1096-68-1973 **Diana Thomson La Corte*** (thomsond@uwm.edu), Department of Mathematical Sciences, EMS Building, Room E403, 3200 N Cramer Street, Milwaukee, WI 53211-3029. *The Newton's Method Backpropagation Algorithm for Holomorphic Complex-Valued Neural Networks.*

Complex-valued neural networks (CVNNs) offer distinct advantages over their real-valued counterparts in modeling real-world data. However, CVNNs pose unique problems. Real-valued activation functions for real-valued neural networks are commonly taken to be everywhere differentiable and bounded, but their complex counterparts cannot possess both desired properties at the same time. In particular, the complex-valued extensions possess poles in a bounded region near zero. We propose to use holomorphic functions as activation functions. In particular, we focus on entire functions, which do not possess poles and are bounded on bounded regions. Our approach allows us to develop the backpropagation algorithm for CVNNs using Newton's method and an adaptive algorithm to determine the learning rates and underrelaxation factors for the algorithm, which guarantees convergence to a local minimum and nonsingularity of the Hessian matrices at the iteration steps. We test the proposed algorithm on a typical classification problem to show the advantage of our approach. (Received September 16, 2013)