

# Stochastic Gradient Descent Convergence: Exploring Variants and Their Convergence Rates

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## 1 Description

The proposed honors thesis research will focus on investigating various variants of stochastic gradient descent (SGD) and their convergence rates. Stochastic gradient descent is a widely used optimization algorithm in machine learning that involves randomly selecting a subset of training examples to compute the gradient and update the model parameters. However, the convergence rate of SGD can be slow, especially for large-scale problems.

The research will explore different variants of SGD such as momentum-based methods, adaptive learning rate techniques, and variance-reducing methods. The main objective will be to analyze and compare the convergence rates of these variants with standard SGD. The research will involve both theoretical analysis and experimental evaluation.

The expected outcome of this research is to provide a comprehensive understanding of the performance of various SGD variants and their convergence rates. The research will contribute to the development of more efficient and effective optimization algorithms for machine learning applications.