**NHU NGUYEN**, University of Rhode Island
*Stochastic Approximation and Applications*

This work develops new results for stochastic approximation algorithms. The emphases are on treating algorithms and limits with discontinuities. The main ingredients include the use of differential inclusions, set-valued analysis, and non-smooth analysis, and stochastic differential inclusions. Under broad conditions, it is shown that a suitably scaled sequence of the iterates has a differential inclusion limit. In addition, it is shown for the first time that a centered and scaled sequence of the iterates converges weakly to a stochastic differential inclusion limit. The results are then used to treat several application examples including Markov decision process, Lasso algorithms, Pegasos algorithms, support vector machine classification, and learning. Some numerical demonstrations are also provided.