



THE UNIVERSITY OF  
CHICAGO

Department of Statistics

MASTER'S THESIS PRESENTATION

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How far is a gradient-based optimization algorithm from global convergence?

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ABSTRACT

Inspired by Perturbed Gradient Descent, we construct a new algorithm by adding a continuous random term into standard gradient descent algorithm in every step, named Modified Perturbed Gradient Descent (m-PGD). We construct an equivalent Simulated Annealing (SA) algorithm for m-PGD, proving that m-PGD is equivalent to SA just considering trajectories of the two algorithms. Then we use global convergence results of SA to prove m-PGD is globally convergent under some conditions. Moreover, we find many gradient-based stochastic optimization algorithms can be written as SA, like SGD. By adding some conditions and doing similar modification as m-PGD, we can have global convergence results for Perturbed-SGD. Therefore, if adding a continuous perturbed term, we can have global convergence results for many gradient-based algorithms under some conditions.