1172-35-9 **Loc H. Nguyen***, 9201 University City Blvd, Charlotte, NC 28332. *The gradient descent method for the convexification to solve boundary value problems of quasi-linear PDEs and a coefficient inverse problem.*

We study the global convergence of the gradient descent method of the minimization of strictly convex functionals on an open and bounded set of a Hilbert space. Such results are unknown for this type of sets, unlike the case of the entire Hilbert space. The proof of this convergence is based on the classical contraction principle. Then, we use our result to establish a general framework to numerically solve boundary value problems for quasi-linear partial differential equations (PDEs) with noisy Cauchy data. The procedure involves the use of Carleman weight functions to convexify a cost functional arising from the given boundary value problem and thus to ensure the convergence of the gradient descent method above. We prove the global convergence of the method as the noise tends to 0. The convergence rate is Lipschitz. Next, we apply this method to solve a highly nonlinear and severely ill-posed coefficient inverse problem, which is the so-called back scattering inverse problem. This problem has many real-world applications. Numerical examples are presented. (Received July 09, 2021)