unified framework for artificial neural networks. This framework borrows from the work presented in grohsetal, and work done by Joshua Padgett, Benno Kuckuk, and Arnulf Jentzen (unpublished). With this framework in place we wish to study ANNs from a perspective of trying to see the number of parameters required to define a neural network to solve certain PDEs. The curse of dimensionality here refers to the number of parameters required to model PDEs and their growth (exponential or otherwise) as dimensions d increase. The Basic Definition of ANNs

definition[Hadamard Product] Let $m, n \in$. Let $A, B \in^{m \times n}$. We define the Hadamard product $\odot :^{m \times n} \times^{m \times n} \to^{m \times n}$ as: align A $\odot B A \odot B_{i,j} = A_{i,j} \times B_{i,j} \quad \forall i, j$